AN EVALUATION OF THE EDUCATIONAL IMPACT OF GYNAECOLOGICAL TEACHING ASSOCIATES IN TEACHING FEMALE PELVIC EXAMINATION

BY

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ABSTRACT

Gynaecology Teaching Associates (GTAs) are lay women trained to undergo and teach gynaecological examination giving immediate feedback to medical students. However, there are only limited data evaluating the acceptability, effectiveness and economic viability of this teaching innovation. This thesis appraises the educational impact of GTA-led teaching of female pelvic examination.

An online survey showed that GTAs were used by under a third of UK medical schools. A study was conducted to establish validity and reliability of a newly developed pelvic examination assessment tool by comparing the performance of novice and experienced students and junior doctors in obstetrics and gynaecology (O&G). This study did not establish adequate psychometric properties so the tool will need further refinement. A large single blinded randomised controlled trial demonstrated an improvement in competence and confidence of medical students taught by GTAs compared with pelvic manikins at the start of their O&G placement. A parallel economic analysis showed that GTA teaching was considered cost-effective, with an investment of £640.20 needed to acquire an additionally competent student and £274.37 per student competent at merit and distinction levels. A qualitative study using semi-structured interviews found that GTA-led teaching was acceptable and considered a positive experience by stakeholders.

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LIST OF ABBREVIATIONS

BWH	Birmingham Women's Hospital
CEAC	Cost Effectiveness Acceptability Curve
CEAT	Cost Effective Analysis of Teaching pelvic examination skills using Gynaecology Teaching Associates (GTAs) compared with manikin models
COTES	Cross Sectional Study on Teaching Pelvic Examination in Medical Schools in the UK
CPs	Clinical Patients
DOPS	Directly Observed Procedural Skills
DRE	Digital Rectal Examination
EASTT	The Experience and Acceptability of Students, Teaching faculty and gynaecology Teaching associates (GTAs) of the pelvic examination teaching programme
GTA	Gynaecological Teaching Associates
HFS	High Fidelity Simulation
ICERs	Incremental Cost Effective Ratios
IEA	Intimate Examination Associates
LFS	Low Fidelity Simulation
Mini-CEX	Mini-Clinical Evaluation Exercise
MSF	Multi Source Feedback
NHSEED	National Health Service Economic Evaluation Database
NICE	National Institute of Clinical Excellence
O&G	Obstetrics and Gynaecology

OSATS	Observed Structured Assessment Tools
OSCE	Observed Structured Clinical Examination
PEAT	Pelvic Examination Assessment Tool
PETAs	Physical Exam Teaching Associates
QALYs	Quality Adjusted Life Years
RCOG	Royal College of Obstetricians and Gynaecologists
RCT	Randomised Controlled Trial
SAT	Senior Academy Tutors
SP	Standardised Patients
SpR	Specialty Registrar
TARGET	Teaching Associates Randomised to evaluate the effectiveness of Gynaecological pelvic Examination versus Traditional teaching using manikins
UoB CMDS	University of Birmingham College of Medical and Dental Sciences
UTA	Urological Teaching Associate

CHAPTER 1: INTRODUCTION AND OBJECTIVES

INTRODUCTION

This thesis will appraise the educational impact of the involvement of Gynaecology Teaching Associates in teaching medical students female pelvic examination skills.

Gynaecological examination

Gynaecological examination refers to a physical examination of the female pelvis in order to assess for abnormalities affecting the lower and upper genital tracts. It comprises of a standard initial abdominal examination. This is then followed by a visual inspection of the lower genital tract i.e. the vulva, perineum and vagina which may require separation of the labia for completion, and palpation of any identified anomalies. A speculum, a specifically designed instrument for exploring body cavities, is then used to separate the vaginal walls to allow visualisation of the intra-vaginal portion of the cervix, a cylindrical anatomic structure situated at the top of the vagina. The cervix is the lowest part of the uterus and connects the lower and upper genital tracts, the latter comprising of the uterus, fallopian tubes and ovaries. Finally bimanual palpation of the pelvis is performed which involves inserting one or two fingers into the vagina and the other hand onto the lower anterior abdominal wall above the mons pubis. The vaginal fingers palpate the cervix and vaginal fornices in a systematic fashion whilst the abdominal hand provides simultaneous gentle counter pressure, thus allowing upper genital tract structures and abnormalities to be felt.

Examination of the female pelvis is an intimate examination and a chaperone is made available regardless of the gender of the practitioner (RCOG, 2017). As with other areas of medicine, a relevant clinical history should be taken before deciding on the need for a subsequent physical examination. The rationale and process of the procedure should be explained prior to undertaking the assessment.

The need for competency in pelvic examination

A proficient and thorough examination of the female genital tract is necessary to diagnose much pathology that affects the female reproductive system. These include ulcers, cysts, inflammation and skin disorders affecting the vulva and vagina. Detectable cervical pathologies include infective discharge and structural abnormalities like polyps, cancerous growths, ulcers and congenital abnormalities. Upper genital tract abnormalities include unscheduled bleeding, passage of products of conception during an inevitable miscarriage, pelvic masses such as fibroids and ovarian cysts. Tenderness elicited within the pelvis can suggest acute problems such as ectopic pregnancies, pelvic inflammatory disease and ovarian cysts while fixity of the pelvic organs suggests adhesions resulting from endometriosis, old infection or previous surgery. Furthermore, an ability to perform gynaecological examinations is required to facilitate common outpatient diagnostic tests such as taking genital tract swabs, cervical smears, cervical or endometrial biopsies or undertaking procedures such as hysteroscopy. Many gynaecological therapeutic interventions require access to the upper genital tracts which can be simple outpatient procedures such as fitting and removing contraceptive coils or more advanced intrauterine surgery. Women may also require pelvic assessments during pregnancy.

Thus, it can be appreciated that gynaecological examination is integral to women's health care. Competence in this skill is important for satisfying the basic requirements of the O&G curricula, as well identifying abnormal findings in A&E and General Practice. Most assessments will be performed in primary care by GPs, specialist nurses and community sexual and reproductive health physicians. However, acute presentations such as early pregnancy complications (vaginal haemorrhage from miscarriage, acute pain from pelvic infection or internal bleeding from ruptured ectopic pregnancies) mandate competency in Accident & Emergency doctors. Other secondary care health care professionals may also benefit from the craft skill as gynaecological conditions are highly prevalent and may co-exist with other medical problems.

Competency in physical examination of all body systems requires not only acquisition of appropriate technical skills but also good communication skills which are of fundamental importance. One can argue that for intimate examinations such as examination of the female pelvis this latter skill is even more essential, given the nature of the procedure. Practitioners need to establish a good rapport with the patient by explaining clearly and sensitively what the process entails and why it needs to be done; thereby obtaining the trust of their patient. In this way a probably nervous and embarrassed patient can feel more at ease when experiencing a sensitive intervention. By minimising the apprehension around intimate examination (Williams and Williams, 2013), women are likely to present promptly in the future with their gynaecological complaints and comply with national screening programmes, thereby optimising their reproductive health throughout the course of their lives.

Teaching pelvic examination

The current provision of teaching gynaecological examination across UK medical schools is unclear but traditional teaching has involved obtaining experience under supervision in clinical placements. These are usually in obstetrics and gynaecology (O&G) but may also be supplemented during sexual health and primary care clinical attachments. During O&G placements supervised practice is normally accessed both on conscious women in outpatient clinics or anaesthetised women in operating theatres after obtaining prior consent. It is likely that multi-faceted approaches are adopted by most medical schools to a varying degree to include theoretical teaching of pelvic anatomy and simulation to practice technical and / or communication skills.

Simulation

Simulation in teaching pelvic examination refers to imitating, to a varying degree, the real-life clinical examination process to achieve educational goals through experiential learning. Pelvic examination skills can be acquired through deliberate practice as an alternative, or more commonly to supplement (i.e. shortening the learning curve for attaining competence in pelvic examination skills) the apprentice style of learning during clinical placements. A student can make mistakes and learn from them without the fear of harming the patient. The ability to make mistakes and learn from them without consequences is potentially important from a patient safety and medical litigation perspective (Brindley and Dunn, 2009).

Simulation technologies therefore serve as an alternative to real patients. (Ziv et al., 2003) The closer simulators resemble reality the higher their 'fidelity'. In teaching pelvic examination, low-fidelity simulators (LFS) are cheap and widely available and usually consist of an inanimate plastic pelvic model or 'manikin'. They are primarily usually used to teach complete novices the fundamental basic technical skills and processes. Higher fidelity simulators (HFS) are more sophisticated (and expensive) and usually utilise computer technology to allow the manikins (alt. mannequin) to produce physical signs and may be linked to physiological monitors. Hybrid systems can be developed to be used in teaching or as part of formal evaluation. LFS pelvic manikins are used in conjunction with a human role player to mimic more realistically a clinical scenario and allow an assessment of communication skills.

Access to teaching in pelvic examination

It is well recognised that the intimate nature of the examination poses additional challenges to medical students, particularly male students, and their teachers in gaining consent for supervised training (Powell et al., 2006). Other factors creating a challenge for pelvic examination teaching include shorter O&G curricula placements, time pressures in outpatient clinics and operating theatres, clinical commitments of faculty members reserved to teach medical students, and lack of confidence and competence of teaching faculty in their own skill of clinical education (Broadmore et al., 2009). Empowerment of patients combined with changes in their expectations of interactions with medical professionals may have further restricted access to clinical cases. Changes in attitudes to teaching gynaecological examination may not be restricted to patients; medical educationalists may

also have become more conservative or less experienced such that they find teaching vaginal examination an increasing challenge (Broadmore et al., 2009). Thus, it appears that the experience of undergraduates to female pelvic examination is becoming increasingly limited such that medical students at the University of Birmingham College of Medical and Dental Sciences (UoB CMDS) have qualified without ever performing a vaginal examination in an outpatient setting (Iyengar et al., 2012).

Whatever the reasons underlying the diminishing exposure of medical students to gynaecological examination are, the current status quo is unacceptable. Teaching innovations are urgently required to enhance teaching of a skill which is fundamental to both gynaecological and emergency care, as well as general medical practice. A strategy becoming increasingly popular is the use of "gynaecological teaching associates" (GTAs). (Kretzschmar, 1978; Kretzschmar and Guthrie, 1984) These women are 'expert patients' who have been trained to undergo and teach gynaecological examination, giving valuable and immediate feedback to the students.

Expert patients in other specialities

Expert patients are used within some medical specialties such as medicine, surgery and orthopaedics. These patients have good clinical signs that can be easily demonstrated and help not only with recognition of signs, but also with examination practice. A variety of terms are used for expert patients across and within medical disciplines e.g. standardised patients, professional patients, simulated patients, patient educators, examination associates etc. For

the purpose of this thesis the term expert patient will be used and when referring to expert patients in gynaecology, the term gynaecological teaching associate (GTA) will be used.

Oswald et al. (2008) reported a programme called Patient Partners in Arthritis, within the Canadian undergraduate medical programs that provided "highly motivated, trained patient volunteers who facilitate an increase in the understanding of all aspects of arthritis which was accomplished through small group sessions led by a trained patient. This was not limited to technical instruction in a musculoskeletal (bone and joint) examination but also explored the reality of living with the disease.

A study in Canada across all 14 English speaking medical schools on the teaching of digital rectal examination (DRE) found that "69% of schools used anatomical rectal models, 62% used video tutorials and 62% involve physician instruction" (Nensi & Chande, 2012). Siebeck et al. (2011) compared LFS using a manikin versus HFS using standardised patients (SPs) for DREs. They found that use of SPs reduced the students' self-rated inhibition significantly more as compared to using a manikin although both methods helped with knowledge acquisition. A study conducted by Fairbank (2011) used Urological Teaching Associates for training in technique and communication skills of hernia, genital and rectal examinations. There was a statistically significant increase in confidence in performing examinations on real patients after teaching with the urological teaching associates. Without the option of employing teaching associates, and utilising only manikins for teaching, medical students report a low level of confidence in performing intimate examinations, whether pelvic or DRE. (Fairbank, 2011)

Expert patients in gynaecology - Gynaecological Teaching Associates (GTAs)

Due to the intimate nature of pelvic examination, expert patients in O&G or Gynaecological Teaching Associates (GTAs) as they are more generally referred to are not readily available. Genital tract examination poses additional challenges compared to say expert patients used in musculo-skeletal examinations. Comfort and dignity need to be ensured especially in a situation where repetitive examinations by medical students may be necessary.

Effectiveness

GTA are trained to teach both physical and communication skills required for a competent pelvic examination. These women are usually from non-medical backgrounds and are recruited and trained by the faculty at teaching hospitals or centrally by a University Medical School. They tend to work in pairs during the O&G medical student placements, to teach the latter how to competently perform pelvic examination. GTAs have been around in the USA from the 1970's. An early article evaluating the potential strengths of GTA-led teaching of gynaecological examination refers to qualities such as "sensitivity" as a woman and the ability to impart interpersonal skills to help medical students learning in a nonthreatening environment" (Kretzschmar, 1978). Others found that GTA interactions with students were more instructive and authentic, being more helpful in imparting communication skills and boosting student confidence (Bokken et al., 2009).

One of the main concerns with teaching pelvic examinations is the anxiety that medical students endure, especially during outpatient clinics on real patients. A study conducted by Seago et al. (2012) provided an outcome on a 'Fear of Pelvic Examination Scale (F-PEXS)'

when students were randomised to a pelvic simulator or a GTA. Students who learnt with a GTA demonstrated statistically significant decreases in F-PEXS scores. Students have reported perceiving their first pelvic examination on a GTA as "transcending unspoken boundaries and taboos, a prerequisite for learning" where "interactive support enables creative learning of interpersonal and palpation skills" (Siwe; Wijma et al., 2007).

GTAs have not just been used to teach medical students but also postgraduates and other health professionals. As well as teaching, some faculties may involve GTAs in informal and formal medical student assessment. They have been used within the military to facilitate Objective Structured Clinical Examination (OSCE) scenarios for pelvic examination, and have been shown to provide a successful assessment of students' clinical skills (Hines et al., 1999). In North America, GTAs are quite commonly used in the medical curriculum and they have also been used in Canada, Australia and Scandinavia. In the UK, GTAs are not established within undergraduate curricula with pelvic examination still mainly taught through simulation on pelvic models (manikins) combined with experience gained from supervised teaching on women attending outpatient clinics and those anaesthetised for surgery within clinical attachments.

In 2011 at the Birmingham Women's Hospital (BWH), a UK University Hospital affiliated to the University of Birmingham College of Medical and Dental Sciences (UoB CMDS), we instituted a GTA teaching programme. This practice has been incorporated into the O&G curriculum since 2011. Final year medical students from the UoB CMDS allocated clinical placements in O&G at the BWH undergo GTA teaching within the first week of their five

week attachment. To date, in keeping with other Universities with GTA programmes experience, such as Oxford University and Kings College, London (Pickard et al., 2003), our students have generally given universally positive feedback (Clark TJ, Personal Communication) on routine post-placement student feedback questionnaires. Abraham (1995) found that out of 232 medical students who received pelvic examination, those who were trained with GTA reported their practical experience as being "significantly better" compared with supervised examination of patients in outpatient clinic. Another study in Antwerp used healthy trained volunteers, called 'Intimate Examination Associates' (IEAs), to teach uro-genital, rectal, gynaecological and breast examination to medical students (Hendrickx et al., 2009). Scores for 'completeness' and 'systematic' approach in examination were significantly higher in the groups taught with the intimate examination associates, and students reported better self-assessed competence and communication skills during their foundation year placements in gynaecology.

Smith et al. (2015) published a systematic quantitative review of the effectiveness of GTA teaching of female pelvic examination. Looking through several electronic bibliographic databases and the Cochrane Library as well as The International Standard Randomised Controlled Trial Number (ISRCTN) Register of Clinical Trials, they identified 11 studies (five RCTs and six observational studies) including 856 participants. GTA teaching was found to improve competence compared with other teaching methods. Communication skills were also improved with GTA teaching, but to a lesser degree, whereas no effect on student confidence was observed. Thus, we concluded that GTA-based teaching of pelvic examination is associated with improvement in the competence and communication skills of

trainees. However, given the observed clinical and statistical heterogeneity, the strength of our inferences was relatively weak. Thus, a pressing need for larger-scale studies incorporating standardised educational outcomes was identified to confirm these findings (Smith et al., 2015).

Experimental, observational and qualitative evidence in conjunction with anecdotal data from students regarding the value of GTA teaching of gynaecological examination appears to be supportive; but whether the GTA programmes in their particular design are successful and cost-effective in delivering key educational outcomes remains unclear such that GTAs do not appear to be universally adopted by medical schools. The published data available are generally descriptive studies of the process and institution of GTA programmes into the undergraduate medical curriculum (Wånggren, Fianu Jonassen et al., 2010; Wånggren, Pettersson et al., 2010; Robertson et al., 2003; Beckmann et al., 1986; Beckmann et al., 1988; Plauché and Baugniet-Nebrija, 1985). Studies addressing student competence and confidence are limited to small, observational series. One non-randomised controlled study from the UK demonstrated that students who had been trained with GTA's were significantly better than those who had been trained with manikins alone (Pickard et al., 2003). However, in this study the GTA training was supplementary to the normal curriculum so the amount of teaching rather than the style of teaching may have acted as a confounding factor. Moreover, a valid assessment tool was not used to assess clinical performance.

Cost-effectiveness

Evaluating the educational benefit of GTAs is also important if we are to allocate scarce undergraduate educational resources efficiently. GTAs are paid professionals and introducing this method of teaching has financial implications for Universities. We conducted a systematic literature search to identify economic analyses of GTA-led teaching of gynaecological examination to both undergraduate and postgraduate healthcare students. The search included Medline, CINAHL and the Cochrane NHS Economic Evaluation Database (NHSEED). Keywords in the search strategy included medical students, medical education, teaching, costs and cost analysis, cost effectiveness, cost analysis, cost benefit analysis. The search strategy (Appendix 1) obtained 1111 results within Medline, 143 results within CINAHL, and 52 results within NHSEED. Articles with a human population and written or translated into English were selected, and a PICO approach (Table 1) was used to scrutinise the abstracts and obtain 14 relevant articles.

Table 1: PICO strategy for the literature search

	Inclusions	Exclusions
Population	Healthcare students and professionals Undergraduate and Postgraduate	Clinical procedures e.g. central venous lines, catheterisations Communication skills
Intervention	Training in clinical examination Human simulators e.g. Professional Patients (PP) Intimate Examination Assistants (IEA) Gynaecological Teaching Associates (GTA) Expert patients Standardised Patients (SP) Physical Examination Teaching Associate (PETA)	Online teaching (e-learning) Drug interventions e.g. for asthma Reorganisation of medical services Care provision by different health professionals Patient education intervention Public investments Work hour reductions Medication insurance costs
Comparator	Another form of teaching e.g. Low fidelity simulation – plastic arm for venepuncture	
Outcome	Cost effectiveness Economic Analysis	Knowledge Skills Satisfaction Effect in QALYs Hospital profitability Burden of a disease Cost neutral control and intervention – investigating change in competence and confidence

The articles filtered from the literature search emphasised the importance and challenge of having consistent, systematic and cost effective undergraduate education (Sandars, 2011). They also highlighted the importance of proficient clinical skills as an essential learning outcome (Al-Elq, 2010) and the possibility that medical schools may not be adequately preparing doctors for practical elements of becoming a junior doctors including physical examination, with correct investigations, diagnosis and management (Rolfe and Sanson-Fisher, 2002). Several conflicts were noted for a clinician's time for teaching examination skills, including lack of protected teaching time. One of the studies highlighted the lack of

academic recognition for teaching as opposed to clinical care and research (Aamodt et al., 2006).

Beckmann et al. (1992) identified the financial pressures in education such that GTA programmes were cancelled as they were deemed “expendable luxuries”. Pradhan et al. (2010) conducted an RCT which evaluated cost effectiveness analysis, where 106 medical students were randomised to either teaching by GTA alone or a GTA in association with a teaching faculty member. The outcome was based upon an OSCE score, which demonstrated significant cost savings with the use of GTAs to teach pelvic examination skills; the cost of the GTA session was $450, with an additional $424 for GTA-faculty member teaching. However, no formal economic analysis was undertaken such that incremental cost effectiveness ratio (ICER) was not calculated nor cost effective acceptability curves (CEACs) generated.

In other specialties, Aamodt et al. (2006) evaluated the cost effectiveness of using expert patients for the purposed of teaching a variety of physical examination skills to 175 students at the University of Kansas. The comparison was previously existing faculty led teaching. High satisfaction and improvement in examination skills were associated with expert patient led training. The authors confirm a cost saving per organ system of $1,300; however, there was no comparison with satisfaction rates after faculty led teaching sessions.

Allen et al. (2011) conducted a cost effectiveness study with the gradual withdrawal of medical faculty, and subsequent introduction of expert patients at the University of

Minnesota in 2006. This study looked at the head to toe examination skills of medical students, involving multiple organ systems, earlier on in the medical school curriculum. The study showed an improvement in OSCE scores. The initial costs of setting up the programme for expert patients declined over the two years in introductory clinical medicine. An older study by Hasle et al. (1994) highlighted that expert patients reduced the costs of teaching and saved faculty teaching time with a positive perception by the students of the skills learnt, and no detrimental impact on skill acquisition in clinical medicine. Costanza et al. (1999) focused on the use of SPs in teaching counselling and clinical skills to community physicians. Although the counselling skills increased marginally, the clinical skills showed substantial improvement. The authors established that the cost per physician trained was $202. Some studies commented on the low costs, rapid set up and turn around associated with LFS using pelvic manikins but no effectiveness measures were defined (Al-Elq, 2015; Bredmose et al., 2010).

Evaluating the teaching of gynaecological examination to medical students and the role of gynaecological teaching associates

The challenges faced by those in Universities tasked with producing competent foundation level doctors are numerous. Gynaecology remains an important part of medical school curricula and the teaching skills in gynaecological examination should be one component of the gynaecological curricula. If we are to optimise such teaching then an awareness of the current provision of pelvic examination teaching conducted at academic institutions around the UK is needed so that variations in practice can be identified and best practice shared and areas of deficiency recognised. Assessing and standardising competence in pelvic

examination may also be hindered by the lack of a universally used valid assessment tool that allows evaluation of pelvic examination skills in an educational setting but also within research designed to develop new, more effective teaching interventions and strategies. One such strategy as outlined above is the use of GTAs but their educational value has not been thoroughly assessed. Current published studies are generally small and the generalisability of their findings are often limited due to the heterogeneous way in which GTA programmes are designed and used as well as the variation in populations, settings (e.g. divergent educational system in different countries) and outcomes evaluated. The economic implications of introducing novel educational methods, especially utilising an expensive human resource, need to be considered; prohibitive costs will make educational packages such as the establishment of GTA programmes non-viable. Finally, a quantitative approach is unlikely to capture all the nuances of a GTA-led approach to teaching intimate pelvic examination. This necessitates the need to undertake qualitative research of all stakeholders.

To evaluate these important areas of teaching female pelvic examination to medical students in the UK, this thesis has been formulated into chapters to address each area in turn. Thus, the thesis comprises of a cross sectional study to identify the current methods of pelvic examination teaching in the medicals schools in the UK, in order to provide a background of current educational provision and the attitudes of academic leads to the use of GTAs. A validation study for a potential pelvic examination assessment tool is then reported being tested on novice and experienced final year medical students as well as junior trainees in O&G. The main chapter describes the design and reports the findings from

a large, single blinded randomised controlled trial (RCT) between the traditional teaching methods of pelvic model (manikin) compared against GTA-led teaching to identify whether there is an improvement in student competence and confidence. The data from the trial including costs incurred are then used to conduct an economic analysis, reporting incremental cost effective ratios (ICERs). Finally, a qualitative study is presented exploring the experience and acceptability of GTA-led teaching to students, teaching and non-teaching faculty members as well as the GTAs themselves.

OBJECTIVES OF THE THESIS

1. To describe the current educational provision for teaching of gynaecological examination in UK medical schools and to ascertain the views of academic leads in O&G pertaining to current teaching approaches, methods of assessment, the importance of obtaining competency and future teaching innovations including the use of expert patients.
2. To estimate the reliability and validity of a new Pelvic Examination Assessment Tool.
3. To estimate the effectiveness of Gynaecological Teaching Associates in improving the level of confidence and competence of medical students in performing gynaecological pelvic examination compared to conventional manikin based teaching.
4. To estimate the cost-effectiveness of Gynaecological Teaching Associates in improving the level of confidence and competence of medical students in performing gynaecological pelvic examination compared to conventional manikin based teaching.
5. To explore the experience and acceptability of medical students, the undergraduate teaching faculty and Gynaecological Teaching Associates of the GTA-led teaching of pelvic examination.
6. To explore the motivation of lay women to become Gynaecological Teaching Associate (GTAs).

CHAPTER 2: Cross Sectional Study on Teaching Pelvic Examination in Medical Schools in the UK (The COTES Study)

The COTES study aims to explore the current practice of medical education in gynaecological examination across the UK. The study participants are the undergraduate academic leads across the UK.

ABSTRACT

INTRODUCTION

Physical examination of the pelvis is an important core skill that medical students need to acquire. However, supervised undergraduate training of pelvic examination may be limited in the clinical environment given difficulties in gaining consent due to the intimate nature of the examination, limited time in the outpatient clinics and the motivational enthusiasm of people willing to ask, resulting in a compromise in competency. On suggested solution is to use expert patients known as Gynaecological Teaching Associates (GTAs). We therefore aimed to explore the current teaching provision and assessment for gynaecological examination in UK medical schools and the views of undergraduate academic leads regarding the use GTAs.

METHODS

A cross sectional survey was sent to undergraduate academic leads for O&G representing 29 of the 30 UK medical schools providing clinical placements. The survey was conducted over a three month period during October 2014 to January 2015 via an online survey tool with reminders to non-responders sent every two to three weeks.

RESULTS

The response rate was 21/29 (72.4%). Whilst teaching of female pelvic examination in O&G curricula varied across UK medical schools, most employed the following methods; supervised training on an inanimate pelvic model i.e. a manikin (20/21, 95.2%) and supervised instruction on women in the clinical environment during outpatient clinics

(17/21, 81.0%) and in the operating theatre on anaesthetised patients (17/21, 81.0%). Only 6/21 (28.6%) of respondents confirmed the use of GTAs or simulated patients for pelvic examination teaching. Competency in pelvic examination was a requirement to pass the clinical O&G placement in 17/21 (81.0%) of UK medical schools but was assessed in 19/21 (90.5%) among which 7/19 (37%) requiring an informal impression of proficiency only. Of the respondents, 6/21(28.6%) confirmed their medical schools utilise GTAs with these teaching programmes being established for 7.6 years on average. All respondents using GTAs believed them to be successful with a mean score, when estimating the success of their GTA programme in improving the teaching of pelvic examination, on a 10 point scale of 9.2 (range 6 to 10) whereas those academic institutions not using GTAs, gave a mean score of 5.73 (range 1 to 10) on a 10 point scale regarding the potential improvement in the teaching of pelvic examination if GTAs were to be introduced.

CONCLUSION

Competency in gynaecological pelvic examination is a requirement for most UK medical schools. Anatomic pelvic models are combined with supervised instruction in outpatient clinics and operating theatres. GTAs are used by less than a third of medical schools and where used are thought to enhance teaching in this core skill in contrast to those universities not using GTAs where academic leads are less convinced of their ability to improve current teaching provision. Further research to evaluate the effectiveness of GTAs in improving core competencies in pelvic examination are needed to inform current educational practice.

KEYWORDS

Undergraduate medical education, pelvic examination, Gynaecology Teaching Associates (GTAs), educational measurement, cross sectional survey.

INTRODUCTION

Physical examination of the pelvis is an important core skill that medical students need to acquire. However, due to its intimate nature some students are graduating unable to perform competent pelvic examinations (Iyengar et al., 2012). Data from survey conducted in the Unites States of America found that female pelvic examination induced significant student anxiety (Pugh and Salud, 2007). Another survey of medical students in New Zealand found that their self-reported confidence was low with only 7% of students reported feeling confident that they could detect an abnormality. However a higher 55% proportion felt they were good at conducting an examination with sensitivity and 67% were comfortable explaining to patients the indication and process of examination (Abraham, 1995). Yeung and Yeeles (2011) identified that medical students were "least confident with vaginal examination" in comparison with digital rectal, groin hernia or testicular examination. The authors recommended that "more training and supervision" is required of medical students prior to qualification as well as during their time as a junior doctor.

A more recent survey of over 200 interns in Saudi Arabia identified the most common reasons for medical students not performing intimate examinations were patient's refusal (33%) and uneasiness in examining patients of opposite gender (27.6%) (Alnassar et al., 2012). Male students have reported elsewhere to feeling that their gender negatively impacted their undergraduate pelvic examination experience; with a greater degree of embarrassment or higher patient refusal (Akkad et al., 2008; Chang et al., 2010). Other practical factors also seem to preclude experience of pelvic examination. A study from the Wellington School of Medicine in New Zealand found that a quarter of women suitable for

examination under anaesthesia prior to surgery were not approached for consent by fifth year medical students who cited insufficient time as the main reason rather than patient refusal. The same survey identified time constraints placed upon supervising gynaecologists as limiting opportunities for conducting examination and more alarmingly student perception of disinterest by gynaecologists in training them (Broadmore et al., 2009). Patients' prior experience may also play a role in whether students receive consent for performing an intimate examination (Mavis et al., 2006).

Competing pressures on undergraduate medical curricula have seen clinical O&G placements shorten in duration. At our host institution, the University of Birmingham Medical School, the O&G placement has reduced from 8 weeks to 5 weeks over the last 10 years. The impact of this on competency is unclear with two studies showing that shorter placements are associated with lower final examination scores (Edwards et al., 2000; Myles, 2004). In contrast, an older study, did not demonstrate any difference in overall performance (Smith et al., 1995). When it comes to evaluation of student performance of pelvic examination, the methods used appear to vary. Portfolios to promote personal and professional development of medical students have been advocated combining clear learning objectives, recording of procedures and documentation of reflective learning (Lonka et al., 2001). Summative assessments at the end of placements or as part of final examinations include the use of Objective Structured Clinical Examinations (OSCE stations) which are reliable and valid tests of clinical competence (Gilson et al., 1998). Furthermore there are some data suggest that students prefer OSCE style assessments of clinical examinations that have been learnt and practised (Lazarus and Kent, 1983). Variation in student assessment method and

requirements may impact further on medical student proficiency and experience of gynaecological examination.

Innovations in teaching are needed to enhance the experience of medical undergraduates in undertaking gynaecological examination in light of the observed restrictions. Moreover, an awareness of potential drivers for these limitations on medical student experience should inform such developments. As a baseline for teaching innovations, an understanding of current teaching provision for this core skill is needed. Traditional teaching involves clinicians providing feedback on pelvic examinations performed by medical students on awake or anaesthetised patients (Lai et al., 2014). Pelvic examination is also taught using simulated clinic sessions (Ronn et al., 2012). Introduction of role-play with well women from the community has shown an increase in the number of pelvic examinations performed by students with the authors concluding that community-based teaching is valuable to prepare medical students for subsequent placements in the hospital setting (Carr and Carmody, 2004).

One innovation that has been introduced to try and improve student experience, confidence and proficiency in intimate physical examination has been the use of expert patients to either assist or deliver independently training in particular clinical examinations. In obstetrics and gynaecology (O&G) these trained expert patients have often been termed “gynaecological teaching associates” (GTAs) (Smith et al., 2015). A recent study conducted described pelvic manikin-GTA hybrid teaching sessions. Students were randomised to manikin only, manikin and simulated patients with “superfluous conversation”, or manikin

and simulated patients with realistic communication to “reflect the typical doctor-patient interaction”. They found that communication skills did not differ between the three groups, but the student that had been taught on the manikin improved technical skill scores during a summative OSCE (Posner and Hamstra, 2013).

Thus it appears that undergraduate medical curricula need revision to improve the teaching of intimate physical examinations. We therefore undertook a survey of undergraduate clinical leads in O&G across UK medical schools to better understand the current provision of training of medical undergraduates in female pelvic examination and to ascertain their views about training in gynaecological examination as regards current teaching approaches, methods of assessment, the importance of obtaining competency and future teaching innovations including the use of expert patients /GTAs.

METHODS

A cross sectional study was conducted for a three month period from October 2014 to January 2015 across the UK to gain insight into how gynaecological pelvic examination is taught and assessed within the O&G curricula across all UK medical schools. Specifically, in undertaking the study, we aimed to:

1. Explore whether competency in pelvic examination is a requirement to pass the O&G block at medical school.
2. Explore whether pelvic examination, including speculum and vaginal examination, is taught formally during the O&G block
3. Identify the forms of assessment of pelvic examination skills

4. Identify whether Gynaecology Teaching Associates (GTAs) are used for the purpose of pelvic examination training, and their involvement in the assessment process.

We attempted to contact all the medical schools across the UK individually through their Undergraduate Office and request contact information of their 'O&G Lead'. This proved difficult as some of the offices did not have anyone in post, or someone new in post that did not have long term experience of the O&G locally. In some cases, the O&G Lead was not known or contact information was denied due to medical school policy. We therefore approached the Academic Board at the Royal College of Obstetricians and Gynaecologists (RCOG 2015), a committee that has responsibility to "promote and safeguard all aspects of academic obstetrics and gynaecology ….including undergraduate training". They provided us with their list of academic leads for undergraduate O&G across UK medical schools (Appendix 2).

An online survey tool (Survey Monkey™) was used to generate a questionnaire. The web link to access the survey along with an emailed covering letter (Appendix 3) was sent to the 29 RCOG Academic Board members (Appendix 2 and 3). Reminders were sent every two to three weeks to non-responders for the three month duration of the study (a cut-off of three months from first contact was used to define closure of the study). The respondent's identity and location were anonymised by virtue of the fact that data collected only displayed the respondent ID and no other identifying information.

The questionnaire included generic questions included exploring existing pelvic examination teaching programmes comprising of both speculum and vaginal examinations. Academic leads were also questioned about the level of competency at examination required by students to 'pass' their O&G block. Part of the survey explored respondent's thoughts about the use of GTAs for the purpose of pelvic examination training, and their involvement in the assessment process. Those medical schools already using GTAs within their undergraduate O&G curricula were asked specific questions pertaining to the use of expert patients which included details of the delivery and perceived success the of the GTA programme. Questions were designed to be open ended and factual without leading the participant to any answer. (Appendix 4)

RESULTS

The response rate from undergraduate clinical leads for O&G across medical schools in the UK was 21/29 (72%). The survey results are shown in Tables 2 and 3, with complete responses available in Appendix 5. Response data are presented as proportions of those responding or expressed as means (standard deviations), medians and ranges.

Table 2: Survey Responses from academic leads for undergraduate obstetrics and gynaecology at UK medical schools: Clinical placement details

Question category	Response	
Regarding the clinical placement in obstetrics & gynaecology		
Year of placement[1]	Year 3 Year 4 Year 5 Year 6	5/21 12/21 8/21 0/21
Duration of placement (weeks)	Mean (SD) Median Range	6.71 (2.2) 6 3 – 12
Regarding gynaecological pelvic examination		
Teaching:		
Teaching methods[1]	Manikin Theatre SP GTA Outpatient clinics Other	20/21 17/21 3/21 6/21 17/21 1/21
Competency:		
Competency is a mandatory requirement of the placement	Yes No	17/21 (81%) 4/21 (19%)
Evaluation of competence	Don't assess Informal impression Bespoke assessment criteria (mark sheet) Generic assessment criteria (mark sheet)	2/21 (10%) 7/21 (33%) 10/21 (47%) 2/21 (10%)
Believe that competence in pelvic examination should be a GMC requirement for a medical degree	Yes No Unsure	13/15 (86%) 1/15 (7%) 1/15 (7%)

Footnotes

GTA – gynaecological teaching associate; SP – simulated patient

[1] more than one response allowed

Teaching of pelvic examination during clinical placements

The majority (12/21, 57.1%) of O&G placements occur in the penultimate year of medical school (fourth undergraduate year for the majority of non-graduate entry students on a five year course, third year for graduate entry students and fifth year for intercalating students). The average duration of the O&G clinical placement was between six and seven weeks (6.7 weeks). Pelvic examination is taught in a variety of ways across UK medical schools, with a majority of medical students being taught on a manikin (20/21, 95.2%), in an outpatient clinic (17/21, 81.0%) or on an anaesthetised patient in theatre (17/21, 81.0%). Only 9/21 (42.9%) respondents reported their medical schools used expert patients (GTAs) or simulated patients to teach pelvic examination (Table 2).

Assessment of competence in pelvic examination

Students' competence at female pelvic examination is assessed using bespoke mark sheets (10/21, 47.6%) or based upon an informal impression (7/21, 33.3%) within the UK university medical schools during their O&G clinical placement. Two out of 21 (10%) did not formally assess their students in gynaecological examination. Of the universities using GTAs, the majority of respondents (4/5, 80%) confirmed that GTAs are involved in student assessment. Competence in pelvic examination skills was believed to be a requirement to pass a clinical placement in O&G by 17/21 (81%) of respondents. A majority of respondents 13/15 (86.7%) agreed that competence in basic female pelvic examination should be a GMC requirement for a medical degree (Table 2).

Gynaecological teaching associates (GTAs)

Table 3 highlights the responses from academic undergraduate leads for O&G regarding the use of GTAs in teaching medical undergraduates gynaecological pelvic examination. 6/21 (28.6%) of respondents reported that their institutions used expert patients (GTAs) to teach pelvic examination skills. The respondents mentioned that the GTAs were recruited mainly from links with Kings College London, and "from a company already providing a similar service to other medical schools". The six university medical schools utilising GTAs to teach undergraduate medical students how to perform female pelvic examination had established their expert patient gynaecological teaching programmes on average eight years previously (range 4 - 10 years). Regarding the structure of GTA teaching, most universities utilised GTAs teaching in pairs (5/6, 80%). Teaching sessions were scheduled during the working day in three universities (50%) and after 5pm in the remaining three universities. Four out of five respondents used group GTA sessions that lasted between one and three hours and one institution reported delivering individualised sessions of 30 minutes duration. All respondents reported that each student received only one GTA teaching session and that these sessions were mandatory as part of their O&G placement. The main problem highlighted by 3/5 respondents in running the GTA programmes was funding, and 2/5 respondents reported no problems.

All respondents using GTAs believed them to be successful with a mean score, when estimating the success of their GTA programme in improving the teaching of pelvic examination, on a 10 point scale of 9.2 (range 6 to 10). Those academic institutions not using GTAs, gave a mean score of 5.73 (range 1 to 10) on a 10 point scale regarding the potential

improvement in the teaching of pelvic examination if GTAs were to be introduced. In the university medical schools not using GTAs, 8/15 respondents (53.3%) confirmed the use of expert patients in the teaching of medical students in other specialities such as rheumatology.

Manikin and gynaecological teaching associate training

The following themes were identified from the free text comments from respondents when considering manikin and GTA teaching of pelvic examination. Respondents felt that as a minimum, their students required manikin teaching, although this was not a substitute for examination on a real patient. Regarding GTA teaching, respondents alluded to the importance of them providing an initial safe practice environment for students and their ability to assess issues around professionalism, communication and empathy in addition to simply evaluating technical pelvic examination skills. Whilst appreciating their potential value, others expressed the general view that practice in a clinical environment could not be replicated and remained of paramount importance. One respondent, who acted as an external examiner, observed that students taught on GTAs were more confident in their OSCE of female pelvic manikins than students who were taught on and assessed on manikins. Future research ideas included the desire for a multi-centre trial to assess effectiveness and cost-effectiveness of GTA teaching of gynaecological pelvic examination.

Table 3: Survey Responses from academic leads for undergraduate obstetrics and gynaecology at UK medical schools: GTA use in teaching

Question category	Response	
University medical schools USING GTAs		
Years since implemented	Mean (SD) Median Range	7.6 (2.3) 8 4 – 10
Number employed	Mean (SD) Median Range	4.6 (2.1) 5 2 – 7
Number per session	One Two NR	1/6 (17%) 4/6 (66%) 1/6 (17%)
Timing of sessions during placement	Introductory week Week 1 and 2 Between week 1-3 Week 1, 2, 3 or 4 Throughout the placement NR	1/6 (17%) 1/6 (17%) 1/6 (17%) 1/6 (17%) 1/6 (17%) 1/6 (17%)
Timing of sessions during day	Day time (0900 – 1700) Evening (1700 onwards)	3/6 (50%) 3/6 (50%)
Number of sessions	One > One[3]	5/6 (83%) 1/6 (17%)
Duration of session (minutes)		30[2] 6090-120 180[4]
Mandatory attendance	Yes No NR	5/6 (83%) 0/6 (0%) 1/6 (17%)
Involved in student assessment	Yes No Not known	4/6 (66%) 1/6 (17%) 0/6 (0%)
Perceived success of programme	Successful Not successful Not known NR	5/6 (83%) 0/6 (0%) 0/6 (0%) 1/6 (17%)
Estimated perceived improvement in teaching of pelvic examination (10 point VAS)	Mean (SD) Median Range	9.2 (1.8) 10 6 - 10

University medical schools NOT USING GTAs		
Estimated perceived improvement in teaching of pelvic examination if introduced (10 point VAS)	Mean (SD) Median Range	5.7 (3.5) 7 1 – 10
Use expert patients in the teaching of medical students in other specialties	Yes No Unknown	8/15 (53%) 4/15 (27%) 3/15 (20%)

Footnotes

GTA – gynaecological teaching associate; NR – non-response; SP – simulated patient; SD – standard deviation; VAS –visual analogue scale

[1] more than one response allowed

[2] per student (rather than per group)

[3] more than one 'if needed'

[4] 180 minutes mentioned by 2 respondents

DISCUSSION

Principal findings

Our study provided a snapshot of gynaecological pelvic examination teaching at a point in time across medical schools in the UK. It showed that gynaecological pelvic examination is taught in a combination of ways across UK medical schools. Most academic institutions reported utilising outpatient clinics and anaesthetised patients in operating theatre. Outside of the clinical environment, pelvic examination skills were taught using manikins by almost all medical schools whereas the use of expert patients is less widespread with less than half having established GTA teaching programmes. UK medical schools appear to regard competency in gynaecological pelvic examination as important with 80% of respondents reporting that this was a requirement to pass the O&G clinical placement and an even higher proportion believing that the skill should be a GMC requirement to a medical degree. Assessment procedures varied across medical schools. Some employed formal and informal evaluation based upon individual OSCE style structured mark sheets or an overall impression

of a student's skills. One in ten respondents reported that their medical schools did not assess for competence.

