

RESEARCH ARTICLE

Two-year longitudinal observational study of junior doctors as clinical teachers: the Associate Clinical Teaching Fellow Program

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Abstract

Introduction: Most clinical teachers are not trained to teach, though they are critical to determining the quality of clinical learning environment. The General Medical Council, United Kingdom, recognises that being a good teacher is not innate, but that skills and attributes can usually be acquired. Clinical teaching is part of training of junior doctors in the United Kingdom, and from learners' perspectives, junior doctors are effective clinical teachers, but there are few structured opportunities to learn how to teach during clinical training. The Associate Clinical Teaching Fellow (ACTF) program was developed to provide such structured platform for clinical trainees. The aim of this paper is to evaluate the quality of teaching by the trainees against the current-standard of clinical teaching in the first 2 years of its inception, and to adapt validated feedback questionnaires for practical use.

Methods: A prospective longitudinal observational study was done over 2 years in a large 1,215 bed tertiary hospital. Multiple cross-sectional assessments of teachings by ACTFs and consultant teachers were done using two validated questionnaires, the Stanford Faculty Development Program-26 (SFDP-26) and the Clinical Teaching Effectiveness questionnaire (CTEQ), and an in-house global (IHG) feedback form prepared by third- and fifth-year students. Both trainees and consultants were unaware of the timing of the SFDP-26 and CTEQ feedbacks. A graphical representation of all responses was used to create a grading system for practical feedbacks.

Results: A total of 507 of 765 (66%) of SFDP-26 and CTEQ and 224 of 286 (78%) of IHG questionnaires were returned for 26 trainees and 31 consultants by 266 medical students. There was a statistically significant higher ratings of trainees in seven of eight domains of SFDP-26, and the median (interquartile ranges [IQR]) overall score was 115 (105–126) and 108 (99–121) for trainees and consultants, respectively ($P < 0.0001$). Similarly, trainees were rated significantly higher in seven of nine CTEQ domains, and this was reflected in the overall score. The patterns were similar for third- and fifth-year students, and the type of learning exposure did not make a difference. With these students, the overall teaching effectiveness correlated (Spearman Correlation Coefficient [SCC]) the most with enthusiastic and stimulating (SCC 0.711; $P < 0.0001$), establishes rapport (SCC 0.69; $P < 0.0001$) and is accessible (SCC 0.67; $P < 0.0001$) in CTEQ, and with learning climate (SCC 0.62; $P < 0.0001$), communication of goals (SCC 0.54; $P < 0.0001$) and evaluation (SCC 0.52; $P < 0.0001$) in SFDP-26.

At the end of their rotations, 30% of both groups of students were neutral or disagreed that consultants were essential to their clinical programs compared to 15% ($P = 0.001$) and 11% ($P < 0.0001$) of third- and fifth-year students, respectively, felt about trainees. By applying a new grading system derived from the full database of responses, the trainees would be graded 1 and consultants 7 out of 10 possible grades.

Conclusions: Teaching delivered by doctors in training within a formal teaching program is of good quality and well received by medical students. There is a need for an equivalent program for trainee clinical education-alists like the Integrated Academic Training scheme of the National Institute of Health Research (NIHR), UK, for trainee academics. More qualitative studies are needed to analyse some of the findings in this study.

Keywords: *medical education; Associate Clinical Teaching Fellow; Faculty Development; SFDP-26; Stanford Faculty Development Program; Clinical Teaching Effectiveness Questionnaire*

To access the supplementary material, please visit the article landing page

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Introduction

Studies have shown that junior doctors (residents and trainees) are effective clinical teachers [1], and some of the studies have shown that from the learner's perspective, junior doctors are as effective as consultants or faculty [2, 3]. Despite teaching being an essential part of core training in the United Kingdom, opportunities to teach in an organised manner are sparse [4]. Many trainees who are interested in teaching have to take a year or two of their clinical training programs and work as full-time teaching fellows.

Whilst General Medical Council directs that all doctors should be prepared to contribute to teaching and training of doctors and students [5], it stated that, 'Being a good teacher and role model is not innate and the skills and attributes can usually be acquired' [6]. It expands on this, in paragraph 21, stating that not everyone is naturally good at educating others, and strengths may lie elsewhere, in research or direct clinical care. It then advises that teachers and trainers in academic and/or clinical settings be selected for these roles [6]. It recommended that appointments to teaching positions be made on the basis of aptitude and competence instead of clinical experience alone, and that consultants and postgraduate trainees involved should have dedicated time within their job plans and career pathways to meet their educational responsibilities and development.

In 2006, The Integrated Academic Training (IAT) became a flagship scheme of the National Institute for Health Research (NIHR) as a way for United Kingdom junior doctors to establish themselves in academia along with their clinical career [7]. This created the Academic Clinical Fellowship (ACF), which allowed the ACF to have 25% of their time protected from clinical work for a maximum of 3 years to pursue academic research, which could also be in education. This has been successful in its first 10 years [7]. A similar program exists for the higher specialist trainees who have completed a PhD or equivalent. Academic Clinical Lecturers (ACL), also funded by NIHR, allows the ACL to have 50% of their time protected from clinical work.