Less than one third of UK medical schools use GTAs to teach female pelvic examination and even in these medical schools their introduction has been relatively recent with programmes established for eight years on average. Of the six universities with GTA teaching programmes, three used an outside agency rather than establishing an in house team. GTA faculties were small, consisting of five women on average. Most worked in pairs and provided a single teaching session to small groups of between one and three hours duration. The timing of GTA instruction did not uniformly take place at the start of clinical placements. The varying time point of teaching within a placement is unlikely to have an educational rationale but rather may reflect the limited human resource availability. All respondents from institutions utilising GTAs considered their programmes to be successful and estimated its success in improving teaching in pelvic examination to be over 9 on average as measured on a 10 point spectrum ranging from no improvement to significant improvement. This latter finding contrasted with universities not employing GTAs who seemed not to be convinced that a GTA programme would improve their current teaching of pelvic examination, rating the improvement if introduced as less than 6 on the 10 point continuous scale. This difference in belief between university medical schools according to the current utilisation of GTAs may reflect a pre-existing enthusiasm for expert patient teaching in gynaecology from the outset, motivating the training and employment of GTAs. Alternatively, this opinion may be based on an observation of the perceived effectiveness of their GTA programmes. The contrary arguments may explain why those institutions without GTA teaching programmes

were ambivalent about the potential impact of GTA-led programmes on improving current provision of pelvic examination teaching.

Whilst we did not conduct a formal qualitative study, the free text comments provided some insight into respondents views pertaining to the utilisation of GTAs in undergraduate medical student curricula. The prevailing views appeared to support the value of GTAs, especially around safe practice, confidence in examination and the assessement of non-technical attributes such as professionalism, communication and empathy. However, the need for examination of real life clinical patients was considered to be of key importance.

Strengths and weaknesses

We tried to enhance response rates to our survey by using a convenient, confidential online surveying tool (Survey Monkey™) anonymising respondent data. Reminders were sent every three weeks over the three month study period to all the academic leads in a group email. Furthermore, participants were incentivised with the option of receiving the results of the survey. Despite these attempts to maximise responses we could only achieve a 70% overall response rate. Thus as with most surveys the spectre of non-response bias is raised. However, with a response rate above 70% and the identification of academic leads for undergraduate education across all UK medical schools offering clinical placements, we believe our sample to be representative. However, we did not identify an academic lead for East Anglia University and as the response data were anonymised we could not identify responders and non-responders. Thus a more detailed exploration of the representativeness of our respondents was not possible.

In an attempt to maximise response and completeness of response we purposely kept the questionnaire short and quick to complete by providing mainly closed and limited response categories. As such a more in depth qualitative exploration of respondents was not possible limiting our ability to explain the quantitative findings. However, the survey provides valuable data to benchmark current provision of teaching for female pelvic examination in UK O&G medical undergraduate programmes.

Comparison with other studies

There have been several published surveys on the topic of intimate examinations in medical school. A number explored attitudes and experiences of medical students and junior doctors towards performing pelvic examination, or patients' acceptability and experience of intimate examination by undergraduate or postgraduate trainees (Abraham, 1995; Akkad et al., 2008; Alnassar et al., 2012; Chang et al., 2010; Pugh and Salud, 2007). Alnassar et al. (2012) investigated how many different intimate examinations were performed as well the barriers faced. Mavis et al. (2006) distributed a survey studying patients' prior experience of student interaction and likelihood of consenting to involvement in O&G history and examination. A better prior student interaction precluded to increased willingness to involve students in O&G care. However, this survey only lasted one week and was localised to the community campuses of one university. Although patients' views were elicited, there were no open questions to identify factors that would encourage a patient to allow intimate examination by a medical student, and vice versa.

Tiong et al. (2013) conducted a cross sectional survey of patients in a private and public hospital in Australia. The authors explored the "willingness to allow a medical student to participate in an interview, physical examination and procedures" as well as patient attitudes towards medical students. The procedures in the survey included electrocardiogram, venepuncture and digital rectal examination (DRE), where the latter is an intimate examination. The results can be extrapolated to potential female pelvic examinations conducted in the NHS. However, the national health system differs and our study was not looking at accommodating increasing student numbers by providing clinical exposure at private medical schools in the UK.

A survey of UK and Ireland medical schools conducted in 1989 (Biggs et al., 1991) identified that medical students undertook 11.5 weeks of O&G placement, compared with the average of 6.7 weeks obtained in our study. Biggs et al. (1991) found that in a majority of medical schools, female pelvic examination teaching took place using slides, videotapes and manikins compared to only two medical schools (6%) that employed GTAs for this purpose. Two decades later, the number of medical schools utilising GTAs has increased to only six. The authors mention that pelvic examination was taught principally in the outpatient department under supervision, on the labour and postnatal ward, as well as by examination of anaesthetised patients in gynaecology, which is still found to be the distribution of teaching methods today. The advantage of their survey is that it was sent to all academic departments of O&G in the UK, and obtained a 100% response rate.

A more recent survey was conducted in 2012 studying digital rectal examination teaching and evaluation across Canadian medical schools (Nensi and Chande, 2012). A variety of teaching methods over and above instruction by clinicians on actual patients were reported including the use of video tutorials, anatomical rectal models, role-playing communication exercises. A higher proportion (8/14, 57%) of respondent Canadian medical schools used standardised (i.e. expert) patients to teach this type of intimate examination compared with only 28% in our UK survey of GTA use within medical schools. Assessment of clinical skills also varied across medical schools in keeping with our findings, ranging from formal OSCE assessment, mandatory attendance at dedicated teaching and no formal evaluation.

Meaning of the study

Our survey found that proficiency in gynaecological pelvic examination is believed to be important by representatives of UK medical schools, however formal assessment of this core skill was only apparent in around 50% of medical schools. Most medical schools teach initially on pelvic manikins and provide students with further clinical instruction in the clinical environment, namely in outpatient clinics and operating theatres. However, it is somewhat surprising that less than one third of medical schools employ GTAs to deliver their teaching in light of evidence to support their effectiveness (Smith et al., 2015). The overall length of clinical placements was relatively short at around seven weeks on average and it is unclear how much experience is obtained in gynaecological examination within these time frames and indeed beyond the specific O&G placement. A previous survey of medical students at UoB CMDS suggested this was extremely limited (Iyengar et al., 2012). Thus, a combination of short placements and a lack of formal assessment may mean that the

competency of newly qualifying medical students in basic gynaecological examination is compromised. Strategies to improve this situation are needed and the wider use of GTAs may be one such innovation. This contention is not just based upon some evidence to support their use (Smith et al., 2015) but also from our survey data where respondents using expert patients in O&G had confidence in the successful impact of their GTAs in improving undergraduate skills in pelvic examination. This contrasted with the conviction of respondents not currently employing GTAs suggesting further research is needed both in the assessment of competency and identifying the most effective and viable cost-effective teaching strategies.

Unanswered questions and future research

The reasons for the observed variations in the approach to teaching and also assessment of gynaecological pelvic examination in UK O&G medical undergraduate programmes are unclear. Moreover, the support for expert patient GTA teaching was greater from respondents from medical schools currently offering such programmes. Qualitative studies are needed to further explore the potential reasons for these differences in educational approach to female pelvic examination teaching. One can speculate that the strength of the evidence-base pertaining particularly to the effectiveness and cost-effectiveness of GTA teaching, may partly explain the observed heterogeneity. This contention is sustained by one of the 21 respondents identifying the need for a multi-centre trial to assess effectiveness and value for money of GTA programmes to provide a stronger evidence base and thus rationale for UK medical schools to adopt this method of teaching pelvic examinations. The best timing and setting for teaching pelvic examination should also be evaluated such as the

use of community teaching programmes, where pelvic examination skills are taught during General Practice or sexual health placements prior to starting hospital placements in O&G. Future studies could compare multi-faceted teaching programmes to help delineate the most effective strategies for enhancing students' confidence, competence and inter-personal communication skills. These include teaching on a pelvic model; computer simulation packages (Pugh and Youngblood, 2002) with GTA or teaching in the clinical environment (outpatient clinics and theatres).

CONCLUSION

Competency in gynaecological pelvic examination is a requirement for most UK medical schools. Anatomic pelvic models combined with supervised instruction in outpatient clinics and operating theatres is the current method of teaching female pelvic examination skills. GTAs are used by less than a third of medical schools and where used are thought to enhance teaching in this core skill in contrast to those universities not using GTAs where academic leads are less convinced of their ability to improve current teaching provision. Further research to evaluate the effectiveness of GTAs in improving core competencies in pelvic examination are needed to inform current variable educational practice.

Chapter 3: Measuring competence: Validating a PElvic Assessment Tool (The PEAT Study)

The PEAT Study explored the validity of a bespoke pelvic examination assessment tool for the use of assessing female genital examinations in the O&G placement at medical school.

ABSTRACT

OBJECTIVE

To estimate the reliability and validity of a new Pelvic Examination Assessment Tool (PEAT).

DESIGN

Cross-sectional study

SETTING

Birmingham Women's Hospital, UK

POPULATION

Final year medical students and, Specialty Trainees (ST) years one and two in Obstetrics and Gynaecology (O&G)

METHODS

The PEAT for evaluating competency in teaching gynaecological examination was developed by a panel of clinical teachers in O&G in conjunction with an evidence-based literature search. The tool consists of six domains, evaluating: attitudes; inspection; bimanual palpation; adnexal examination; speculum; communication; and a global score using a 10cm visual analogue scale (VAS). The 60 participants were divided into three groups of 20 according to their experience in performing gynaecological examination: novice student (week one of O&G clinical placement); experienced student (completed five week clinical placement in O&G); and competent practitioner (junior doctors at ST1 and 2 training levels).

Each participant performed a pelvic examination with a role player and pelvic model, which was video recorded. 20 assessors, identified as consultants involved with undergraduate O&G education from outside of the West Midlands, were sent 15 video clips with a mix of participants from each group. All assessors were asked to use the PEAT for each student and all were blinded to the participant's level of experience. Once all assessments had been completed, assessors were asked to complete a questionnaire about the utility, relevance and face validity of the PEAT using categorical and visual analogue scales. The inter-assessor reliability of the PEAT was evaluated and the construct that higher PEAT scores would be obtained for the participant groups with greater experience was tested. Statistical analysis was performed for continuous variables using the Student t-test and Cronbach's alpha was calculated to test reliability.

OUTCOME MEASURES

Face and Construct validity; Reliability.

RESULTS

8/20 (40%) assessors returned their assessment packs. One was not usable because the assessor did not use the VAS to evaluate the participants. There was a significant increase in the mean score in the 'inspection' domain for novice students compared with experienced students (mean difference 13.2, 95% CI [2.4, 24.1], p=0.02). Significant decreases in the mean scores in the 'adnexal examination' domain for both novice students and experienced students compared with junior doctors were also apparent (mean difference -8.0, 95% CI [-18.8, 2.8], p=0.04 and -9.4, 95 CI [-18.8, -0.1], p=0.05 respectively). No other significant

differences were observed between participant groups for all other assessment domains. The mean assessor score for the ease of use and perceived effectiveness of the PEAT to evaluate competence in gynaecological examination was 7.4 (SD ±1.32) and 6.6 (SD ±1.19) on a 10cm VAS respectively. The PEAT had good or excellent internal consistency ($\alpha \geq 0.7$) in 4/8 assessors (50%).

CONCLUSION

The PEAT appears to be easy to use and have face validity. However, further refinements are necessary for this PEAT to establish construct validity and improve reliability.

KEYWORDS

Medical education; medical students; OSATS; pelvic examination; reliability; vaginal examination; validated exercises.

INTRODUCTION

Medical students are required by the GMC (2015) to be proficient in performing a full female pelvic examination prior to graduating as doctors. Iyengar et al. (2012) found that some students were graduating without having performed a female pelvic examination on a conscious patient. At present, in many UK medical schools a formal summative assessment of gynaecological examination is not undertaken. At medical schools where it is, this is based upon the use of manikins and non-validated assessment tools. In some UK medical schools such as the University of Birmingham College of Medical and Dental Sciences (UoB CMDS), evaluation of the medical student's competence at pelvic examination is done by subjective faculty assessment during their obstetrics and gynaecology (O&G) placement (Reznick, 1993). This assessment is typically performed at the end of the teaching placement and is based on the assessors' recollection of the students' performance. This kind of assessment has been shown to have poor validity and reliability (Reznick, 1993). This is in contrast to objective structured assessments of technical skill (OSATS), which use task specific and global rating scales and have been used to evaluate a wide range of clinical and surgical skills (Cremers et al., 2005; Goff et al., 2000; Grober et al., 2004; Lentz et al., 2005).

After searching three electronic databases (Medline, Embase and CINAHL), no citations were identified that evaluated an assessment tool for pelvic examination. Thus, there is a need to develop an assessment tool for female clinical pelvic examination. Van der Vleuten (1996) described five criteria that determine the usefulness of an assessment method: namely reliability, validity, acceptability to learners and faculty, impact on future learning and

practice, as well as costs. We designed a pilot study with the objective of evaluating the first two stated criteria of reliability and validity of a pelvic examination assessment tool (PEAT).

METHODS

Study population

We designed a cross sectional study to obtain provisional data pertaining to the potential reliability, utility and validity of a new PEAT for use in undergraduate medical education. The 60 study participants were divided into three groups of 20 according to their experience in performing gynaecological examination: (i) 'novice student' (defined as a medical student in week one of their O&G clinical placements); (ii) 'experienced student' (defined as a medical student having completed their five week clinical placement in O&G with signed-off competency to perform pelvic examination) and (iii) 'competent practitioner'. This latter group consisted of junior doctors in their 1st and 2nd year of speciality training in O&G. For the purposes of our study we restricted competent practitioners to relatively junior trainees because it was felt that they were closer in age and appearance to the target student population. Medical students and junior doctors were approached by the Director of the Clinical Teaching Academy at the Birmingham Women's Hospital (BWH) during the beginning of their O&G placement (TJC). They were made aware that outcome and assessment as part of the trial would not be incorporated into their final academic grade or postgraduate performance reviews.

Each participant was asked to fill in a pre-assessment questionnaire to assess the comparability of participant groups. The following baseline demographic data were

collected: age; gender; ethnicity; confidence in examination assessed using a 10cm VAS score; number of previously performed examinations; and an interest in a future career in O&G.

Clinical scenario and pelvic examination

Each participant was presented with the same clinical scenario which required the performance of a pelvic gynaecological examination. The written information provided instructions of the tasks to be completed and to provide a summary of findings to the examiner at the completion of the examination (Figure 1). A role player was used to simulate the verbal responses of a real patient. The written instructions informed the participants that they were to perform the pelvic examination on the manikin provided after positioning the role player as if they were a real patient. The scenario (including examination of the manikin) was video recorded and each recording was sent to three assessors unfamiliar with the participants to ensure that they were blinded to the participants' level of experience.

Each assessor received 15 recordings each, with an equal mixture of recordings (5-5-5) in a random order from all three participant groups. A larger number of videos were not sent to avoid assessor fatigue resulting in a drop in performance or response rate. Although it would be approximately 2 ½ hours of work, we reflected that 15 was a reasonable number of videos to allow assessors to gain familiarity with PEAT, and for us to analyse reproducibility of scores across the assessors.

Figure (Fig.) 1: Instructions to Candidate

Setting

You are a doctor in the Gynaecology Outpatient Department. Please treat this as a real life situation.

Clinical Details

Mrs Helen Smith has presented with painful periods.

Task

Perform a speculum and bimanual vaginal examination. Do not perform an abdominal examination.

You will be presented with a role player (Mrs Smith) and a pelvic module. You are to address and position the role player but perform the pelvic examination on the manikin.

When / If you visualise the cervix please inform the assessor.

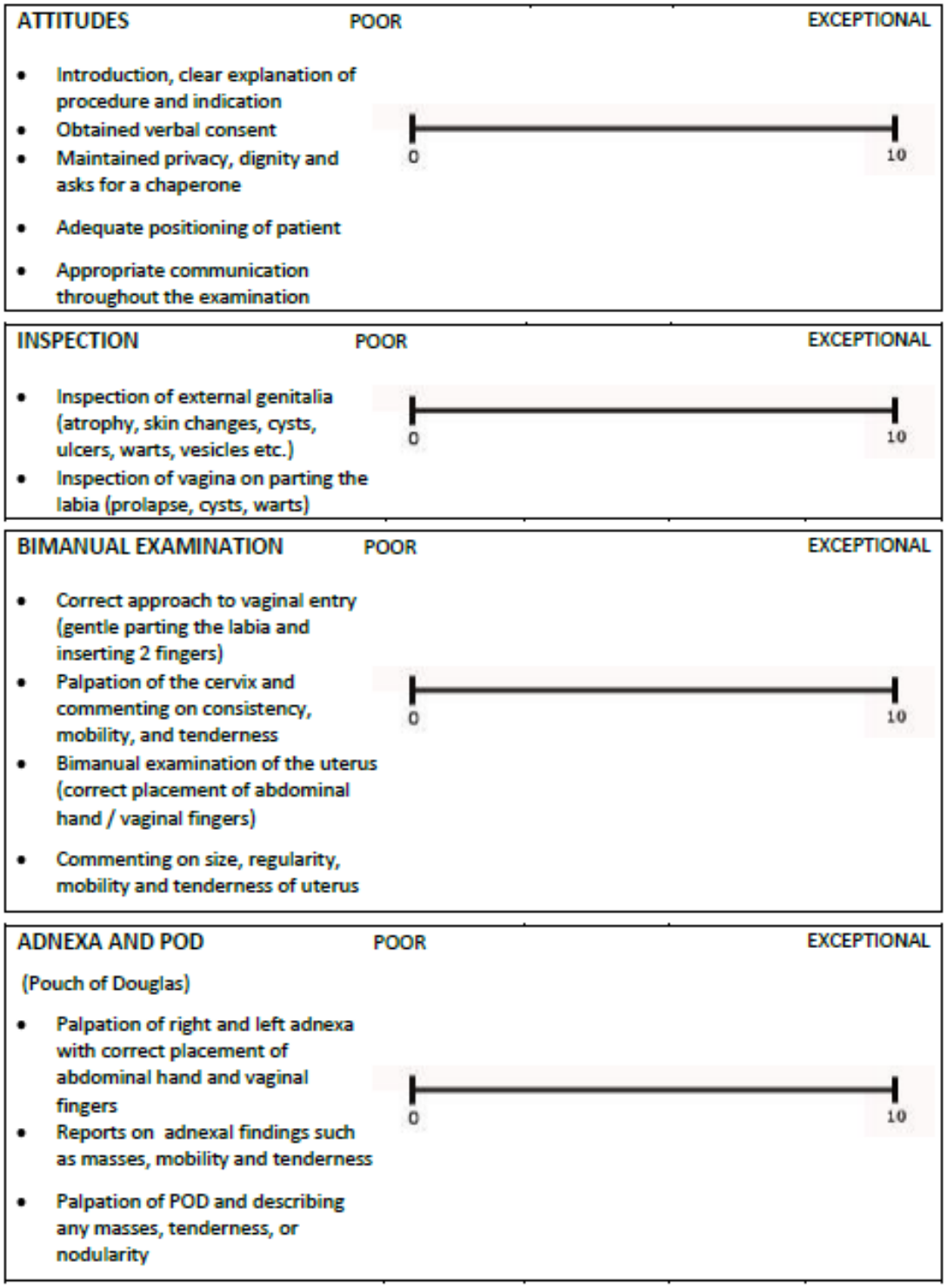
Questions the Assessor will ask you at the end of the examination

Summarise / present your findings.

Assessment

The PEAT (Figure 2) was formulated using points that were considered important by members of the clinical undergraduate O&G teaching faculty at the BWH and UoB CMDS after consultation with gynaecologists, patients and the available medical literature. The PEAT (Figure 2) consisted of six domains assessing: (1) attitudes; (2) inspection; (3) bimanual examination; (4) adnexal examination; (5) speculum examination; (6) post examination communication; and an additional overall global score. Each domain was assessed using a 10cm visual analogue score (VAS).

Fig. 2: The pelvic examination assessment tool (PEAT)



SPECULUM EXAMINATION	POOR	EXCEPTIONAL
• Preparation (gel, configuration, speculum and lighting) • Appropriate gentle insertion of speculum by parting labia and inserting to posterior fornix • Visualisation of the cervix by gentle, gradual opening of the instrument and directing of light • Commenting on cervix (size, surface, ectropion, polyps, bleeding, discharge etc) • Correct withdrawal ensuring cervix, vaginal mucosa and pubic hair not caught and speculum semi closed • Techniques to facilitate visualisation	0	10
• Cervix visualised	YES	NO

POST EXAMINATION	POOR	EXCEPTIONAL
• Communicates that the procedure has finished • Asks patient to get dressed whilst maintains privacy and dignity • Explanation of findings • Answers patient questions	0	10

GLOBAL ASSESSMENT	POOR	EXCEPTIONAL
• Overall approach, manner, confidence, interaction and conduct. • Professionalism • Communication	0	10

The assessors were sent a pack with a cover letter explaining the purpose of the PEAT study including the instructions given to the candidate. They were advised to use PEAT to assess the examination skills of the 15 participants, with the videos provided on a memory stick. To ensure confidentiality, the memory sticks were locked, requiring a password that was allocated to them by the researcher sent in the post. They were also sent 15 assessment tool marking sheets (Fig. 2), a feedback form (Appendix 6) and a stamped addressed envelope to return all study material. The feedback form used VAS scoring to investigate whether the PEAT was easy to use, and whether the assessor considered this an effective tool to assess competence. There was a space for other comments that allowed assessors to give any additional feedback on PEAT. Themes were considered to have emerged where more than one respondent provided similar feedback in the open responses.

The validity of an assessment tool provides an indication as to whether the test is measuring what it is intended to measure (Schuwirth and van der Vleuten, 2006). We hypothesised that higher PEAT scores would be obtained for the participant groups with greater experience, i.e. junior doctors would score highest in all facets of the pelvic examination compared with novice medical students and possibly compared to experienced medical students. The feedback form completed after the assessments by the examiners was intended to determine face validity. The reliability of an assessment tool refers to its ability to give reproducible results. We examined inter-assessor reliability by observing agreement of two or more assessors evaluating the same video assessment.

Statistics

The validity and reliability of the PEAT were considered to be of equal importance and were the primary outcomes assessed. Validity was tested using the proxy measure of construct validity; this was demonstrated with scores derived from the PEAT reflecting the participant experience. Reliability was measured using inter-assessor reliability between assessors who were blinded to the other assessors' marks. Statistical analysis was performed for continuous variables using mean, standard deviation and standard error of mean. Cronbach's alpha was used to test reliability (inter-assessor variability) using a two way mixed, consistency, average-measures intra-class correlation for each element of PEAT (attitudes; inspection; bimanual examination; adnexal examination; speculum examination; post examination communication; and an additional overall global score) with $p>0.7$ considered good (Cicchetti, 1994; McGraw and Wong, 1996).

We also tested whether the baseline characteristics of the medical students (novice and experienced) were predictive of student global performance as scored by the independent assessors. The independent variables: gender, age, ethnicity, confidence in examination and expressed interest in a future career in O&G, were tested in univariable and multivariable analyses.

RESULTS

The background demographics are shown in Table 4. The distribution of gender and ethnicity were comparable across the three participant groups. The level of interest in a career in O&G was comparable between the two student groups as was the age distribution whereas

these demographics were higher in specialist trainees in O&G. Confidence in pelvic examination was highest in junior doctors in O&G, followed by experienced students and lowest in inexperienced students. No student had performed more than 10 gynaecological examinations prior to the study in contrast to specialist trainees in O&G who had all done so (Table 4).

10 out of the 20 assessors returned their feedback forms but only 8/20 (40%) returned their completed student assessment packs although 1/8 assessors did not use the VAS to evaluate the participants performance and so could not be included in analysis.

Table 4: Baseline characteristics of participants

Characteristic		Inexperienced 5th year	Experienced 5th year	ST 1/2
Sex	**Male**	7 (35%)	6 (30%)	4 (20%)
	Female	13 (65%)	14 (70%)	16 (80%)
Ethnicity	**White British**	16 (80%)	14 (70%)	9 (45%)
	White	0 (0%)	0 (0%)	1 (5%)
	Chinese	0 (0%)	2 (10%)	1 (5%)
	Black	0 (0%)	1 (5%)	2 (10%)
	Asian Pakistani	2 (10%)	0 (0%)	4 (20%)
	Asian Indian	2 (10%)	3 (15%)	2 (10%)
No of previous examinations	**0**	3 (15%)	0 (0%)	0 (0%)
	1 to 5	17 (85%)	15 (75%)	0 (0%)
	6 to 10	0 (0%)	5 (25%)	0 (0%)
	>10	0 (0%)	0 (0%)	20 (100%)
Age	**20 to 23**	16 (80%)	17 (85%)	0 (0%)
	24 to 26	4 (20%)	3 (15%)	8 (40%)
	27 to 30	0 (0%)	0 (0%)	9 (45%)
	>30	0 (0%)	0 (0%)	3 (15%)
Mean confidence VAS (SD)		2.6 (2.0)	5.7 (2.3)	8.3 (1.5)
Mean interest O&G VAS (SD)		4.4 (3.0)	4.7 (2.0)	9.0 (2.4)

Construct Validity:

There were two significant results supporting construct validity. There was a significant decrease in the mean score in the adnexal examination domain for the novice student versus the junior doctor (mean difference -8.0, 95% CI [-18.8, 2.8], p=0.04] and for experienced students versus junior doctors (mean difference -9.4, 95 CI [-18.8, -0.1], p=0.05). However, there was a significant increase in the mean score in the inspection domain for the novice versus the experienced students (mean difference 13.2, 95% CI [2.4, 24.1], p=0.02) opposing the construct that more experienced students and junior doctors should score higher than novice students. No other significant differences were noted between participant groups for all other domains (Table 5).

Table 5: Construct Validity: discriminative capacity of the pelvic examination assessment tool (PEAT) for participants with different levels of experience

	Grade	n	Mean (SD)
Global Assessment	Novice student	29	59.7 (19.3)
	Experienced student	37	55.5 (17.9)
	Junior doctors	34	59.4 (15.7)
Attitudes	Novice student	31	62.9 (23.8)
	Experienced student	37	62.6 (19.6)
	Junior doctors	34	63.8 (20.4)
Inspection	Novice student	30	56.5 (21.1)[1]
	Experienced student	37	43.3 (22.8)[1]
	Junior doctors	32	43.5 (26.5)
Bimanual Examination	Novice student	29	58.3 (19.1)
	Experienced student	36	55.7 (17.6)
	Junior doctors	33	61.7 (14.0)
Adnexal examination	Novice student	29	51.4 (24.6)[2]
	Experienced student	36	50.0 (20.8)[3]
	Junior doctors	33	59.4 (17.8)[2,3]
Speculum	Novice student	29	62.4 (17.8)
	Experienced student	36	58.9 (15.1)
	Junior doctors	33	60.5 (16.5)
Post Examination	Novice student	29	53.0 (21.1)
	Experienced student	36	55.4 (20.2)
	Junior doctors	33	46.8 (17.5)

Footnotes

There were no significant differences between the mean ratings of participants with different levels of experience determined by student's T test except for: 1) $p = 0.02$; 2) $p = 0.04$; 3) $p = 0.05$

Face validity:

The mean score for ease of use of the PEAT was 7.4 (range 5.2 – 9.7) on a 10cm VAS derived from the 10 assessors completing the feedback forms. The assessors mean perception of the effectiveness of the PEAT in assessing competence in gynaecological examination was 6.6 (range 4.7 – 8.5). Themes from examiner open feedback included the view that the order of the examination was not accurately reflected in the PEAT because the domain evaluating "speculum examination" came after the domains evaluating bimanual examination (Figure 2). Another theme was the ease of use with one examiner commenting that the PEAT was "a nice simple tool".

Reliability:

The inter-rater reliability was assessed using a two-way mixed, consistency, average-measures intra-class correlation (McGraw and Wong 1996). For the global score the intra-class correlation was in the excellent range 0.83 indicating that the assessors had a high degree of agreement (Cicchetti 1994). For the domain of speculum examination the Cronbach's alpha score was questionable at 0.65 and for the other elements of PEAT the intra-class correlation was poor: attitudes = 0.15; inspection = 0.56; bimanual examination = 0.32; adnexal examination = 0.37; post examination communication = 0.15)

DISCUSSION

Principal findings

In our study we were unable to establish construct validity for the PEAT, which was that a qualified doctor should score higher than a medical student when performing a pelvic

examination. There were no consistent differences between the three groups representing different experience levels in female pelvic examination. The PEAT demonstrated construct validity for adnexal examination, where the most experienced group, namely junior doctors, performed this aspect of examination better compared with novice and experienced medical students. However, no differences were observed between the levels of experience between student groups within this domain. Furthermore, in contrast to our expectation, novice students scored more highly in the inspection domain compared with their more experienced counterparts; experienced students and junior doctors.

Face validity was demonstrated for the PEAT with examiners considering the tool effective in measuring competence in gynaecological examination. Moreover, examiners reported the PEAT to be comprehensible, quick and easy to use. The reliability of the PEAT appeared to be excellent for the global score, but poor for the individual elements of the assessment. The individual elements of PEAT could be removed from the tool but the consideration of each element maybe important for informing the assessor when considering the global score of a participant.

This study demonstrates that when considering reliability, the global score should be used in preference to the other elements for hypothesis testing, although inferences should be made with caution due to the small number of respondents. The PEAT in its current form appears to have some strength, especially when considering its utility and face validity. However, revision is needed to demonstrate construct validity and improve reliability before the PEAT can be routinely used in clinical education and formative assessment.

The useability of the PEAT expressed by the assessors may reflect its design. By incorporating a VAS for marking each domain we hoped to harness the sensitivity of a continuous scale and produce an easy, rapid way of scoring performance. We expected most clinicians to be familiar with VAS for measuring clinical outcomes and so anticipated that proficiency in using the PEAT would be quickly achieved. In addition, by explicitly defining the components to be considered when deciding where to score each domain within the PEAT, we hoped to optimise its user-friendliness thereby aiding its validity and reliability. In a clinical examination setting, standardised assessment instruments need to be clear and easily completed to score candidates in real time reducing the likelihood of recall bias and also to enhance their practical use especially where a large number of candidates are to be assessed.

The failure of the PEAT to consistently discriminate between the relative experiences of candidates in gynaecological examination suggests that the tool requires considerable refinement before it can be widely adopted. However, it is possible that the design of our study was biased in favour of the medical students for several reasons. Firstly undergraduates in their final year have generally become well versed in OSCE style assessments because they are commonly used in assessments across different specialties. In contrast, junior doctors at ST1 and ST2 levels may have become less familiar with this type of assessment. Secondly, whilst our choice of using role players combined with manikins for examination is representative of assessment methods for intimate examination used by the majority of UK medical schools (see Chapter 2), it may have biased against more experienced junior doctors who undoubtedly would be more familiar with examining real patients.

Thirdly, the pelvic manikin used in our chosen scenario had no genital tract pathology. It is possible that the presence of pathology may have yielded different results with more experienced participants displaying higher levels of competence (Fraser and Greenhalgh, 2001). Fourthly, our population of students were in their fifth and final year and so many may have already gained some experience of pelvic examinations e.g. during their sexual health attachments in their fourth year, within general practice placements or during their student selected modules. Therefore, the baseline experience of students will have varied and the 'novice student' may potentially have more experience in performing gynaecological examinations than those deemed an 'experienced student', having completed their final year O&G placement.

Another explanation for the apparent lack of construct validity of the PEAT could relate to examiner training. A greater familiarity with the assessment tool would lead to improvements when assessing pelvic examinations (Epstein, 2007). Face-to-face training to improve understanding of the tool would have been ideal (Academy of Medical Royal Colleges, 2009). A final bias to consider is that of selection. Participation in this study was voluntary and so it is plausible that more self-confident students were recruited thereby overestimating average performance. However, to some degree these arguments apply to participating junior doctors and moreover confidence does not necessarily correlate with clinical skills (Mavis, 2001). It is therefore possible that our results might not be externally valid in students who possess a lower level of initiative, and further studies may need to consider accounting for personality traits (Pieters et al., 1992) or designs whereby the full student cohort could be evaluated.

Although the methodology was robust, the study could be modified to improve the return of feedback from assessors by encouraging both medical students and junior doctors to perform to the best of their ability, immersing themselves in the role play scenario. Ideally, the examination would be performed on real patients or GTAs to increase the authenticity of the assessment, with their faces blurred or hidden to protect their privacy. The study could also be conducted using an online programme rather than sending out memory sticks and paper questionnaires. Access could be safeguarded with separate information for username and password for the assessors. Incentives could also be offered to the assessors to increase response rates.

Bearing in mind the times pressures faced by busy clinicians, reducing the numbers of recordings sent from 15 to 6 may improve response rates. However, there is a danger that if there is a low response rate, we may find ourselves with even less data e.g. if eight assessors replied, we would have only six videos from each leading to a total of 48 assessments rather than 120 assessments that we received in the study. The assessor questionnaire could have also used a numbered scale from 0 to 10 to allow clinicians the option to score marks. Alteration of PEAT by changing the order of the examination with speculum before bimanual and adnexal examination may be more in line with teaching and existing clinical practice.

Strengths and weaknesses

Our study is novel because to our knowledge it is the first to attempt to validate a PEAT for use in evaluating competence in gynaecological examination in either undergraduate or postgraduates. The methodology to establish construct and face validity, as well as reliability

was robust. A reasonable number of novice and experienced students, as well as junior doctors were recruited to this study to establish validity and reliability of the PEAT. The task required to be undertaken by candidates was standardised with identical instructions provided to all participants. We stipulated no time limit for the examination and inappropriate content that was unrelated to pelvic examination skills (Schuwirth and van der Vleuten, 2006). We recruited all assessors from outside our University Medical School and post-graduate training region in order to ensure blinding of assessors to the level of experience of the participants in the study thereby enhancing objective impartial assessment (McAleer, 2005).

Limitations of our approach include the fact that pelvic examination was performed on a manikin rather than a real patient. We tried to make the encounter as realistic as possible with the presence of a role player to provide verbal responses during the examination of the manikin. Despite this, it is unlikely that this setting neither replicated the experience of examining a real patient nor induced similar levels of anxiety (Epstein, 2007). To create a more realistic examination, future studies could consider the use of expert or simulated patients (gynaecology teaching associates or 'GTAs'). However, given that most medical schools do not employ GTAs, any PEAT should be valid for use in simulated manikin-based scenarios and generalisable. Another limitation of our study is that we used a one-off assessment to establish competence. One could argue that using serial assessments looking at improvements in the VAS scores would give a superior indicator of competence (Leach, 2002), as this would provide a formative method of assessment. However, summative assessments of core clinical examination skills are still common components of final medical

school examinations and validated measuring instruments such as the PEAT should be developed for such purposes.

The low response rate, with only 40% of assessors returning their assessment sheets on the participants impacted adversely on the power of the study to establish validity (Schuwirth and Van der Vleuten, 2006). Hence, it was difficult to establish construct validity of PEAT.

Implications for practice and research

Assessment in postgraduate medical education has a better evidence base than in undergraduate education although we are aware of no validated tools for evaluating proficiency in female pelvic examination. In the postgraduate years, performance is assessed by not only by senior clinicians, but also by patient, peers and other members of the team e.g. secretaries in multi-source feedback (MSF) (Boursicot et al., 2010; Davis and Ponnamperuma, 2005). Mini-clinical evaluation exercise (mini-CEX) is commonly used in postgraduate education for observation of history taking, clinical skills as well as general attitude and professional behaviour (Norcini, 2005). Similarly, directly observed procedural skills (DOPS) are used to assess and provide feedback on particular skills e.g. injections (Norcini and McKinley, 2007). Although these methods were initially created for assessment within a particular specialty, they are now more widely available, and applicable to other specialties such as O&G (Setna et al., 2010). Previous studies in O&G have used observed structured assessment tools (OSATS) for establishing competence in postgraduate surgical skills and have demonstrated construct validity (Goff et al., 2002). The PEAT we developed is a type of OSAT and with further revision we hope to show validity and reliability in both an

undergraduate and postgraduate population. If developed it could be used for both formative assessment (where competency can be attained ideally over a period of time during the clinical placement) and summative assessment (Norcini, 2007).

Many clinical competencies tested in undergraduate medical students are judged by methods which have not gone through rigorous psychometric testing. There is a need for valid, useable instruments for evaluating core clinical skills. In our study we attempted to develop a PEAT for assessing competence in gynaecological examination. However, qualitative work to obtain the views of students, patients, educationalists and clinicians may aid the development of a more valid and reliable PEAT (Epstein, 2007; University of Birmingham, 2015). Pilot studies, such as the current one, can then be undertaken to identify the potential reliability and validity of a refined PEAT. In addition, the derived data can be used to help inform the design and size of future, larger-scale studies. Such studies should incorporate more assessors to better evaluate psychometric performance of the revised PEAT before it can be introduced into routine educational practice.

CONCLUSION

Training in obstetrics and gynaecology is integral to the undergraduate medical school curriculum. Innovations in training and assessment are urgently needed to ensure medical undergraduates qualify with the necessary competence in this core clinical skill. To our knowledge, this is the first study to try to develop and validate a pelvic examination assessment tool which ideally can be used in both undergraduate and postgraduate medical education both formatively and summatively. The PEAT we tested demonstrated utility and

face validity but further refinements are needed to establish reliability and construct validity in larger scale studies inclusive of strategies to optimise response rates of assessors.

Chapter 4: Teaching Associates Randomised to evaluate the effectiveness of Gynaecological pelvic Examination versus Traditional teaching using manikins. (The TARGET Trial)

The TARGET study was a randomised controlled trial designed to compare pelvic examination teaching for final year medical students either by traditional manikin teaching or a new Gynaecological Teaching Associate (GTA) programme. The outcomes explored were the confidence and competence pre-teaching and post-teaching at the end of the O&G block.

ABSTRACT

OBJECTIVES

To assess whether teaching female pelvic examinations using gynaecological teaching associates (GTAs); women who are trained to give instruction and feedback on gynaecological examination technique, improves the competence, confidence and communication skills of medical students compared to conventional pelvic manikin based teaching methods.

DESIGN

Randomised controlled trial

SETTING

Birmingham Women's Hospital**,** UK and nine other University of Birmingham affiliated teaching hospitals in the UK

PARTICIPANTS

492 final year medical students

INTERVENTIONS

GTA teaching of female pelvic examination compared with conventional pelvic manikin based teaching at the start of a five week clinical placement in obstetrics and gynaecology (O&G).

MAIN OUTCOME MEASURES

The confidence and competence of students performing pelvic examination was measured at the end of their clinical placement. Each student's perception of their confidence was measured on a 10cm visual analogue scale. Domains of competence were measured by a senior clinical examiner using a standardised assessment tool which utilised 10cm visual analogue scales and also by a GTA using a four point Likert scale (unsatisfactory, borderline, satisfactory and good.). Assessors were blinded to the allocated teaching intervention.

RESULTS

408/492 (82%) students completed both the intervention and outcome assessment. Self-reported confidence was higher in students taught by GTAs compared with those taught on manikins (median score GTA 6.3; vs. conventional 5.8; p= 0.03). Competence was also significantly higher in those taught by GTAs when assessed by an examiner (median global score GTA 7.1 vs. conventional 6.0; p = <0.001) and by a GTA (p = <0.001).

CONCLUSIONS

GTA teaching of female pelvic examination at the start of undergraduate medical student O&G clinical placements improves their confidence and competence compared with conventional pelvic manikin based teaching. GTAs should be introduced into undergraduate medical curricula to teach pelvic examination.

TRIAL REGISTRATION

Clinicaltrials.gov reference number NCT01944592

KEYWORDS

Female pelvic examination, Gynaecology Teaching Associates, Confidence, Competence, Randomised controlled trial, Expert patient, Medical student

INTRODUCTION

Competency in female pelvic examination is required in order to qualify as a doctor. It is recognised that the intimate nature of the examination poses additional challenges to medical students and their teachers in gaining consent for supervised training (Pugh and Salud, 2007). However, other factors may now be affecting student experience. These include competing pressures on contemporary undergraduate medical curricula resulting in traditional clinical placements, such as obstetrics and gynaecology (O&G), becoming shortened in many academic medical institutions. Empowerment of patients combined with changes in their expectations of interactions with medical professionals may have further restricted students' access to clinical cases (Jha et al. 2010). Changes in attitudes to teaching gynaecological examination may not be restricted to patients; clinical teachers may also have become more conservative or less experienced such that they find teaching vaginal examination an increasing challenge.

Whatever the reasons underlying the diminishing exposure of medical students to gynaecological examination, the current status is unacceptable. Teaching innovations are urgently required to enhance teaching of a skill, which is fundamental to both gynaecological and general medical practice. A strategy gaining popularity is simulation using 'expert patients' known as gynaecological teaching associates (GTAs) (Robertson et al., 2003). These women have been trained to both undergo and teach gynaecological examination simultaneously providing instruction and immediate feedback to students. In North America GTAs are quite commonly used in the medical curriculum and they have also been used in Canada, Australia and Scandinavia (Herbers et al., 2003; Holzman et al., 1977; Kleinman et

al., 1996; Livingstone and Ostrow, 1978; Pradhan et al. 2010; Wanggren et al., 2010). However, the majority of undergraduate medical programmes continue to teach pelvic examination using inanimate pelvic models (manikins) combined with experience gained from supervised teaching on women attending outpatient clinics and those anaesthetised for surgery within clinical placements. However, the length of clinical placements varies in length across medical schools and the quality of experience is likely to be inconsistent between students from the same medical school.

Smith et al. (2015) recently conducted a systematic review comparing GTA teaching of pelvic examination with other teaching methods. This suggested that the use of GTAs is associated with significant improvements in student competence and modest improvements in communication skills and no apparent difference in student confidence (Smith et al., 2015). However, these data were scarce and heterogeneous, being limited to small observational and randomised series with typical samples less than 100 students. Moreover, GTA training was often supplementary to the normal curriculum, so the amount of teaching rather than the style of teaching may have acted as a confounding factor (Herbers et al., 2003; Livingstone and Ostrow, 1978; Pickard et al., 2003). Thus, there is a need for large, robust randomised controlled trials (RCT) to identify the key components of GTA teaching packages and to ascertain their optimal duration and frequency. Moreover, evaluating the educational benefit of GTAs is also important to rationalise the allocation of scarce undergraduate educational resources.

With opinion as to the value of GTAs not yet solidified and in the absence of rigorous scientific assessment of the educational benefits of GTAs, we undertook a large RCT to compare the effectiveness, in terms of student confidence and competence, of teaching female pelvic examination to medical students using GTAs when compared to conventional teaching.

METHOD

The TARGET trial (Teaching Associates Randomised to evaluate the effectiveness of GTA taught pelvic Examination versus Traditional teaching using manikins) was a single blinded, parallel-group RCT to assess the effectiveness of GTAs teaching pelvic examination compared with conventional pelvic manikin based teaching.

Recruitment of Gynaecological Teaching Associates (GTAs)

Women from a non-clinical background were recruited and employed as GTAs by the University of Birmingham in order to teach pelvic examination to medical students in small group sessions. Recruitment took the form of poster advertisements followed by formal interviews. (Appendix 7) During 2011, suitable applicants were selected and then taught how to demonstrate and teach clinical skills by both consultants and senior specialist trainees in O&G over a six month period. A cohort of eight GTAs with a minimum of two years' experience performed teaching and examination.

Student Recruitment and Randomisation

Year five medical students beginning their O&G clinical placement at the University of Birmingham were invited to participate in the study one week prior to commencement of their clinical placement via email and were provided with information leaflets and consent forms. (Appendix 8 and 9) The TARGET trial was introduced to students by a member of the Birmingham Women's Hospital (BWH) undergraduate teaching faculty (AJ, TJC, JKG) during their introductory lecture on day one of their placement. Consenting students were recruited. All students were considered suitable for the trial, and there were no exclusion criteria. Third party randomisation was performed by the Birmingham Clinical Trials Unit (BCTU) at the end of day one of the clinical placement. Students were allocated in a 1:1 ratio through a telephone randomisation service. Randomisation blocks were stratified by student gender to ensure balance between groups. The randomisation blocks were kept centrally at the BCTU and varied in size so that allocation could not be deduced. The study was a single blinded RCT where the assessors were unaware of the pelvic examination teaching method the students had received at the start of their O&G placement.

Teaching interventions

Allocated formal teaching of gynaecological pelvic examination took place within four days of randomisation after which the students went on to complete their standard five week clinical placements in O&G at ten hospitals recognised as Clinical Teaching Academies for the University of Birmingham Medical School. All participating students were given a lecture on pelvic examination before being split into groups of four for a two hour teaching session. The content of the two hour session was dictated by whether the student was randomised to

GTA teaching or conventional pelvic manikin based teaching. Those students who did not take part in the study received the standard teaching usually provided by their allocated hospital.

GTA teaching

For students allocated to GTA teaching, a pair of GTAs discussed the pre-examination gynaecological consultation including the process of consent and preparation of a patient with the students. This was followed by a role-play in a consultation room, where one played a patient and the other the medical student. Each student then conducted a gynaecological examination including abdominal palpation, speculum examination and bimanual examination with feedback on technique, pressure and communication skills from both the GTA being examined and the supervising GTA. The other students in the group all observed the active student. Once all students had completed conducting an examination they repeated the examination on the other GTA who was not examined initially, but this time they were allowed to perform the examination uninterrupted and feedback was provided at the end.

Conventional pelvic manikin based teaching

For students allocated to conventional teaching the pre-examination gynaecological consultation, including the process of consent and preparation of a patient, was discussed with the students by a Clinical Lecturer from the undergraduate faculty. Any queries from students were addressed. Once this was completed, the Clinical Lecturer demonstrated a gynaecological examination on a pelvic manikin. Each student then performed a pelvic

examination, comprising speculum and bimanual examination on the manikin with feedback on technique and communication skills from the Clinical Lecturer. The other students in the group all observed the active student. Questions on examination technique were answered and students then repeated the examination on the pelvic manikin, but this time they were allowed to perform the examination uninterrupted and feedback was provided at the end .

Outcome measures

Assessment of confidence and competence

The level of student perceived confidence and competence was collected prior to teaching interventions to explore whether baseline confidence and competence differed between groups. (Appendix 10) Students rated their confidence and competence on an ungraduated 10 cm visual analogue scale (VAS). Student perceived confidence and competence at the end of their five week O&G clinical placement was evaluated in the same way on a 10cm VAS, immediately prior to an objective, summative assessment of competency. (Appendix 11) All self-reported student outcomes were collected using an anonymous questionnaire.

Objective student competence in performing gynaecological examination was assessed using an objective structured clinical examination (OSCE) station, which comprised a clinical scenario requiring the student to explain and conduct a speculum and bimanual examination of a female patient attending an outpatient clinic. The role of the patient was played by one of the GTA faculty and students were observed by a single passive examiner. Examiners were O&G Consultants or Specialist Trainees at Registrar level and all had an interest in medical education as well as familiarity in OSCE style assessments. The examiners assessed the

students independently using a standardised assessment tool (Appendix 12) which comprised of seven domains relating to various communication and practical aspects of the procedure and a global assessment for competence. All domain responses were measured on an ungraduated 10cm VAS. In addition, the GTAs were asked to give an overall rating of the student's communication and clinical examination skills, as perceived by them in their patient role, on a four point Likert scale with response categories: "Unsatisfactory", "Borderline", "Satisfactory" and "Good". The examiners were blinded to the students' teaching methods. The GTAs involved in the final assessment were allocated to students they had not taught in the GTA teaching session.

Secondary outcomes

A number of secondary, self-reported student outcomes were collected by anonymous questionnaire, immediately prior to OSCE assessment of competency, to further assess the impact of initial teaching interventions on student experience during their five week clinical placements in O&G. Subjective data pertaining to the student's perception of the usefulness of their clinical placement in teaching gynaecological examination were collected. Objective data, regarding the number of vaginal examinations performed, were also collected; the students were asked how many vaginal examinations they had performed (excluding those on GTAs) and in what setting i.e. (i) women in the outpatient clinic or ward environment; (ii) women under general anaesthesia prior to operative intervention. Students were asked about the impact of initial GTA or manikin training on subsequent experience and exposure to examination during the O&G placement. These responses were measured using an

ungraduated 10cm VAS. Further free-text comments on training or opportunity to undertake pelvic examinations were also invited.

Sample size

The sample size was estimated by identifying a useful improvement in student competence at undertaking female pelvic examination following GTA-based teaching over conventional teaching. In a previous, small randomised UK study (Pickard et al., 2003), the average score in the final assessment of those students given extra training with GTAs was 77.1% compared to 59.2% for those on the standard training course. The standard deviations for all assessments ranged from 9.4 to 15.0. Moreover, from surveying Senior Academy Teachers at the BWH Clinical Teaching Academy, a 5% improvement in competence and confidence was considered clinically meaningful. Thus, by adopting a cautious approach and assuming a minimum significant improvement in results of 5% with a power of 90%, a significance of 0.05 (two tailed test) and a standard deviation of 15.0, we predicted we would need 200 students in each arm of the RCT. The sample size was inflated to 480 to allow for 20% loss to follow up (student drop out).

Statistical analysis

Analysis was by intention to treat. Baseline characteristics of the students enrolled in the two groups were compared to ensure that randomisation had produced comparable groups of students. Categorical measures were presented as frequencies and percentages and analyses with chi squared tests. Analysis of normal plots and summary statistics guided which statistical analysis was performed for continuous variables measures on VAS. As

almost all the data was not normally distributed, continuous variables were displayed as medians and interquartile ranges and analysis performed using the Mann-Whitney Test. Categorical outcomes were analysed using regression analysis. All analysis was performed using SPSS software version 21.

RESULTS

Participants and follow up

492 medical students were recruited and randomised between August 2013 and December 2014, with 408 (82.9%) attending the final assessment. Baseline characteristics of the students in both groups were similar (Table 6). In total, 241/247 (98%) students randomised to the GTA group attended teaching compared with 240/245 (98%) in the conventional teaching group (Fig. 3). Primary outcome responses were available from 408/481 (85%) participants who received teaching.

Table 6: Baseline characteristics of students. Values are numbers (%) unless stated otherwise

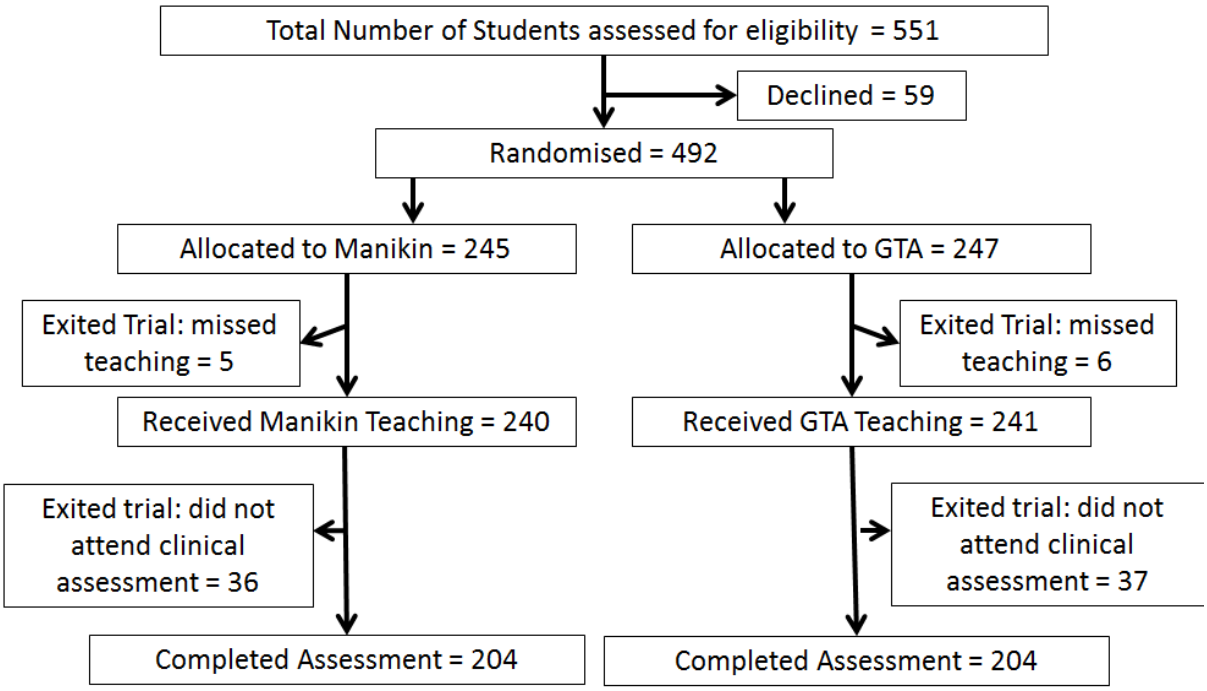
Characteristics		Gynaecological teaching associate (n=247) n (%)	Conventional faculty teaching with manikins (n=245) n (%)
Demographics			
Sex	Female	161 (65)	158 (65)
	Male	86 (35)	87 (35)
Age	20-23	159 (64)	171 (70)
	24-26	67 (27)	58 (24)
	27-30	17 (7)	9 (4)
	>30	4 (2)	6 (2)
Ethnicity	White	166 (67)	160 (65)
	Asian	54 (22)	59 (24)
	Black	3 (1)	5 (2)
	Mixed	7 (3)	8 (3)
	Other	13 (5)	10 (4)
Pre-Trial Gynaecological Experience			
Number of previously performed pelvic examinations on a female patient	0	73 (30)	57 (23)
	1 to 5	163 (66)	183 (76)
	6 to 10	7 (3)	3 (1)
	>10	2 (1)	0 (0)
Interest in a future career in obstetrics and gynaecology		3.7 (3.0)[1]	3.4 (3.0) [1]

Footnote

[1] Median (interquartile range)

Fig. 3: TARGET Trial Flow of Participants

Flow chart showing enrolment, randomisation and follow-up of participants in the TARGET trial



Confidence in pelvic examination

At the end of the five week clinical placements in O&G there was a significant improvement in confidence from baseline in female pelvic examination for students in both the GTA group (median increase from baseline 3.8; $p<0.001$) and conventional teaching group (median increase from baseline 3.2; $p <0.001$). However, the degree of confidence in pelvic examination for those students taught by GTAs was higher (median score; GTA 6.3 [IQR 2.1] vs. conventional 5.8 [IQR 2.1]; $p= 0.03$).

Competence in pelvic examination

When students scored their own competence at the end of the teaching block there was no significant difference between the groups (median score; GTA 6.5 [IQR 2.0] vs. conventional 6.4 [IQR 2.0]; p= 0.3). However, objective third party assessment by examiners and GTAs consistently showed a better performance by students receiving GTA teaching in gynaecological examination across almost all measures. The global score for competence assessed by examiners during the OSCE was significantly higher in those taught by GTAs (median score; GTA 7.1 [IQR 3.0] vs. conventional 6.0 [IQR 3.0]; p= <0.001). Those students taught by GTAs scored significantly higher than those taught conventionally in six elements of the pelvic examination but not for inspection (median score; GTA 7.1 [IQR 3.0] vs. conventional 6.7 [IQR 4.0]; p= 0.5) and the number that correctly identified the cervix (GTA 142/204 [70%] vs. conventional 126/201 [63%]; OR 1.41 [95% CI 0.93 to 2.13]; p=0.7) (Table 7). Assessment by the GTAs during the OSCE also showed a statistically significantly better performance by those taught by GTAs (p = <0.001), (Table 8). A subgroup analysis was done for student sex as this was used as a stratification variable during randomisation. There were no significant differences between male and female students perceived confidence after training (median score; male 6.0 [IQR 2.4] vs. female 6.3 [IQR 2.0]; p= 0.4) and competence assessed by an examiner (median score; male 6.5 [IQR 3.0] vs. female 6.5 [IQR 3.0]; p= 0.5).

Table 7: Examiner results of objective structured clinical assessment (OSCE)

	GTA median; IQR (number)[2]	Conventional median; IQR (number)[2]	*P*[1]
Attitudes	8.2; 3.0 (203)	7.2; 3.0 (198)	0.001
Inspection	7.1; 3.0 (202)	6.7; 4.0 (200)	0.5
Bimanual Examination	6.7; 3.0 (200)	5.8; 3.0 (199)	0.001
Adnexa and POD	6.3; 4.0 (200)	5.7; 3.0 (200)	0.006
Speculum Examination	6.8; 3.6 (204)	5.8; 3.4 (201)	0.001
Post Examination	7.0; 3.0 (199)	6.3; 4.0 (191)	0.003
Global Assessment	7.1; 3.0 (201)	6.0; 3.0 (194)	<0.001
Mean Score	7.0; 3.0 (205)	6.3; 2.8 (202)	0.001
	GTA n/N (%)	**Conventional n/N (%)**	***P*[3]**
Cervix Viewed	142/204 (70)	126/201 (63)	0.7

Footnotes

IQR = interquartile range; 1 = Mann U Whitney test; 2 = numbers vary according to responses received as some 100mm VAS left blank by assessors; 3 = Chi squared test.

Table 8: Gynaecological teaching associate assessment results

GTA Assessment	GTA (N=203) n (%)	Conventional (N=199) n (%)	*P*[1]
Good	113 (56)	60 (30)	<0.001
Satisfactory	65 (32)	95 (48)	
Borderline	15 (7)	27 (14)	
Unsatisfactory	10 (5)	17 (9)	

Footnotes

[1] = P value for trend using regression analysis

Secondary outcomes

There was no significant difference between groups in the number of pelvic examinations performed during the placement (p = 0.4). However, the students who were taught by GTAs performed significantly more examinations on patients who were awake (median number; GTA 3.0 [IQR 4.0] vs. conventional 2.0 [IQR 4.0]; p= 0.02) and were more satisfied with their

opportunities to perform pelvic examination during their placement (median score; GTA 6.6 [IQR 2.3] vs. conventional 6.0 [IQR 3.2]; p= 0.02). Those students taught by GTAs perceived the usefulness of their training as being better (median score; GTA 8.7 [IQR 2.1] vs. conventional 8.1 [IQR 2.1]; p= <0.001) and thought that the initial training had a more positive impact on exposure to pelvic examination during their placement (median score; GTA 7.1 [IQR 2.0] vs. conventional 6.4 [IQR 3.0]; p= <0.001), (Table 9) There was no post-placement difference between allocated teaching groups in a future career interest in O&G although significantly more female students reported considering a career in O&G (median score; female 5.2 [IQR 4.0] vs. male 3.3 [IQR 4.0]; p = <0.001).

Table 9: Post-teaching questionnaire results

Characteristics		GTA median; IQR (number)[3]	Conventional median; IQR (number)[3]	*P*[1]
Perceived *usefulness* of training method received at the start of O&G block		8.7; 2.1 (203)	8.1; 2.1 (201)	<0.001
***Number of pelvic examinations* performed during O&G placement**	**0**	6 (3%)	9 (5%)	0.4[2]
	1 to 5	114 (56%)	116 (59%)	
	6 to 10	70 (34%)	60 (30%)	
	>10	14 (7%)	13 (7%)	
Patient awake		3.0; 4.0 (194)	2.0; 4.0 (192)	0.02
Patient under general anaesthetic		1.0; 3.0 (200)	2.0; 3.0 (194)	0.2
***Impact* of initial training i.e. manikin / GTA on experience and exposure to gynaecological pelvic examination during the O&G placement**		7.1; 2.0 (200)	6.4; 3.0 (199)	<0.001
***Overall satisfaction* with the opportunity to *undertake pelvic examination* during O&G placement**		6.6; 2.3 (204)	6.0; 3.2 (201)	0.02
Overall satisfaction* with the O&G *placement		7.6; 2.0 (201)	7.8; 2.0 (200)	0.7
Interest in *future career* in O&G		4.7; 4.0 (201)	5.0; 4.0 (200)	0.9

Footnotes

IQR = interquartile range

[1] Mann U Whitney test unless otherwise specified

[2] P value for trend using regression analysis

[3] numbers vary according to responses received as some 100mm VAS left blank by students.

DISCUSSION

Principal findings

This single blinded RCT has shown that teaching of female pelvic examination to medical students by GTAs compared to conventional teaching by physicians is significantly better in terms of acquired competence and self-assessed confidence. Not surprisingly, confidence in

pelvic examination improved for both groups after initial teaching in pelvic examination and a five week clinical placement in O&G, but this improvement was significantly greater in those taught by GTAs. Students trained by GTAs perceived their training method as being more useful and thought that GTA training had a greater impact on their subsequent exposure to gynaecological pelvic examination during their O&G placement. Those taught by GTAs performed significantly more examinations on conscious women in the clinical environment and reported being more satisfied with these opportunities. Students taught by GTAs were also found to be more competent than those receiving conventional teaching when evaluated by trained examiners and the GTAs themselves. Enhanced competence was not just restricted to global assessment but also observed in all individual elements of the pelvic examination (attitude, speculum examination, bimanual examination of the uterus, examination of the adnexa and pouch of Douglas and post examination feedback) with the exception of the domain of inspection and identification of the cervix where no differences were observed between groups.

The reasons underpinning the improved performance of students receiving initial instruction by GTAs before a short clinical placement are unclear. Inanimate manikins, regardless of their degree of sophistication, cannot easily replicate the reality of conducting intimate examination in a real-life clinical situation. However, the use of trained, expert patient teachers provides valid human examination experience for students in a non-threatening environment conducive to learning. Moreover, GTAs are unique in being able to give immediate feedback to students in ways that cannot be reproduced by teaching on pelvic manikins, consented anaesthetised patients pre-surgery or real patients in outpatient clinics.

Our data supports the notion that initial GTA training enhances student experience during the subsequent clinical placement in O&G with students feeling more satisfied and undertaking more supervised examinations in conscious women. This may reflect the authenticity of GTA teaching, allowing students to overcome embarrassment and stress which has been well reported with genital tract examinations (Livingstone et al., 1978; Theroux et al., 2006) thereby improving their confidence and willingness to engage more fully in the clinical setting.

Strengths and Weaknesses

The strengths of this trial include the strict randomisation process, its large size and the blinding of examiners to the teaching method of the students. The rate of loss to follow up was acceptable with 20% of the cohort not attending for the final voluntary OSCE assessment of competency. To optimise follow up students had been informed that the evaluation would not contribute towards their final degree marks and that they would receive immediate feedback regarding their performance. However, it appears that the combination of the pressure of an assessed clinical examination, time taken out of study and recreation during the final year dissuaded a minority of students to not attend.

Some limitations of our trial should be noted. In the absence of a validated competency assessment tool in female pelvic examination we used a bespoke OSCE developed and used for over three years by our undergraduate faculty and which appears to have face validity. Undergraduate medical student and examiners are familiar with OSCEs and so we believe that our competency assessments are valid and reproducible. It is possible that the observed

differences in competency were reduced because most students had received a session of GTA teaching for pelvic examination during their third year of training albeit as part of their General Practice placement and this instruction was limited to vaginal assessment without speculum examination. Finally, students were examined five weeks after their initial training and immediately after completion of their O&G teaching block such that the sustainability of the imparted knowledge and skills in the longer term is unclear.

Comparison with other studies

Data pertaining to GTA teaching of female pelvic examination are scarce and heterogeneous. Published data are limited to small observational and randomised series with typical samples less than 100 students (Smith et al., 2015). Overall, these data suggest that GTA teaching of pelvic examination is associated with significant improvements in student competence, modest improvements in communication skills and no apparent difference in student confidence compared with other teaching methods (Smith et al., 2015). There have been a few previous RCTs that have indicated teaching of pelvic examination by GTAs is effective (Herbers et al., 2003; Livingstone et al., 1978; Pickard et al., 2003). However, these were small trials that provided the GTA teaching as additional training, so it is hard to distinguish whether the benefit was conferred through the extra time spent teaching rather than the efficacy of the teaching method.

In contrast to our trial, one RCT compared 53 GTA taught students to 53 taught by the faculty with a real patient but found no statistical difference in competence or confidence (Pradhan et al., 2010). The difference in results seen in our study could be explained by its

much larger size and, more rigorous methodology. Moreover this trial (Pradhan et al., 2010) used a real patient rather than a manikin for teaching in the control group which may have provided greater authenticity thereby blunting the potential advantages of simulation using GTAs. On a practical level, the availability of 'real' patients willing to allow students to learn pelvic examination in a structured teaching environment is likely to prove difficult.

CONCLUSION

Implications for clinicians and policy makers

There is a pressing need to improve the teaching of gynaecological examination to enhance student experience and competence in order to deliver better care in women's health and to safeguard patients. Evidence from this trial confirms that the GTA programme in its current design was effective in achieving better key educational outcomes compared to conventional teaching i.e. an increase in confidence and competence. Educators can confidently use GTAs to replace or supplement existing methods to teach competence in female pelvic examination and so help improve the current suboptimal situation. Experience of intimate examination is not restricted to gynaecological assessment (Hendrickx et al., 2009) and so medical schools should consider employing GTA equivalents to assist with other intimate examinations such as uro-genital, breast, rectal, and prostate if the findings of our trial can be replicated in other disciplines.

Future research

Future research needs to be conducted into methods of GTA training. More thought is needed to design the timing, frequency and duration of GTA sessions. Since GTAs have been

shown to have a benefit in undergraduate teaching, exploring whether postgraduate trainees early in their O&G career would benefit from GTAs for simple and complex pelvic examination teaching could be investigated. GTAs could also be used to aid training in the performance of simple clinical procedures e.g. ultrasound scans. Development of validated assessment tools for measuring competence, communication skills and confidence in intimate examination will aid rigorous and standardised comparisons between teaching packages. This intervention should be evaluated in RCTs incorporating economic assessments to provide robust evidence for effectiveness, cost-effectiveness and sustainability of GTA programmes. Future research should also aim to identify which students may respond better to GTA teaching whilst also exploring attitudes and anxieties (both GTA and student) to intimate examination through qualitative research.

Chapter 5: Cost Effective Analysis of Teaching pelvic examination skills using Gynaecology Teaching Associates (GTAs) compared with manikin models. (The CEAT Study)

The CEAT study aims to explore the cost-effectiveness of teaching intimate female pelvic examination skills to final year medical students using Gynaecology Teaching Associates (GTAs) compared with traditional teaching using manikin models. The cost effectiveness was calculated alongside a single blinded randomised controlled trial (RCT) where students placed at Birmingham Women's Hospital (BWH) during their Obstetrics and Gynaecology (O&G) placement were randomised to pelvic examination teaching either with a GTA or a pelvic model (manikin). The cost effectiveness has been calculated per 'competent' student.

ABSTRACT

OBJECTIVE

To determine the cost-effectiveness of Gynaecology Teaching Associate (GTA) teaching versus conventional pelvic model (manikin) teaching of pelvic examination skills for final year medical students within a UK undergraduate Obstetrics and Gynaecology (O&G) curriculum.

DESIGN

Economic evaluation carried out alongside a randomised controlled trial (RCT).

PERSPECTIVE

The UK National Health Service (NHS) perspective was used in the estimation of costs and the interpretation of results.

SETTING

Birmingham Women's Hospital, UK and nine other University of Birmingham College of Medical and Dental Sciences (UoB CMDS) affiliated teaching hospitals in the UK.

PARTICIPANTS

Final year UoB medical students in their O&G clinical placements between August 2013 and December 2014.

CONTROL AND INTERVENTIONS

Participants were randomised to either GTA or conventional teaching of gynaecological pelvic examination.

METHODS

492 students participated in the trial, with 240 receiving manikin teaching and 241 receiving GTA teaching. 408 (83%) of students completed their assessment. Proficiency in gynaecological pelvic examination was estimated by a senior clinical examiner, blinded to the method of teaching, using a standardised assessment tool. University of Birmingham Medical School thresholds were applied to determine proficiency levels; competence (pass) 50%, merit 60% and distinction 70%. Costs incurred by the UoB CMDS in the delivery of both the educational pathways (control and intervention) were combined. All costs are reported in the 2013-4 prices and earlier costs have been adjusted using inflation indices.

OUTCOME MEASURES

Cost per student competent in pelvic examination at completion of a five week clinical O&G placement. Costs incurred by the UoB CMDS in the delivery of both the educational pathways (control and intervention).

RESULTS

GTA teaching was more effective compared to conventional teaching with 20 more students considered competent at pass level and 28 more students competent at merit and distinction levels respectively. However, the average cost of GTA teaching was £45.06 per

student compared with £7.40 per student for conventional teaching, with an increased cost of £37.66 per student. The incremental cost effectiveness ratio demonstrated that it cost an additional £640.20 per competent student and £274.37 per student competent at merit level and £274.37 at distinction level compared with conventional manikin based teaching.

CONCLUSIONS

GTA teaching of female pelvic examination at the start of undergraduate medical student O&G clinical placements is shown to cost more and be more effective. GTA teaching is likely to be considered cost-effective in the context of other tests, and over the lifespan of a competent doctor's career.

KEYWORDS

Undergraduate medical education, medical student, pelvic examination, Gynaecology Teaching Associates (GTAs), competence, cost effectiveness

INTRODUCTION

Current teaching methods focus on theoretical knowledge of pelvic anatomy, communication skills role played with a teacher, practice of skills on an anatomical model (manikin), and supervised teaching in outpatient clinics and theatres. However, these current teaching approaches do not allow the nuances of this intimate examination to be appreciated and may not be the most efficient way of ensuring medical students attain a level of proficiency required by the GMC (2015). With dwindling clinical exposure, teaching innovations that assist in medical students achieving competence prior to graduation are urgently needed. One suggestion is the introduction of expert patients known as Gynaecology Teaching Associates (GTAs), who are recruited and trained to instruct medical students in achieving practical experience (Kretzschmar, 1978; Kretzschmar and Guthrie, 1984).

Despite apparent educational benefits of GTA-led teaching (Smith et al., 2015), this educational innovation is an expensive human resource. (Pickard et al., 2003; Pradhan et al., 2010; Siwe at al., 2007; Wanggren et al., 2010) Those tasked with designing and delivering undergraduate medical education, need to do so within the context of financial constraints on higher education and mindful of other competing priority areas within medical school curricula. Thus, in the climate of existing educational and NHS financial restraints, new educational interventions need not only to be effective but also cost-effective in delivering learning outcomes in key components of the curriculum. There are also few economic assessments evaluating the use of expert patients in teaching non-genital tract examinations (Black and Marcoux, 2002; Aamodt et al., 2006) and no rigorous, formal economic analyses

of GTA teaching of gynaecological examination. Thus in light of this uncertainty we undertook an economic evaluation alongside a large RCT to estimate the cost effectiveness of a GTA led teaching programme for pelvic examination skills in comparison with the use of traditional pelvic model (manikin) teaching. An economic evaluation is "the comparative analysis of alternatives courses of action in terms of both their costs and consequences" (Drummond et al., 2005). Thus the objective of this evaluation is to explore whether GTA based teaching provides additional competency to medical students and whether any increase in competency would be considered good value in the context of scarce NHS resources.

METHODS

This economic evaluation was carried out alongside the TARGET (**T**eaching **A**ssociates **R**andomised to evaluate the effectiveness of **G**ynaecological pelvic **E**xamination versus **T**raditional teaching using manikins) trial; a pragmatic single-centre single-blinded randomised controlled trial comparing pelvic examination teaching using anatomic models i.e. pelvic manikins (control) with expert patients - GTAs. All final year students from the UoB CMDS were invited to participate in the study on the first day of their clinical O&G placement. The RCT recruited almost 90% of all eligible students, of which half were randomised into the control group i.e. LFS with a manikin teaching facilitated by a teaching faculty member, and the other half the experimental intervention; GTA teaching (Appendix 13).

Teaching took place during the first of five weeks of the students' placements in O&G, prior to graduation. The trial outcome measures were confidence and competence in performing pelvic examinations assessed at the end of the fifth week of the student's placements. Pre-teaching and pre-assessment questionnaires were distributed that included the students' own perceptions of their confidence and competence levels. Scoring by assessors was conducted using a 0 – 10 cm Visual Analogue Scale (VAS) on a bespoke assessment tool. The assessors marking their examination were blinded to the intervention the student's had received, which eliminated bias. The data from the RCT have been extrapolated to explore which of the two teaching methods was more cost effective in terms of the outcome of competence as determined by the assessors.

Figures 4 and 5 detail the composition and course of the control (manikin) and experimental (GTA) teaching interventions during the RCT. The introductory PowerPoint presentations were the same for each teaching intervention (Appendix 14). The teaching sessions took place between 1700 and 1900 hours. After the initial teaching, the participants completed their five week O&G placements at their assigned hospitals within the West Midlands, all of which were affiliated to the UoB CMDS. Opportunities during the clinical placement for conducting supervised pelvic examination either in O&G outpatient department settings or operating theatres were available regardless of initial teaching allocation.

Recruitment to the TARGET RCT took place from 27th August 2013 to 12th December 2014. Each clinical placement lasted five weeks. Teaching of female pelvic examination was

undertaken during the first placement week with both teaching methods delivered simultaneously but within different environments at the BWH (Appendix 15).

Fig. 4: Programme of Manikin teaching (2 hours; 1 Lecturer: 6 students)

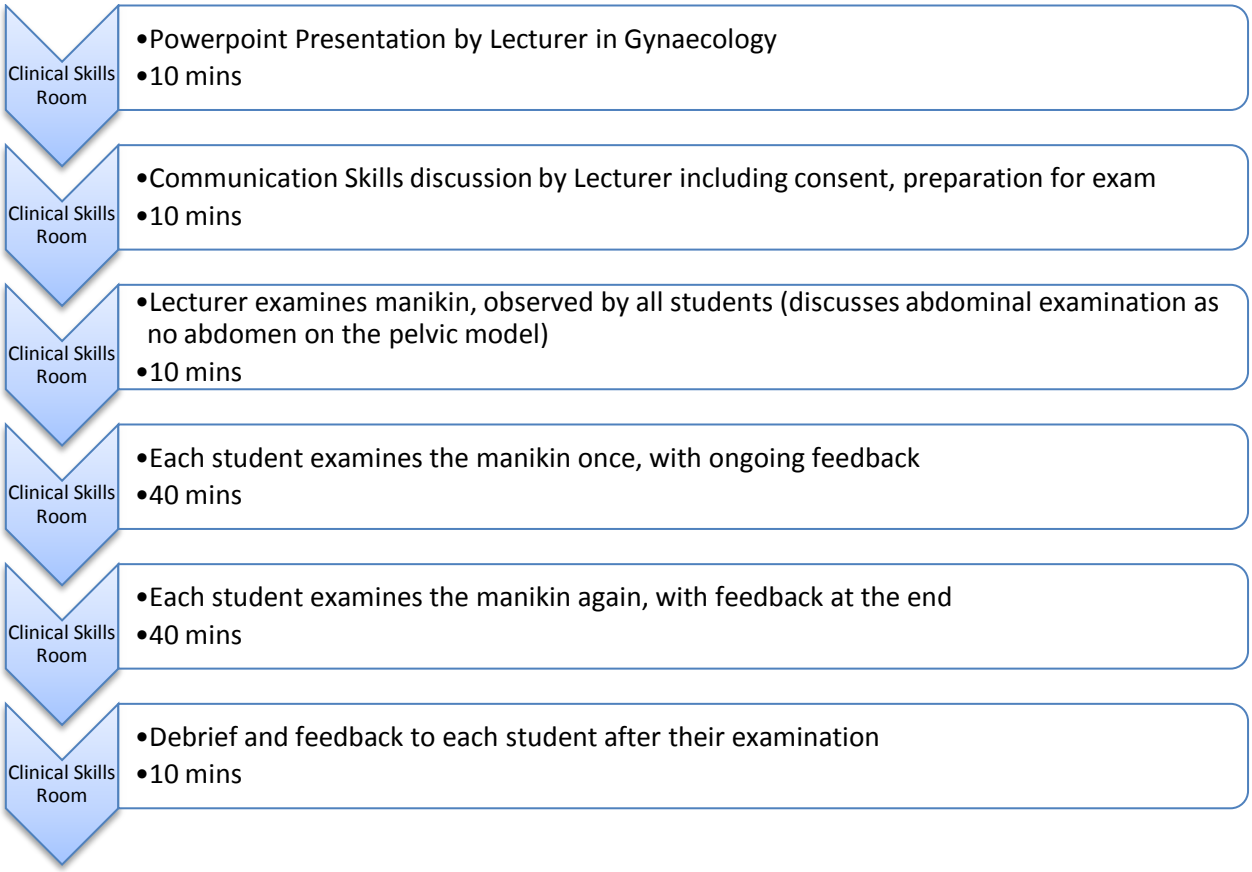
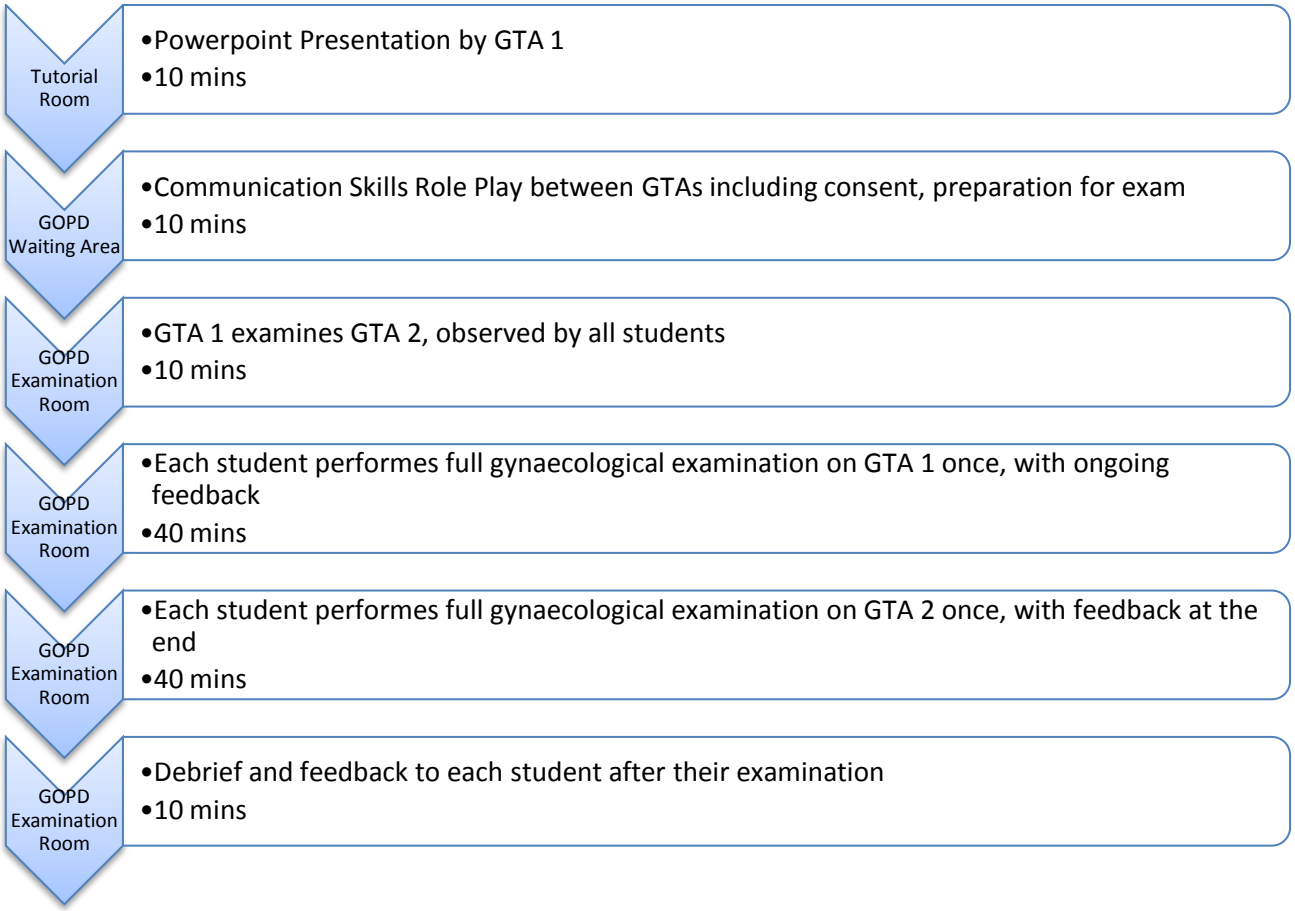


Fig. 5: Programme of GTA teaching (2 hours; 2 GTAs: 4 students)



RESOURCE USE AND COST DEFINITION (Table 10)

All costs in the analysis are in UK pounds (£), based on 2013/2014 values. Apart from the intervention, all other resource use is the same for all students in control and intervention arm respectively. The costs have been calculated as a bottom up approach incorporating all resources used for the purposes of teaching in the manikin and GTA arm. The BWH finance department provided the costs of running the GOPD, including indirect facilities, facilities, depreciation, divided and overhead costs of 10% factored in.

Manikin based teaching

A Clinical Teaching Fellow (CTF) was employed by BWH for the purpose of teaching final year medical students during their O&G placement. The cost to the hospital of employing the CTF was £43,434 per annum over 52 weeks. This base salary reflects no on-calls, and an average working week of 40 hours. Therefore, the hourly cost is calculated at £20.82. Actual costs of the faculty member teaching manikin examination may vary as there is a pay scale depending on the number of years worked in the NHS, prior to taking the CTF post. No travel costs are accounted for as the CTF is on site at BWH and continued to teach the sessions after working hours.