Whilst both ACF and ACL can choose their academic pathway to be in education, there is no equivalent structure for 'non-research based' educationalists who wish to make substantial contributions to undergraduate and postgraduate clinical teaching. Formal roles for trainees interested in education are limited to Clinical Teaching Fellowships, but these are often full-time posts and relatively scarce. Some studies have looked at establishing programs using junior doctors to teach medical students specific skills [1] and for revision studies [3]. In the Health Education England North East training region, the median teaching sessions delivered by core trainees over their 2-year medical rotation were three, and 36% had not delivered any training at all [4].

To fill and extend the gap in integrating career pathway for educationalist into their clinical program, the Associate Clinical Teaching Program (ACTF) was created in 2011, and in its first 2 years, a prospective, longitudinal evaluation of the program was done by multiple cross-sectional surveys with validated questionnaires comparing junior doctors to the current standard of teaching by consultants.

The ACTF Program

The Associate Clinical Teaching Fellow (ACTF) program was established at the University Hospitals Birmingham NHS Foundation Trust (UHB) to provide a structure of support to clinical trainees interested in teaching during their training and to help develop educational portfolios. First established in 2011–12 academic year, it was open to all trainees from Foundation Year 2 upwards. Application was via submission of a two-page education-focused curriculum vitae (CV), and appointments were made by a selection panel of two senior clinicians and an administrator from the submitted CVs. To be eligible, the trainees must have a minimum of 9 months left in their clinical rotation in the hospital, so they can teach for a whole academic session. On appointment, each ACTF was allocated a mentor from the teaching faculty and was each given a book, *Teaching Made Easy* [8].

Each ACTF is expected to commit to delivering 2 h of teaching per week to an allocated group of up to five to six medical students for an entire rotation or semester. As with consultants, the ACTFs, working within the curriculum, were free with topics and teaching methods chosen.

The ACTFs had a compulsory 2-day education course, which is organised within the first 3 months of each academic year for the ACTFs, which was a combination of lectures, tutorials and workshops (Supplementary file 1), and provided 14 hours of continuous professional development. There was a compulsory 1-hour monthly educational forum to allow for the exchange of ideas, guest lectures and journal club discussions.

ACTFs were paired for the purpose of peer-reviewing each other using the Clinical Teaching Observation Record developed by the Medical Education Unit of the University of Birmingham (UoB) (Supplementary file 2). The same form was used to review the ACTFs by a member of faculty at least once in the academic year.

Senior ACTFs were appointed as clinical examiners for medical students' examinations. Others were part of the Medical School's Angoff Standard Setting panel, and some, part of examination question setting panel. Many took part in audits, evaluation and research projects that cumulated in 16 oral and poster presentations in national and international conferences in the first 5 years (Supplementary file 3).

Aims

The aim of this study was to evaluate the effectiveness of junior doctors (ACTFs) as clinical teachers of medical students when fully integrated within the teaching structure of the hospital against the current standard of clinical teaching in the United Kingdom, the consultants. The secondary aim was to determine how to adapt the validated questionnaires for giving practical feedback.

Methods

Study design and participants

The setting was a large 1,215 bed tertiary teaching hospital, UHB, United Kingdom. The evaluation of the ACTFs was a prospective longitudinal observational study over 2 years, with multiple cross-sectional surveys. The main outcome measure was equivalence or not of junior doctors' teaching performance compared to consultant supervisors, as evaluated by medical students using two validated faculty development and a bespoke questionnaires.

The students were third- and fifth-year medical students of the UoB rotating through UHB in the academic years 2011–2012 and 2012–2013. These two groups of students were in a group of five or six students, supervised by a consultant throughout their stay at UHB. Third- and fifth-year students rotated through UHB for 13 and 8 weeks, respectively.

Data collection

Data collection was over 2 years. There were two time points in each rotation, four semesters for third year students and eight rotations for fifth year students. Past the half-way point of a rotation, a teaching session of an ACTF or consultants were targeted in the same week. A faculty member or an administrator gave out the feedback forms after the end of the session and collected them afterwards. At the end of the rotation, at the final formal lecture, which all students were supposed to attend, feedback forms about the students' overall time at UHB were distributed. In this bespoke feedback forms, four questions were added to assess the ACTFs and SATs.

Study instruments

The Stanford Faculty Development Program (SFDP-26) is a validated questionnaire consisting of 26 questions assessing seven domains of effective teaching on a 5-point Likert scale [9]. The domain assessed with 25 items are as follows:

- (1) Establishing learning climate,
- (2) Control of session,
- (3) Communication of goals,
- (4) Facilitating understanding and retention,

- (5) Evaluation,
- (6) Feedback and
- (7) Promoting self-directed learning.

There was one item on overall teaching effectiveness. They are measured on a five-point Likert scale for items 1–25 (1–5 = Strongly Disagree–Unsure–Strongly Agree) and the overall teaching effectiveness from 1 = poor to 5 = excellent. SFDP-26 has a high overall internal consistency 0.97, and an internal consistency of constructs ranging from 0.82 to 0.95 [9].

A second validated questionnaire, the Clinical Teaching Effectiveness Questionnaire (CTEQ) [10], was used along with SFDP-26.