The total invoice to BWH of manikin purchase was £3301.75. However, for the purposes of the trial, costs of delivery have been excluded. (Appendix 16) During the trial, the pelvic manikin (Appendix 17) was used from 27th August 2013 to 14th November 2014, where teaching was only conducted during the first week of the O&G placement. Costs were calculated per week of use and are appropriately annuitized following the methods of Drummond et al., (2015). (Appendix 18)

GTA based teaching

In addition to the other equipment required, a roll of 200 sheets was placed at the end of the examination bed for the purposes of covering the bed and patient to maintain dignity during the teaching. These are usually changed in between the examination of patients. During the initial demonstration, where GTA 1 examined GTA 2, two sheets were used as a 'modesty blanket' for GTA 2, and three sheets were used for covering the examination table.

GTA 1 would have used the same sheets on the bed and cover throughout all the examinations, which would have then been changed for GTA 2. Approximately 10 sheets per GTA pair were used, and with approximately 8 teaching sessions per week, and accounting for superfluous waste, the price per week has been calculated at £2.76.

Tissues were also used at the end of the examination for the GTAs comfort to wipe away any excess Aquagel. A box of 100 tissues were priced at £3.60, and an estimation of two tissue boxes per week (£7.20) has been incorporated including use of students after washing hands.

Table 10: Resource use and costs

Resource	Details	Cost (£)
Manikin arm costs		
Lecturer / SpR		£20.82 per hour
Manikin [1]	Costs per week	£14.50 per teaching week
Disposable speculum [2]	1 speculum required for the teaching session	£0.77 per speculum
GTA arm costs		
GTA / chaperone pay		£30 per hour
Disposable speculum [2]	2 speculums used per student	£0.77 per speculum
Aquagel [3]	2 sachets required per student	£1.54 per student
Gloves [4]	4 gloves per student	£0.10 per student
	2 gloves for the GTA demonstration	£0.05 per GTA
Couch Roll (Tissue) [5]		£2.76 per week
Tissue box [6]		£7.20 per week

Footnotes

[1] See Appendix 18

[2] 25 speculums priced at £19.23 including VAT. (Appendix 19)

[3] 5g package priced at £73.80 for 48 sachets. One sachet is adequate for one full examination including application on the speculum for insertion and on the gloved fingers for bimanual examination.

[4] £5 per box of 200 disposable latex-free gloves. A pair of gloves is required per examination, and two examinations performed within one GTA session, the total cost of four gloves was £0.10 per student. For the initial GTA demonstration of examination, £0.05 has been calculated.

[5] 200 sheets priced at £5.51

[6] 100 tissues priced at £3.60

OUTCOMES

At the end of the five week placement in O&G, the students in the trial were invited back to perform a full pelvic examination on a GTA blinded to their teaching allocation. A senior examiner, who was also blinded to the teaching the student had received, completed the assessments sheets (Appendix 12) using a bespoke pelvic assessment tool evaluating seven domains considered important in gynaecological examination (see Chapter 3). The students' assessments were performed on a 0 – 10cm VAS scale over seven domains including 'Global

Assessment'. The scores in the seven different domains were then averaged to provide a final value or 'score' for that student which has been used as the educational outcome in this economic evaluation. If an assessor did not mark one of the domains in error, the average would be achieved using only the marked domains as a denominator. (Appendix 12)

In the absence of a validated defined numerical threshold of competence, the University of Birmingham Medical School recommended marking thresholds were applied; a pass score should be 50% (corresponding to an average VAS score equal or greater than 5.0), a merit 60% (average VAS score ≥6.0) and distinction 70% (average VAS score ≥7.0) (Appendix 20). We calculated cost per competence level achieved using each of the aforementioned levels as the threshold.

The cost per competent student is obtained from a single study based estimate with a sufficient source of clinical effectiveness data due to large number of participants (~400 students). The single blinded RCT had equal numbers of participants in the control and intervention arm, thus making it a useful means of comparison for cost effectiveness.

ASSUMPTIONS

The cost of recruiting and employing the GTAs included flyer advertisements on boards around BWH and the University of Birmingham Hospital and use of hospital email. These associated costs were considered negligible. The initial meeting costs included the 'Seminar Room' hire and Consultant time, which in this case was performed out of working hours. Rooms within the Education Resource Centre at the BWH are chargeable between 0900 and

1700 hours. No costs were incurred for the first meetings with potential GTAs who were keen on finding out what pelvic examination skill training of undergraduate teaching of medical students would involve. Two further teaching sessions took place in the GOPD where one Specialist Registrar and the Clinical Teaching Fellow taught the GTAs the knowledge, skill and communication skills required to perform a full pelvic examination. The costs of training have been assumed as neutral rather than incorporated into the cost effectiveness analysis. Each medical school, hospital or institution would face similar start-up costs depending on local teaching facilities and staff present.

The study assumed that the aforementioned equipment including number of gloves and speculums are accurate. It was assumed that all equipment during the teaching session functioned correctly and no additional costs have been assumed to account for extra equipment requirements over and above those already estimated. The presence of functioning pelvic models (manikins) was assumed in all hospitals and the estimated five year life-span of the pelvic models has been factored into the analysis.

ANALYSIS

In the first stage of the analysis we conducted a cost consequence analysis that involves comparing the costs and outcomes (competency in pelvic examination expressed as achieving a threshold score of 50% or more on an OSCE) associated with the control and intervention arm of the RCT in a disaggregated manner (Drummond et al., 2005). The purpose of this first analysis is to explore whether or not a case of dominance exists. For example, if the introduction of the new intervention was shown to be both more effective

and less costly than the comparator then the intervention shows dominance over the alternative and the decision is straight forward. The converse is also true, if the new intervention is shown to be more costly and less effective than the alternative, the intervention can be said to be dominated by the alternative. If dominance is not shown by an assessment of costs and consequences, an additional cost effectiveness analysis will be carried out and the results will be expressed in terms of the extra cost per additionally competent medical student at the end of a five week clinical placement in O&G. In addition to the base case analysis, a series of one-way deterministic sensitivity analysis were carried out to explore the robustness of the base case results to plausible variations in teaching methods and facilities used. In the base case analysis costs were compared in the two teaching arms of the RCT (control versus intervention) excluding room hire i.e. tutorial room, GOPD examination room, and clinical skills room. (Appendix 21) The costs of individual items such as gloves, Aquagel, couch roll and tissue boxes were identified. Uncertainties around the key costs in the base case analysis were performed and a cost effectiveness analysis curve (CEAC) was generated.

We also carried out two dimensional bootstrapping to explore all the uncertainties together. The objective of bootstrapping is similar to the objective of probabilistic sensitivity analysis. In model based analyses probabilistic sensitivity analysis (PSA) is required to explore all uncertainties together and to provide a distribution in the cost effectiveness plane. One dimensional bootstrapping is used to find a confidence interval around a single variable such as a cost. Two dimensional bootstrapping, in which costs and outcomes for the same medical student are re-sampled together, is the appropriate method to generate a

distribution in the cost effectiveness plane. It is therefore the equivalent of a probabilistic sensitivity analysis for a model.

Sensitivity analyses included:

(i) the costs of tutorial and clinical skills room hire in accordance with the Education Resource Centre rental policy. The BWH costs come from the finance department provided the costs of running the GOPD, including indirect facilities, facilities, depreciation, divided and overhead costs of 10% factored in. For the manikin arm, the Clinical Skills Room in the ERC at BWH is used for both the initial PowerPoint teaching, and examination of the manikin. The cost per working day (8 hours) for the clinical skills room was £200. Therefore, the cost for the two hours of teaching required was £50. For the GTA arm, a tutorial and GOPD room were both used for teaching purposes. A tutorial room in the ERC was used for the initial PowerPoint teaching for the medical students, which lasted 15 minutes. The cost per working day (8 hours) for the tutorial room is £100. Therefore, the cost for the 10 minutes of teaching = £2.08. The GOPD Room is currently 7.9 m^2. The following costs of the examination room use were calculated from costs incurred to the trust and provided by the finances department. (Table 11) If the cost of the examination room was £333 per week, one hour of use would cost £8.33.

Table 11: Gynaecological outpatient room hire cost (Birmingham Women's Hospital, UK)

Average Cost	£ Including overhead (10%)
Cost per week (40 hour week i.e. 5 days x 8 hours' work)	333
Cost per month	2,665

(ii) changing the interest rate on the annual cost of capital outlay from 3% to 1.5%

(iii) ideal costs of GTAs for teaching i.e. GTAs paid for a maximum of two hours for teaching eight students, rather than extended hour costs claimed during the trial

(iv) using an equal number of students in both arms i.e. 24 students, over the course of the teaching week

(v) reducing GTA cost to £20 per hour

RESULTS

Competence Levels

Of the 492 students randomised into the TARGET trial 408 (83%) completed their competency assessment at students at the end of their five week clinical O&G placement. 310/408 achieved pass-level competency (50% overall score), 240 merit level scores and 182 distinction level assessment scores. Table 12 shows student competency according to group allocation and stratified by pre-defined competency thresholds.

Table 12: Students who achieved competence according to UoB CMDS levels (University of Birmingham, 2015 – Regulations)

Competence Level	Total Number of Students who achieved competence	Students taught by GTA (intervention)	Students taught on a manikin (control)	Difference in competence
50%	310	161	149	12
60%	240	134	106	28
70%	182	105	77	28

Base Case Analysis

The results for the base case analysis are presented in Table 13. A full breakdown of costs is provided in Appendix 21. The overall costs of the GTA and manikin teaching arms were £1509.21 and £9191.60 respectively. The number of students found to be competent at 50%, 60% and 70% were greater in the GTA arm compared with the manikin arm. (Table 12) Therefore the difference in competence at each of these levels was 12, 28 and 28 students respectively.

The ICER for the manikin arm compared with GTA arm was £3.14 per additional student competent at 50% for the GTA intervention. ICERs for 60% and 70% competence were £1.34 per additional student competence. This means that each competent student in the GTA arm costs £3.14 extra to get to 50% competence level, and £1.34 extra to get to 60% (merit level) and then 70% (distinction level) competence.

Table 13: Costs effectiveness results (Base Case)

	GTA n = 204	**Manikin n = 204**	**Mean difference**
Overall costs (£)	9191.60	1509.21	7682.39
Costs per students in the trial arm (£)	45.06	7.40	37.66
Costs per 50% competent student (£)	57.09	10.13	46.96
Costs per 60% competent student (£)	68.59	14.24	54.35
Costs per 70% competent student (£)	87.53	19.60	67.93
Incremental Cost Effectiveness Ratio (ICER) for GTA compared to Manikin (Δ cost / Δ competence difference)			
ICER 50% competence	640.20		
ICER 60% competence	274.37		
ICER 70% competence	274.37		

Deterministic Sensitivity Analysis

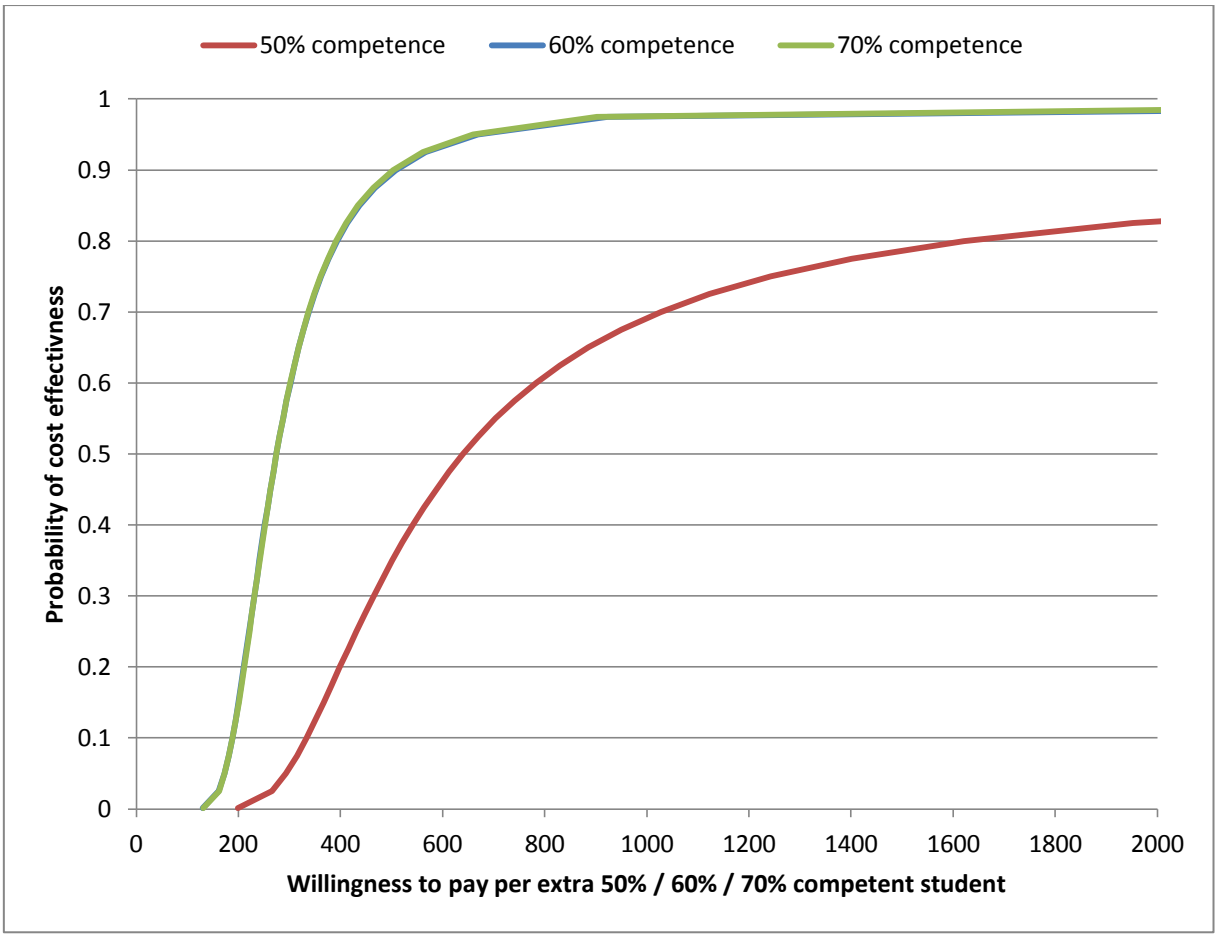
Holding the outcome data constant, one-way deterministic sensitivity analyses were carried out by changing the cost data. As shown in Table 14, GTA teaching remained more expensive but more effective in all of the scenarios considered. A full breakdown of costs is provided in Appendix 22 – 26.

Table 14: Costs effectiveness results (deterministic sensitivity analysis)

Sensitivity Analysis	DSA 1 (Inclusion of room hire)	DSA 2 (Interest rate change to 1.5%)	DSA 3 (Ideal costs of GTA teaching)	DSA 4 (Equal number of students in each arm)	DSA 5 (Reduce GTA cost to £20 per hour)
Overall cost difference	7,075.10	7,686.88	8317.39	5804.46	5917.39
Cost difference per student in RCT arm (n=204)	34.68	37.68	40.77	28.45	29.01
Incremental Cost Effectiveness Ratio (ICER) for GTA compared to Manikin					
ICER 50% competence	589.59	640.57	693.12	483.71	493.12
ICER 60% competence	252.68	274.53	297.05	207.30	211.34
ICER 70% competence	252.68	274.53	297.05	207.30	211.34

The Cost effectiveness Acceptability Curves (CEACs) shown in Figure 6 demonstrate that there is an increased probability of cost-effectiveness with using GTAs to train students to a 60% or 70% competence level, as compared with a 50% competence level.

Fig. 6: Cost Effectiveness Acceptability Curves (CEAC) for 50%, 60% and 70% competence.[1]



Footnote

[1] When all the 3 CEAC lines are merged onto one graph, the willingness to pay for 60% and 70% are similar and therefore cannot be differentiated.

DISCUSSION

Principal findings

The use of GTAs is cost-effective for training undergraduate medical students in becoming proficient in gynaecological pelvic examination beyond basic university competency expectations. The additional £274.37 investment from medical schools to train a student towards 'merit' or 'distinction' level competency appears viable. The economic advantage of GTA teaching of final year medical students for achieving 50% 'pass' level competency was less pronounced with nearly one in four students failing to achieve the minimum threshold in both trial groups. A higher financial outlay of £640.20 in the GTA group to gain an additionally competent student is again within feasible limits, but there is greater uncertainty around the cost-effectiveness of the GTA intervention even at higher willingness to pay thresholds. This finding may be explained by the fact that low fidelity manikin based teaching appears to be adequate in training students to reach the minimum basic competency threshold but the limitations of training on an inanimate anatomic pelvic model precludes higher technical skills, including abilities in communication, to be acquired. Thus, it appears that we can be more confident in the fiscal argument to support GTA teaching programmes to achieve higher level competency in female pelvic examination as opposed to simply attaining basic aptitude. These inferences are further supported by the minimal change in results observed in sensitivity analyses.

Our base case analysis is reflective of the real world where gynaecological outpatient examination rooms are already in existence. GTA teaching takes place after hours in most cases because the GTAs themselves mostly have work commitments and can only be

available for teaching after outpatient clinic hours. In this situation, there is unlikely to be any conflict between GTA teaching and clinical demands for the examination rooms in a general gynaecological outpatient department.

Strengths and weaknesses

This economic analysis was conducted alongside a high quality RCT, the TARGET trial which represents the largest randomised prospective study to estimate the costs and effectiveness of GTAs compared with traditional manikin based teaching of female pelvic examination to medical students. The trial had good follow up and completeness of clinical outcome data. Our assessment of costs in both the GTA and manikin groups of the trial were based on real, direct salary expense; we had invoices of all expenses incurred with the GTAs and the chaperones, and we accounted for all likely expenses that could be incurred with both arms of the trial e.g. speculums, gloves, couch roll, tissue box etc. Furthermore, we conducted sensitivity analyses which demonstrated the stability of our base case findings and enhance their generalisability. Thus, these methodological strengths support the validity of our results.

Limitations of our approach include the fact that the robustness of collected economic data may be less compared with clinical data because the former were collected retrospectively in contrast to the prospectively collected clinical outcome data. Thus, there may be greater inaccuracy around estimation of the costs as opposed to the educational outcomes. However, extensive sensitivity analyses around plausible ranges of costs did not substantially change our main findings. Randomisation in the TARGET trial was stratified by gender but in

the interests of simplicity and clarity, the economic analysis did not explore the differences in costs and outcomes in subgroups of students (e.g. age, prior experience, ethnicity, cultural beliefs etc.). We conducted several one way sensitivity analyses of components considered important drivers of cost-effectiveness estimates but we did not undertake more extensive probabilistic sensitivity analyses. However, given the limitations of the cost data and the precision of the clinical outcome data more extensive statistical analyses would be unlikely to affect the level of confidence in our findings.

The ideal length of follow up required to answer economic questions is longer than follow up necessary to answer clinical applications. The economic analysis reflects short term outcomes i.e. competence at the end of the placement. Long term outcomes such as proficiency as a qualified junior doctor, patient safety, costs of unnecessary investigations ordered, and patient satisfaction were not feasible within this study. We also did not evaluate the cost-effectiveness of the GTA intervention from a student or patient perspective such that confidence, calmness and other important qualitative outcomes were not accounted for.

Comparison with other studies

One of the main obstacles to the introduction of HFS including use of expert patients is their additional costs. Thus, formal economic evaluations such as the current one presented are needed to justify any additional investment if a demonstrable educational benefit can be observed. Thus, it is surprising that we could not identify any other formal economic studies. Most controlled studies evaluating GTAs are observational and there is considerable

heterogeneity between the design of studies including the way in which GTAs are used, the type of students, comparators and timing of assessments. (Smith et al., 2015) This observed variation limits the generalisability of findings and this is true for economic assessments where the costs of educational programmes, salaries etc. inevitably will vary both within and across national borders. Thus precise economic comparisons are difficult to make.

In general, salaries of the GTAs are the main cost driver. The RCT by Pradhan et al. (2010) was similar to ours in respect to using student performance in OSCE scores as an outcome. Whilst they did not perform an economic evaluation there costs are likely to differ from ours because two students were trained in one GTA session lasting only 30 minutes whereas we used larger groups of four students over a two hour period. Aamodt et al. (2006) used generic physical exam teaching Associates (PETAs) for teaching a variety of physical examination skills but the organ systems evaluated were not specified so we cannot easily compare with our current study evaluating intimate female examination. The authors found salary cost savings because PETAs were used to replace the higher expense of using a faculty of clinicians. However, other costs were unaccounted for and the clinical outcome was based upon student satisfaction evaluated on a 5-point Likert scale. Another US study by Allen et al. (2011) also evaluated the use of patient educators to train students in 'head to toe' examination skills and whilst they found mean student performance was statistically lower with compared to clinician-led instruction this was marginal (two percentage points on average) and significant educator salary costs per student declined from $449 in 2006 to $196 in 2008. Black and Marcoux (2002) and Hasle et al. (1994) also employed simulated patients across a variety of examination systems and found salary cost-savings without

apparent compromise in student performance. Thus these studies appear to also support the use of trained lay educators physical exam instruction from a financial view point because educational outcomes are similar but they are a less costly resource. However, in the absence of a formal economic assessment such as ours and the use of a robust educational outcome measure, the inferences we can derive are weak especially when trying to extrapolate to intimate female examination.

Meaning of the study – implication for clinicians / policy makers

With ever increasing time and resource pressures upon the undergraduate medical school curricula, decisions have to be made as to where the teaching priorities lie. Thus, any innovation that increases the cost-effectiveness of attaining an important educational outcome should be welcomed. The GMC (2015) and most academic leads believe that competency in gynaecological examination is a core clinical requirement for graduating doctors (Personal Communication Janjua A, 2016). Thus, the use of GTAs may provide a financially sound, effective solution especially in an area where it is increasingly difficult for students to gain experience given the intimacy of the examination, pressures on supervising clinicians' time and patient expectations. (Broadmore et al., 2009; Pugh and Salud, 2007) This contention is further supported when one considers the potential patient resource and safety implications of inadequately trained junior doctors, especially in acute medical situations (Allen et al., 2013). If an examination is performed competently, further unnecessary investigations and interventions can be avoided. At BWH, a transvaginal ultrasound costs £550.14 on the local tariff, thus the one off additional cost of £640.20 per competent student demonstrated in this study compares very favourably with such a cost.

An ultrasound is a one off screen applied to a single woman and may be need to be repeated. It is important to reflect on the long term benefits of money spent on one student, which has lifelong positive ramifications for patient care and safety in a competent manner. As explained above, if one method of teaching is less costly and more effective at generating competent students than the other, it is considered 'dominant' and the policy recommendation based on the result is clear. However, the study is only limited to existing costs of teaching, and the ramifications as well as future costs of the lack of excellent teaching need to be explored further.

Decision makers such as the National Institute for Health and Care Excellence (NICE) compared the results of economic evaluations to a pre-defined acceptable threshold in terms of cost per QALY, but since the results of cost effectiveness analysis presented here are in natural units and not QALYS there is no pre-defined threshold with which to compare the results of this study which makes interpretation difficult. Furthermore, cost-effectiveness thresholds have been arbitrarily set and accepted for clinical interventions. (Claxton et al., 2015) In contrast there is no minimum acceptable ICER for educational outcomes and those policy makers within universities tasked with teaching medical students according to GMC minimum requirements need to take a view as to the benefit of employing expert patients such as GTAs. Moreover, our economic analysis fully supports the use of GTAs for training more students to become exceptional in pelvic examination but not necessarily for acquiring mediocrity. Thus educationalists and those setting medical school curricula need to decide whether they consider GTAs to be cost-effective across all competency thresholds or for achieving higher level competencies beyond minimal GMC

requirements. When considering these caveats, policy makers should be cognisant of the fact that the O&G clinical placement is generally the only opportunity for medical students to gain experience in female pelvic examinations during their undergraduate years before independent practice as a junior doctor.

Unanswered questions and future research

Our trial, as with most GTA programmes in UK universities (Chapter 2) utilised them for a single session early in students' clinical placement. However, a greater exploration as to the repeated use of GTAs throughout the clinical placements may change the cost-effectiveness in either direction. Furthermore, to investigate the true cost effectiveness of GTA teaching, we need to look beyond just the outcome of short-term student competence outside of the clinical environment, and look at long-term healthcare and cost outcomes with regards to impact on patient safety. We also need to investigate impact on patient satisfaction and experience; ethical approval would need to be sought for a study where patients in gynaecological outpatient clinics are randomised to students being taught in advance by either GTA or manikin. Given the uncertainties around determining cost-effectiveness in undergraduate medical education, discrete choice experiments should be conducted among all stakeholders allocating resources to identify clinical training priorities.

The current economic study inevitably had simplifications. More specific explorations can be conducted such as evaluating the cost effectiveness of GTAs in enhancing communication skills. Students could be provided with a 'debriefing session' after their first GTA examination where they reflect on their examination skills with group input. This could be followed with

an assessment at the end of their placement that incorporates a clinical scenario to use experiential learning i.e. links knowledge and learning in the GTA teaching session to a past patient encounter to look for outcomes of competence more relevant to a real life clinic scenario.

It is likely that a multi-faceted approach is desirable to help medical students achieve competency in gynaecological pelvic examination. This may utilise LFS with manikins, computer simulations, expert patients and supervision in the clinical setting. Packages of training should be evaluated for cost-effectiveness and with technological advances in simulation this may incorporate assessment of HFS manikins designed to provide greater realism.

CONCLUSION

Pelvic examination in gynaecology is an important core skill for medical students. They will inevitably require this skill as junior doctors in acute settings such as accident and emergency departments and O&G wards as well as electively in many medical disciplines involving the care of women but especially in general practice and O&G. Our cost-effectiveness analysis, comparing traditional teaching method on a manikin with GTA led teaching of pelvic examination skills for final year medical students within the O&G curriculum, conducted alongside a large RCT supported the economic case for the use of GTAs to help medical students acquire competency in this core skill, and more compellingly for achieving higher levels of proficiency. Further research is needed to replicate our findings in other educational settings, to compare GTAs against other multi-faceted packages of training, and to explore longer term clinical outcomes as well as to evaluate the impact of GTA training upon student and patient acceptability and experience.

Chapter 6: The Experience and Acceptability of Students, Teaching faculty and gynaecology Teaching associates (GTAs) of the pelvic examination teaching programme (The EASTT Study)

The EASTT study aimed to explore the experience and acceptability of gynaecology teaching associates (GTAs) in the female pelvic examination teaching programme at the Birmingham Women's Hospital. The study participants were a sample of the stakeholders involved in the teaching programme for final year medical students in their Obstetrics and Gynaecology (O&G) clinical placement.

ABSTRACT

OBJECTIVES

To explore the experience and acceptability of medical students, the undergraduate teaching and non-teaching faculty and Gynaecological Teaching Associates (GTAs) themselves of a GTA-led curriculum for teaching pelvic examination skills during the final year obstetrics and gynaecology (O&G) clinical placement. The study also explored other issues identified as important to GTAs, medical students and undergraduate teachers of this innovative teaching. An additional aim was to ascertain the motivation of lay women to become GTAs.

METHODS

A qualitative study was undertaken. Data was collected through semi-structured interviews, a group interview with a supplemental interview, and non-participant observation with stakeholders (final-year medical students, teaching and non-teaching undergraduate faculty, and GTAs). Twenty students and eight faculty staff were interviewed. A group interview with a supplemental interview was carried out with four of the GTAs. Non-participant observation was carried out to observe how teaching took place including conversations and chronology; and behaviours demonstrated by GTAs and students, as well as an indication to variations in the latter.

ANALYSIS

Sequential thematic analysis was conducted on transcripts from the twenty medical student semi-structured interviews, as well as GTA group interview with a supplemental interview.

Data from the three methods (field notes, medical student and GTA interviews) was triangulated to establish the validity of findings.

RESULTS

Medical students reported increased confidence in undertaking female pelvic examinations after the GTA-led training programme. They reported a lack of opportunities for male medical students to obtain experience of gynaecological examination prior to the introduction of the GTA-led teaching programme. The medical students reported that the programme was acceptable as a method of teaching. However, they opined that their friends, relatives and non-medical colleagues may find the nature of the teaching method difficult to comprehend. Students reported that communication skills vital to examination and the establishment of a professional rapport to help relax the patient and improve the patient experience were enhanced. Both students and the undergraduate teaching faculty reported an improved student confidence in clinical practice. The students commented that the intimate nature of the teaching programme may be viewed amongst individuals outside the medical profession as odd and “abnormal”. This finding reflects the difficulty in recruiting women to become GTAs from the general population. Lay women corroborated the rewarding nature of the teaching, as well as feeling respected and valued as teachers and the benefit provided to the students.

CONCLUSION

GTA-led female pelvic examinations have been described as a positive experience by all stakeholders involved. This form of teaching has been found to be an acceptable means of

teaching with positive outcomes for students. There are some concerns documented, especially the ability to recruit and monitor an effective GTA teaching programme, as well as to ensure the safety of the GTAs themselves. The motivation to become a GTA predominantly focused on the rewarding nature of the work, feeling respected and valued as teachers and the subsequent benefit noted for the students.

KEYWORDS

Undergraduate medical education, pelvic examination, Gynaecology Teaching Associates (GTAs), manikin, competence, confidence

INTRODUCTION

Medical students require proficiency in female pelvic examination to pass both their O&G placements and graduate medical school. Iyengar et al. (2012) have stated that some students complete their training without the opportunity to perform a female pelvic examination on a patient who is awake. Male students report feeling that their gender negatively impacted on their undergraduate pelvic examination experience, with a greater degree of embarrassment or higher rate of patient refusal (Akkad et al., 2008; Chang et al., 2010).

Gynaecology Teaching Associates (GTAs) are women trained to teach pelvic examination skills. The undergraduate teaching faculty at the Birmingham Women's Hospital (BWH) recruited and trained a GTA faculty to provide independent teaching of clinical gynaecological examination to include instruction in technical aspects, psychological aspects and communication skills. GTAs at BWH were trained to work in pairs, teaching groups of four final year medical students during the introductory week of their five week clinical attachment in O&G. GTA-led teaching has been incorporated into the O&G block at BWH for the past three years.

Qualitative literature search of GTA teaching of female pelvic examination

We performed a literature search in three electronic databases: Medline; Embase and CINAHL. Keywords employed in the search included: intimate examination; gynaecological teaching associate; qualitative studies; qualitative methods and experiences. In different disciplines expert patients were referred to as standardised patients (SP), clinical patients

(CP) or intimate examination associates (IEA). There was limited information on the experience of medical students, teaching faculty and GTAs within a curriculum where pelvic examination skills were taught by GTAs. There were also very few studies that explore the social acceptability of GTAs within a teaching programme. There were limited papers from UK due to the general lack of provision of GTA-led training in the education curriculum. The majority of the literature consisted of studies undertaken in the Southern hemisphere or European Medical schools. Several papers predated the 1990s. Papers that were not published in English were excluded. Overall fifteen studies have been reviewed and seventeen were excluded.

In contrast to other types of clinical examination, pelvic examinations were considered particularly intrusive and in addition to acquiring craft skills clinicians were felt to be sensitive to issues of concern to the women having to undergo these examinations (Moore et al., 2000; Robertson et al., 2003). In light of such considerations, others have questioned the ethics of medical students undertaking their first pelvic examination on real patients (Caldicott et al., 2003). Some authors have suggested that medical students may be embarrassed to undertake pelvic examinations as well as be concerned about inflicting unintentional pain on a patient, especially those who may already have underlying gynaecological pain. Such aspects were felt to possibly hinder the ability of students to obtain the necessary skills required to undertake an effective pelvic examination. Utilising healthy knowledgeable GTAs has been recognised by a number of authors as being effective in promoting confidence and competence in pelvic examination, as well as developing

interpersonal skills among medical students (Dabson et al., 2014; Pickard et al., 2003; Wanggren et al., 2010).

The GTA's experience of the pelvic examination teaching programme has been addressed to a limited extent in the literature. A qualitative study of thirteen professional patients using in-depth interviews identified five themes during the analysis including "embodied knowledge", "promoting a proper approach", "redrawing private boundaries", "feeling confident" and "doing something meaningful" (Siwe et al., 2006). Limited reference to the disadvantages of such a programme, the difficulty of recruiting professional patients, attrition of GTAs and the latter's perceptions of the morality or social acceptance of such a programme do not appear to be addressed in the available literature. The issue regarding recruitment and retention of GTAs requires further exploration and may potentially relate to issues of social acceptance of such a role.

Medical students' experience of the pelvic examination teaching programme has been examined with relative frequency in the literature. A qualitative questionnaire based study on 97 Swedish medical students highlighted that students perceived that the professional patient programme reduced their stress and anxiety towards the procedure, and post training the students felt more relieved, calm and secure (Wanggren et al., 2005). The students also felt the teaching raised their awareness of regard for the patient's feelings, integrity and privacy during the procedure. Similar outcomes are described in the analysis of individual interviews of 24 medical students from North Sweden which clarified that

gynaecological teaching women (GTW) increased the confidence and skills of medical students following their first exposure to pelvic examination (Grankvist et al., 2014).

A study was conducted on the feelings, attitudes and skills of medical students and ratings from clinical patients regarding pelvic examination training in a study of 41 Swedish medical students using a coded questionnaire evaluation. Students reported an increase in "confidence" and a sense of calmness and relief following the clinical patient teaching session. However this study involved clinical patients rather than GTAs who were providing feedback on the students' performance rather than delivering a programme of teaching (Wanggren et al., 2010). Another study described positive experiences of 67 Australian students who had undertaken a GTA pelvic examination teaching programme (Robertson et al., 2003). Student evaluation of the programme highlighted improved communication and confidence in undertaking sensitive examinations.

A UK based study originating from Newcastle University involved 16 students from years two to five who were recruited to undergo semi-structured interviews regarding undertaking intimate physical examinations in a GTA programme (Dabson et al., 2014). The self-selection of this sample may have been unrepresentative as the individuals who chose to take part may have had a particular interest in the subject. Their findings revealed that "emotional discomfort with the learning of intimate physical examination" was common amongst students at the University engaged in procedures of this nature and potentially may have affected their learning and the mastery of clinically important skills. The authors suggested that the findings may also be of the relevance for medical students in general and further

research was required in the area. Another study, published over 10 years ago, compared and assessed the skills of students trained by GTAs and those undertaking traditional teaching. They found that the GTA teaching programme provided superior teaching as the students undergoing the GTA programme were perceived as having better communication and practical skills in the clinical setting when undertaking pelvic examination procedures (Pickard et al., 2003).

A qualitative analysis of in-depth interviews with twelve female fifth-year medical students undertaking pelvic examination training using professional patients highlighted the advantage of "transcending unspoken boundaries and taboos, which was considered a prerequisite for learning (Siwe; Wijma et al., 2007). The paper describes the students' feelings regarding the physical mechanics of performing intimate examination but the issues relating to the underpinning psychological aspect of undertaking this procedure were not addressed. Twelve fifth-year male medical students undergoing GTA teaching were also interviewed by Siwe et al. (2012) with the aim of gaining an understanding of their experiences and social processes. They identified a prominent concern relating to undertaking a pelvic examination and establishing a "professional rapport" and also highlighted the importance of managing the examination well in a situation which "might become sexually charged."

A systematic review of patient involvement in teaching and assessing intimate examination skills highlighted the advantages over traditional methods of teaching (Jha et al., 2010). These advantages included reduced anxiety, improved performance of clinical skills and the

positive student evaluation of such instruction programmes. Further research in this area was recommended by the authors of this secondary research, particularly regarding the psychological impact on GTAs and students of expert patient teaching of gynaecological examination. The systematic review did not identify any literature evaluating the acceptability and experience of GTA teaching programmes for individuals in O&G teaching faculties.

The need for a qualitative study

Thus it can be seen that the acceptability of GTA-led teaching to medical students and their teachers has not been extensively explored. To justify continued investment of time and resource into this novel form of simulated teaching it is important to better understand the experiences of students, teachers and GTAs and appreciate issues of significance to these stakeholders. Moreover, the sensitive nature of genital tract examination may create prejudicial views from students, teachers and clinicians as to the stimulus for lay women to act as GTAs. Thus, we considered it worthwhile to explore the motivation of lay women to become GTAs.

We therefore undertook a qualitative study using semi-structured individual interviews, a group interview and non-participant observation to gain insight into medical student, GTA and faculty experience and acceptability of the GTA pelvic examination teaching programme. A sequential thematic analysis was then conducted to identify, analyse and report patterns within the data. Participants included final year medical students in the O&G block, the undergraduate teaching faculty and GTAs working at Birmingham Women's Hospital.

OBJECTIVES

In undertaking the study, we aimed to:

1. Explore the experience of medical students, the undergraduate teaching faculty and GTAs of the GTA-led curriculum for teaching pelvic examination skills during the final year O&G clinical placement.
2. Explore the acceptability of medical student and undergraduate teaching faculty acceptability of pelvic examination for final year medical students in the O&G clinical placement.
3. Identify issues of importance to GTAs, medical students and undergraduate teachers in clinical teaching of female pelvic examination.
4. Explore the motivation of lay women to become GTAs.

METHODS

Participants

The three stakeholder groups for GTA teaching were identified as medical students, undergraduate teaching faculty and the GTAs themselves. Final year medical students and the Consultant-level undergraduate teaching faculty participated in semi-structured interviews. Although the initial plan was to conduct a focus group for the GTAs, this was not possible due to lack of involvement of all GTAs on the faculty. Furthermore, work commitments meant a group interview of 3 GTAs took place in addition to a supplemental interview of one GTA. A total of 20 students, out of 55 contacted, who participated in GTA teaching during their O&G placement, took part in an interview lasting 20 minutes. (Table 15)

Table 15: Demographics of students who participated in semi-structured interviews

	Male	Female
Number of students	8	12
Age (years)		
Mean	24.3	25.1
Range	23-26	22-31
GTA + GTA	7	11
GTA + Chaperone teaching[1]	1	1

Footnotes

[1] Chaperones included nurses or doctors qualified in performing female pelvic examination. They were called in to assist with teaching whilst the pelvic examination was performed on the GTA.

The undergraduate faculty consisted of Senior Academy Tutors (SATs), Senior Tutors and Academy Teachers. For the purposes of this study the 'Teaching Faculty' were defined as the three SATs who provided weekly tutorials, reviewed clinical activities and provided pastoral support for fifth year (final year) medical students during their five week clinical attachment. In addition to these SATs, two Senior Tutors; one for Obstetrics and another for Gynaecology tasked with overseeing the teaching programme were part of this teaching faculty. The remainder of the Consultant body were "Academy Teachers" i.e. clinical teachers who have students attached to them in clinical environments but who have less regular, formal teaching commitments or responsibility for assessment. These Academy teachers were considered 'Non-Teaching faculty members' for the purpose of this qualitative study to differentiate them from those O&Gs with greater responsibilities for teaching of medical students. All members of the undergraduate faculty were expected to follow the progress of students throughout their five week block, identifying and addressing any deficiencies in training.

Prior to the decision to recruit and train a faculty of GTAs, the whole undergraduate faculty were involved in the decision to proceed with this method of training at BWH. Four teaching and four non-teaching faculty members took part in semi-structured interviews lasting approximately 20 minutes each. (Table 16)

Table 16: Demographics of teaching and non-teaching faculty who participated in semi-structured interviews

	Teaching	**Non Teaching**
Number of Consultants	4	4
Age (years)		
Mean	45.00	45.50
Median	43.50	45.00
Years as a Consultant		
Mean	6.50	6.75
Median	6.50	7.50
Years in medical education		
Mean	11.25	15.00
Median	12.00	15.00

The GTAs themselves started with eight members employed by BWH for the purposes of teaching pelvic examination skills. Over time, some of the GTAs have moved away for professional and/or personal reasons. As the educationalists behind the teaching programme itself, the insight of the GTAs was deemed invaluable. Their experience of the teaching programme including positive aspects, developments for improvement and barriers to teaching are considered vital. The acceptability perspective is also important from their personal, family and social point of view. All eight GTAs were invited to a focus group as they have known each other over five years, and have worked together in pairs for the purposes

of teaching. They were seen to be comfortable with each other, and not inhibited to discuss their experiences with other GTAs present. (PC, AJ 2014)

Qualitative Methods

The focus of this qualitative study was to explore the experience and acceptability of the GTA teaching programme via semi-structured interviews, a focus group, and the use of non-participant observation. Participants involved in all methods of research were provided with an information sheet, an opportunity to ask questions about their involvement, and a signed consent form was obtained. Participants were informed of the voluntary nature of their participation and that they had the right to withdraw from the study. (Appendix 27 and 28)

Medical student semi-structured interviews; and GTA group interview with a supplemental interview were audio/digitally recorded and transcribed by a postgraduate co-ordinator at BWH. Field notes were taken by me during non-participant observation. All interviews were conducted over a period of 10 weeks, starting 11th February 2015.

The interview topic guide included questions around behaviour, opinion / belief, feelings, knowledge and background demographic information of study participants. Questions were designed as "open-ended, neutral, sensitive and clear to the interviewee" (Patton, 1987). Further questions were introduced as sequential analysis uncovered aspects that needed further exploration during the interviews.

Semi-structured interviews were performed starting with an open question and followed by other questions for the respective groups of medical students and teaching faculty. Both the trial co-ordinator and interviewee were engaged in dialogue to construct meaning to the experience and acceptability of the GTA pelvic examination teaching programme. In this case, a semi-structured interview allowed for a mix of both open questions with a loose structure, and also some structured questions highlighted in Appendices 3 and 4.These sought to explore the students' and faculty members' own framework of meanings. The trial co-ordinator was sensitive to the language and concepts of the participants and had a flexible agenda during the interview. For any uncertainty, clarifying questions were asked allowing the trial co-ordinator to check answers rather than make assumptions.

Medical Student Interview (Appendix 29)

Purposive sampling was used for medical students who received GTA teaching in their final year O&G placement. They were sent an invitation to participate in the trial via email with the information leaflet and consent form attached. Approximately 20 minutes were reserved for interviewing the students. 55 students were contacted via email and 22 responded that they would participate, although 2 students withdrew their consent prior to attending the semi-structured interview.

Teaching and Non-Teaching Faculty Interview (Appendix 30)

Both teaching and non-teaching faculty were chosen using purposive sampling; all four members of the teaching faculty were interviewed. Teaching faculty were four Consultants actively involved in medical student teaching i.e. Senior Academic Tutors / Senior Tutors.

Non-teaching faculty were noted not to be actively involved in teaching, but who had experience of medical students attending their gynaecology clinics or theatres. The faculty was approached in person by the CI (TJC) for participation in the study. Approximately 20 minutes were reserved for interviewing the faculty at a date and time convenient to them according to their clinical activities.

Intended Focus Group for GTAs (Appendix 31)

The current group of eight GTAs were employed and trained simultaneously, and have experience of working with each other over the course of 4 years, by either teaching pelvic examination skills on the other GTA, or undergoing examination themselves. The focus group was chosen for rapid data collection bearing in mind their level of comfort. Although we aimed to recruit all eight GTAs within the teaching faculty through population sampling, only four consented to participate. One of the GTAs left during the programme to pursue work commitments in another city, another was pregnant and unable to attend, and the remainder were unavailable due to work commitments.

Due to logistics of bringing together the different GTAs, three of the GTAs participated in a focus group, and the fourth GTA was interviewed using the same questions. They were all informed that "By agreeing to attend the focus group, you are consenting to your information being used for research, and agree to the results being used for analysis. If you choose to withdraw after 13th March 2015, your data will be transcribed and although anonymous, will be unable to be deleted."

The group interview was conducted at BWH in the Education Resource Centre for a pre-determined duration of 60 to 90 minutes. Refreshments i.e. tea, coffee and biscuits, were provided. To start the group interview, the trial co-ordinator explained the aim of the study, which was to investigate the experience of GTAs themselves within the teaching programme, and explore the acceptability both in a personal and wider context.

Non Participant Observation (Appendix 32)

The format of the GTA led teaching session has been detailed in Chapter 4 (***Teaching interventions:*** *GTA teaching).* For the purposes of conducting non-participant observation, GTAs and students were informed of the aim of the observation, and consent was obtained prior to the session commencing. The students were informed that notes were taken to understand the teaching programme itself, and not to evaluate their performance. Due to the intimate nature of GTA pelvic examination and the setting of the observation, video recording was not conducted. The traditional method of field notes written by the trial co-ordinator during and after the GTA teaching was used for data collection. During both the PowerPoint teaching and out-patient department clinical skills teaching, the trial co-ordinator observed verbal and non-verbal cues, and documented behaviour and interaction by sitting and writing discretely. The following series of steps were followed for this method of data collection (Creswell et al., 2007).

a) Setting for observation selected (Education Centre) and permission from gatekeepers obtained (Head of Academy and Undergraduate Co-ordinator).
b) Obtain informed consent from participants.
c) Location and timing is pre-determined by the length of the GTA teaching

d) Researcher decided role to be adopted (Non-participant observer)
e) Physical setting and behaviours – actions, interactions and reactions observed and noted
f) Researcher notes their own feelings and reactions
g) Researcher disengages from the site and debriefs participants while assuring anonymity.

The trial co-ordinator was a post-graduate trainee within the O&G specialty who acted as a non-participant during observations. She was neither taught as a medical student would be, nor teach as a GTA. The rationale for being a non-participant observer was due to the trial co-ordinator's position as the clinical teaching fellow, implying an inability to participate as either a medical student or a GTA within the setting. Within each GTA teaching session, there were only four students allocated to a pair of GTAs. Utilising one student's space within the teaching removed 25% of the taught population, thus taking away the value of one extra student's studied behaviours and interactions. Both the GTAs and students were informed at the start of their session as to the purpose of the observation, and that their teaching or clinical skills respectively were not being assessed. Voluntary participation and ability to withdraw from the study was highlighted prior to obtaining consent to observe teaching. (Appendices 1 and 2) Students were reassured that opting out of the study did not adversely affect their grades or ability to pass the O&G placement, hence avoiding student coercion in the study, given the trial co-ordinators relative position of authority within the educational department.

Ethical Consideration

Ethical approval was obtained from the University of Birmingham Ethics Review Board and the Birmingham Women's Hospital Research and Development Department. Two researchers performed the semi-structured interviews, and group interview with a supplemental interview, followed by thematic analysis. Protection of anonymity and confidentiality was paramount to ensuring ethical practice during the study. The information leaflet and consent form were explicit about the inability to anonymise digital recordings, but that all written material would ensure confidentiality of participants e.g. Medical Student 1 (MS1). (Appendices 27 and 27)

THEMATIC ANALYSIS

Data was collected to explore the experience of GTA teaching of pelvic examination skills. Experience for the students has been described as knowledge or skill gained through involvement in and / or exposure to participating in the GTA teaching programme. It also encompasses perspectives on feelings and opinions about satisfaction with the teaching programme. The experience of the teaching faculty includes their perception of knowledge and skill enhancement by the medical students, and their opinion and satisfaction with the programme. The GTAs disclosed their experiences of student involvement, feelings and opinions on the training they provided, and their perspective on beneficial and ineffective teaching sessions.

The acceptability of GTA led teaching has also been explored amongst medical students and members of the teaching and non-teaching faculty. This facet examines whether GTA

teaching is a welcome addition to the medical students' curriculum in the final year. Results delved into whether GTAs are considered suitable, ethical, morally permissible, and satisfactory for the aim of achieving competence in pelvic examination. The secondary outcome was achieved through exploring the motivation of lay women to become GTAs.

Digital audio recording from all the interviews was transcribed to provide a written record, with the original recording preserved for reference. Transcribing was allocated to one of the postgraduate co-ordinators at BWH, which offered security of data protection within the premises.

Sequential analysis (Simons et al., 2008) was performed while in the field, which allowed analysis of themes as they arose, hence drawing tentative conclusions, and refining questions for further semi-structured interviews or for the GTA group and supplemental interview. Once all data collection was completed, content analysis (Baxter, 1991; Mayring, 2002) using a 'coding' system was used; this quantified the number of times a certain theme emerged. Due to lack of access as well as training on how to operate NVIVO as intended during ethical approval, the trial co-ordinators conducted manual methods of coding. Both AJ and LB were involved in the analysis, with comparisons conducted to ensure trustworthiness of findings.

Reflection was undertaken throughout by discussions with an independent advisor in order to minimise researcher bias. Data from the four methods (field notes, medical student, faculty and GTA interviews) was triangulated to establish the validity of findings.

Non Participant Observation

Due to the nature of hand written field notes, the findings were coded manually. Although an initial six to ten non-participant observations were intended, saturation was reached after observing four teaching sessions where findings became repetitive and no new events or interactions were recorded.

RESULTS

The findings of the study are presented under ten identified themes that cut across the student, GTA, teaching and non-teaching faculty. These focus on the importance of pelvic examination skills within the medical curriculum, and exposure to learning and practising this key skill in a clinical environment. The students' confidence in performing the intimate examination and using appropriate communication skills was also highlighted. Differences between manikin and GTA led teaching were identified and an overall impact on clinical practice was stressed. Drawbacks of this novel method of teaching were noted by the stakeholders including widespread acceptability and perceived morality of this vocation. Lastly, the motivation of GTAs was recognised as a pivotal aspect of providing this teaching innovation. Findings are presented with supporting evidence provided from participating stakeholders under each theme: GTA, Teaching Faculty (TF), Non-teaching faculty (NTF), and medical student (MS).

Theme 1: The importance of pelvic examination skills

Medical students, both teaching and non-teaching faculty and the GTAs themselves focused on the importance of being able to perform a satisfactory internal pelvic examination as a

medical student. This was considered essential in order to diagnose pathology, and it was considered a body system of equal importance to other systems. However the students suggested that much less tuition time was given to undertaking an internal examination of the pelvis than an examination of other body systems throughout their medical school curriculum. Furthermore it was considered very relevant to the medical students' future careers as they may be requested to undertake this procedure during their F1 and F2 rotations, and further if they chose a career in O&G, A&E or GP. Clinical importance was mentioned by MS#5 (medical student number 5) regarding undertaking this examination not just in "the obs and gynae setting but with female patients experiencing lower pelvic pain or abdo(minal) pain". It was perceived as being quite a sensitive examination and practice was required to distinguish normal from abnormal features.

The teaching faculty highlighted that patient care is at the forefront of learning this skill, where TF #2 suggested that "an examination could easily give you the answer that you need and that would potentially cut delays in treatment for someone, avoid unnecessary referrals and cut down on stress for patients". NTF #4 stressed that "pelvic examination is mandatory. It is important today as trainees rely so much on imaging and basic skills are going out of the window. It should be part of your management". Essentially the clinical staff recognised how important is was to be able to perform this procedure properly as besides being "the bread and butter" (NTF #3) of gynaecology it "is probably going to come into most branches of medicine that they do and there is an understandable fear that we see people where the doctor looking after them is not happy to perform the examination" (TF #2). Non-participant observations confirmed the themes identified through student, faculty and GTA

conversations. This was identified when students asked GTAs “does everyone in the year get to do it (GTA teaching)?”, thus recognising the important of learning this skill. Students were also seen to be attentive during the examinations performed by their peers. GTAs emphasised the importance of performing a competent pelvic examination at the beginning of their teaching sessions.

Theme 2: Exposure

Five students commented that there was minimal exposure to pelvic examination on the wards or in practice, particularly for male students. For example a male student (MS#14) aged 25 years commented that “some days like yesterday, no-one wanted me in the room” and there was a general feeling amongst five of the students that this was understandable and normal. NTF #4 noted that “the men do not get the opportunity as the patients do not generally allow them to do examinations”. GTA teaching and practising pelvic examination “deflates some of the embarrassment” of performing the examination on patients. TF #4 stated that GTA teaching is not “considered normal, but it should be” in order to “give them (students) opportunity to develop”. TF #4 also stated that “ignorance” can be a barrier to considering GTA teaching normal.

During an observed teaching session, students were asking about what they observed about the initial role play and discussion between the 2 GTAs. They responded that they observed “good eye contact, consent, opportunity to ask questions, explained procedure, opportunity to wee (pass urine) if necessary, reassuring”. This demonstrated invaluable exposure to not only the clinical skill, but also the process of getting the patient ready.

Non-participant observation also highlighted that the students also had exposure to the nuances of examination i.e. the appropriate size of gloves for the students' own comfort, which size of speculum to choose and the difference between them, using fists under the coccyx to help visualise the cervix, parting the skin prior to inserting the speculum, ensuring the speculum was not partially in which could cause more discomfort to the patient, managing patients who are bleeding or even techniques with patients who have increased abdomen and pelvic weight distribution. During the teaching sessions, students not only got the opportunity to practice themselves, but to observe their peers examining and learn different techniques. They were able to visualise the cervix without the stress of handling the speculum or performing the examination so they could focus on what the anatomy looked like. One of the female students (MS#8), aged 25 years, commented that she was "glad I didn't do this for the first time on a real patient".

Students not only had exposure to GTAs with normal anatomy, but also to GTAs who had undergone hysterectomies, so they were able to relate the abdominal scars with the internal findings. They also found it more appropriate to perform their first examination in a GTA teaching setting, a male student (MS#1) commented that it would be "weird (to) go to theatre to do it".

Theme 3: Confidence

Eleven of the students suggested that it was important to gain confidence in the procedure and that with other examination skills taught at medical school "you got used to doing them before doing them on a patient" and had time to practice the skills in a relaxed environment.

Additionally one of the male students (MS#11) commented that following the teaching, he had gained confidence to actively seek out opportunities to undertake the procedure.

The GTAs echoed the views of the faculty members, and emphasised that it was essential that students gained confidence and competence in this skill. GTA #3 stated “I would like to think that the people who do the examinations might pick up things like that whereas if it’s just their first time and they’ve never done it before it’s a bit like a rabbit in the headlights”. Improved confidence in handling the speculum, undertaking the bi-manual examination and techniques for visualising the cervix were part of the general feedback highlighted by the medical students.

GTA #3 commented that provision of a safe, relaxed environment enhanced the learning experience of the students and commented that “in some respects it is quite nice when something doesn’t go quite to plan, because you can give them the confidence and the ability to go in again and be more confident”. An overall perspective that arose was that the confidence that they attained from the teaching enabled them to maximise the opportunities available to them in the subsequent hospital placements. NPO observed that after the PowerPoint presentation students appeared relaxed and engaged and not anxious about the upcoming examination on the GTAs.

During teaching sessions, students routinely performed two examinations. The first was with guidance and formative feedback throughout and with their peers observing. The second was without their peers, and with the GTA-patient and GTA-teacher, with no interruption

and feedback provided at the end. Through the observations performed, students were found to be more confident and polished at performing the examination the second time around.

When students appeared flustered with the abdominal examination aspect of the examination, the GTA-patient herself was noted to say “relax, ask me what it’s for” when referring to an abdominal incision. GTAs also highlighted that “it’s lovely when they find what they’re looking for” during the examination.

One of the students (MS#14) observed during the teaching that she felt “clumsy with my words, what to say and when”. However, the GTA reassured her that “everyone has come out very respectful” during the examination, which prompted the student to say “glad that’s what you feel” with more confidence. Where students felt uncertain saying “have I forgotten anything?” they received positive reinforcement from the GTAs “No, I was going to say well done!”, which improves confidence to not only perform future examinations, but also to put themselves forward to perform them, whether in theatre or outpatient clinic.

Positive feedback during the examination e.g. “well done”, “that’s it, you’re on it”, “very well explained” and “very good” all helped instil confidence in the students performing the pelvic examinations.

Theme 4: Communication Skills

Nine of the medical students reported that the GTA teaching gave them the ability to build on prior knowledge focused on ensuring patient comfort and dignity and improved their communication skills, especially knowing "the right thing to say" and provided "more knowledge than a textbook". One student (MS#8) reported that before the teaching they were concerned that they would "inappropriately describe the procedure and make the patients feel less comfortable." After the teaching they mentioned that they felt much more confident regarding the communication aspect of the procedure.

TF #1 mentioned how following the teaching he noted how "the student will explain the whole procedure, take consent, be polite and considerate to the patient and inform them of what will happen. I think they appreciate that the patient understands what they say". Furthermore NTF #2 mentioned how "in today's medicine communication is extremely important", which reinforces the importance of this skill being taught during the GTA session. Fifteen of the twenty medical students commented on the utility of learning techniques regarding good communication and helping the patient relax, making "this the focus rather than the more academic side". The importance of good communication in enhancing the utility of the procedure was highlighted by NTF #2 who stated that if the patient is not at ease then "you don't have the confidence of the patient (and the) experience will not be a good examination and you may miss things."

Non participant observation highlighted that students were also taught to adopt a familiar ABC approach during their consultation with the GTAs in the teaching session. This tip was

provided by the GTAs i.e. A for assess patients, B for bladder, C for consent and chaperone prior to beginning the examination. Phrases such as "(you might want to have your) bladder empty as (it) will be more comfortable (during the examination)" were taught to help both students and patients identify why this was being encouraged. The GTAs also clarified how to explain the purposes of the chaperone to the patient. Students were also seen to adopt good communication during examination i.e. "you will feel me touching" when referring to the examination of the vulva, and "you will feel me pushing (with the speculum)". GTAs were well versed in their role play and examination communication skills and on observation appeared well practised. This is a huge advantage to students observing and learning from them.

At the end of performing an examination, one of the female students said "(there are) tissues there to sort yourself out" without meaning to sound dismissive. This prompted laughter amongst all the students and GTAs. The male student present commented "oh my God" on the error in the former's communication skill. The female student apologised and said she had "meant in it a nice way". The GTA present reassured her with "Less is more… minimise anything that makes patient uncomfortable… don't worry this is teaching". Although the female student appeared embarrassed and uncomfortable, this practice in simple communication skills can go a long way in avoiding complaints from patients during their examinations.

Good communication was also demonstrated where GTAs encouraged students "don't be afraid to ask again to be sure they (patients) understand everything" when referring to the

discussion prior to the examination. They also encouraged the students to be specific when asking for clothing items to be removed for the examination, and the use of a "modesty blanket". The students were found to emphasise their aforementioned discussion during the interview by mentioning the following during their teaching session: "the hardest bit is the communication"; "feel like we're stumbling (without the GTA teaching)"; "don't want to sound technical"; and "come out and say something you didn't want to say". When students were found to use inappropriate communication e.g. "open your legs" or "going to part knees with hands", they were corrected immediately, which improves future dialogue with patients.

To end the examination, students were taught to say "when you're ready if you come next door (into the consultation room) and we'll have a chat (about what we found)". This informative statement allowed for a suitable completion to the examination.

Theme 5: Intimacy

A summary of a discussion with TF #4 highlighted that students may understand the theoretical aspects of the procedure but actually undertaking it on a real patient could be quite embarrassing for them so the opportunity to utilise GTAs was beneficial.

Four of the students commented that the procedure had "the potential to be awkward and difficult" and particularly for male student MS#5, who felt that "you're quite hesitant doing it and (you are) a bit awkward so I think from that point of view getting exposure to it was pretty good". Furthermore MS#9 commented that "for a bloke it's hard to know what you

can say and how to put the patient at ease and often you're more uncomfortable than them (the patient)".

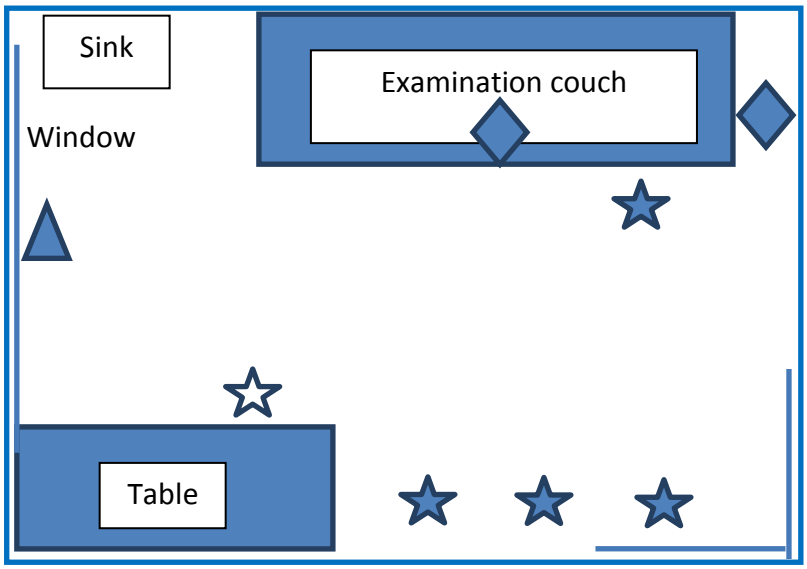
In support of the programme, TF #4 commented that GTA examination "deflates some of the embarrassment" of performing the examination on patients. MS#3 mentioned that although GTA teaching is not the current norm for teaching pelvic examination skills, it should be as it provides "students (with the) opportunity to develop". Additionally that "ignorance" can be a barrier to considering GTA teaching normal.

Students themselves highlighted "it's a bit intimate" after performing the examination and giving their feedback to the GTAs. Although the GTAs encouraged the students, saying "don't be shy", some were noted to be slightly uncomfortable to begin with. A male student in particular was found to be standing in the room in a position where he would not be able to observe his peers' examination. (Fig. 7) He was also quiet during the other examinations and volunteered last to perform the examination himself.

Final year medical students at the University of Birmingham are required to demonstrate competency in this clinical skill to complete the O&G placement by obtaining a signature in their logbook from a clinician after supervised examination of a patient in clinic or theatre. Listening to their discussions during the non-participant observation, they were found to be discussing the "signing off" of competency after performing the pelvic examination twice on GTAs, rather than any awkwardness or discomfort they have experienced during the teaching itself. This was reinforced by the GTAs praising them that students were

"sympathetic that this was an intimate exam". When a male student felt uncomfortable and stated "I feel like I'm pushing a lot", the advantage of the immediate feedback from the GTA saying "no, don't worry, this is what is expected" averted the embarrassment of an intimate procedure.

Fig. 7: Examination room



Trial co-ordinator (non-participant observer)

Female students

Male student

GTAs

Theme 6: Manikin compared with GTA teaching

Overall fifteen of the students had found that having an initial session undertaking the procedure on a manikin had been helpful in understanding the mechanics of the procedure. However, MS#8 mentioned that "the feedback you get from doing it live on a person is important as you don't get that from a manikin". Although MS#4 declared that "either one (manikin or GTA teaching) in isolation is not sufficient to reinforce the teaching", and MS#6 suggested that use of "the manikin just so that you are comfortable with actual physical and technical aspects of it and the GTA aspect of it is about the human interaction and the communication and just getting your confidence level up". Another student (MS#1) commented that "it was a safe environment when using the manikin".

TF #3 commented that a manikin is "piece of plastic" with "no emotions" and is "built in the easiest possible way". The GTAs concurred with this perspective, where GTA #1 stated "it is easy to find the cervix in a manikin" and therefore translating such into practice can be quite a stretch without the addition of GTA teaching. However building confidence on undertaking the procedure on a manikin initially may have some advantages as mentioned by TF #1, who said "the manikin will not shout or scream in pain or show emotion, which can go either way for the student". Overall fifteen of the study participants commented that employing GTAs to teach pelvic examination skills enhanced repetition and consistency and was more realistic. The interaction facilitated by the GTA teaching was felt by TF #3 to "remove the artificiality and gives the students the aspect of real life" Generally the sentiment was that ideally both methods should be employed to enhance learning.

On observation, compared with manikin teaching, the students all had a more practical teaching experience where they got comfortable with the size of gloves they needed to use, speculum handling in front of the person they are about to examine, and maintaining a rapport during examination to keep a comfortable and relaxed environment. One of the GTAs provided an invaluable tip for the students, mentioning “put the patient in control, allow the patient to tell you when she’s ready”, which is an invaluable tool exclusive to GTA teaching that fosters a good environment for the examination itself.

The manikin teaching employs a clinician and certain theoretical aspects were not covered during GTA examination i.e. when a student asked about the difference between retroflexed and retroverted. One of the GTAs advised the student to “ask a clinician”. This is something very minor that could be added in to the teaching itself, or students can easily look up this information in their textbooks. Tips from the GTAs such as “tie your hair up so you can see with the light behind (you)” or “look at my face (during abdominal examination)” are unique to the GTA experience compared with manikin teaching.

One of the major differences noted between the GTA and manikin teaching was that manikin teaching lasted a maximum of two hours according to the records by the undergraduate co-ordinator. On the other hand, due to an increase in student numbers to five per GTA teaching session, the teaching continued on longer than anticipated. The GTAs did apologise for this when it did occur, and students adjusted amongst themselves.

Both manikin and GTA teaching received the same PowerPoint presentation on female anatomy for the purposed of clinical examination. However, manikin teaching took place in a clinical skills room, which is larger than the examination rooms for GTA teaching.

During GTA teaching, the pelvic floor pressure allows some assistance in closure of the speculum, which is different to manikin teaching, where the speculum has to be closed all the way manually by the student performing the examination. The GTAs teach the students to "feel it (speculum) pop off the cervix and allow it to close naturally".

Theme 7: Impact on clinical practice

Practical application of academic knowledge was noted by NTF #2 who mentioned that "as far as GTA examinations are concerned, most will have normal pelvises and will have a normal pelvic examination. It is important to know what is normal before going on to understand what is abnormal". Eight of the students concurred that is was a good step between theory and examining actual patients and promoted a thorough holistic approach which focused on ensuring patient comfort and dignity. TF #3 commented that practice under general anaesthetic is "artificial" and that GTA practice is "as close as possible to real life scenario". Another advantage of GTA teaching was that by performing the examination better, this would reflect with fewer complaints from patients. TF #3 observed that "students will be practicing on patients, and it will be much kinder for the patient and expose the students to a better clinical examination strategy." Additionally TF #2 considered that as "it is a very sensitive area and very important that the woman is going through the

examination for a reason by someone who knows what they are doing and will be able to assess and treat them appropriately."

Good teaching has been described by NTF #2 as "systematic, methodical and logical", which are qualities the GTA teaching embodies, and has been confirmed through the non-participant observation. The students commented on useful tips provided by the GTAs that "sound really simple but you just wouldn't consider", such as knowing how to help relax the patient, moving the bed, controlling the speculum and other "technical tips and knowledge (that) were really enhanced".

On observation, one of the GTAs mentioned to the students that during a prior teaching session, one of the students used a tissue to wipe down the excess gel at the end of the examination procedure rather than offering the box of tissues to the GTA to wipe in privacy. This understandably made the GTA uncomfortable and the student was debriefed as to why this was not appropriate at the end of the examination. It is important to note that if this took place in clinical practice, and the student had no prior experience or had received teaching on how to end an examination, this could have easily led to a complaint from a patient. Importantly, bad practices have the opportunity of being corrected with GTA teaching.

The students were noted to have had previous exposure of GTA examination in their third year of medical school. However, this was only a bimanual examination without a speculum examination, focus on formative feedback or communication skills. One of the students

(MS#12) reiterated the oddity of this by saying “so random, come out of nowhere, makes sense now”. Another student (MS#1) mentioned that “when I did it in (the) third year, (I) didn’t know what I was feeling for”.

GTAs mentioned to the students that patients “may not know they will be examined in clinic when they are referred”, which will allow students to use this key knowledge during their clinical practice. An interesting fact noted was that during GTA teaching, the students are encouraged to get the examination couch to hip height, which improves examination technique and visualisation, but also prevents long term back pain after repeated examinations. This advice is invaluable for the students as they progress to becoming clinicians and have the responsibility of maintaining their own health and wellbeing in addition to keeping patient care and safety as a priority. As GTA#3 said, the aim is to create future clinicians who are “caring and sensitive as well as competent and confident”.

Students were also encouraged to recognise their limitation, which is an attribute encouraged by the GMC for all clinicians. One of the GTAs mentioned to a student that “if (they have) not seen something don’t pretend (you have) seen it – ask for help”. This is a good clinical quality to inculcate amongst the students.

During one observation one of the male students did mention that after this teaching and feeling comfortable he would “maybe do O&G” and that he was “willing to change (his) mind”.

Theme 8: Drawbacks

There was concern from a NTF #1 and #2 who stated that that there are barriers to GTA examination, for example getting volunteers and making sure it is done appropriately, which requires good training of the GTAs. NTF #2 also expressed that "more medical aspects of it (teaching by GTAs) might be inappropriate", and "they could definitely train certain aspects, for example communication". The GTAs themselves mentioned that their limited numbers prohibited a more personalised approach to the teaching. GTA #3 remarked that "some do need more help than others, some take to it like a duck to water and then others even after 3 attempts find it difficult and sometimes I feel that they could do with another session". There were a maximum number of speculum examinations that was comfortable for individual GTAs, and this could cause an issue if larger student group sizes were allocated to a pair of GTAs. This was also a problem where there a GTA with a chaperone during teaching, so the single GTA would have to undergo two examinations per student, amounting to approximately 10 examinations in total. GTA #4 felt that because of the intimate nature of the teaching being a GTA "takes a certain kind of person to do it" which could inhibit recruitment and hinder the expansion of such a programme.

TF #2 mentioned that it is important to ensure that GTAs are not taken advantage of and that the programme is "well regulated" and that although it is a great service, "that she could not personally do it".

NTF #4 commented that "one (potential) disadvantage is that if GTAs are not properly trained, it could perpetuate the cycle of bad examination technique". The cost of instituting

and running such a programme may be prohibitive to its expansion, where NTF #3 commented that barriers are more to do with the logistics of recruiting volunteers, and mainly money rather than personal objections, and speculated that its presence in the undergraduate curriculum will be “resource driven”.

The GTA team were physiologically varied regarding aspects such as body mass index, presence of uterus and cervix and intrauterine devices as well as previous surgical procedures. This may be a drawback in the different experiences students receive, especially where a GTA has had a hysterectomy and there is no cervix to visualise. However, the technique is the same and the other GTA in the pair during teaching would have had a cervix so they should have had the opportunity to visualise it atleast once during their teaching session. A drawback mentioned by students (MS#2, #7 and #9) was the difficulty in being able to pick GTAs with interesting pathology.

Another concern raised by TF #2 was that the GTAs were from a non-clinical background, and that “if you don’t have the extra medical knowledge alongside it, then if they (students) say what do you do if you find this or that, then the GTAs won’t be able to answer (the question)”. Also GTA#3 commented that the less confident students found the programme quite challenging. GTA #4 mentioned that “if you’re walking around and you’ve just taught the student, you see them on the way out and it can be a bit awkward” potentially for both parties.

In cases where a GTA was more firm with the students, and interrupted their first examination repeatedly, they appeared disinterested during the remainder of the examinations performed by their peers. In one case, one of the students was sitting on the floor, which could be attributed to exhaustion at the end of the day, the heat in the room due to the radiators being turned on or due to feeling demoralised and unwilling to observe other examinations.

One of the disadvantages noted during GTA teaching was that on one occasion there was no correction of the jargon used by a student where she said “start by lightly palpating” rather than explaining she would be “pressing” on the abdominal area, or where she said “visualise the cervix” rather than “see the cervix”. However the general demeanour of this student was good and she was confident in performing her examination, which could mean that the GTA observing didn’t want to stop her and hamper her confidence.

Whilst waiting outside for her turn to perform the second examination, one female student mentioned that she “doesn’t like fake situations” or “when you’re being watched” whilst performing examinations. However, students in all universities have observed / supervised examinations for all clinical examinations, so this may be a drawback particular to that student’s learning style. A male colleague of hers did reply that “it’s good to be watched” to know that the examination is being performed in the correct manner.

Theme 9: Acceptability and morality

All students commented that GTA teaching was acceptable as it was an essential procedure and an important skill, albeit requiring an explanation of rationale regarding the nature of the training. MS#9 considered that it was "immoral not to have the appropriate training" as female pelvic examination is an essential procedure that happened across healthcare settings on a regular basis. In addition, to undertake the procedure for the first time on a patient potentially as a qualified doctor raised more of an ethical question amongst the student participants than taking part in the GTA teaching itself. TF #1 confirmed that it was better to practice on a volunteer "rather than performing your first speculum examination on your first patient not knowing anything." This theme was echoed by GTA #1 who mentioned that the patient relies on doctors to "know what to do and would not be happy to be experimented or practiced on".

Currently it was perceived by MS#2 that "outside of the healthcare setting the teaching would not be considered as normal". MS#7 commented that family and friends would "think it strange that people would volunteer to do it but would rather they have medical students practice before doing it on a real patient". The students noted that it could be construed as an unusual experience requiring an explanation of the rationale, but that generally as a medical student many of their experiences were highly unusual compared to their contemporaries. Students reported that friends at other medical schools were quite envious of their opportunity and MS#9 commented that "if it was part of every medical student's education, then it would be very normal" and that "people would be very grateful to have had it rather than not to have it because it seemed awkward or abnormal". NTF #1

commented that in time it could be considered socially acceptable, although initially people won't take as normal, first it will seem odd, then normal and routine. This is a novel way of teaching that is currently unfamiliar to the general public. NTF #1 recognised that "it was not like a normal job...but (that) once the process is established this may be different". Interestingly, when considering the morality of such teaching, TF #3 commented that "if the examination under anaesthetic is morally acceptable then why should examination of a GTA not be?" TF #4 had strong views on social acceptability and stated that "society demands that doctors be perfect and society demands that doctors never make mistakes and always get it right and is it socially acceptable to cut up dead people at medical school. I don't see that GTAs are any less socially acceptable than cadaveric dissection. Society can only have it one way or another."

The majority of the students had felt reluctant to discuss the GTA sessions with family and non-medical fellow students and friends because of the unusual nature of the teaching. The teaching faculty responded positively to the programme from the perspective of the student experience but TF #2 commented that society may perceive "that's quite an intimate thing for someone to volunteer to have done for the greater good of humanity basically". MS#15 who had mentioned the programme to non-medical friends commented that they thought it was "a little strange" and another student MS#10 was informed it was "quite peculiar". TF#1 reported there could also be a "social stigma", which could be a barrier to intimate examinations being performed on GTAs. GTA #3 mentioned that when discussing her role in a non-medical setting she had experienced mixed reactions where "one person asked me did my husband know I was doing this? ….I said yes he does know, but why would my husband

have any say as to my cervix, it's nothing sexual …but that (to some of the public) that you are going to let someone do that to you without a reason comes as a shock". Half of the GTAs openly discussed the nature of the teaching with family and friends whom they reported were supportive and GTA #4 commented "they think it's brilliant". GTA #1 and GTA #2 reported that they were not explicit when discussing their work and were vague regarding their job title, becoming graduate teaching associates rather than gynaecological teaching associates, mainly because it was a unusual job and also perhaps reflecting the different personality types within the teaching team.

The GTAs were all very motivated to mainstream the teaching model as they felt that all students should have the opportunity to undertake the procedure on a healthy normal individual who could provide feedback regarding the procedure rather than undertaking the procedure using a manikin, as part of a theatre procedure or on a symptomatic patient. They felt that if the procedure was undertaken with confidence and competence it would encourage patients to be less fearful of the examination and return for repeat examinations if required, for example for cervical smears which occur at least every 3 years. However there was may still be a societal perplexity regarding this teaching method which they suggest may explain why it can be difficult to recruit volunteers. GTA #3 commented "I don't know but perhaps because it is such an intimate examination that they only think you should be having them when there is a medical necessity. I don't keep quiet about what I do. From my point of view the more open I am about it, perhaps more people would be more interested in doing it".

Field notes from the non-participant observation support the acceptability expressed by the students, through watching their active participation in these teaching sessions, their gratitude for the teaching they have received, and their appreciation for the skills they have learnt. One of the students did offer her gratitude by saying “thank you for letting us do this” to the GTAs after her teaching session.

Observations also highlighted that the GTAs mention to the students that they have a “massive interest in female health” and they all “work together to support you (students) in your learning”.

Theme 10: Motivation to become a GTA

Motivation to become a GTA predominantly focused on the rewarding nature of the work, feeling respected and valued as teachers and the subsequent benefit noted for the students. The GTAs commented on the feedback regarding the teaching, with GTA #1 stating “that’s my inspiration to come back when they (the medical students) have said yes, you really helped me”. Additionally a keen interest in women’s health and the altruistic aspect of the work was described, with GTA #2 declaring that “it is such an important examination for women because if someone has had a bad experience, they are unlikely to return readily for subsequent investigations and it could be my Mum, daughter or friend and I would like it done in the best way.”

The opportunity as a lay woman to undertake the role and provide benefits to both students and patients without a long formal degree was seen as an advantage. GTA #3 commented

that “this looked like something I could actually do without having 3 years of going to University …and feel that I was making a difference too”.

Additionally, the attraction of teaching small groups motivated the GTA team and the reward of imparting the skills and knowledge they had acquired was satisfying. GTA #2 said, “I think it’s brilliant when they find the cervix and feel the uterus because as much as you can tell them what it’s like it’s not until they feel it that they realise and you can high five!” Furthermore, observing the students leaving feeling “relieved, grateful and happy” was reported as most gratifying by GTA #4.

There was also a comment from GTA#2 that the effect of women presenting late with a cancerous lesion, because of a fear of undergoing a speculum examination, encouraged the GTA to join the team. If the procedure could be made less traumatic by training future doctors to be more confident and competent, women may attend more readily with symptoms that may be due to pathology at an earlier and treatable stage. The teaching may also encourage individuals to consider gynaecology as a career because they feel less daunted by the examination involved. GTA #3 commented “those (medical students) that may have been in two minds actually say I might go into gynaecology now …it’s got to be better for everyone.”

DISCUSSION

Principal findings

This qualitative study has highlighted the importance of GTA-led teaching for final year undergraduate medical students in O&G. Both medical students and the undergraduate faculty have reported increased confidence in undertaking female pelvic examinations after the GTA-led training programme. Medical students reported a lack of opportunities in particular for male medical students to obtain exposure to, and experience of, gynaecological examination prior to the introduction of the GTA-led teaching programme. Both students and the undergraduate faculty agreed that this programme was an acceptable means of teaching. However, they commented that their friends, relatives and non-medical colleagues may find the nature of the teaching method difficult to comprehend and relate to. The undergraduate faculty also had concerns about the training and monitoring of GTA-led teaching, including safety of the GTAs themselves.

Students also reported that communication skills which are vital to examination and the establishment of a professional rapport to help relax the patient and improve the patient experience were enhanced after GTA teaching. The students commented that the intimate nature of the teaching programme may be viewed amongst individuals outside the medical profession as odd and “abnormal”. This finding reflects the difficulty in recruiting women to become GTAs from the general population. One very promising aspect from the study is that GTAs are a highly motivated group of educators who have altruistic intentions and are keen to provide excellent teaching to students, which will consequently benefit patients.

Strengths of the study

This qualitative study explores the opinions and actions of a wide stakeholder group for GTA teaching for medical students. The study comprehensively investigates both the experience and acceptability of GTA pelvic examination teaching of all of the groups, and their opinion on working towards incorporating GTA teaching within the university curriculum.

A range of investigative methods were used for data collection, from semi-structured individual interviews to a group interview, and the use of non-participant observation, where triangulation was used to check for common themes.

The interview set-up for medical students, teaching and non-teaching faculty avoided some common pitfalls such as the trial co-ordinator presenting their own perspective, use of sensitive language to avoid awkward or embarrassing questions, jumping from one subject to the other, and using the interviewee's own responses to facilitate further questions. Interruptions from phone calls or outside were avoided by encouraging that mobile phones be turned on silent or off, and a "do not disturb" sign was placed on the door.

A group interview for the GTAs was advantageous because not only was it a convenient and rapid method of data collection, but it was also a way to encourage discussion and group analysis of the GTAs own experiences of teaching pelvic examination skills. The interaction was used to identify group norms and scrutinise ideas expressed within the GTA culture. A group discussion allowed an open conversation and allowed criticism of the teaching programme.

The advantage of using non-participant observation was that it "helped overcome the discrepancy between what people say and what they actually do" (Mays and Pope, 1995). The value of doing this fieldwork was to capture events and interactions that are unspoken, as well as discrepancies between the data obtained from all the interviews and actual practice.

"Triangulation reveals the varied dimensions of a phenomenon and helps create a more accurate description." (Fielding and Fielding, 1989) And each single qualitative method of investigation has its own respective weakness. The use of multiple 'vantage points' has helped answer the research questions with greater clarity and reduced the overall margin of error (Beitmayer et al., 1993). Using these multiple methods increased the overall understanding of stakeholder experience and acceptability of the GTA programme with a more accurate picture. Although there are different methods of triangulation, the choice for this study was 'intra-method triangulation' at the level of data collection. In this case, all 3 data-generating facets including semi-structured interviews, GTA group and supplemental interview, and non-participant observation helped provide a clearer and more holistic picture of the experience and acceptability of the GTA teaching programme (Jenks, 1999).

Weaknesses of the study

The trial co-ordinator was performing the non-participant observations, which could contribute an element of bias to the field notes. The trial co-ordinator was also the teaching fellow for the students' five week O&G placement at BWH. There is the possibility of the "Hawthorne effect", where the presence of the trial co-ordinator at a small teaching session

can modify the dynamics of the group including aspects of physical actions, interactions and dialogue (Holloway and Wheeler, 2010). Students may be encouraged to appear more interested, listen carefully and perform conscientiously (Roethlisberger and Dickson, 1939). This may lead to different results than a complete stranger conducting the non-participant observation with different findings of experiences and acceptability. Also, taking notes during GTA teaching can also distract the medical students and GTAs, which itself can cause reactions among the participants. It is also a possibility that students are not stating the drawbacks of the teaching programme to the trial co-ordinators during the semi-structured interviews as they associate us with the teaching programme. Other stakeholders that were not included in the study include the people responsible for funding GTAs from UoB CMDS.

The group and supplemental interview with the GTAs was also conducted with the same co-ordinator. However, reflecting on the transcripts of the GTA discussion, the latter are noted to have had a forthright discussion on their opinions.

The intention was to hold a focus group involving all eight members of the GTA faculty. However, due to work commitments, this was not possible, and a group interview with three GTAs and another supplemental interview with one GTA was organised, which highlights a potential issue of representativeness. The group interview for the GTAs could have been started by providing participants with post-it notes where they could anonymously write the problems with the teaching programme. This could have been followed by a group deliberation, to remove any stigma from one individual for having highlighted the problem. The room set up for the discussion was also not ideal, with seating around a table, rather

than the preferred option of having the chairs in a circle to create a more conducive and informal environment for dialogue.

Although initially the first three semi-structured interviews conducted for the students were to be observed by a qualified qualitative researcher who would assess the interviewing technique using Whyte's defectiveness scale, this did not take place (Whyte, 1982). However, the trial co-ordinator was trained in participating in semi-structured interviews with previous studies and closely followed the question script. (Appendix 29, 30, 31, 32)

Comparison with other studies

In comparison with other studies, the qualitative study reflects similar findings. The students highlighted the importance of the examination and the need for sensitivity and proficiency regarding the procedure which has been reflected by other authors (Moore et al., 2000; Robertson et al., 2003). Additionally they felt more comfortable initially practicing the procedure on healthy volunteers rather than clinical patients especially as they had felt they were less likely to cause pain to the healthy GTAs rather than patients who may have pathology. The utility of feedback to medical students regarding their performance from GTAs and the noted limitations of manikin teaching were seen in this study as well as previous studies (Jha et al., 2010). The ethics of undertaking of the procedure for the first time on clinical patients has also been raised in the literature (Caldicott et al., 2003).