- (1) Teacher was clear and organised,
- (2) Enthusiastic and stimulating,
- (3) Establishes rapport,
- (4) Actively involves students,
- (5) Is knowledgeable and analytic,
- (6) Demonstrates clinic skills and procedure,
- (7) Provides direction and feedback and
- (8) Is accessible.

With this eight, there was a ninth on overall teaching effectiveness. As in SFDP-26, it was measured on a five-point Likert scale, and for all items from 1 = poor to 5 = excellent. The items showed high reliability for 20 ratings between 0.83 and 0.90 [10].

At the end of their placement, students were asked to complete an in-house global (IHG) feedback questionnaire assessing overall educational experiences at UHB. To this global feedback, four questions were added:

- (1) Our firm tutor is essential to our clinical program
- (2) Our firm tutor (.....) is
- (3) Our ACTF is essential to our clinical program
- (4) Our ACTF (.....) is

For questions 1 and 3, it used the Likert scale from 1 = Strongly disagree to 5 = Strongly agree, and for questions 2 and 4, 1 = Poor to 5 = Excellent. In parenthesis, were the names of the individuals.

Data analysis

For the ordinal scale, median was used to summarise data, and variability is expressed as interquartile range. The Mann–Whitney U analysis was used to compare differences between two independent groups. For categorical data, contingency table was used to compare proportions between two groups, and they were analysed using Chi-squared test. The Fisher's exact test was used if contingency cell numbers are low. The Spearman's rank correlation test was used to test the relationship between the two validated

questionnaires used in this study. Statistical analyses were made using XLSTAT version 2021.3.1 by Addinsoft.

Ethics

This study, registered with Integrated Research Approval System (IRAS) with project ID 229015, was an evaluation of an innovative teaching program. After going through the IRAS project filter and the Medical Research Council decision tool, <http://www.hra-decisiontools.org.uk/research/>, ethics approval was not deemed necessary.

Results

Demography

The study period was over two academic years with a total of 266 third- and fifth-year undergraduate medical students placed at UHB. In total, 187 (70%) were third-year students (96 and 91 in the first and second years, respectively) and 79 (30%) were fifth-year students (40 and 39 in the first and second years, respectively).

A total of 20 ACTFs were in-post for either part or all of the study period. In the first year, 47 trainees applied for an ACTF post and 12 were appointed. In the second year, 55 trainees applied for eight ACTF positions, as four previously appointed ACTFs continued in post. Over the 2 years, there were nine (45%) females, and nine (45%), eight (40%) and three (15%) trainees from surgery, medicine and anaesthetics, respectively. Eleven (55%) were specialist trainees, and the others were core trainees. Two trainees had Masters in Medical Education, one had a diploma, and three had a postgraduate certificate. Six were instructors in Advanced Life Support, Advance Trauma Life Support, or Care of the Critically Ill Surgical Patient.

Questionnaires

Seven hundred and sixty-five SFDP-26 and CTEQ questionnaires were distributed to third-year (561) and

fifth-year (204) students. In total, 507 (66.3%) were completed and returned. Response rates were 70.2% (394/561) and 55.4% (113/204) for third- and fifth-year students, respectively. A total of 286 IHG feedback forms were distributed to students in both years. Of which, 224 (78.2%) global feedback forms were completed and returned. Of these, 79.2% (186/235) and 74.5% (38/51) were from third- and fifth-year students, respectively.

Feedback was obtained on a total of 26 trainees and 31 consultants. Of the trainees, 19 (73.1%) were ACTFs, three (11.5%) were full-time UHB Teaching Fellows and the remaining four were in non-formal teaching roles. The two most common teaching activities reported assessed were small-group tutorial sessions (47.7%) and small-group bedside teaching (47.5%).

SFDP-26 and CTEQ overview

The median aggregate scores and interquartile ranges (IQR) of the seven domains of SFDP-26, and its global score are shown in Table 1. In six of seven domains and in the global score, the distribution of the ordinal ratings statistically significantly favoured the trainees. The sole exception was the domain of 'promoting self-directed learning'.

This is reflected in the overall median (IQR) SFDP-26 score of 115 (105–126) for trainees and 108 (99–121) for consultants ($P < 0.0001$). A similar picture was seen with the overall score of CTEQ, with a better median (IQR) score of 44 (39–45) for trainees and 41 (36–44) for consultants ($P < 0.0001$).

For a meaningful interpretation, graphical representation of Likert responses to all the questions in SFDP and CTEQ was analysed.

The distributions of the Likert responses in all the 26 questions of the SFDP were more favourable to the trainees (Fig. 1), and these reached statistical significance in all but six questions, Q6, 7, 17, 23, 24 and 25. The latter three were all questions in the 'promoting and

Table 1. Assessment of single teaching episodes with SFDP26 and CTEQ

Domains	Items	Maximum score	Trainees (n = 203)	Consultants (n = 304)	P**
Learning climate	1–4	20	20 (18–20)*	18 (16–20)*	<0.0001
Control of session	5–7	15	12 (11–14)	12 (11–14)	0.025
Communication of goals	8–11	20	18 (16–20)	16 (14–19)	<0.0001
Promoting understanding and retention	12–14	15	13 (11–15)	12 (10–14)	<0.0001
Evaluation	15–18	20	19 (16–20)	17 (16–20)	0.006
Feedback	19–22	20	18 (16–20)	17 (16–19)	0.000
Promoting self-directed learning	23–25	15	13 (12–15)	12 (12–15)	0.057
Global teaching effectiveness	26	5	5 (5–5)	5 (4–5)	<0.0001
SFDP-26 (total)	1–26	130	115 (105–126)	108 (99–121)	<0.0001
CTEQ	1–9	45	44 (39–45)	41 (36–44)	<0.0001

*Median scores with interquartile ranges (IQR). **Mann–Whitney U test. SFDP, Stanford Faculty Development Program; CTEQ, Clinical Teaching Effectiveness Questionnaire.