The medical students estimated that their confidence and competence in performing pelvic examination increased following the GTA teaching which had been reflected

comprehensively in similar studies (Grankvist et al., 2014; Wanggren et al., 2005). The teaching and non-teaching faculty highlighted the benefits of the GTA programme for the students that had the teaching during their O&G placement particularly regarding their ability to seek out additional opportunities to practice and their confidence in discussing the procedure with patients, an outcome also identified in previous studies (Dabson et al., 2014; Robertson et al., 2003; Wanggren et al 2010).

The GTA group and supplemental interview findings confirmed some of the themes highlighted by other studies. The GTAs mentioned the satisfaction involved in seeing the students confidence increase during the teaching sessions and providing a safe environment in which they could practice their communication skills and the technical aspects of the procedure. The rewarding nature of the GTA role had been reflected by previous studies (Siwe et al., 2006). The GTAs also mentioned practical difficulties, such as larger than optimum student groups reducing time available for each individual to practice the procedure in this setting, which may be exacerbated by the difficulties of recruiting individuals to work in this role, which is a unique finding from the study. Other new findings include the issues relating to acceptability of GTAs within the public's perception were mentioned by participants from all groups which may prohibit the recruitment of individuals to this type of employment. This novel aspect of universal social and moral acceptability and normality of the programme amongst the medical students, GTAS and O&G consultants compared to the perceived public perception by study participants had not been addressed in the literature. Individuals in the non-teaching faculty and medical students groups both mentioned the potential awkward and embarrassing nature of the procedure that is

reflected in literature which may inhibit learning (Dabson et al., 2014). However the aspect of limited opportunities for male students to undertake pelvic examination has not been examined to any degree in previous studies. Negative aspects of the provision of GTA teaching highlighted in systematic reviews, such as personal relationship problems for GTAs and physical discomfort caused during the procedure were not apparent in this study (Jha et al., 2010).

Implication for clinicians and policy makers

The implications of this study for clinicians and policy makers is to consider developing the GTA pelvic examination teaching programme further within the O&G curriculum for all students in the final year. It is also important that education leaders in universities around the country consider the advantages of such a programme within their own medical schools. The commonly held misconception that GTA teaching would not be acceptable has been addressed through this study. It is easy to see why there may be wider social barriers to this method of education for medical students. However, there may also be ethical barriers to cadaveric dissection which is used across universities for the purposes of education. Medical student experiences are different and somewhat unconventional to what society would expect generally. Wide stakeholder participation has demonstrated that GTA teaching provides a good experience and is acceptable for all individuals concerned.

It is also important to consider the emotional impact on patients who have had pelvic examinations performed badly or the ones that develop anxieties for future pelvic examinations as a result of poor training for trainees in the skill of performing pelvic

examination. The increasing burden of litigation is also important to consider where inappropriate communication or physical examination in this intimate area can lead to a greater long term burden on the NHS. There could also be future costs of unnecessary investigations through performing poor or incomplete examinations due to a lack of skill of detecting the presence or absence of pathology.

Unanswered questions and future research

Future research will be required to investigate patient perspective of GTA teaching. This could be done as a quantitative or a qualitative study exploring their opinions. Ethical approval would need to be sought for randomising patients during clinics to students who have received either manikin, or GTA teaching and studying the level of patient perceived competence at the end. This form of trial would need a thorough protocol to overcome the multiple avenues of bias such as patient characteristics and their previous experiences. Expanding the programme to other intimate areas of teaching could include rectal, breast, prostate and testicular examinations.

Although our study has highlighted acceptability amongst the stakeholders, further study needs to explore whether students taught via a GTA programme have a better rapport with patients compared to students taught using manikins. A consequential positive effect on patients would be a good motivator for educational curriculum change.

Public participation through focus groups could be held within the women's health department of hospitals to clarify what GTA training and teaching for medical students entails, and allow investigation into the public's opinions and perceptions.

CONCLUSION

The EASTT study aimed to explore the experience and acceptability of final year undergraduate students, the undergraduate teaching and non-teaching faculty and GTAs of the innovative female pelvic examination teaching programme at the BWH. The themes were identified through medical student semi-structured interviews, GTA group and supplemental interviews, and triangulated with non-participant observation. These confirm both a positive experience of all stakeholders and a widespread acceptability of the GTA led pelvic examination teaching at BWH. There was recognition of the importance of good pelvic examination skills, and the clinical impact of the teaching for the patients' experience and safety. Students in particular confirmed an improved confidence in performing pelvic examination in the clinical environment and developing improved communication skills, which are both key to putting the patient at ease during an intimate examination. Although there are some benefits of manikin teaching, the holistic nature and life-like experience of performing the examination on a real person has been noted to have a significant benefit. There are some concerns documented, especially the ability to recruit and monitor an effective GTA teaching programme, as well as to ensure the safety of the GTAs themselves. One very promising aspect from the study is that GTAs are a highly motivated group of educators who have altruistic intentions and are keen to provide excellent teaching to students, which will consequently benefit patients.

Chapter 7: Discussion and Conclusion

DISCUSSION

Female pelvic examination is one of the core skills required to achieve as a medical student. The main opportunity for medical undergraduates to acquire this skill is during their O&G placement. However, there are several challenges to learning this skill correctly and being comfortable performing it on patients in clinical setting. Firstly, female pelvic examination requires overcoming the apprehension of intimacy, which can get in the way of learning and practice. (Pugh and Salud, 2007) Secondly, diminishing exposure created by a reduction in the duration of O&G placements in the UK from an average of 11.3 weeks in 1975-6 (Biggs et al. 1991) to 6.7 weeks in our 2014 survey of UK medical schools (Chapter 2). Thirdly, a gradual increase in medical student numbers has placed challenges on clinical educators to achieve an optimum learning environment with adequate opportunities for students to acquire examination skills. Finally, patient expectations have changed, creating issues around medical students gaining to perform examination. Why patients' expectations have changed is unclear but may relate to transparency and a greater appreciation of their autonomy or a suspicion around the medical profession created by negative media stories. These barriers to ensuring that a medical student graduates with competency in pelvic examination need to be addressed in the interest of patient safety.

In an attempt to do this, this thesis explored the current provision of medical student training in pelvic examination including the assessment methods used, the validity of a newly developed pelvic assessment tool and then evaluated the potential benefit, both

educational and economic, of introducing trained expert patients, i.e. gynaecological teaching associates (GTAs) to a medical school curriculum. GTAs provide immediate feedback on both communication and clinical skills, which cannot be replicated with a manikin or more sophisticated simulation methods (Pugh and Salud, 2007). Finally our research work examined the views of GTAs, medical students and their clinical educators regarding the teaching or pelvic examination with particular reference to the use of GTAs.

Current provision of training in gynaecological examination in UK medical schools

Our cross-sectional survey of academic leads for undergraduate education across UK medical schools offering O&G clinical placements provided a snap shot of current educational provision regarding teaching female pelvic examination and the opinions of respondents with responsibility for undergraduate training. The 70% response rate implied the responses obtained were representative of the population studied. Response data confirmed that the main medium of teaching pelvic examination skills remains the use of an anatomical pelvic model (manikin), which is consistent with data from a survey in 1989 (Biggs et al. 1991). A small proportion of medical schools utilised GTAs to teach and / or assess pelvic examination skills. Beyond the clinical skills lab, the majority of medical students were provided with supervised teaching of pelvic examination on conscious patients in outpatient clinics, and anaesthetised patients in theatre. UK medical schools consider competency in this skill to be important prior to graduation and agree with the GMC, which states that competence in "full physical examination" is required prior to graduation. (GMC 2015) Although this is a key skill to acquire during medical school, only some of the latter formally assess medical students prior to achieving successful completion of the placement.

GTAs were considered a successful means of teaching pelvic examination skills in the medical schools that currently used them. However, academic leads in the medical schools that did not have this teaching facility were equivocal regarding the potential benefit of introducing GTAs to their undergraduate educational curriculum. This may reflect a lack of experience of GTA led teaching programmes, a prejudice against the use of non-clinical teachers or the dearth of compelling evidence pertaining to effectiveness in key educational outcomes and their economic viability to support their introduction. However, these medical school academic leads for O&G recognised the importance of using expert patients in other disciplines e.g. rheumatology, where the exposure and correct examination of an arthritic knee joint could not be adequately replicated in an inanimate simulation model. Academic O&G leads in open responses to the survey expressed the view that performing an examination on real people was invaluable and some acknowledged the diminishing exposure of clinical experience of gynaecological examination in the clinical setting. One of the respondents of the survey who acted as an external examiner believed students trained by GTAs were more confident in their OSCEs using a manikin than the respondents own students who were both taught and assessed using manikins.

Validity of pelvic examination assessment

The majority of academic leads we surveyed supported the notion that medical student competency in female pelvic examination should be a mandatory requirement complying with current GMC requirements (GMC 2015). However, assessment methods varied from none, to informal to formal examinations. Even the formal assessments varied in the absence of a standardised, validated assessment tool. Thus, we attempted to design and

validate a gynaecological examination assessment tool to viably measure student competency and also allow innovations in teaching of this core skill to be rigorously compared. The pelvic examination assessment tool (PEAT) consisted of several assessment domains in the stages of the pelvic examination as a well as a global assessment. However, with the exception of the 'adnexal examination' examination domain, the PEAT failed to demonstrate construct validity, although psychometric face validity, ease of use and reliability (for the global score) was established. The lack of construct validity may reflect the inadequacy of the developed PEAT. However, it could be attributed to a decreasing level of familiarity with OSCE style assessments within postgraduates (junior doctors) compared to current medical students, our use of only a 'normal' pelvic model (as opposed to one with abnormalities), the lack of realism of the scenario created (using an inanimate pelvic model and actress) or inadequate examiner training in the use of the PEAT. Redesign of the PEAT in response to examiner and student feedback received combined with a redesigned validation study is required. In an attempt to blind examiners from knowledge of the experience of those being assessed we sent videos to gynaecologists involved in undergraduate education outside of the West Midlands deanery. However, this methodologically sound decision seemed to compromise our response rate. Thus, to obtain more robust results any study redesign should ensure improved assessor response rates as well as increase the sample size of novice and experienced students as well as junior doctors, and assessment of competence at several intervals needs to be conducted.

Effectiveness of gynaecological teaching associates

We conducted a large, single blinded RCT on nearly 500 final year medical students, by far the largest such study in the published literature. Not surprisingly, the TARGET trial demonstrated that initial teaching with either supervised practice on a manikin or by GTAs followed by a five week placement increased student self-assessed confidence and competence in pelvic examination. However, a positive effect of initial GTA teaching in week one of a five week clinical O&G placement compared with conventional manikin-based teaching delivered by a member of the clinical teaching faculty was demonstrated. Student perceived confidence was enhanced after GTA teaching at the end of the placement as was objective assessment of student competence. Secondary outcomes such as perception of teaching method, impact on clinical placement and overall satisfaction were also found to be more positive after GTA teaching. Our findings are in keeping with another smaller RCT where GTA teaching was found to result in greater student competence compared with manikin teaching (Pickard et al, 2003). Our trial is of higher quality as it was larger and had employed more valid outcome assessments because 'real' women were used as opposed to assessments on low fidelity manikins. Our study findings also support the generally positive findings observed in a recently conducted systematic review of mainly controlled observational studies but also some RCTs regarding the effectiveness of GTAs in teaching competency in technical and communication pelvic examination skills (Smith et al. 2015).

Positive outcomes supporting GTA led teaching programmes has generally been observational in nature or conducted within a small RCT. (Smith et al. 2015) Our large, blinded, multi-centre RCT provides authenticity to the outcomes assessed. However, one

flaw is the lack of an assessment tool that demonstrates construct validity. Despite this deficiency (pervasive amongst all prior studies in the absence of a psychometrically validated outcome assessment) our tool had face validity. We believe that undergraduate medical student and examiners are familiar with OSCEs and so our competency assessments are likely to be valid and reproducible.

Thus, GTAs seem to be effective in teaching gynaecological examination to medical students compared with conventional methods and such innovations are urgently needed in light of the hurdles outlined above restricting medical student exposure to a fundamental skill that the GMC expect to be acquired prior to qualification. Further studies are needed however, to determine the optimal design of GTA teaching programmes, taking into account duration of sessions, group sizes, timing, number of encounters and sustainability of the imparted knowledge and skills in the longer term, especially in clinical practice as junior doctors.

Cost effectiveness of gynaecological teaching associates

Our economic analysis performed alongside the TARGET RCT comparing GTA and manikin teaching demonstrated that if the goal of medical school curricula is to acquire basic competence (50% 'pass' level) then an initial, single, two hour introductory teaching session with GTAs may not be a cost-effective option compared with traditional manikin-based teaching with a clinical member of the undergraduate teaching faculty. However, higher levels of proficiency, (i.e. 60% 'merit' or 70% 'distinction' levels), can be achieved cost effectively with GTA teaching. Teaching on a manikin has its limitations such as an inability to practice communication skills and work with immediate feedback from the patient for

examination technique. Changing variables such as GTA pay, inclusion of room hire costs or having ideal numbers of students in each arm of the trial demonstrated the stability, and hence generalisability of the base case findings.

Although our cost effectiveness analysis was based on the short term outcomes of competence at the end of the O&G placement, long term outcomes were not evaluated so the sustainability of the effectiveness and cost-effectiveness of the intervention remains unclear.

The costs incorporated in the analysis were only the teaching costs during the first week of the O&G placement. Whilst the timing and delivery of GTA teaching varies between medical schools providing this form of teaching (see Chapter 2), they generally provide a one introductory session early in the placement with GTAs working in pairs consistent with our base-case analysis. We may have underestimated the costs of GTA teaching as we did not factor in late unavailability of GTAs (e.g. on a menstrual period, unpredicted work / family commitments) which may lead to rescheduling of sessions or use of a female chaperone to accompany the one active GTA. This emphasises the importance of establishing a GTA faculty of sufficient size for the number of medical students and sessions likely to be required and to accommodate the lack of availability of GTA members.

Due to resource limitations, economics evaluations are required to justify investment into an educational intervention. This cost effectiveness analysis performed is the first of its kind, due to the heterogeneity of the design of previous studies. (Smith et al. 2015) It is difficult to

make precise economic predictions across the UK and worldwide due to varying local and worldwide university related factors. However, within the UK, the costs of supplies would be approximately in line with our findings, with the potential major difference in the cost of Lecturer / SpR. The sensitivity analysis has already factored in a change in GTA pay from £30 to £20 per hour.

Although previous RCTs have compared outcomes, cost effectiveness has not been calculated. (Pradhan et al. 2010) We identified one RCT that also found expert patients (Physical Exam Teaching Associates) to be cost effective in providing student satisfaction for the teaching a variety of clinical examination skills. However, these results were based upon the teaching of generic examination skills and not specifically pelvic examination as in our RCT (Aamodt et al. 2006) so limiting comparability of findings. Some observational studies have estimated the cost of expert teaching programmes for generic examination skills and appear to support the use of trained lay educators; comparable educational outcomes being achieved for reduced costs. (Allen et al. 2011; Black and Marcoux 2002; and Hasle et al. 1994) However, in the absence of a formal economic assessment such as ours and the use of a robust educational outcome measure, the inferences we can derive are weak especially when trying to extrapolate to intimate female examination.

Experience and acceptability of a GTA teaching

Semi-structured interviews and a group interview triangulated with non-participant observation provided a holistic overview and confirmed acceptability from all stakeholders (medical students, teaching and non-teaching faculty and GTAs) for the GTA teaching

programme. The use of both open and closed questions during interviews and identifying common themes during analysis demonstrated a positive experience with this innovative teaching method.

The findings of our study are concordant with a previous study, which highlights students' comfort with performing pelvic examinations on a healthy expert patients compared with ill patients presenting acutely. The importance of immediate feedback reported by others (Jha et al., 2010) was also noted as in our qualitative study. Interviews with medical students confirmed a positive impact on both self-perceived confidence and competence, which has been reflected in previous studies (Grankvist et al. 2014 and Wanggren et al. 2010).

The group and supplemental interview with the GTAs highlighted the altruistic motivation of women, observed by others (Siwe et al. 2006) who were recruited and trained to teach pelvic examination skills to medical students to ensure competence. Some GTAs highlighted poor prior experience as patients, vowing to ensure other patients' experience in the future would be more positive. Public perception of this occupation may still be marred by personal or societal norms, whereas acceptability within the healthcare system is perceived to be more acceptable. (see Chapter 6)

Implications for practice, clinicians and policy makers

The GMC states that a full physical examination, which includes a female pelvic examination, is a requirement for graduation (GMC 2015). With limited exposure to performing pelvic examination, there is a potential that medical students may graduate without achieving

competency in pelvic examination (Iyengar et al. 2012) GTA led teaching programmes provide an innovative method of instruction and practice for teaching pelvic examination skills to medical students. Whilst GTA teaching is not widely established across UK medical schools, a least six medical schools in the UK do use them routinely (see Chapter 2) and consider them effective. In contrast UK medical schools without GTA programmes appear less convinced of their educational value. The quantitative effectiveness and economic data in conjunction with our qualitative findings provide evidence to support the use of GTAs in undergraduate medical school curricula. Academic leads for medical schools without GTA teaching programmes should be encouraged to familiarise themselves with the accumulating evidence of benefit and strongly consider introducing this innovation, according to the priorities of their teaching objectives.

GTAs can provide standalone teaching or form part of multi-faceted teaching programmes alongside LFS using manikins, computer simulation, bespoke teaching courses etc. Teaching by health care professionals within the clinical environment remains of prime importance and this consideration should be taken into account when designing GTA teaching packages so that they complement and enhance student experience within their clinical placements (Chapter 4). Those medical schools with established programmes should be encouraged to share good practice amongst all medical schools and collaborate in further research to optimise important educational outcomes related to female pelvic examination skills. Quality assurance of the GTA-led teaching programme is important as in all branches of medicine, particularly here where the GTAs are lay women. Whilst the RCT demonstrated an improvement in competence and confidence, measures should be in place as with any

teaching innovation that the quality of teaching is ensured to be of a high standard. Peer observation methods should be embedded in the teaching programme.

Whilst our RCT data evaluating the effectiveness of GTAs in improving educational and to lesser degree clinical outcomes (Chapter 4) can be assessed, the economic case is perhaps less clear. Resources such as time and money are limited both in undergraduate and postgraduate education. Thus, the introduction of a cost effective methods of teaching medical students craft skills such as proficiency in clinical examination, should be deliberated. Unlike drug trials, where QALYs can be obtained, establishing cost-effectiveness of an educational intervention is more problematic as there are no acceptable limits of ICERs to consider an educational outcome to be cost-effective. Our economic analysis performed alongside the TARGET RCT supports the use of GTAs to obtain an exceptional level of competence in performing pelvic examinations as opposed to basic competency (Chapter 5). However, in contrast to the examination of other body systems, medical student experience in gynaecological examination is increasingly limited (Iyengar et al,. 2012) whereas proficiency in this area remains of key in many postgraduate clinical practice settings such as general practice, accident and emergency, internal medicine, general surgery and sexual health. Moreover, our analysis could not evaluate other potential consequences peculiar to intimate female pelvic examination. These include psycho-social effects (Boendermaker et al. 2008) for the patient and additional costs arising from unnecessary investigations and litigation (e.g. missed pathology or accusations of inappropriately performed examinations). Thus, medical schools should consider whether aspiring to higher levels of competence is a priority when allocating scarce resources.

One caveat to the above discussion is the argument for an ongoing requirement for competency in gynaecological examination at undergraduate level. With the face of the medical curriculum in a state of overhaul particularly around teaching priorities and the inevitable competition for space on the curriculum, and limited resources, it may be that medical students may in time not require competence at performing a female pelvic examination, but be required to have only observed it. It may be that this skill will be only required of postgraduate trainees entering specialities where gynaecological examination is a key component. The viability and safety of such a policy of targeted, deferred postgraduate teaching of a skill that is necessary across a wide range of specialities is unclear and not the subject of this thesis. Even if such an extreme policy were adopted, the utility of GTA teaching in a postgraduate setting should be considered.

Qualitative data have demonstrated a positive experience and acceptability among stakeholders towards a GTA led pelvic examination teaching programme. Anecdotal concerns about widespread societal antipathy towards this teaching innovation were not corroborated from our standardised interviews and so such concerns can be dismissed. Policy makers need to now consider developing GTA programmes within undergraduate curricula across medical schools in the UK.

Future research priorities

The available evidence suggests that educators can confidently use GTAs to replace or supplement existing methods to teach competence in female pelvic examination. However, there is currently very little robust data evaluating expert patient educational interventions.

Future research should evaluate different multi-faceted teaching approaches e.g. combinations of instruction, teaching packages, computer simulation, LFS with manikin, hybrid models with manikins and role players and expert patients – GTAs (Pugh and Youngblood, 2002). Importantly how best to integrate them into key experience obtained in the real-life outpatient clinical setting during their O&G placements needs to be assessed. GTA teaching structures such as the optimal faculty size and number of GTAs: students within a teaching session should be explored as should the objectives and main focus of GTA teaching e.g. the relative emphasis of technical and communication skills. More thought is also needed to understand the best timing, frequency and duration of GTA sessions. Future research should also aim to identify which students may respond better to GTA teaching whilst also exploring attitudes and anxieties (both GTA and student) to intimate examination through qualitative research.

Our trial was the largest RCT evaluating the use of GTAs to date and although it was conducted across several hospitals in the West Midlands in the UK, they were affiliated to one university medical school (University of Birmingham, UK). One could argue that this parochialism limits the transferability of our findings. Thus, a multi-centre trial to assess the effectiveness and value for money of GTA programmes in order to provide an even stronger evidence base and thus rationale for UK medical schools to adopt this method of teaching pelvic examination will be beneficial. Moreover, such trials could incorporate an evaluation of the long term impact on healthcare by exploring whether medical students taught using a GTA programme demonstrate improved patient care and safety, and report improved confidence, competence and more positive clinical experiences. Such trials should

incorporate economic endpoints and use validated assessment tools for measuring competence, communication skills and confidence in intimate examination which will aid rigorous and standardised comparisons between teaching packages (Setna et al. 2010).

Gynaecological examination skills are necessary for most junior doctors and so the transferability of observed educational benefits of GTAs in undergraduates should be researched in the early postgraduate setting. Investigation can be conducted to elicit whether there is a benefit of GTA expertise for postgraduate trainees, especially with complex or rare clinical findings that cannot be appreciated via a textbook. Colletti et al. (2008) demonstrated that students who had experience of breaking bad news station on pregnancy loss with a SP demonstrated improved performance on clinical performance examination as opposed to students who had no interactions with SPs at all. Beyond the use of practising technical skills, GTAs can be used for ultrasound technique or for interactions involving breaking bad news (Posner, 2011), and sexual health consultations (Boendermaker et al., 2008).

The above suggested research should include economic evaluations. Our trial utilised GTAs for a single session early in students' clinical placement. However, a greater exploration as to the repeated use of GTAs throughout the clinical placements may change the direction and magnitude of cost-effectiveness. Packages of training should be evaluated for cost-effectiveness and with technological advances in simulation this may incorporate assessment of HFS manikins designed to provide greater realism. Furthermore, to investigate the true cost effectiveness of GTA teaching, we need to look beyond just the outcome of

short-term student competence outside of the clinical environment, and look at long-term healthcare and cost outcomes with regards to impact on patient safety. Another economic research consideration is the wider use of expert patients across other medical specialities particularly those where intimate examination needs to be taught e.g. urogenital, breast and rectal procedures. We also need to investigate impact on patient satisfaction and experience. Given the uncertainties around determining cost-effectiveness in undergraduate medical education, discrete choice experiments should be conducted among all stakeholders allocating resources to identify clinical training priorities.

As the end point is to ensure excellence in clinical care and safe-guarding of patients, it may be important to elicit patient views on the training of medical students. Patient variables in clinics and theatres pose a great challenge to using them for quantitative data in an RCT comparing different methods of teaching pelvic examination skills. However, they can be invited in a qualitative study, via a focus group, to provide their opinion on medical student teaching by GTAs.

CONCLUSION

It is essential to accomplish competence in performing female pelvic examination during medical school. Innovations in training and assessment are urgently needed to ensure medical undergraduates qualify with the necessary competence in this core clinical skill. Although GTAs are commonly used to teach medical students in America, Canada, Australia and Scandinavia, they are in the minority at medical schools in the UK. Current provision includes anatomic pelvic models (manikins) combined with supervised instruction in outpatient clinics and operating theatres.

The thesis examines the current provision of female pelvic examination teaching and assessment in medical schools across the UK. Validation of a novel pelvic examination assessment tool is tested, which can be used in undergraduate and postgraduate settings, both formatively and summatively. The tool demonstrated face validity and was easy to use by assessors in a formal assessment setting. Evidence from a large randomised controlled trial confirms that the use of GTAs improved both confidence and competence compared to teaching using a manikin. Although there is no defined willingness to pay threshold in education, cost effectiveness analysis alongside the large RCT supports the use of GTAs. The qualitative study using semi-structured interviews and group interviews for all the stakeholders involved in undergraduate pelvic examination teaching demonstrated that GTA use provides a positive experience, and is an acceptable practice of teaching. Although there are concerns about recruitment and monitoring an effective programme, this highly motivated group of educators may be the answer to achieve cost effective teaching in an environment where clinical exposure to this key skill is rapidly shrinking.

Enhanced student competence and confidence in both technical and communication female pelvic examination skills can be achieved using teaching programmes run by GTAs. UK Medical schools should share best practice, familiarise themselves with accumulating evidence of benefit and strongly consider the introduction of GTAs into their medical school curricula with the ultimate aim of graduating more proficient students delivering better care in women's health.

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Contribution to authorship

All authors meet the criteria for authorship, in detail: AJ designed and conducted the study; collected and analysed the data. AJ wrote and revised the manuscript. TJC supervised the study and assisted in analyses and review of the manuscript.

Declaration of competing interests

For all authors there is no financial interest

Details of ethics approval

Not applicable.

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PEAT:

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Contribution to authorship

All authors meet the criteria for authorship, in detail: TJC, JC and PS designed the study. PS and JC conducted the study. AJ collected and analysed the data under the supervision of PS and TJC. AJ wrote and revised the manuscript. TJC, PS and JC revised the manuscript for important intellectual content.

Declaration of competing interests

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Contribution to authorship

All authors meet the ICJME criteria for authorship. In detail: NR, SM and TJC recruited and trained the GTAs. TJC, PS and AJ designed the study with input from JP, JKG and SI. AJ conducted the study; collected and analysed the data with TJC and PS. PS provided statistical support. AJ, PS and TJC wrote all drafts of the manuscript. TJC supervised the study. All authors revised the manuscripts for important intellectual content.

Declaration of competing interests

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.

Details of ethics approval

Ethical approval was provided by the University of Birmingham Ethical Review Board. Approval number ERN_130476. All participants gave informed consent before taking part.

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CEAT:

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Contribution to authorship

All authors meet the criteria for authorship, in detail: JC, TR and AJ designed the study; AJ conducted the study; collected and analysed the data, Nicola Okeahialam (NO) assisted with with data analysis. AJ wrote and revised the manuscript. TR supervised the study and assisted in analyses and review of the manuscript.

Declaration of competing interests

GTAs currently employed by BWH where Professor TJ Clark is Director of Academy, and A Janjua is Clinical Teaching Fellow.

Details of ethics approval

University of Birmingham and Birmingham Women's Hospital ethical approval granted

Funding

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Contribution to authorship

All authors meet the criteria for authorship, in detail: AJ and LB designed and conducted the study; AJ and LB collected and analysed the data. AJ and LB wrote and revised the manuscript. TJC supervised the study and assisted in analysis and review of the manuscript.

Data Management

The original field notes were stored securely in the trial co-ordinator's office. Transcripts were digitally uploaded securely and password protected. The transcripts were kept in locked surroundings at all times, within the Birmingham Women's Hospital premises. The basic information about the participants did not include the participant's name, but their study allocated number. Information and recordings were collected on secured computers and all research team members had signed confidentiality agreements and were trained in Good Clinical Practice. The field notes and transcripts were stored as per the ethical board requirements, and then destroyed to maintain confidentiality.

Declaration of competing interests

For all authors there is no financial interest

Details of ethics approval

University of Birmingham and Birmingham Women's Hospital ethical approval granted: ERN_14-1414

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APPENDICES

Appendix 1a: Medline Search History

1. MEDLINE; exp STUDENTS, MEDICAL/; 23044 results.
2. MEDLINE; exp EDUCATION, MEDICAL/; 135509 results.
3. MEDLINE; (medical AND (student OR students OR education)).ti,ab; 99844 results.
4. MEDLINE; 1 OR 2 OR 3; 201388 results.
5. MEDLINE; exp TEACHING/; 69175 results.
6. MEDLINE; teaching.ti,ab; 102176 results.
7. MEDLINE; exp COST-BENEFIT ANALYSIS/; 63428 results.
8. MEDLINE; exp COSTS AND COST ANALYSIS/; 190833 results.
9. MEDLINE; (cost AND (effective OR effectiveness OR analysis)).ti,ab; 140029 results.
10. MEDLINE; 5 OR 6; 149938 results.
11. MEDLINE; 7 OR 8 OR 9; 281790 results.
12. MEDLINE; 4 AND 10 AND 11; 1111 results.

(No time limits or other filters)

Appendix 1b: CINAHL Search History

13. CINAHL; exp STUDENTS, MEDICAL/; 5415 results.
14. CINAHL; exp EDUCATION, MEDICAL/; 15755 results.
15. CINAHL; (medical AND (student OR students OR education)).ti,ab; 21292 results.
16. CINAHL; 13 OR 14 OR 15; 21292 results.
17. CINAHL; exp TEACHING/; 124606 results.
18. CINAHL; teaching.ti,ab; 32228 results.
20. CINAHL; exp COSTS AND COST ANALYSIS/; 56094 results.
21. CINAHL; (cost AND (effective OR effectiveness OR analysis)).ti,ab; 23181 results.
22. CINAHL; exp COST BENEFIT ANALYSIS/; 14075 results.
23. CINAHL; 17 OR 18; 145342 results.
24. CINAHL; 20 OR 21 OR 22; 69503 results.
25. CINAHL; 16 AND 23 AND 24; 143 results.

(No time limits or other filters)

Appendix 2: 30 UK Universities awarding medical degrees and clinical placements represented by members of the Royal College of Obstetricians & Gynaecologists Academic Board surveyed

Aberdeen (University of), School of Medicine
Barts and The London School of Medicine and Dentistry, Queen Mary, University of London
Birmingham (University of), School of Medicine
Brighton and Sussex Medical School
Bristol University
Cambridge (University of), School of Clinical Medicine
Cardiff University, School of Medicine
Dundee (University of), Faculty of Medicine, Dentistry and Nursing
Edinburgh (The University of), College of Medicine and Veterinary Medicine
Exeter / Plymouth University Peninsula Schools of Medicine and Dentistry
Glasgow (University of), College of Medical, Veterinary and Life Sciences
Hull York Medical School
Imperial College School of Medicine, London
Keele University, School of Medicine
King's College London School of Medicine (at Guy's, King's College and St Thomas' Hospital)
Leeds (University of), School of Medicine
Leicester (University of), Leicester Medical School
Liverpool (University of), Faculty of Health and Life Sciences
Manchester (University of), Faculty of Medical and Human Sciences
Newcastle University Medical School
Nottingham (The University of), Faculty of Medicine and Health Sciences
Oxford (University of), Medical Sciences Division
Queen's University Belfast, Faculty of Medicine and Health Sciences
Sheffield (The University of), School of Medicine
Southampton (University of), School of Medicine
St George's, University of London
Swansea University, School of Medicine
University College London, University College Medical School
Warwick (The University of), Warwick Medical School

Not surveyed – Norwich East Anglia University (see text for details).

Appendix 3: Cover letter for COTES (Cross Sectional Study on Teaching Pelvic Examination in Medical Schools in the UK) survey (2014)

Dear Undergraduate Lead for O&G,

As part of my MD in Medical Education exploring how pelvic examination skills are taught in medical schools across the country. I would be very grateful for your participation in the online questionnaire, which should take up less than 10 minutes of your time. I am currently supervised by Mr Justin Clark, Professor Janesh Gupta and Professor Tracey Roberts, all from the University of Birmingham.

Survey Link: https://www.surveymonkey.com/s/teaching_pelvic_examination

The reason we are conducting research on pelvic examination skills at medical school level is that experience of physical examination of the female pelvis is limited in short O&G placements. It is well recognised that the intimate nature of the examination poses additional challenges to medical students and their teachers in gaining consent for supervised training.

Teaching innovations seem to be needed to widen experience and hopefully enhance competence. One strategy is to use "Gynaecological Teaching Associates" or GTA's for short. These women are 'simulated patients' who have been trained to undergo and teach gynaecological examination, giving valuable and immediate feedback to the students.

Thank you in anticipation of your involvement in this survey. If you would like to be informed of the results of the survey, please could you email your interest to:

Kind regards

Aisha Janjua

Clinical Teaching Fellow / Honorary Lecturer

Birmingham Women's Hospital / University of Birmingham

APPENDIX 4: Survey Monkey COTES study questionnaire

Teaching Pelvic Examination in Medical Schools

General Information on Teaching Pelvic Examination

***1. In which year of medical school does the O&G placement occur?**

- ☐ Year 3
- ☐ Year 4
- ☐ Year 5
- ☐ Year 6

***2. How long is the O&G block?**

3. Is competency in pelvic examination a requirement to pass the block?

- ◯ Yes
- ◯ No

***4. How is pelvic examination (speculum and vaginal examination) taught?**

- ☐ Manikin
- ☐ Theatre
- ☐ Simulated patient / Gynaecology Teaching Associates (GTAs)
- ☐ Other (please specify)
- ☐ OP Clinics

Other (please specify)

***5. How do you evaluate students' competence in pelvic examination?**

- ☐ Don't assess
- ☐ Informal impression
- ☐ Bespoke assessment criteria (mark sheet)
- ☐ Generic assessment criteria (mark sheet) – Please state source

Source (please specify)

***6. Do you use GTAs to teach female pelvic examination?**

- ◯ Yes - if yes, please complete pages 2, 3 and 4
- ◯ No - if no, please complete pages 3 and 4

Teaching Pelvic Examination in Medical Schools

If YES: (Do you use GTAs to teach female pelvic examination?)

7. How were the GTAs recruited?

8. How many GTAs are currently employed in O&G?

9. When did the GTA programme start?

10. How do GTAs teach?

- [ ] Alone
- [ ] In Pairs
- [ ] In Groups

Other (please specify)

11. When do the sessions occur in the placement e.g. week 1?

12. When in the day do the sessions occur?

- [ ] Day (0900 – 1700)
- [ ] Evening (1700 onwards)

Other (please specify)

13. How long is each individual session? (hours / minutes)

14. How many sessions does a student receive during their clinical placement?

- ◯ One
- ◯ Two
- ◯ Three

Other (please specify)

15. Are they voluntary or mandatory sessions?

- ◯ Voluntary
- ◯ Mandatory

Other (please specify)

Teaching Pelvic Examination in Medical Schools

16. Are the GTAs involved with student assessment?

- ◯ Yes
- ◯ No
- ◯ Unsure

Other (please specify)

17. What are the main problems in running your GTA programme? (e.g. out of hours / not enough GTAs)

18. Do you think your GTA programme is successful?

- ◯ Yes
- ◯ No
- ◯ Unsure

19. How successful do you estimate your GTA programme to be in terms of improving teaching of pelvic examination?

No improvement ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ Significant improvement

20. If not, how can it be improved?

Teaching Pelvic Examination in Medical Schools

If NO: (Do you use GTAs to teach female pelvic examination?)

21. In your opinion, would the introduction of a GTA programme improve teaching of pelvic examination?

No improvement ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Significant improvement

22. Do you think competence in basic female pelvic examination is should be a GMC requirement for a medical degree?

- ○ Yes
- ○ No
- ○ Unsure

23. From your knowledge, does your medical school use expert patients in the teaching of medical students in other specialties? (e.g. rheumatology)

Teaching Pelvic Examination in Medical Schools

Comments

***24. Any other comments on manikin / GTA teaching?**

Thank you for completing the questionnaire. Please press 'Done'

APPENDIX 5: Complete response data from COTES study questionnaire

Generic Questions – All Participants

Q1: In which year of medical school does the O&G placement occur?		
Answer Options	**Response Percent**	**Response Count**
Year 3	23.8%	5
Year 4	57.1%	12
Year 5	38.1%	8
Year 6	0.0%	0
answered question		**21**
skipped question		**0**

Q2: How long is the O&G block?	
Answer Options	**Average**
	6.7 weeks
answered question	**21**
skipped question	**0**

Q3: Is competency in pelvic examination a requirement to pass the block?		
Answer Options	**Response Percent**	**Response Count**
Yes	81.0%	17
No	19.0%	4
answered question		**21**
skipped question		**0**

Q4: How is pelvic examination (speculum and vaginal examination) taught?		
Answer Options	**Response Percent**	**Response Count**
Manikin	95.2%	20
Theatre	81.0%	17
Simulated patient / Gynaecology Teaching Associates (GTAs)	42.9%	9
Other (please specify)	4.8%	1
OP Clinics	81.0%	17
Other (please specify)		1
answered question		**21**
skipped question		**0**

Other: “We also teach with simulated patient dressed with the pelvic trainer between to get student used to explaining procedure to patient”

How do you evaluate students’ competence in pelvic examination?		
Answer Options	**Response Percent**	**Response Count**
Don’t assess	9.5%	2
Informal impression	33.3%	7
Bespoke assessment criteria (mark sheet)	47.6%	10
Generic assessment criteria (mark sheet) – Please state source	9.5%	2
Source (please specify)		8
answered question		**21**
skipped question		**0**

Q6: Do you use GTAs to teach female pelvic examination?		
Answer Options	**Response Percent**	**Response Count**
Yes - if yes, please complete pages 2 and 4	28.6%	6
No - if no, please complete pages 3 and 4	71.4%	15
answered question		**21**
skipped question		**0**

Questions – 'Yes' to GTA use for pelvic examination teaching

Q7: How were the GTAs recruited?
Answer Options
From company already providing similar service to other medical schools
Through contacts with the kings GTA service and then they have developed into a local service
Through local advertising network - "daily info"
Employed by KCL
Med school approached GTA UK

Q8: How many GTAs are currently employed in O&G?	
Answer Options	**Average**
	4.6 GTAs

Q9: When did the GTA programme start?			
Answer Options	**Average**	**Range**	**Standard Deviation**
	7.6 years ago	4 – 10 years ago	2.30

Q10: How do GTAs teach?		
Answer Options	**Response Percent**	**Response Count**
Alone	20.0%	1
In Pairs	80.0%	4
In Groups	0.0%	0
Other (please specify)		0

Q11: When do the sessions occur in the placement e.g. week 1?
Answer Options
Introductory week

Throughout the placement on a Tuesday afternoon with about 6 students maximum
Week 1-3
Weeks 1 and 2 after practice on mannequins
Weeks 1,2,3,or 4

Q12: When in the day do the sessions occur?		
Answer Options	**Response Percent**	**Response Count**
Day (0900 – 1700)	50.0%	3
Evening (1700 onwards)	50.0%	3
Other (please specify)		0

Q13: How long is each individual session? (hours / minutes)
Answer Options
30 minutes per student
3 hours
90-120 minutes
1 hour, 3-4 students
3hrs for a small group of students
Average = 1.8 – 1.9 hours

Q14: How many sessions does a student receive during their clinical placement?		
Answer Options	**Response Percent**	**Response Count**
One	100.0%	5
Two	0.0%	0
Three	0.0%	0
Other (please specify)		1 “more than one if needed”

Q15: Are they voluntary or mandatory sessions?		
Answer Options	**Response Percent**	**Response Count**
Voluntary	0.0%	0
Mandatory	100.0%	5
Other (please specify)		0

Q16: Are the GTAs involved with student assessment?		
Answer Options	**Response Percent**	**Response Count**
Yes	80.0%	4
No	20.0%	1
Unsure	0.0%	0
Other (please specify)		0

Q17: What are the main problems in running your GTA programme? (e.g. out of hours / not enough GTAs)
Answer Options
Funding
No problems has worked very well for years
It is expensive, some people think. It takes time and focus to manage the team well. But I would not say these are problems
Underpay
No problems, works very well

Q18: Do you think your GTA programme is successful?		
Answer Options	**Response Percent**	**Response Count**
Yes	100.0%	5
No	0.0%	0
Unsure	0.0%	0

Q19: How successful do you estimate your GTA programme to be in terms of improving teaching of pelvic examination?				
Answer Options Scale No improvement = 0 Significant improvement = 10	**Rating Average**	**Range**	**Median**	**Response Count**
	9.20	6 – 10	10	5

Q20: If not, how can it be improved?
Answer Options
N/A
This shouldn't be a compulsory box as i have ticked yes!
Question 19 is a curious question!
Feedback indicates high success
Possibly look at more than one session per student

Questions – 'No' to GTA use for pelvic examination teaching

Q21: In your opinion, would the introduction of a GTA programme improve teaching of pelvic examination?				
Answer Options Scale No improvement = 0 Significant improvement = 10	**Rating Average**	**Range**	**Median**	**Response Count**
	5.73	1 – 10	7	15

Q22: Do you think competence in basic female pelvic examination is should be a GMC requirement for a medical degree?		
Answer Options	**Response Percent**	**Response Count**
Yes	86.7%	13
No	6.7%	1
Unsure	6.7%	1
answered question		**15**
skipped question		**6**

Q23: From your knowledge, does your medical school use expert patients in the teaching of medical students in other specialties? (e.g. rheumatology)		
Answer Options	**Response Percent**	**Response Count**
Yes	53.3%	8
No	26.7%	4
Don’t know	20.0%	3

Generic Question – Additional Comments for All Participants

Q24: Any other comments on manikin / GTA teaching?
Answer Options
‘No’ x 4 responses
Real patients under anaesthesia during elective surgery is best option.
Manikin teaching should be a minimum requirement
Students should be taught this skill in hysteroscopy and colposcopy clinics, simulation training is no substitute.
Need a proper multi-centre trial to assess effectiveness and value for money. Small trial at Bart's showed improved confidence and communication but no difference in 'technical' skills at end of one year
GTA has not been adequately assessed in too many schools in the UK so the impact would be difficult predict without a greater evidence base.
It is helpful as a safe practice environment early on in the clinical skills teaching but clearly this needs to move to real patients during the clinical block
They assess more than pelvic examination skills. The GTA can pick up and report to us issues around professionalism, communication and empathy.
I think that it can become mechanical and it is essential that the students have experience with conscious patients.
It evaluates well.
Both are necessary I think. But in my view the clinical session which combines communication and technical skills and puts the woman's voice at the heart of the teaching is essential leaning
Manikins used to teach pelvic examination at beginning of third and final year - students taught

by experienced gynaecologists. Students given formal check list

We run skills sessions during the rotation on mannequins to assess competence

We have not lost the ability to teach students actually in clinical practice.