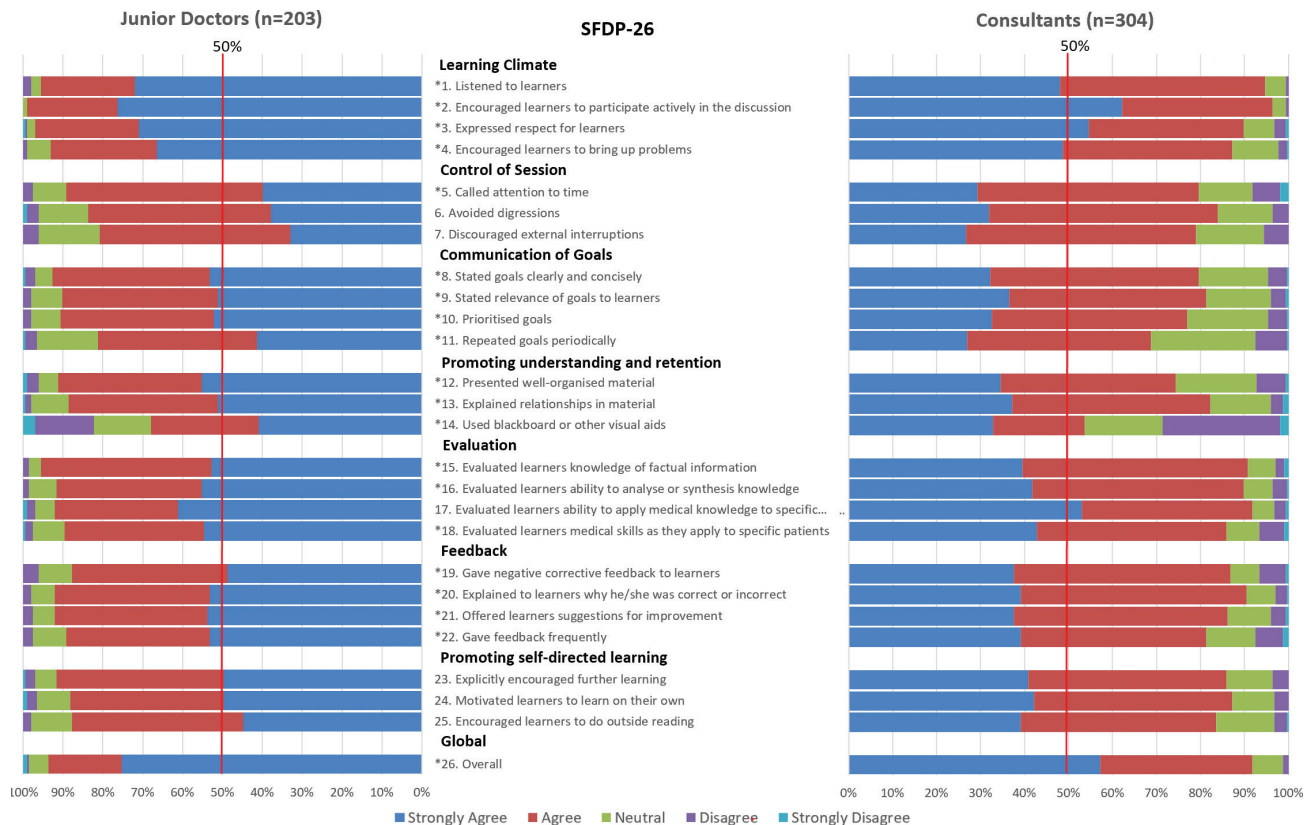


Fig. 1. Stacked comparison of Stanford Faculty Development Program (SFDP) responses. Statistical analysis using Chi-squared and Fisher's exact test. * $P < 0.05$ (significant).

self-directed learning' domain. The response 'strongly agree' reached 50% of responses in all, but seven questions, 5, 6, 7, 11, 14, 19 and 25, for the trainees. Questions 5, 6 and 7 were all of the domain 'control of session'. In contrast, only four of the responses about the consultants did 'strongly agree' reached 50%, and two of these were in the domain of 'learning climate' (Fig. 1). At the other end, in the combined responses of neutral, disagree and strongly disagree, more than 20% of students returned these responses in only 1 of 26 (4%) questions for trainees compared to 7 of 26 (27%) for consultants.

Similarly, in CTEQ (Fig. 2), the distribution of the Likert responses favoured the trainees in all the domains, but it did not reach statistical significance in only two of nine questions. These were in the domains of 'is knowledgeable and analytic' and 'provides direction and feedback'.

For the trainees, the response 'excellent' reached 50% in all domains, and only failed to reach 60% in two domains: 'demonstrates clinical skills and procedure' and 'provides direction and feedback'. In contrast, four of nine of the responses for consultants failed to reach 50%, and these were 'the teacher was clear and organised', 'demonstrates clinical skills and procedure', 'provides direction and feedback' and 'is accessible'. It only reached 60% in two domains for consultants.

At the other end, less than 10% of students gave the combined responses of average, below average or poor to all the nine questions in the junior doctors responses compared to only three of nine (33%) responses for the consultants.

Factors influencing SFDP-26 and CTEQ

Seniority of medical students

More trainees were judged to be excellent in the overall question of global teaching effectiveness, and this pattern was similar between both groups of students (Fig. 3), but it did not reach statistical significance with fifth-year students. Fifth-year student generally scored trainees and consultants higher than third-year students. This is reflected in the fifth-year students' overall median (IQR) scores for SFDP-26, at 122 (111–129) compared to the third-year students at 109 (101–120), $P < 0.0001$. The CTEQ median score was similar, 45 (41–45) and 41 (37–45), respectively, $P < 0.0001$.

Is knowledgeable and analytical

(question 5 of CTEQ) – In Fig. 2, there was no statistically significant difference in the students' responses to this question with regards to trainees and consultants. Seventy-three percent of students graded this question excellent, 24% good and 3% other responses for the

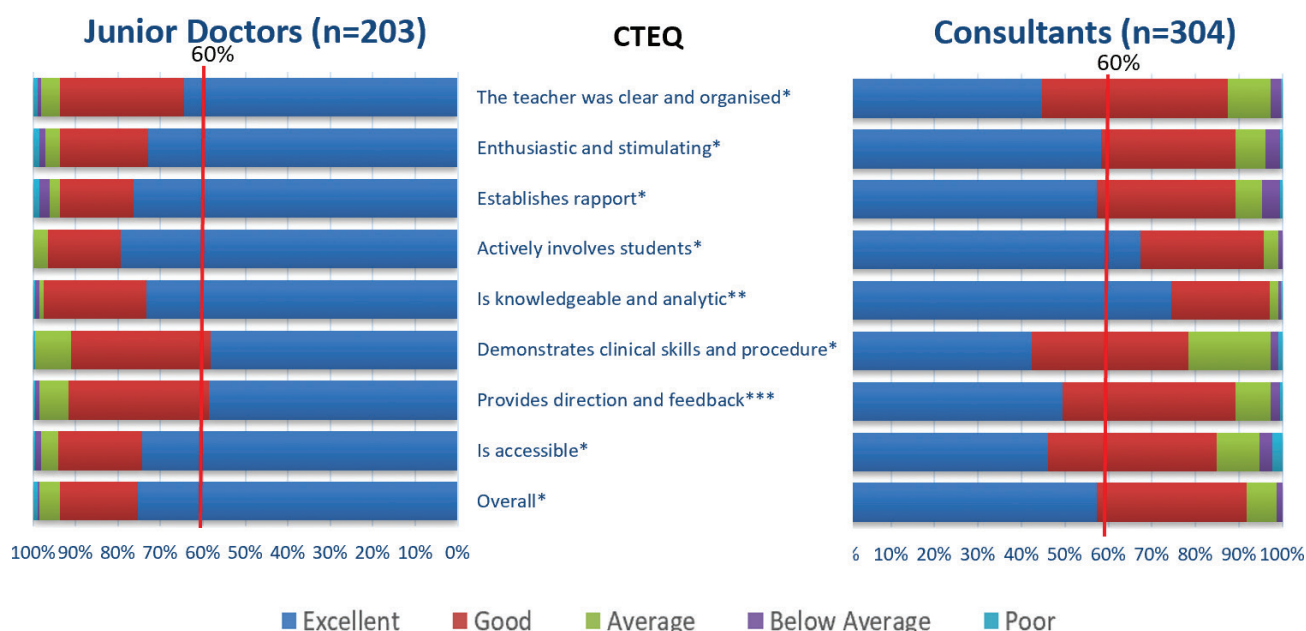


Fig. 2. Stacked comparison of Clinical Teaching Effectiveness Questionnaire (CTEQ) responses. Statistical analysis using Chi-squared and Fisher's Exact test. * $P < 0.05$ (significant), ** $P = 0.876$ (NS), *** $P = 0.328$ (NS).

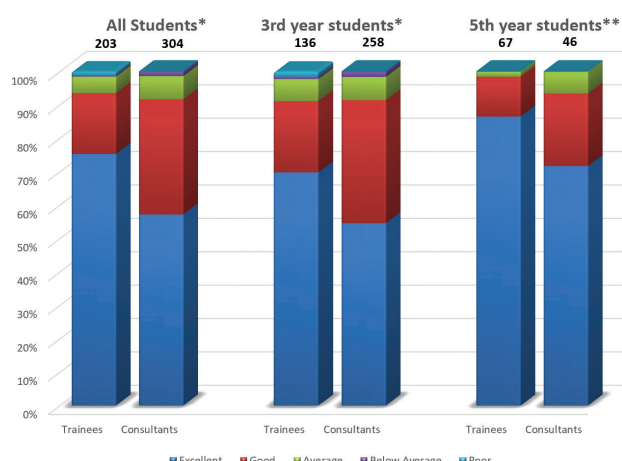


Fig. 3. Global assessment of overall teaching effectiveness, questions 9 and 26 of CTEQ and SFDP-26, respectively. Chi-square with Fisher's Exact test; * $P < 0.05$, **not statistically significant.

trainees, and 74, 23 and 3%, respectively, for consultants ($P = 0.876$). When analysed by students' year, the lack of differences persisted for both groups.