We find that patients in outpatient clinics are usually happy to be examined by a student trained on mannequin and then with consent in theatre

My experience of acting as external examiner at a medical school where they use GTAs has impressed me. The students are more confident in their OSCEs (using a manikin) than our students who are taught on manikins and patients and assessed on manikins.

We teach on manikins in year 2 and use manikins as part of OSCE examinations in year 3 O&G exams and finals. The med school does not use GTAs for teaching other intimate examination e.g. PR or breast examination, this is perhaps an area for expansion.

APPENDIX 6: Examiners' Feedback for Pelvic Examination Assessment Tool (PEAT)

Examiners' Feedback for Pelvic Examination Assessment Tool (PEAT)

Many thanks for your help in taking the role as an examiner for the PEAT study. We would like feedback from your experience using this Pelvic Examination Assessment Tool (PEAT). Please mark a single cross on the visual analogue scales provided.

1. Is the Pelvic Examination Assessment Tool (PEAT) easy to use?

Very difficult _____ Very easy

2. Do you feel that the PEAT is effective in assessing competence in gynaecological examination?

Very ineffective _____ Very effective

3. For the last 10 candidates assessed, please estimate your average speed of assessment when using the PEAT

Very slow _____ Very quick

4. Any other comments? (e.g. suggestions to improve the PEAT)

.....
.....
.....

APPENDIX 7: GTA Recruitment Poster (2011)

UNIVERSITY OF BIRMINGHAM

Department of Primary Care and General Practice

Are you female? Would you like to get involved with training our future doctors?

We are currently recruiting women to be trained as a Gynaecological Teaching Associate to work with our undergraduate medical students. It would mean helping to teach medical students to correctly perform a pelvic exam in gynaecology.

Learn more

To get involved or to find out more about the programme please don't hesitate to contact:
Janesh Gupta MSc, MD, FRCOG
Pofessor of Obstetrics and Gynaecology
University of Birmingham
Birmingham Women's Hospital
Birmingham, B15 2TG
England

Note: error in the spelling of 'Professor' in the original poster (2011)

APPENDIX 8: TARGET Participant Information Sheet

Participant Information Sheet
TARGET Trial (Version 2: 17/05/2013)

We would like to invite you to take part in a study designed to compare two methods of teaching undergraduate medical students pelvic examinations. Before you decide whether to take part we would like you to understand the purpose of this research and what it would involve for you. One of our team will go through the information sheet with you and answer any questions that you have.

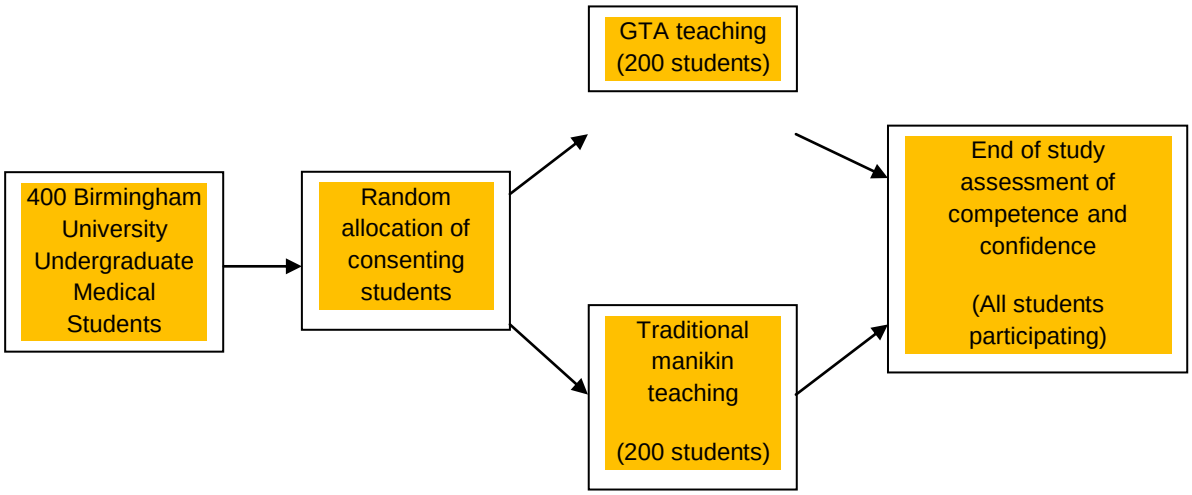
Study background

The Birmingham Women's Hospital is conducting a research project comparing the effectiveness of different methods of teaching pelvic examination. Traditionally medical students have been taught gynaecological examination with pelvic manikins to first gain experience and confidence before examining real patients under supervision. However, medical students can also be taught gynaecological examination by women from a non-medical background, who have been trained to teach this intimate examination on themselves in small groups. These women are known as 'Gynaecological Teaching Associates', or 'GTAs' for short, and are now an available training resource at the Birmingham Women's Hospital.

Purpose of the research

The study aims to investigate whether there is a measurable difference in participants' competence and confidence in performing pelvic examination, between students taught by GTA's and students taught by traditional manikin methods.

Study design



What will happen if I choose to take part?

You will be randomly assigned to one of the above groups; either to be taught by the GTA's or by traditional methods using a pelvic manikin. You will then receive your teaching during the first week of your O&G placement.

At the end of the 5-week rotation in O&G, you will be asked to complete a short written questionnaire regarding your confidence with gynaecological examination. In addition, you will be observed performing a pelvic examination on a GTA by a member of the research group.

Your responses and assessment results will be kept confidential and you will be allocated an anonymous study participant number. Results will not be used in your placement assessments or final examinations. Should you opt out of the trial, or should you withdraw during the study, then this will have no bearing upon future assessments.

Do I have to take part?

It is up to you whether you decide to join the study. If you agree to take part we will ask you to sign a consent form. You are free to withdraw your participation at any point.

What are the disadvantages of participating in this study?

There are no disadvantages of participating in this study. The assessment at the end of the 5 week O+G placement does not impact on your academic record.

What are the advantages of taking part in this study?

You will be given constructive feedback after your assessment examination at the end of the study. This could help you improve your skills at pelvic examination in your future career. Extra teaching will give you more confidence during your O&G placement.

For further information

You can discuss the details of this study with:

APPENDIX 9: TARGET Consent Form

Birmingham Women's NHS
NHS Foundation Trust

Version 3 (22/05/2013)

Consent Form

TARGET Trial

Please initial Box

1.	I confirm that I have read and understood the information sheet relating to the study dated (17/05/2013) version 2. I have had the opportunity to consider the information and ask questions and these have been answered satisfactorily.	☐
2.	I understand that my participation is voluntary and that if I take part, I am free to withdraw at any time, without giving reason, and without my medical education being affected.	☐
3.	I accept that the researchers may telephone or email me.	☐
4.	I understand that the information will be used for medical research only and that I will not be identified in any way in the analysis and reporting of the results. I understand that any information relating to the trial will be held in confidence within Birmingham Women's Hospital and the University of Birmingham and only be accessible by the researchers.	☐
5.	I understand what is involved in the TARGET Trial, agree to participation and to be randomised between trial arms.	☐

_____	_____	_____
Name of student	date	signature
_____	_____	_____
Name of person Taking consent	date	signature

When completed: 1 for participant; 1 for researcher site file; 1 (original) to be kept in Student University Site File.

Student Participant Number ☐☐☐

APPENDIX 10: TARGET Participant Pre-O&G Placement Questionnaire

Birmingham Women's NHS
NHS Foundation Trust

Participant Questionnaire: Pre O&G Placement – TARGET Trial (Version 4: 1/10/2013)

Student Participant Number ☐☐☐

1. Sex Male ☐ Female ☐

2. Age 20-23 ☐

24-26 ☐

27-30 ☐

>30 ☐

3. Ethnicity

What is your ethnic group? ……

4. Competence in pelvic examinations (please mark on the scale) e.g.

Incompetent Competent

5. Confidence in pelvic examinations (please mark on the scale)

Not confident Very confident

6. Number of previously performed pelvic examinations on a patient

0 ☐

1-5 ☐

6-10 ☐

>10 ☐

6. Interest in future career in obstetrics and gynaecology (please mark on the scale)

No interest Very interested

APPENDIX 11: TARGET Participant post O&G placement questionnaire

Participant Questionnaire: Post O&G Placement – TARGET Trial (Version 3: 1/10/2013)

Student Participant Number | | | |

1. Competence in pelvic examinations (please mark on the scale) e.g.

Incompetent Competent

2. Confidence in pelvic examinations (please mark on the scale)

Not confident Very confident

3. How would you rate your overall satisfaction with the opportunity to undertake gynaecological examination during your O&G clinical placement? (please mark on the scale)

Not satisfied Very satisfied

4. How would you rate your overall satisfaction with your O&G clinical placement? (please mark on the scale)

Not satisfied Very satisfied

5. Number of pelvic examinations performed during the course of my O&G placement

Total number

0 ☐ Number on awake (GOPD/Wards) patients _____

1-5 ☐ Number on patients under general anaesthetic _____

6-10 ☐

>10 ☐

6. Usefulness of the pelvic examination training at the commencement of the O&G rotation? (please mark on the scale)

Not useful Very useful

7. Interest in future career in obstetrics and gynaecology (please mark on the scale)

No interest Very interested

8. What impact did the initial training you received in pelvic examination have on your subsequent experience of, and exposure to, gynaecological examination during your O&G rotation?(please mark on the scale)

No impact Major impact

Please add any comments about any aspect of the training you received in gynaecological examination or subsequent opportunity and experience of gynaecological examination during your allocated clinical placement

_____
_____
_____
_____
_____
_____

THANK YOU FOR TAKING PART IN THIS STUDY

APPENDIX 12: Pelvic examination and assessment tool (objective structured clinical examination)

Birmingham Women's NHS
NHS Foundation Trust

TARGET TRIAL Assessment Tool version 3 (1/10/2013)

Student Participant Number

Clinician Marking _____

ATTITUDES	POOR	EXCEPTIONAL
• Introduction, clear explanation of procedure and indication • Obtained verbal consent • Maintained privacy, dignity and asks for a chaperone • Adequate positioning of patient • Appropriate communication throughout the examination		

INSPECTION	POOR	EXCEPTIONAL
• Inspection of external genitalia (atrophy, skin changes, cysts, ulcers, warts, vesicles etc.) • Inspection of vagina on parting the labia (prolapse, cysts, warts)		

BIMANUAL EXAMINATION	POOR	EXCEPTIONAL
• Correct approach to vaginal entry (gentle parting the labia and inserting 2 fingers) • Palpation of the cervix and commenting on consistency, mobility, and tenderness • Bimanual examination of the uterus (correct placement of abdominal hand / vaginal fingers) • Commenting on size, regularity, mobility and tenderness of uterus		

ADNEXA AND POD (Pouch of Douglas) POOR EXCEPTIONAL

- Palpation of right and left adnexa with correct placement of abdominal hand and vaginal fingers
- Reports on adnexal findings such as masses, mobility and tenderness
- Palpation of POD and describing any masses, tenderness, or nodularity

SPECULUM EXAMINATION POOR EXCEPTIONAL

- Preparation (gel, configuration, speculum and lighting)
- Appropriate gentle insertion of speculum by parting labia and inserting to posterior fornix
- Visualisation of the cervix by gentle, gradual opening of the instrument and directing of light
- Commenting on cervix (size, surface, ectropion, polyps, bleeding, discharge etc)
- Correct withdrawal ensuring cervix, vaginal mucosa and pubic hair not caught and speculum semi closed
- Techniques to facilitate visualisation
- Cervix visualised **YES** **NO**

POST EXAMINATION POOR EXCEPTIONAL

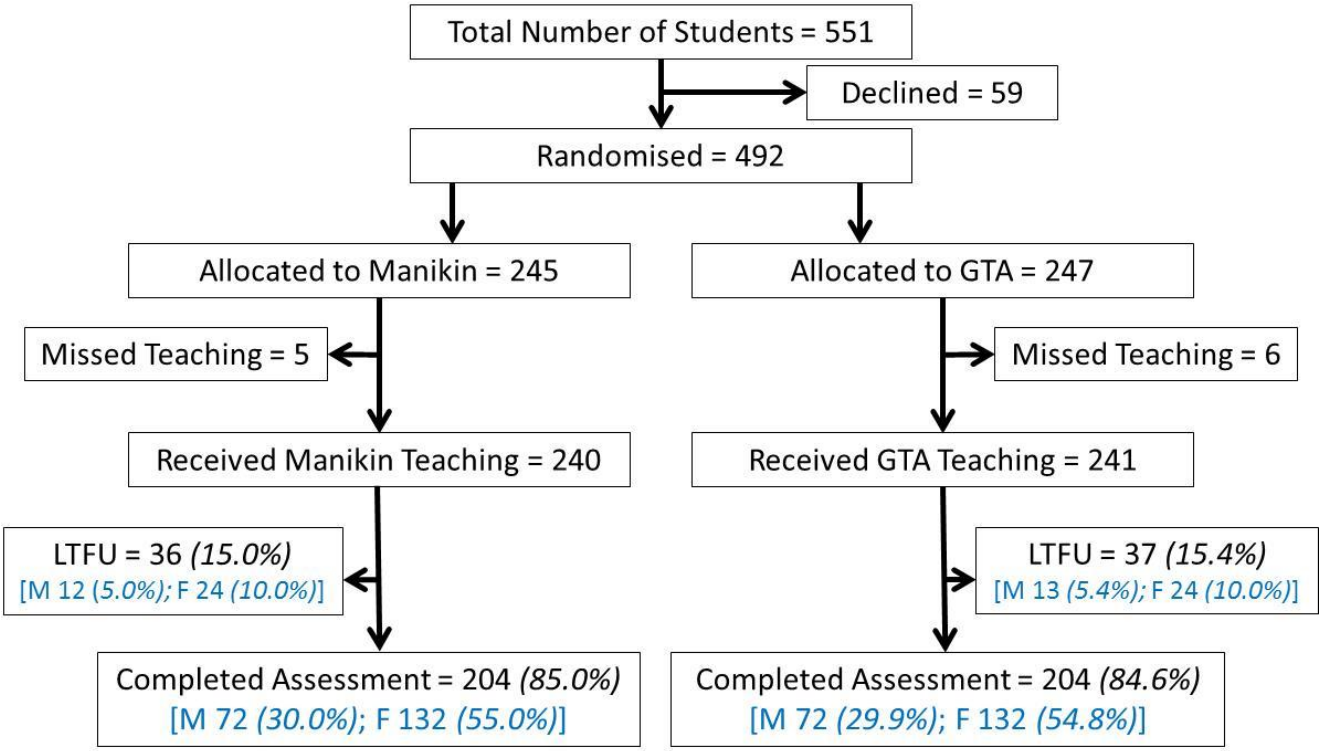
- Communicates that the procedure has finished
- Asks patient to get dressed whilst maintains privacy and dignity
- Explanation of findings
- Answers patient questions

GLOBAL ASSESSMENT	POOR	EXCEPTIONAL
• Overall approach, manner, confidence, interaction and conduct. • Professionalism • Communication		
• Feedback		

GTA ASSESSMENT (circle)

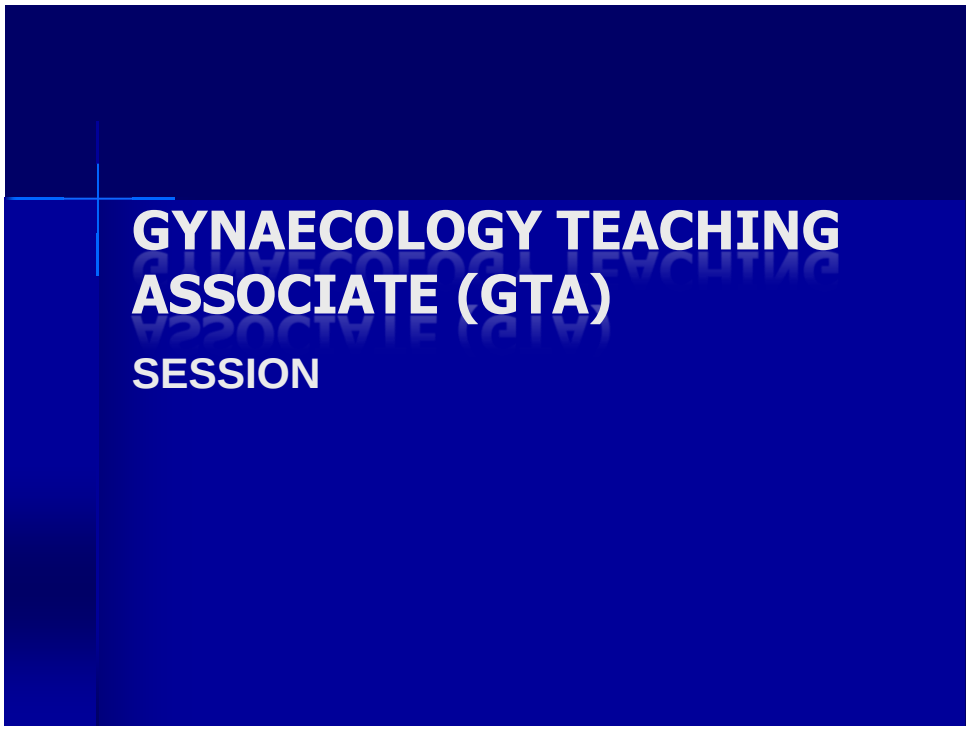
Good **Satisfactory** **Borderline** **Unsatisfactory**

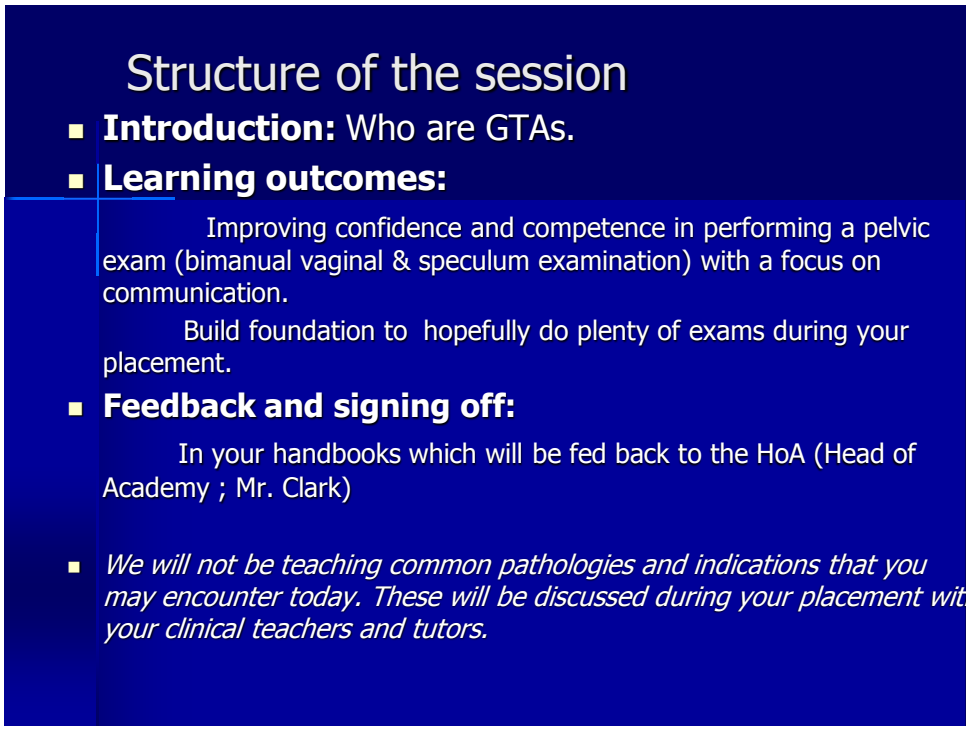
APPENDIX 13: Trial Progress Data (TARGET, CEAT)



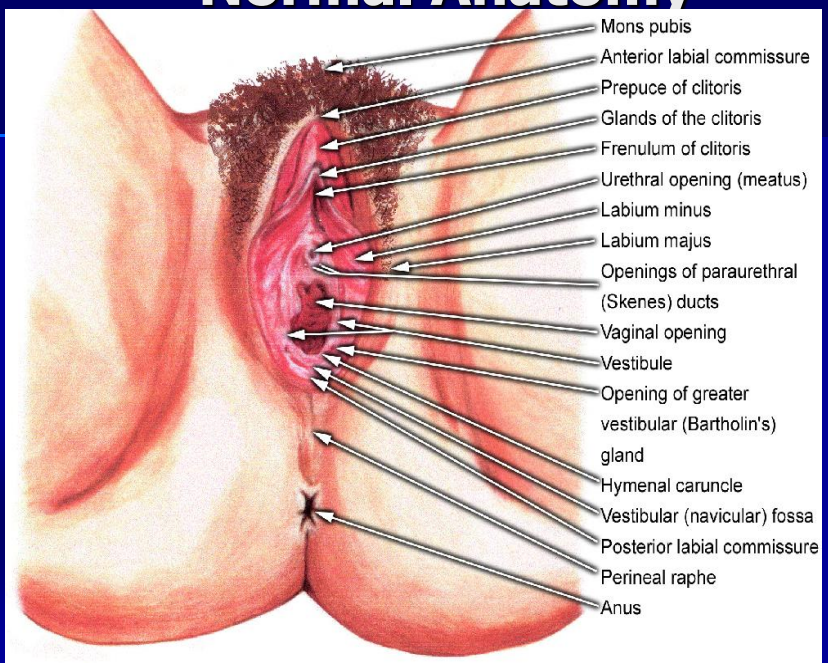
- Total number of students available = 551
- Consented & randomised = 492 [492/551 (89.3%)]
- Attended Teaching = 481 [781/492 (*97.8%*)]
- Missed teaching = 11 [11/492 (2.2%)]
- Current sample size = 240 / 241 in each arm = 481
- Loss to follow up = 73 [73/481 (15.2%)]
- Completed assessment = 408 [408/481 (84.8%)]

APPENDIX 14: PowerPoint™ for Teaching Prior To Examination Practice

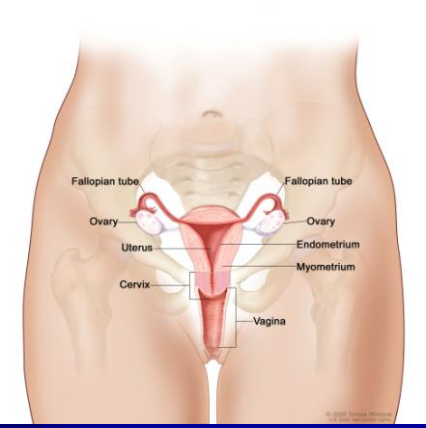


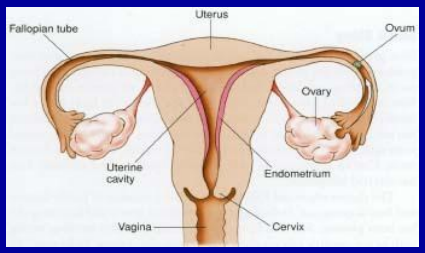


Normal Anatomy



Normal Anatomy





APPENDIX 15: Placements in the Randomised Controlled Trial (TARGET, CEAT)

Footnotes:

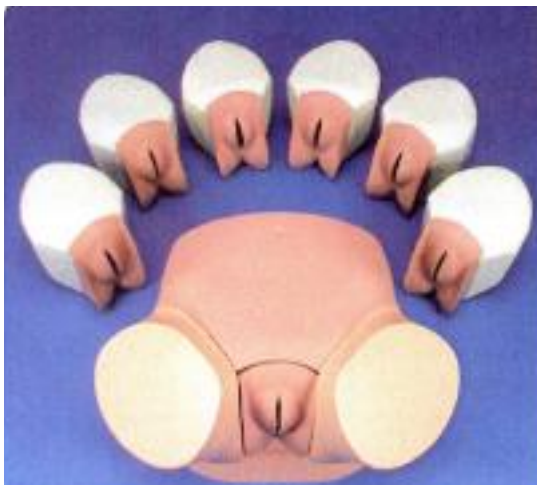
[1] Number of students agreeing to participate

[2] Number of students in each placement

APPENDIX 16: Cost of Manikin (Invoice)

[The content was redacted to protect sensitive information.]

APPENDIX 17: Pelvic Model (Manikin)



APPENDIX 18: Manikin Cost

Although the suppliers 'Limbs and Things' do not specify a time limit for use of the equipment, on average, a 5 year period is thought to be an appropriate time to replace a pelvic manikin. The pelvic manikin is a capital cost incurred by the ERC at BWH.

The pelvic model was purchased on 7/4/2010. The cost was inflated to get it in parity with all other costs accounted for in the base case. The cost of the manikin was worked out to be £3454.08.

Personal Social Services Research Unit: Unit Costs of Health and Social Care 2014 (Compiled By Lesley Curtis)

16.2 The hospital & community health services (HCHS) index

Hospital and community health services (HCHS) pay and price inflation is a weighted average of two separate inflation indices: the pay cost index (PCI) and the health service cost index (HSCI). The PCI measures pay inflation in the HCHS. The PCI is itself a weighted average of increases in unit staff costs for each of the staff groups within the HCHS sector. Pay cost inflation tends to be higher than pay settlement inflation because of an element of pay drift within each staff group. Pay drift is the tendency for there to be a gradual shift up the incremental scales, and is additional to settlement inflation. The estimate of pay inflator for the current year is based on information supplied by the Department of Health and on pay awards of NHS staff. The HSCI is calculated monthly to measure the price change for each of 40 sub-indices of goods and services purchased by the HCHS. The sub-indices are weighted together according to the proportion of total expenditure which they represent to give the overall HSCI value. The pay cost index and the health service cost index are weighted together according to the proportion of HCHS expenditure on each. This provides an HCHS combined pay & prices inflation figure.[3]

Year	Hospital & community health services (HCHS)		
	Pay & prices index (1987/8=100)	Annual % increases	
		Prices[4]	Pay[4]
2003/04	224.8	1.5	7.3
2004/05	232.3	1.0	4.5
2005/06	240.9	1.9	4.7
2006/07	249.8	3.0	4.1
2007/08	257.0	1.8	3.5
2008/09	267.0	5.2	3.0
2009/10	268.6	-1.3	1.8
2010/11	276.7	2.8	3.1
2011/12	282.5	4.1	0.9
2012/13	287.3	3.1	0.9
2013/14	290.5	1.8	0.7

Inflation of costs

	Indices	**Manikin Cost (5 years)**
2010/2011	276.7	£3290
2013/2014	290.5	£3454.08

The annual cost for the manikin over 52 weeks was calculated using the formula in the box below. The recommended discount rate of 3% was applied, which is a good proxy for the interest rate. (Drummond, M.F. et al., 2005)

Annual cost for capital outlay (Drummond, M.F. et al., 2005) – page 74

$K = E/ (1+r) +\ldots E/ (1+r)^n$

K = capital outlay; E = annual cost for the capital outlay; n = number of years; r = interest rate

What is E?

Capital outlay = K =3454.08

n = 5 years

Interest rate = r = 3%

$K = E/ (1+r) + E/ (1+r)^2 + E/ (1+r)^3 + E/ (1+r)^4 + E/ (1+r)^5$

3454.08 = E [Annuity factor, 5 years, interest rate 3%] – from Annex 4.2, Discount Table 2

3454.08 = E [4.5797]

$\therefore$ E = £754.22 = Annual cost for the pelvic manikin over 52 weeks

During the trial, the pelvic manikin was used from 27th August 2013 to 14th November 2014 where teaching was only conducted during the first week of the O&G placement.

In total 9 placements were recruited into the RCT.

Therefore, the cost of the manikin over nine weeks of teaching was £130.54, and over 1 week of teaching was £14.50.

APPENDIX 19: Speculum Invoice

[The content was redacted to protect sensitive information.]

APPENDIX 20: Criteria & Descriptors for Marking Scheme (University of Birmingham, 2015)

Level Criteria and Outcomes	Mark Range	Grade Descriptor
Distinction Evidence of substantial preparation (reading, research, planning) Demonstrates an authoritative grasp of concepts, methodology and content Evidence of originality, insight and learning beyond the curriculum A sense of what is contextually appropriate Ability to sustain an argument or idea Ability to think analytically/critically & to synthesise material effectively Ability consistently to produce comprehensive & appropriate ranges of original & creative solutions to problems Excellently structured and articulated work, which communicates ideas coherently using a range of appropriate methods of presentation	77% +	**Outstanding Performance** Consistently outstanding Trivial Defects only Fulfils 'distinction' criteria to an exceptionally high standard
	73–76%	**Excellent** Outstanding in more respects Very few minor defects Displays all the 'distinction' criteria to a very high standard
	70–72%	**Very good, some excellent** Some outstanding and excellent work Some minor defects Displays all the 'distinction' criteria
Merit Evidence of use of a wide range of appropriate sources Demonstrates a sound, consistent and above average level of understanding of concepts, methodology and content appropriate to the subject Evidence of critical judgement and insight, ability to synthesise with some originality of thought Work demonstrates a very good degree of accuracy, clarity, critical analysis and some originality Ability to produce appropriate solutions to problems, showing some creativity Very well structured and good standard of presentation, which illustrates pertinent issues within a clear framework	67-69%	**Very Good** Work consistently of a very high standard Any defects minor Displays all 'merit' criteria with greater insight and originality
	63-66%	**Good, some very good** Work of a high standard Some defects Displays all 'merit' criteria
	60-62%	**Good** Work of a high standard Deficiencies more significant Displays all 'merit' criteria but with less originality & insight
Pass Achieves the relevant learning outcomes for that module but with some deficiencies/shortcomings Evidence of sound preparation and reading Sound understanding of key concepts, methodology and content appropriate to the subject Work demonstrates a good degree of accuracy, clarity, critical analysis and occasional originality Ability to produce appropriate solutions to problems, some of which may show creativity There should be no major omissions or misunderstandings Well structured, reasonable standard of presentation, which illustrates pertinent issues with a clear framework	57-59%	**Satisfactory** Sound work with few significant defects Demonstrates all pass' criteria with a reasonable degree of critical analysis and originality
	54-56%	**Satisfactory, some weaknesses** Sound work, but with some notable deficiencies Displays all 'pass' criteria
	50-53%	**Significant weaknesses, but achieves relevant learning outcomes** Work meets 'pass' criteria, but with some significant and/or recurring deficiencies

<table>
<tr><td rowspan="3">Fail
Does not achieve relevant learning outcomes
Some evidence of sound preparation
Some deficiencies or shortcomings
Some understanding of key concepts, methodology and content appropriate to the subject
Outcomes may be routine but work will demonstrate some degree of accuracy and clarity
Ability to produce appropriate solutions to problems, but with little or no creativity
Some major omissions or misunderstandings
Reasonable presentation and organisational structure</td><td>47-49%</td><td>Marginal fail
Just fails to achieve learning outcomes
May demonstrate some critical analysis & originality, but with major omissions or misunderstandings</td></tr>
<tr><td>43-46%</td><td>Fail
Routine work, which may display some evidence of engagement with concepts and possibly with clear presentation, but with little critical analysis</td></tr>
<tr><td>40-42%</td><td>Clear Fail
Displays some evidence of engagement with concepts, but with defects in presentation & analysis</td></tr>
<tr><td rowspan="3">Bad Fail (cannot be ‘excused’ on averaging)
Inadequate with major deficiencies and shortcomings
Little evidence of preparation and reading
Very little understanding of key concepts and methodology
Little content relevant to the subject
Major omissions and misunderstandings
Poor structure and presentation with errors that interfere with communication of ideas</td><td>35-39%</td><td>Bad Fail
Displays some evidence of engagement with concepts, but with serious defects</td></tr>
<tr><td>30-34%</td><td>Weak
Work demonstrates serious defects and misunderstandings</td></tr>
<tr><td><30%</td><td>Very weak
Work does not meet basic requirements</td></tr>
</table>

APPENDIX 21: Base case analysis

Tables 5 and 6 summarise the cost, and Table 7 provides a breakdown of all costs over the 9 blocks of the trial.

GTA arm

GTA	Cost over trial (£)
GTA pay	6565.00
Chaperone pay	1272.00
Disposable speculum	412.72
Aquagel	825.44
Gloves	26.80
Couch Roll (Tissue)	24.84
Tissue box	64.80
Total	**9191.60**

Manikin arm

Manikin	Cost over trial (£)
Lecturer / SpR	1353.30
Manikin	130.5
Speculum	25.41
Total	**1509.21**

Breakdown of costs

Block 1 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		6	7	8	4	**25**
		£				
GTA Pay		195.00	180.00	300.00	187.50	**862.50**
Chaperone pay		0.00	0.00	0.00	0.00	**0.00**
Disposable speculum		10.01	11.55	13.86	6.93	**42.35**
Aquagel		20.02	23.10	27.72	13.86	**84.70**
Gloves		0.65	0.75	0.90	0.45	**2.75**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		235.64	215.40	342.48	208.74	**1002.26**
Manikin - Student Numbers		9	7	8		**24**
		£				
Lecturer / SpR		41.64	41.64	41.64		**124.92**
Manikin		14.50	0.00	0.00		**14.50**
Speculum		0.77	0.77	0.77		**2.31**
Total		56.91	42.41	42.41		**141.73**

Block 2 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	8	7	7	**30**
		£				
GTA pay		309.00	255.00	255.00	339.00	**1158.00**
Chaperone pay		0.00	0.00	0.00	0.00	**0.00**
Disposable speculum		13.86	13.86	12.32	12.32	**52.36**
Aquagel		27.72	27.72	24.64	24.64	**104.72**
Gloves		0.90	0.90	0.80	0.80	**3.40**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		361.44	297.48	292.76	376.76	**1328.44**
Manikin - Student Numbers	4	8	8	8		**24**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.91	42.41	42.41	42.41		**184.14**

Block 3 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	8	7	7	**30**
		£				
GTA pay		250.00	180.00	285.00	180.00	**895.00**
Chaperone pay		0.00	60.00	0.00	0.00	**60.00**
Disposable speculum		13.86	13.86	12.32	12.32	**52.36**
Aquagel		27.72	27.72	24.64	24.64	**104.72**
Gloves		0.90	0.90	0.80	0.80	**3.40**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		302.44	282.48	322.76	217.76	**1125.44**
Manikin - Student Numbers	6	6	7	8	3	**30**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64	20.82	**187.38**
Manikin	14.50	0.00	0.00	0.00	0.00	**14.50**
Speculum	0.77	0.77	0.77	0.77	0.77	**3.85**
Total	56.91	42.41	42.41	42.41	21.59	**205.73**

Block 4 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Fri	Total
GTA - Student Numbers		9	7	8	4	4	**24**
			£				
GTA pay		157.50	120.00	82.50	210.00	60.00	**630.00**
Chaperone pay		0.00	0.00	82.50	60.00	60.00	**202.50**
Disposable speculum		15.40	12.32	13.86	6.93	6.93	**55.44**
Aquagel		30.80	24.64	27.72	13.86	13.86	**110.88**
Gloves		1.00	0.80	0.90	0.45	0.45	**3.60**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	0.00	**7.20**
Total		214.66	157.76	207.48	291.24	141.24	**1012.38**
Manikin - Student Numbers		8	8	6	8		**30**
			£				
Lecturer / SpR		41.64	41.64	41.64	41.64		**166.56**
Manikin		14.50	0.00	0.00	0.00		**14.50**
Speculum		0.77	0.77	0.77	0.77		**3.08**
Total		56.91	42.41	42.41	42.41		**184.14**

Block 5 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers	4	8	4	8	4	**28**
		£				
GTA pay	60.00	180.00	150.00	124.50	120.00	**634.50**
Chaperone pay	60.00	180.00	0.00	124.50	0.00	**364.50**
Disposable speculum	6.93	13.86	6.93	13.86	6.93	**48.51**
Aquagel	13.86	27.72	13.86	27.72	13.86	**97.02**
Gloves	0.45	0.90	0.45	0.90	0.45	**3.15**
Couch Roll (Tissue)	2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box	7.20	0.00	0.00	0.00	0.00	**7.20**
Total	151.20	402.48	171.24	291.48	141.24	**1157.64**
Manikin - Student Numbers	7	7	7	7		**28**
			£			
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.91	42.41	42.41	42.41		**184.14**

Block 6 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		4	7	7	6	**24**
		£				
GTA pay		150.00	180.00	270.00	150.00	**750.00**
Chaperone pay		0.00	60.00	0.00	0.00	**60.00**
Disposable speculum		6.93	12.32	12.32	10.78	**42.35**
Aquagel		13.86	24.64	24.64	21.56	**84.7**
Gloves		0.45	0.80	0.80	0.70	**2.75**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		181.20	277.76	307.76	183.04	**949.76**
Manikin - Student Numbers	7	7	6	6		**26**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.91	42.41	42.41	42.41		**184.14**

Block 1 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Wed	Total
GTA - Student Numbers		7	3	9	4	4	**19**
			£				
GTA pay		105.00	120.00	180.00	60.00	60.00	**525.00**
Chaperone pay		105.00	0.00	60.00	60.00	60.00	**285.00**
Disposable speculum		12.32	5.39	15.40	6.93	6.93	**46.97**
Aquagel		24.64	10.78	30.80	13.86	13.86	**93.94**
Gloves		0.80	0.35	1.00	0.45	0.45	**3.05**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	0.00	**7.20**
Total		257.72	136.52	287.20	141.24	141.24	**963.92**
Manikin - Student Numbers	8		8	8			**24**
			£				
Lecturer / SpR	41.64		41.64	41.64			**124.92**
Manikin	14.50		0.00	0.00			**14.50**
Speculum	0.77		0.77	0.77			**2.31**
Total	56.91		42.41	42.41			**141.73**

Block 2 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		6	7	4	4	**21**
		£				
GTA pay		180.00	120.00	180.00	120.00	**600.00**
Chaperone pay		0.00	120.00	60.00	0.00	**180.00**
Disposable speculum		10.01	12.32	6.93	6.93	**36.19**
Aquagel		20.02	24.64	13.86	13.86	**72.38**
Gloves		0.65	0.80	0.45	0.45	**2.35**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		220.64	277.76	261.24	141.24	**900.88**
Manikin - Student Numbers	6	9		8		**23**
		£				
Lecturer / SpR	41.64	41.64		41.64		**124.92**
Manikin	14.50	0.00		0.00		**14.50**
Speculum	0.77	0.77		0.77		**2.31**
Total	56.91	42.41		42.41		**141.73**

Block 3 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	4	5	4	**21**
		£				
GTA pay		180.00	120.00	150.00	60.00	**510.00**
Chaperone pay		60.00	0.00	0.00	60.00	**120.00**
Disposable speculum		13.86	6.93	8.47	6.93	**36.19**
Aquagel		27.72	13.86	16.94	13.86	**72.38**
Gloves		0.90	0.45	0.55	0.45	**2.35**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		292.44	141.24	175.96	141.24	**750.88**
Manikin - Student Numbers	7	9		7		**23**
		£				
Lecturer / SpR	41.64	41.64		41.64		**124.92**
Manikin	14.50	0.00		0.00		**14.50**
Speculum	0.77	0.77		0.77		**2.31**
Total	56.91	42.41		42.41		**141.73**

APPENDIX 22: Sensitivity Analysis 1: Addition of tutorial room and clinical skills room hire