Teaching environment

The two main teaching formats where the feedbacks were given were bedside teachings, 243 (47.9%) and tutorials, 244 (48.1). Sixty percent of tutors were described as excellent at bedside teachings, which was similar to 68% at tutorials. There were no statistically significant differences in the Likert response distribution between both activities to

the global assessment. The overall median (IQR) SFDP-26 score given at bedside teachings was 110 (102–122), which was not statistically significantly different from 113 (103–124) given for tutorials. The CTEQ overall median score for both activities were the same, 42 (38–45).

Overall assessment feedback

A total of 286 IHG feedback forms were distributed to students in both years. A total of 224 (78.2%) global feedback forms were completed and returned. Of these, 79.2% (186/235) and 74.5% (38/51) were from third-year and fifth-year students, respectively. Each fifth-year student gave feedbacks for two consultants and two trainees, raising total feedbacks from fifth-year students as 76 to the total feedback to 262. These feedbacks were part of the usual ones taken by the hospital at the end of rotations, about the students' time, and two questions were added for the purpose of this study (Figs. 4 and 5).

In the forms, the teachers being assessed were named, and these were all individuals who were attached to the students and met them every week for the duration of their rotation.

Thirty percent of students were unsure or disagreed that consultants were essential to their clinical programs.

Assessments

SFDP-26 versus CTEQ

There was a strong positive correlation between SFDP-26 and CTEQ with a Spearman Correlation coefficient (SCC) of 0.81 ($P < 0.0001$). Furthermore, there was a stronger positive correlation between CTEQ and the

Our Teacher was

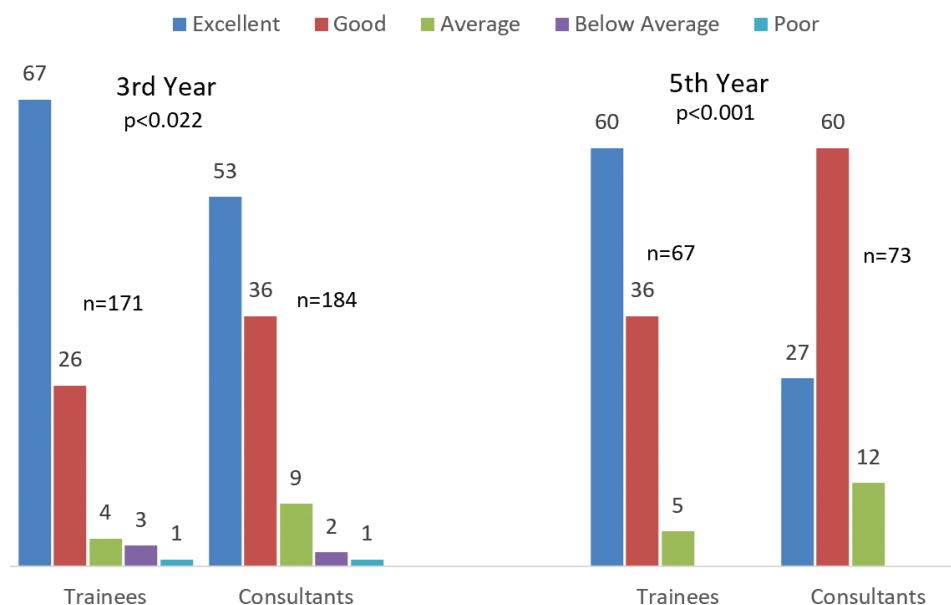


Fig. 4. Bespoke global feedback of teaching delivered over the whole rotation. X-axis in percentages. Chi-square with Fisher's Exact test for analysis. $P < 0.05$ as statistically significant.

Our teacher was essential to our clinical program

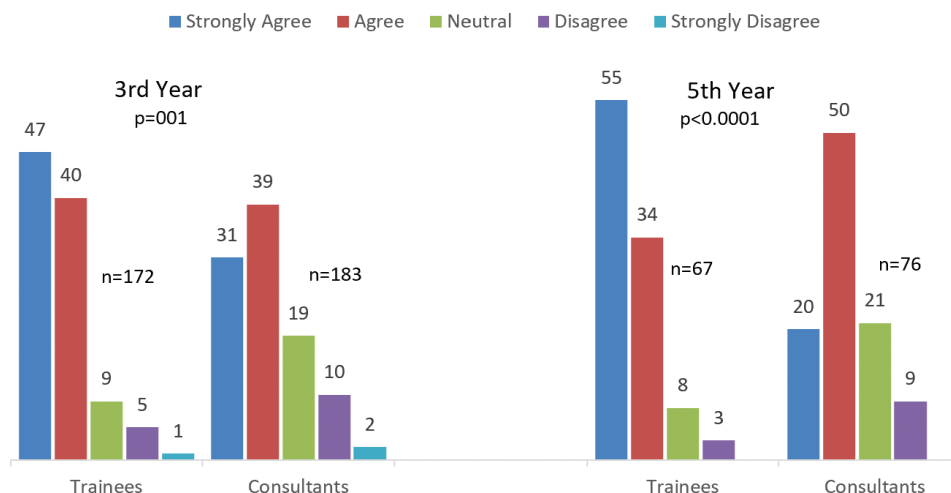


Fig. 5. Bespoke global feedback of teaching delivered over the whole rotation. X-axis in percentages. Chi-square with Fisher's Exact test for analysis. $P < 0.05$ as statistically significant.

global assessment (question 26 of SFDP-26 and question 9 of CTEQ) with SCC of 0.81 ($P > 0.0001$) compared to the correlation between SFDP-26 and the global assessment at 0.69 ($P < 0.0001$).

In CTEQ, the three top domains that correlated with the global assessment were 1. Enthusiastic and stimulating (SCC 0.711; $P < 0.0001$), 2. Establishes rapport (SCC 0.69;

$P < 0.0001$) and 3. Is accessible (SCC 0.67; $P < 0.0001$). For SFDP-26, the top three domains were 1. Learning Climate (SCC 0.62; $P < 0.0001$), 2. Communication of goals (SCC 0.54; $P < 0.0001$) and 3. Evaluation (SCC 0.52; $P < 0.0001$).

At the end of the study period, the CTEQ was adopted, and three free standing questions were added (Supplementary file 4).

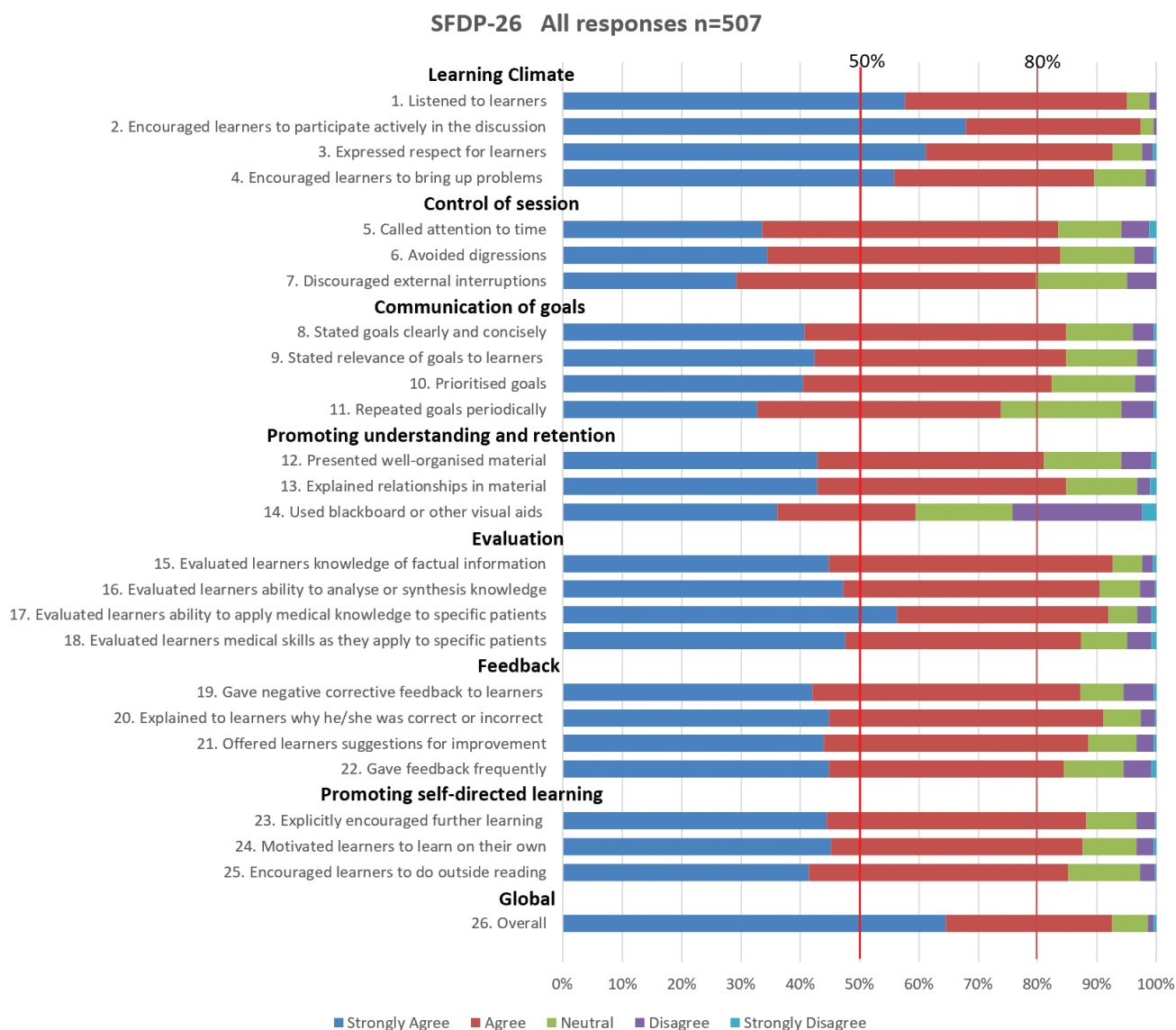


Fig. 6. Stacked bar charts of all 507 responses to the Stanford Faculty Development Program (SFDP-26). A total of 203 (40%) responses were about junior doctors and 304 (60%) about consultants.