Block 1 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		6	7	8	4	**25**
		£				
GTA Pay		195.00	180.00	300.00	187.50	**862.50**
Chaperone pay		0.00	0.00	0.00	0.00	**0.00**
Tutorial Room hire		2.08	2.08	2.08	2.08	**8.32**
GOPD Room hire		16.65	22.89	37.46	16.65	**93.65**
Disposable speculum		10.01	11.55	13.86	6.93	**42.35**
Aquagel		20.02	23.10	27.72	13.86	**84.70**
Gloves		0.65	0.75	0.90	0.45	**2.75**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		254.37	240.37	382.02	227.47	**1104.23**
Manikin - Student Numbers		9	7	8		**24**
		£				
Lecturer / SpR		41.64	41.64	41.64		**124.92**
Clinical Skills Room hire		50.00	50.00	50.00		**150.00**
Manikin		14.50	0.00	0.00		**14.50**
Speculum		0.77	0.77	0.77		**2.31**
Total		106.91	92.41	92.41		**291.73**

Block 2 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	8	7	7	**30**
		£				
GTA pay		309.00	255.00	255.00	339.00	**1158.00**
Chaperone pay		0.00	0.00	0.00	0.00	**0.00**
Tutorial Room hire		2.08	2.08	2.08	2.08	**8.32**
GOPD Room hire		27.06	31.22	33.30	35.38	**126.96**
Disposable speculum		13.86	13.86	12.32	12.32	**52.36**
Aquagel		27.72	27.72	24.64	24.64	**104.72**
Gloves		0.90	0.90	0.80	0.80	**3.40**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		390.58	330.78	328.14	414.22	**1463.72**
Manikin - Student Numbers	4	8	8	8		**24**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Clinical Skills Room hire	50.00	50.00	50.00	50.00		**200.00**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	106.91	92.41	92.41	92.41		**384.14**

Block 3 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	8	7	7	**30**
		£				
GTA pay		250.00	180.00	285.00	180.00	**895.00**
Chaperone pay		0.00	60.00	0.00	0.00	**60.00**
Tutorial Room hire		2.08	2.08	2.08	2.08	**8.32**
GOPD Room hire		31.22	29.14	37.46	22.89	**120.71**
Disposable speculum		13.86	13.86	12.32	12.32	**52.36**
Aquagel		27.72	27.72	24.64	24.64	**104.72**
Gloves		0.90	0.90	0.80	0.80	**3.40**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		335.74	313.70	362.30	242.73	**1254.47**

Manikin - Student Numbers	6	6	7	8	3	**30**
			£			
Lecturer / SpR	41.64	41.64	41.64	41.64	20.82	**187.38**
Clinical Skills Room hire	50.00	50.00	50.00	50.00	25.00	**225.00**
Manikin	14.50	0.00	0.00	0.00	0.00	**14.50**
Speculum	0.77	0.77	0.77	0.77	0.77	**3.85**
Total	106.91	92.41	92.41	92.41	46.59	**430.73**

Block 4 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Fri	**Total**
GTA - Student Numbers		9	7	8	4	4	**24**
			£				
GTA pay		157.50	120.00	82.50	210.00	60.00	**630.00**
Chaperone pay		0.00	0.00	82.50	60.00	60.00	**202.50**
Tutorial Room hire		2.08	2.08	2.08	2.08	2.08	**10.40**
GOPD Room hire		20.81	14.57	20.82	33.30	14.57	**104.07**
Disposable speculum		15.40	12.32	13.86	6.93	6.93	**55.44**
Aquagel		30.80	24.64	27.72	13.86	13.86	**110.88**
Gloves		1.00	0.80	0.90	0.45	0.45	**3.60**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	0.00	**7.20**
Total		237.55	174.41	230.38	326.62	157.89	**1126.85**

Manikin - Student Numbers		8	8	6	8	**30**
			£			
Lecturer / SpR		41.64	41.64	41.64	41.64	**166.56**
Clinical Skills Room hire		50.00	50.00	50.00	50.00	**200.00**
Manikin		14.50	0.00	0.00	0.00	**14.50**
Speculum		0.77	0.77	0.77	0.77	**3.08**
Total		106.91	92.41	92.41	92.41	**384.14**

Block 5 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers	4	8	4	8	4	**28**
			£			
GTA pay	60.00	180.00	150.00	124.50	120.00	**634.50**
Chaperone pay	60.00	180.00	0.00	124.50	0.00	**364.50**
Tutorial Room hire	2.08	2.08	2.08	2.08	2.08	**10.40**
GOPD Room hire	14.57	45.79	18.73	31.22	14.57	**124.88**
Disposable speculum	6.93	13.86	6.93	13.86	6.93	**48.51**
Aquagel	13.86	27.72	13.86	27.72	13.86	**97.02**
Gloves	0.45	0.90	0.45	0.90	0.45	**3.15**
Couch Roll (Tissue)	2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box	7.20	0.00	0.00	0.00	0.00	**7.20**
Total	167.85	450.35	192.05	324.78	157.89	**1292.92**
Manikin - Student Numbers	7	7	7	7		**28**
			£			
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Clinical Skills Room hire	50.00	50.00	50.00	50.00		**200.00**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	106.91	92.41	92.41	92.41		**384.14**

Block 6 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		4	7	7	6	**24**
		£				
GTA pay		150.00	180.00	270.00	150.00	**750.00**
Chaperone pay		0.00	60.00	0.00	0.00	**60.00**
Tutorial Room hire		2.08	2.08	2.08	2.08	**8.32**
GOPD Room hire		18.73	29.14	33.30	18.73	**99.90**
Disposable speculum		6.93	12.32	12.32	10.78	**42.35**
Aquagel		13.86	24.64	24.64	21.56	**84.7**
Gloves		0.45	0.80	0.80	0.70	**2.75**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		202.01	308.98	343.14	203.85	**1057.98**
Manikin - Student Numbers	7	7	6	6		**26**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Clinical Skills Room hire	50.00	50.00	50.00	50.00		**200.00**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	106.91	92.41	92.41	92.41		**384.14**

Block 1 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Wed	Total
GTA - Student Numbers		7	3	9	4	4	**19**
			£				
GTA pay		105.00	120.00	180.00	60.00	60.00	**525.00**
Chaperone pay		105.00	0.00	60.00	60.00	60.00	**285.00**
Tutorial Room hire		2.08	2.08	2.08	2.08	2.08	**10.40**
GOPD Room hire		24.98	14.57	29.14	14.57	14.57	**97.83**
Disposable speculum		12.32	5.39	15.40	6.93	6.93	**46.97**
Aquagel		24.64	10.78	30.80	13.86	13.86	**93.94**
Gloves		0.80	0.35	1.00	0.45	0.45	**3.05**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	0.00	**7.20**
Total		284.78	153.17	318.42	157.89	157.89	**1072.15**

Manikin - Student Numbers	8		8	8		**24**
			£			
Lecturer / SpR	41.64		41.64	41.64		**124.92**
Clinical Skills Room hire	50.00		50.00	50.00		**150.00**
Manikin	14.50		0.00	0.00		**14.50**
Speculum	0.77		0.77	0.77		**2.31**
Total	106.91		92.41	92.41		**291.73**

Block 2 (2014-5)	Mon	Tue	Wed	Thurs	Fri	**Total**
GTA - Student Numbers		6	7	4	4	**21**
			£			
GTA pay		180.00	120.00	180.00	120.00	**600.00**
Chaperone pay		0.00	120.00	60.00	0.00	**180.00**
Tutorial Room hire		2.08	2.08	2.08	2.08	**8.32**
GOPD Room hire		22.89	29.14	29.14	14.57	**95.74**
Disposable speculum		10.01	12.32	6.93	6.93	**36.19**
Aquagel		20.02	24.64	13.86	13.86	**72.38**
Gloves		0.65	0.80	0.45	0.45	**2.35**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		245.61	308.98	292.46	157.89	**1004.94**
Manikin - Student Numbers	6	9		8		**23**
			£			
Lecturer / SpR	41.64	41.64		41.64		**124.92**
Clinical Skills Room hire	50.00	50.00		50.00		**150.00**
Manikin	14.50	0.00		0.00		**14.50**
Speculum	0.77	0.77		0.77		**2.31**
Total	106.91	92.41		92.41		**291.73**

Block 3 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	4	5	4	**21**
		£				
GTA pay		180.00	120.00	150.00	60.00	**510.00**
Chaperone pay		60.00	0.00	0.00	60.00	**120.00**
Tutorial Room hire		2.08	2.08	2.08	2.08	**8.32**
GOPD Room hire		29.14	14.57	14.57	14.57	**72.85**
Disposable speculum		13.86	6.93	8.47	6.93	**36.19**
Aquagel		27.72	13.86	16.94	13.86	**72.38**
Gloves		0.90	0.45	0.55	0.45	**2.35**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		323.66	157.89	192.61	157.89	**832.05**
Manikin - Student Numbers	7	9		7		**23**
		£				
Lecturer / SpR	41.64	41.64		41.64		**124.92**
Clinical Skills Room hire	50.00	50.00		50.00		**150.00**
Manikin	14.50	0.00		0.00		**14.50**
Speculum	0.77	0.77		0.77		**2.31**
Total	106.91	92.41		92.41		**291.73**

APPENDIX 23: Sensitivity Analysis 2: Interest rate change to 1.5%

Block 1 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		6	7	8	4	**25**
		£				
GTA Pay		195.00	180.00	300.00	187.50	**862.50**
Chaperone pay		0.00	0.00	0.00	0.00	**0.00**
Disposable speculum		10.01	11.55	13.86	6.93	**42.35**
Aquagel		20.02	23.10	27.72	13.86	**84.70**
Gloves		0.65	0.75	0.90	0.45	**2.75**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		235.64	215.40	342.48	208.74	**1002.26**
Manikin - Student Numbers		9	7	8		**24**
		£				
Lecturer / SpR		41.64	41.64	41.64		**124.92**
Manikin		13.89	0.00	0.00		**13.89**
Speculum		0.77	0.77	0.77		**2.31**
Total		56.30	42.41	42.41		**141.12**

Block 2 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	8	7	7	**30**
		£				
GTA pay		309.00	255.00	255.00	339.00	**1158.00**
Chaperone pay		0.00	0.00	0.00	0.00	**0.00**
Disposable speculum		13.86	13.86	12.32	12.32	**52.36**
Aquagel		27.72	27.72	24.64	24.64	**104.72**
Gloves		0.90	0.90	0.80	0.80	**3.40**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		361.44	297.48	292.76	376.76	**1328.44**
Manikin - Student Numbers	4	8	8	8		**24**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	13.89	0.00	0.00	0.00		**13.89**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.30	42.41	42.41	42.41		**183.53**

Block 3 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	8	7	7	**30**
		£				
GTA pay		250.00	180.00	285.00	180.00	**895.00**
Chaperone pay		0.00	60.00	0.00	0.00	**60.00**
Disposable speculum		13.86	13.86	12.32	12.32	**52.36**
Aquagel		27.72	27.72	24.64	24.64	**104.72**
Gloves		0.90	0.90	0.80	0.80	**3.40**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		302.44	282.48	322.76	217.76	**1125.44**
Manikin - Student Numbers	6	6	7	8	3	**30**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64	20.82	**187.38**
Manikin	13.89	0.00	0.00	0.00	0.00	**13.89**
Speculum	0.77	0.77	0.77	0.77	0.77	**3.85**
Total	56.30	42.41	42.41	42.41	21.59	**205.12**

Block 4 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Fri	Total
GTA - Student Numbers		9	7	8	4	4	**24**
			£				
GTA pay		157.50	120.00	82.50	210.00	60.00	**630.00**
Chaperone pay		0.00	0.00	82.50	60.00	60.00	**202.50**
Disposable speculum		15.40	12.32	13.86	6.93	6.93	**55.44**
Aquagel		30.80	24.64	27.72	13.86	13.86	**110.88**
Gloves		1.00	0.80	0.90	0.45	0.45	**3.60**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	0.00	**7.20**
Total		214.66	157.76	207.48	291.24	141.24	**1012.38**
Manikin - Student Numbers		8	8	6	8		**30**
			£				
Lecturer / SpR		41.64	41.64	41.64	41.64		**166.56**
Manikin		13.89	0.00	0.00	0.00		**13.89**
Speculum		0.77	0.77	0.77	0.77		**3.08**
Total		56.30	42.41	42.41	42.41		**183.53**

Block 5 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers	4	8	4	8	4	**28**
			£			
GTA pay	60.00	180.00	150.00	124.50	120.00	**634.50**
Chaperone pay	60.00	180.00	0.00	124.50	0.00	**364.50**
Disposable speculum	6.93	13.86	6.93	13.86	6.93	**48.51**
Aquagel	13.86	27.72	13.86	27.72	13.86	**97.02**
Gloves	0.45	0.90	0.45	0.90	0.45	**3.15**
Couch Roll (Tissue)	2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box	7.20	0.00	0.00	0.00	0.00	**7.20**
Total	151.20	402.48	171.24	291.48	141.24	**1157.64**
Manikin - Student Numbers	7	7	7	7		**28**
			£			
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	13.89	0.00	0.00	0.00		**13.89**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.30	42.41	42.41	42.41		**183.53**

Block 6 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		4	7	7	6	**24**
			£			
GTA pay		150.00	180.00	270.00	150.00	**750.00**
Chaperone pay		0.00	60.00	0.00	0.00	**60.00**
Disposable speculum		6.93	12.32	12.32	10.78	**42.35**
Aquagel		13.86	24.64	24.64	21.56	**84.7**
Gloves		0.45	0.80	0.80	0.70	**2.75**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		181.20	277.76	307.76	183.04	**949.76**
Manikin - Student Numbers	7	7	6	6		**26**
			£			
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	13.89	0.00	0.00	0.00		**13.89**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.30	42.41	42.41	42.41		**183.53**

Block 1 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Wed	Total
GTA - Student Numbers		7	3	9	4	4	**19**
			£				
GTA pay		105.00	120.00	180.00	60.00	60.00	**525.00**
Chaperone pay		105.00	0.00	60.00	60.00	60.00	**285.00**
Disposable speculum		12.32	5.39	15.40	6.93	6.93	**46.97**
Aquagel		24.64	10.78	30.80	13.86	13.86	**93.94**
Gloves		0.80	0.35	1.00	0.45	0.45	**3.05**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	0.00	**7.20**
Total		257.72	136.52	287.20	141.24	141.24	**963.92**
Manikin - Student Numbers	8		8	8		**24**	
			£				
Lecturer / SpR	41.64		41.64	41.64		**124.92**	
Manikin	13.89		0.00	0.00		**13.89**	
Speculum	0.77		0.77	0.77		**2.31**	
Total	56.30		42.41	42.41		**141.12**	

Block 2 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		6	7	4	4	**21**
			£			
GTA pay		180.00	120.00	180.00	120.00	**600.00**
Chaperone pay		0.00	120.00	60.00	0.00	**180.00**
Disposable speculum		10.01	12.32	6.93	6.93	**36.19**
Aquagel		20.02	24.64	13.86	13.86	**72.38**
Gloves		0.65	0.80	0.45	0.45	**2.35**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		220.64	277.76	261.24	141.24	**900.88**
Manikin - Student Numbers	6	9		8		**23**
			£			
Lecturer / SpR	41.64	41.64		41.64		**124.92**
Manikin	13.89	0.00		0.00		**13.89**
Speculum	0.77	0.77		0.77		**2.31**
Total	56.30	42.41		42.41		**141.12**

Block 3 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	4	5	4	**21**
		£				
GTA pay		180.00	120.00	150.00	60.00	**510.00**
Chaperone pay		60.00	0.00	0.00	60.00	**120.00**
Disposable speculum		13.86	6.93	8.47	6.93	**36.19**
Aquagel		27.72	13.86	16.94	13.86	**72.38**
Gloves		0.90	0.45	0.55	0.45	**2.35**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		292.44	141.24	175.96	141.24	**750.88**
Manikin - Student Numbers	7	9		7		**23**
		£				
Lecturer / SpR	41.64	41.64		41.64		**124.92**
Manikin	13.89	0.00		0.00		**13.89**
Speculum	0.77	0.77		0.77		**2.31**
Total	56.30	42.41		42.41		**141.12**

APPENDIX 24: Sensitivity Analysis 3: Ideal GTA Cost

Block 1 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		6	7	8	4	**25**
		£				
GTA Pay		120.00	240.00	240.00	120.00	**720.00**
Chaperone pay		0.00	0.00	0.00	0.00	**0.00**
Disposable speculum		10.01	11.55	13.86	6.93	**42.35**
Aquagel		20.02	23.10	27.72	13.86	**84.70**
Gloves		0.65	0.75	0.90	0.45	**2.75**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		160.64	275.40	282.48	141.24	**859.76**
Manikin - Student Numbers		9	7	8		**24**
		£				
Lecturer / SpR		41.64	41.64	41.64		**124.92**
Manikin		14.50	0.00	0.00		**14.50**
Speculum		0.77	0.77	0.77		**2.31**
Total		56.91	42.41	42.41		**141.73**

Block 2 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	8	7	7	**30**
		£				
GTA pay		240.00	240.00	240.00	240.00	**960.00**
Chaperone pay		0.00	0.00	0.00	0.00	**0.00**
Disposable speculum		13.86	13.86	12.32	12.32	**52.36**
Aquagel		27.72	27.72	24.64	24.64	**104.72**
Gloves		0.90	0.90	0.80	0.80	**3.40**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		292.44	282.48	277.76	277.76	**1130.44**
Manikin - Student Numbers	4	8	8	8		**24**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.91	42.41	42.41	42.41		**184.14**

Block 3 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	8	7	7	**30**
		£				
GTA pay		240.00	240.00	240.00	240.00	**960.00**
Chaperone pay		0.00	60.00	0.00	0.00	**60.00**
Disposable speculum		13.86	13.86	12.32	12.32	**52.36**
Aquagel		27.72	27.72	24.64	24.64	**104.72**
Gloves		0.90	0.90	0.80	0.80	**3.40**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		292.44	342.48	277.76	277.76	**1190.44**
Manikin - Student Numbers	6	6	7	8	3	**30**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64	20.82	**187.38**
Manikin	14.50	0.00	0.00	0.00	0.00	**14.50**
Speculum	0.77	0.77	0.77	0.77	0.77	**3.85**
Total	56.91	42.41	42.41	42.41	21.59	**205.73**

Block 4 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Fri	Total
GTA - Student Numbers		9	7	8	4	4	**32**
			£				
GTA pay		240.00	240.00	240.00	120.00	120.00	**960.00**
Chaperone pay		0.00	0.00	82.50	60.00	60.00	**202.50**
Disposable speculum		15.40	12.32	13.86	6.93	6.93	**55.44**
Aquagel		30.80	24.64	27.72	13.86	13.86	**110.88**
Gloves		1.00	0.80	0.90	0.45	0.45	**3.60**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	0.00	**7.20**
Total		297.16	277.76	364.98	201.24	201.24	**1342.38**
Manikin - Student Numbers		8	8	6	8		**30**
			£				
Lecturer / SpR		41.64	41.64	41.64	41.64		**166.56**
Manikin		14.50	0.00	0.00	0.00		**14.50**
Speculum		0.77	0.77	0.77	0.77		**3.08**
Total		56.91	42.41	42.41	42.41		**184.14**

Block 5 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers	4	8	4	8	4	**28**
			£			
GTA pay	120.00	240.00	120.00	240.00	120.00	**840.00**
Chaperone pay	60.00	180.00	0.00	124.50	0.00	**364.50**
Disposable speculum	6.93	13.86	6.93	13.86	6.93	**48.51**
Aquagel	13.86	27.72	13.86	27.72	13.86	**97.02**
Gloves	0.45	0.90	0.45	0.90	0.45	**3.15**
Couch Roll (Tissue)	2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box	7.20	0.00	0.00	0.00	0.00	**7.20**
Total	211.20	462.48	141.24	406.98	141.24	**1363.14**
Manikin - Student Numbers	7	7	7	7		**28**
			£			
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.91	42.41	42.41	42.41		**184.14**

Block 6 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		4	7	7	6	**24**
			£			
GTA pay		120.00	240.00	240.00	120.00	**720.00**
Chaperone pay		0.00	60.00	0.00	0.00	**60.00**
Disposable speculum		6.93	12.32	12.32	10.78	**42.35**
Aquagel		13.86	24.64	24.64	21.56	**84.7**
Gloves		0.45	0.80	0.80	0.70	**2.75**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		151.20	337.76	277.76	153.04	**919.76**
Manikin - Student Numbers	7	7	6	6		**26**
			£			
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.91	42.41	42.41	42.41		**184.14**

Block 1 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Wed	Total
GTA - Student Numbers		7	3	9	4	4	**27**
			£				
GTA pay		240.00	120.00	240.00	120.00	120.00	**840.00**
Chaperone pay		105.00	0.00	60.00	60.00	60.00	**285.00**
Disposable speculum		12.32	5.39	15.40	6.93	6.93	**46.97**
Aquagel		24.64	10.78	30.80	13.86	13.86	**93.94**
Gloves		0.80	0.35	1.00	0.45	0.45	**3.05**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	0.00	**7.20**
Total		392.72	136.52	347.20	201.24	201.24	**1278.92**
Manikin - Student Numbers	8		8	8		**24**	
			£				
Lecturer / SpR	41.64		41.64	41.64		**124.92**	
Manikin	14.50		0.00	0.00		**14.50**	
Speculum	0.77		0.77	0.77		**2.31**	
Total	56.91		42.41	42.41		**141.73**	

Block 2 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		6	7	4	4	**21**
			£			
GTA pay		120.00	240.00	120.00	120.00	**600.00**
Chaperone pay		0.00	120.00	60.00	0.00	**180.00**
Disposable speculum		10.01	12.32	6.93	6.93	**36.19**
Aquagel		20.02	24.64	13.86	13.86	**72.38**
Gloves		0.65	0.80	0.45	0.45	**2.35**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		160.64	397.76	201.24	141.24	**900.88**
Manikin - Student Numbers	6	9		8		**23**
			£			
Lecturer / SpR	41.64	41.64		41.64		**124.92**
Manikin	14.50	0.00		0.00		**14.50**
Speculum	0.77	0.77		0.77		**2.31**
Total	56.91	42.41		42.41		**141.73**

Block 3 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	4	5	4	**21**
		£				
GTA pay		240.00	120.00	120.00	120.00	**600.00**
Chaperone pay		60.00	0.00	0.00	60.00	**120.00**
Disposable speculum		13.86	6.93	8.47	6.93	**36.19**
Aquagel		27.72	13.86	16.94	13.86	**72.38**
Gloves		0.90	0.45	0.55	0.45	**2.35**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		352.44	141.24	145.96	201.24	**840.88**
Manikin - Student Numbers	7	9		7		**23**
		£				
Lecturer / SpR	41.64	41.64		41.64		**124.92**
Manikin	14.50	0.00		0.00		**14.50**
Speculum	0.77	0.77		0.77		**2.31**
Total	56.91	42.41		42.41		**141.73**

APPENDIX 25: Sensitivity Analysis 4: 6 students in both control and intervention arms (total 24 students)

Note: This table can be multiplied by 9 blocks to get the total costs incurred over the trial.

Block 1 (2013-4)	Mon	Tue	Wed	Thurs	Fri	**Total**
GTA - Student Numbers		8	8	8	0	**24**
			£			
GTA Pay		240.00	240.00	240.00	0.00	**720.00**
Chaperone pay		0.00	0.00	0.00	0.00	**0.00**
Disposable speculum		10.78	10.78	10.78	0.00	**32.34**
Aquagel		21.56	21.56	21.56	0.00	**64.68**
Gloves		0.70	0.70	0.70	0.00	**2.10**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		283.00	273.04	273.04	0.00	**829.08**
Manikin - Student Numbers		6	6	6	6	**24**
			£			
Lecturer / SpR		41.64	41.64	41.64	41.64	**166.56**
Manikin		14.50	0.00	0.00	0.00	**14.50**
Speculum		0.77	0.77	0.77	0.77	**3.08**
Total		56.91	42.41	42.41	42.41	**184.14**

APPENDIX 26: Sensitivity Analysis 5: GTA cost reduced to £20

Block 1 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		6	7	8	4	**25**
			£			
GTA Pay		80.00	160.00	160.00	80.00	**480.00**
Chaperone pay		0.00	0.00	0.00	0.00	**0.00**
Disposable speculum		10.01	11.55	13.86	6.93	**42.35**
Aquagel		20.02	23.10	27.72	13.86	**84.70**
Gloves		0.65	0.75	0.90	0.45	**2.75**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		120.64	195.40	202.48	101.24	**619.76**
Manikin - Student Numbers		9	7	8		**24**
			£			
Lecturer / SpR		41.64	41.64	41.64		**124.92**
Manikin		14.50	0.00	0.00		**14.50**
Speculum		0.77	0.77	0.77		**2.31**
Total		56.91	42.41	42.41		**141.73**

Block 2 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	8	7	7	**30**
		£				
GTA pay		160.00	160.00	160.00	160.00	**640.00**
Chaperone pay		0.00	0.00	0.00	0.00	**0.00**
Disposable speculum		13.86	13.86	12.32	12.32	**52.36**
Aquagel		27.72	27.72	24.64	24.64	**104.72**
Gloves		0.90	0.90	0.80	0.80	**3.40**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		212.44	202.48	197.76	197.76	**810.44**
Manikin - Student Numbers	4	8	8	8		**28**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.91	42.41	42.41	42.41		**184.14**

Block 3 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	8	7	7	**30**
		£				
GTA pay		160.00	160.00	160.00	160.00	**640.00**
Chaperone pay		0.00	60.00	0.00	0.00	**60.00**
Disposable speculum		13.86	13.86	12.32	12.32	**52.36**
Aquagel		27.72	27.72	24.64	24.64	**104.72**
Gloves		0.90	0.90	0.80	0.80	**3.40**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		212.44	262.48	197.76	197.76	**870.44**
Manikin - Student Numbers	6	6	7	8	3	**30**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64	20.82	**187.38**
Manikin	14.50	0.00	0.00	0.00	0.00	**14.50**
Speculum	0.77	0.77	0.77	0.77	0.77	**3.85**
Total	56.91	42.41	42.41	42.41	21.59	**205.73**

Block 4 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Fri	Total
GTA - Student Numbers		9	7	8	4	4	**32**
			£				
GTA pay		160.00	160.00	160.00	80.00	80.00	**640.00**
Chaperone pay		0.00	0.00	82.50	60.00	60.00	**202.50**
Disposable speculum		15.40	12.32	13.86	6.93	6.93	**55.44**
Aquagel		30.80	24.64	27.72	13.86	13.86	**110.88**
Gloves		1.00	0.80	0.90	0.45	0.45	**3.60**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	0.00	**7.20**
Total		217.16	197.76	284.98	161.24	161.24	**1022.38**
Manikin - Student Numbers		8	8	6	8	**30**	
			£				
Lecturer / SpR		41.64	41.64	41.64	41.64	**166.56**	
Manikin		14.50	0.00	0.00	0.00	**14.50**	
Speculum		0.77	0.77	0.77	0.77	**3.08**	
Total		56.91	42.41	42.41	42.41	**184.14**	

Block 5 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers	4	8	4	8	4	**28**
			£			
GTA pay	80.00	160.00	80.00	160.00	80.00	**560.00**
Chaperone pay	60.00	180.00	0.00	124.50	0.00	**364.50**
Disposable speculum	6.93	13.86	6.93	13.86	6.93	**48.51**
Aquagel	13.86	27.72	13.86	27.72	13.86	**97.02**
Gloves	0.45	0.90	0.45	0.90	0.45	**3.15**
Couch Roll (Tissue)	2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box	7.20	0.00	0.00	0.00	0.00	**7.20**
Total	171.20	382.48	101.24	326.98	101.24	**1083.14**
Manikin - Student Numbers	7	7	7	7		**28**
			£			
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.91	42.41	42.41	42.41		**184.14**

Block 6 (2013-4)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		4	7	7	6	**24**
		£				
GTA pay		80.00	160.00	160.00	80.00	**480.00**
Chaperone pay		0.00	60.00	0.00	0.00	**60.00**
Disposable speculum		6.93	12.32	12.32	10.78	**42.35**
Aquagel		13.86	24.64	24.64	21.56	**84.7**
Gloves		0.45	0.80	0.80	0.70	**2.75**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		111.20	257.76	197.76	113.04	**679.76**
Manikin - Student Numbers	7	7	6	6		**26**
		£				
Lecturer / SpR	41.64	41.64	41.64	41.64		**166.56**
Manikin	14.50	0.00	0.00	0.00		**14.50**
Speculum	0.77	0.77	0.77	0.77		**3.08**
Total	56.91	42.41	42.41	42.41		**184.14**

Block 1 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Wed	Total
GTA - Student Numbers		7	3	9	4	4	**27**
			£				
GTA pay		160.00	80.00	160.00	80.00	80.00	**560.00**
Chaperone pay		105.00	0.00	60.00	60.00	60.00	**285.00**
Disposable speculum		12.32	5.39	15.40	6.93	6.93	**46.97**
Aquagel		24.64	10.78	30.80	13.86	13.86	**93.94**
Gloves		0.80	0.35	1.00	0.45	0.45	**3.05**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	0.00	**7.20**
Total		312.72	96.52	267.20	161.24	161.24	**998.92**
Manikin - Student Numbers	8		8	8			**24**
			£				
Lecturer / SpR	41.64		41.64	41.64			**124.92**
Manikin	14.50		0.00	0.00			**14.50**
Speculum	0.77		0.77	0.77			**2.31**
Total	56.91		42.41	42.41			**141.73**

Block 2 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		6	7	4	4	**21**
		£				
GTA pay		80.00	160.00	80.00	80.00	**400.00**
Chaperone pay		0.00	120.00	60.00	0.00	**180.00**
Disposable speculum		10.01	12.32	6.93	6.93	**36.19**
Aquagel		20.02	24.64	13.86	13.86	**72.38**
Gloves		0.65	0.80	0.45	0.45	**2.35**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		120.64	317.76	161.24	101.24	**700.88**
Manikin - Student Numbers	6	9		8		**23**
		£				
Lecturer / SpR	41.64	41.64		41.64		**124.92**
Manikin	14.50	0.00		0.00		**14.50**
Speculum	0.77	0.77		0.77		**2.31**
Total	56.91	42.41		42.41		**141.73**

Block 3 (2014-5)	Mon	Tue	Wed	Thurs	Fri	Total
GTA - Student Numbers		8	4	5	4	**21**
		£				
GTA pay		160.00	80.00	80.00	80.00	**400.00**
Chaperone pay		60.00	0.00	0.00	60.00	**120.00**
Disposable speculum		13.86	6.93	8.47	6.93	**36.19**
Aquagel		27.72	13.86	16.94	13.86	**72.38**
Gloves		0.90	0.45	0.55	0.45	**2.35**
Couch Roll (Tissue)		2.76	0.00	0.00	0.00	**2.76**
Tissue box		7.20	0.00	0.00	0.00	**7.20**
Total		272.44	101.24	105.96	161.24	**640.88**
Manikin - Student Numbers	7	9		7		**23**
		£				
Lecturer / SpR	41.64	41.64		41.64		**124.92**
Manikin	14.50	0.00		0.00		**14.50**
Speculum	0.77	0.77		0.77		**2.31**
Total	56.91	42.41		42.41		**141.73**

APPENDIX 27: EASTT Participation Information Sheet

Birmingham Women's NHS
NHS Foundation Trust

EASTT

EASTT: What is the Experience and Acceptability of Students, Teaching faculty and gynaecology Teaching associates (GTAs) of the pelvic examination teaching programme.

Participant Information Sheet

We would like to invite you to take part in a study to explore the experience and acceptability of incorporating gynaecology teaching associates (GTAs) in the final year medical student curriculum to teach pelvic examination skills.

Before you decide whether to take part we would like you to understand the reason for this research and what it would involve for you. One of our team will go through the information sheet with you and answer any questions that you have.

What is the purpose of the study?

The purpose of this study is to explore the experience of medical students, teaching faculty and GTAs during the GTA led curriculum for teaching pelvic examination skills in the final year O&G clinical placement.

Why have I been invited?

You have been invited as you are a stakeholder within the teaching programme conducted by GTAs at Birmingham Women's Hospital. You have been invited to provide your opinion in the setting of a one-to-one interview or a focus group with a facilitator. In order to put forward the case for using GTAs to teach pelvic examination skills, we have to explore the acceptability and experience of those involved in this aspect of the final year curriculum.

Do I have to take part?

It is up to you to decide to join the study. We will describe the study and go through this information sheet. If you agree to take part we will ask you to sign a consent form. You are free to withdraw your participation at any point. You will be given 24 hours between reading the information sheet and signing the consent form. If you are not able to sign the consent form prior to attending the interview or focus group, you can sign it on the day itself.

What will happen if I choose to take part?

Interview: You will have a semi-structured interview by either trial co-ordinator, who is interested in understanding your views on the GTA involvement in the teaching of pelvic examination skills for final year medical students.

Focus Group: You will participate in a focus group with your GTA peers. The trial co-ordinator / facilitator will ask questions to encourage group discussion on GTA involvement in the teaching of pelvic examination skills for final year medical students.

Your interviews / focus groups will be recorded on a digital recorded so that thematic analysis for this qualitative study can take place. Unfortunately, as we are recording the examination there can be no anonymisation of voice, but once transcribed onto paper, each participant will be given a participant number rather than documenting their name e.g. GTA 1, Medical Student 2.

You can choose to withdraw from the study. If you have participated in an interview, the recording can be destroyed if you so wish. However, if you have participated in a focus group, the ability to remove your contribution from the discussion is not feasible.

What are the disadvantages of participating in the study?

The only disadvantage for you is the time given up to participate in the interview or focus group.

What benefits can come from participating in the study?

If you choose, the Chief Investigator can provide you with results of the study after its completion and analysis

For further information

The UK Clinical Research Collaboration has produced a guide entitled, 'Understanding clinical Trials'. This can be downloaded from their website: www.ukcrn.org.uk and maybe useful if you require general information about research. If you require specific information about the research project please contact any of the following trial staff listed below:

Aisha Janjua (Clinical Teaching Fellow)

Mr J Clark (Consultant Obstetrician and Gynaecologist)

Birmingham Women's hospital, Mindelsohn Way, Edgbaston, Birmingham B15 2TG

APPENDIX 28: EASTT Consent Form

EASTT Birmingham Women's NHS
NHS Foundation Trust

EASTT: What is the Experience and Acceptability of Students, Teaching faculty and gynaecology Teaching associates (GTAs) of the pelvic examination teaching programme.

		Please initial Box
1.	I confirm that I have read and understood the information sheet relating to the study dated (13/10/2014) version 1. I have had the opportunity to consider the information and ask questions and these have been answered satisfactorily.	☐
2.	I understand that my participation is voluntary and that if I take part, I am free to withdraw at any time, without giving reason, and without my medical education being affected.	☐
3.	I accept that the researchers may telephone or email me.	☐
4.	I understand that the information will be used for medical research only and that I will not be identified in any way in the analysis and reporting of the results. I understand that any information relating to the trial will be held in confidence within Birmingham Women's Hospital and the University of Birmingham and only be accessible by the researchers.	☐
5.	I understand what is involved in the EASTT Study, agree to participation in the interview or focus group as required.	☐

_____	_____	_____
Name of student	Date	Signature
_____	_____	_____
Name of person Taking consent	Date	Signature

When completed: 1 for participant; 1 for researcher site file; 1 (original) to be kept in Student University Site File.

Participant Number

☐☐☐_☐☐☐

TF - Teaching Faculty

ST – Student

GTA - Gynaecology Teaching Associate

APPENDIX 29: Interview Questions for Medical Students

Demographics: Age; Gender; GTA+GTA or GTA+Chaperone teaching

Why do you think pelvic examination skills are important?

What do you think constitutes good pelvic examination teaching? And bad ones?

What are your experiences of pelvic examination teaching?

During GTA teaching, please could you explain if and how the following were affected / improved?

- Knowledge
- Skill
- Behaviour during pelvic examination

How did you feel during the GTA teaching of pelvic examination skills?

How do you think GTA teaching of pelvic examination skills affected / improved your experience during your O&G block?

Do you think GTAs are adequate to satisfy pelvic examination teaching, or should they be used in conjunction with manikin teaching?

What is your opinion of employing GTAs to teach pelvic examination skills?

Do you have any objections towards GTA teaching? If so, please discuss.

Do you think GTAs teaching is considered morally acceptable? Please rationalise your answer.

Do you think GTAs teaching is considered normal? Please rationalise your answer.

Do you think GTAs teaching is considered socially acceptable? Please rationalise your answer.

Have you informed your family members you participate in GTA teaching? Please explain?

Have you informed your friends you participate in GTA teaching? Please explain?

APPENDIX 30: Interview Questions for Teaching and Non-Teaching Faculty

Demographics: Age; Gender; Years as a Consultant; Years involvement in formal medical education

Why do you think pelvic examination skills are important?

What do you think constitutes good pelvic examination teaching? And bad ones?

What are your experiences of pelvic examination teaching?

What is your involvement in teaching pelvic examination skills to medical students?

In your opinion, please could you explain if and how you think GTA teaching affects / improves the following?

- Knowledge
- Skill
- Behaviour during pelvic examination

What is your opinion of employing GTAs to teach pelvic examination skills compared to the traditional manikin (pelvic model)?

Do you think GTAs are adequate to satisfy pelvic examination teaching, or should they be used in conjunction with manikin teaching?

In your opinion, what are the drawbacks of traditional manikin teaching?

In your opinion, what are the drawbacks of GTA pelvic examination teaching?

What are the barriers to implementing a curriculum wide GTA teaching programme? (within University of Birmingham; or expand to national medical school O&G curriculum)

What is your opinion of employing GTAs to teach pelvic examination skills?

Do you have any objections towards GTA teaching? If so, please discuss.

Do you think GTAs teaching is considered morally acceptable? Please rationalise your answer.

Do you think GTAs teaching is considered normal? Please rationalise your answer.

Do you think GTAs teaching is considered socially acceptable? Please rationalise your answer.

Have you informed your family members the medical students receive GTA teaching? Please explain?

Have you informed your friends the medical students receive GTA teaching? Please explain?

APPENDIX 31: Interview Questions for GTA Group Interview and Supplemental Interview

Why do you think pelvic examination skills are important?

What do you think constitutes good pelvic examination teaching? And bad ones?

What are your experiences of pelvic examination teaching?

What are your experiences of pelvic examination teaching prior to entering this programme?

What is your view on the current method of GTA teaching compared to traditional manikin (pelvic model) teaching?

How did you hear about the GTA programme?

What made you consider to become a GTA / What are your motivations for becoming a GTA?

How do you feel as a GTA during teaching of pelvic examination skills?

What are the positive experiences of the GTA teaching programme?

What are the drawbacks of the GTA teaching programme?

Do you think GTAs are adequate to satisfy pelvic examination teaching, or should they be used in conjunction with manikin teaching?

Do you think GTAs teaching is considered morally acceptable? Please rationalise your answer.

Do you think GTAs teaching is considered normal? Please rationalise your answer.

Do you think GTAs teaching is considered socially acceptable? Please rationalise your answer.

Have you informed your family members you participate in GTA teaching? Please explain?

Have you informed your friends you participate in GTA teaching? Please explain?

APPENDIX 32: Non Participant Observation Points to Note for Investigator

Demographics: Age of students being taught; Gender; GTA+GTA or GTA + Chaperone teaching

Who?

- Who and how many people are present at the GTA teaching?
- Is the session taught by GTA+GTA or GTA + Chaperone?
- What are their characteristics?
- What is their role?

What?

- What is happening during the teaching?
- What are the actions or behaviours by the GTAs and medical students?
- What are the rules of behaviour observed during the PowerPoint teaching and out-patient teaching?
- What are the variations in the behaviour observed?
- Are there any signs of disinterestedness or boredom?
- What are the verbal responses and physical behaviours exhibited during GTA teaching?
- What is the reaction to feedback given by the GTA or chaperone?
- What do the other students do whilst their colleague if performing the examination?

Where?

- Where are the interactions taking place?
- Where are medical students and GTAs located in the physical space?

When?

- When do conversations and interactions take place?
- What is the sequence and timing of PowerPoint teaching and pelvic examination teaching of all the medical students?

Why?

- Why are the medical students acting in a particular way?
- Why are the GTAs acting in a particular way?
- Why are there variations in behaviour?
- *(These can be investigated further during the medical student interview and GTA focus group. Further questions added to the respective topic guides.)*

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PUBLISHED PAPERS

Presentations

Regional Poster: Pelvic Examination and Assessment Tool, BMOGS, Leicester (3rd October 2014)

Regional Poster: TARGET Trial: Teaching Associates Randomised to evaluate the effectiveness of Gynaecological pelvic Examination versus Traditional teaching using manikins, BMOGS (2nd October 2015)

National Poster: Teaching Associates (GTAs) compared with manikin models, RCOG Annual Academic Meeting, RCOG London (2nd – 3rd March 2017)

National Oral Presentation: A qualitative study of the impact and acceptability of gynaecological teaching associates, RCOG Annual Academic Meeting, RCOG London (2nd – 3rd March 2017)

International Oral Presentation: The EASTT Study: The Experience and Acceptability of Students, Teaching faculty and Gynaecology Teaching associates (GTAs) of the pelvic examination teaching programme, RCOG World Congress, Cape Town, South Africa (20th – 22nd March 2017)

Publications

Janjua, A., Smith, P., Chu, P., Raut, N., Malick, S., Gallos, I., Singh, R., Irani, S., Gupta, J.K., Parle, J., Clark, T.J. (2016) The effectiveness of gynaecology teaching associates in teaching pelvic examination to medical students: A randomised controlled trial, *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 210, 58-63, Mar. 1, 2017. (in print)

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The EASTT Study: The Experience and Acceptability of Students, Teaching faculty and Gynaecology Teaching associates (GTAs) of the pelvic examination teaching programme (BJOG Abstract, accepted)

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