Adaptation of validated questionnaires

The practical utilisation of both validated questionnaire in regular clinical settings is difficult using the median global scores (Table 1). For ease of interpretation, we used the visual representation of the Likert responses.

The Likert responses of both SFDP-26 and CTEQ fell into three patterns, strongly agree, agree and the rest (neutral, disagree and strongly disagree). We put these as Grade A, Grade B and Grade C, respectively. By analysing the complete dataset of SFDP-26, 40% of students strongly agreed with 21 of 26 (81%) of questions, and only 3 of 26 (12%) of questions attracted strongly agreed by 60% of students (Fig. 7). Fifty percent was used as a positive differentiating line. On the other side, 18/26

(69%) questions were judged Grade C (unsure, disagree or strongly disagree) by 10% of students, but 20% of students judged only 2/26 (8%) questions as Grade C. Twenty percent was taken as a negative differentiating line.

A total of 507 feedback forms were filled for 57 doctors (26 trainees and 31 consultants), that is 8.9 forms per doctor. Thus, to utilise the gradings above, a minimum of 10 forms is necessary.

If this grading was applied to Fig. 1 and assuming these were individuals, the junior doctors will be graded as Grade 1 because more than 50% of students strongly agreed with 19 of 26 (73%) questions, compared to consultants who only had 3 of 26 (12%) questions. Consultants will be graded as Grade 7 because more than 20% of

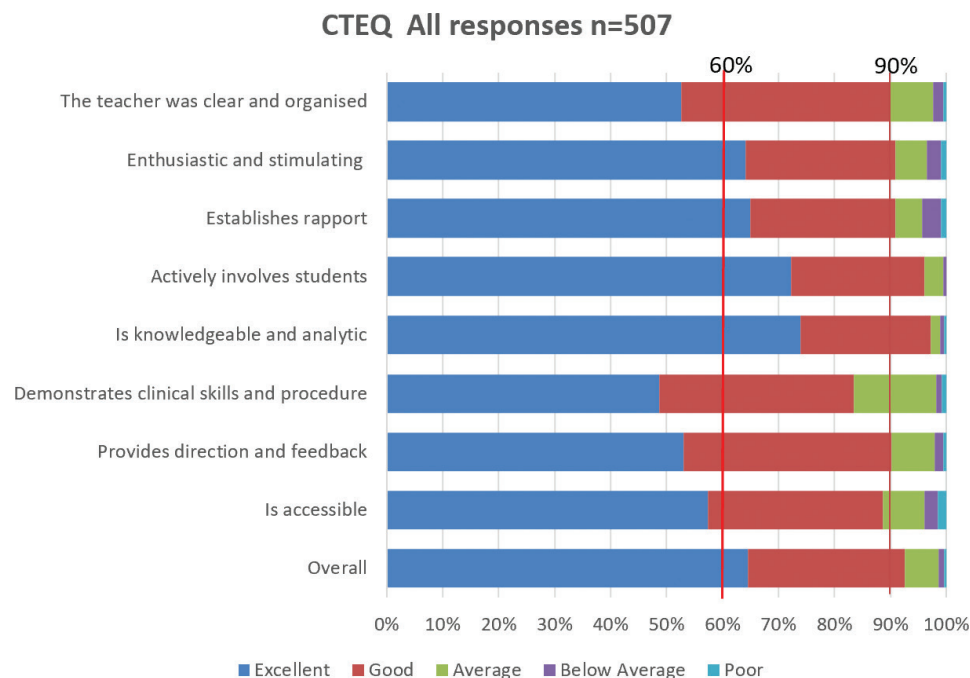


Fig. 7. Stacked bar charts of all 507 responses to the Clinical Teaching Effectiveness Questionnaire (CTEQ). A total of 203 (40%) responses were about junior doctors and 304 (60%) about consultants.

Table 2. Grading of SFDP-26 Likert responses for formative assessments

*Likert Grade	**No. of Questions (%)	***Proportion of Students (%)	Grade
A	≥66	≥50	1
A	50–65	≥50	2
A	≥50	≥50	3
C	≥10	≥20	
A	33–49	≥50	4
A	<33	≥50	5
A	<50	≥50	6
C	≥10	≥20	
C	10–32	≥20	7
C	33–49	≥20	8
C	≥50	≥20	9
C	≥10	≥50	10

*Five Likert scales merged into three, A = Excellent/Agree Strongly, B = Good/Agree and C = the other three responses. **Proportion of questions given the score in the left column. ***The proportion of students who marked the question as in column A.

students were unsure to strongly disagreed with 7 of 26 (27%) of questions, compared to trainees where 20% or more of students were unsure or strongly disagreed with only 1 of 27 (4%) of questions (Table 2).

In a similar fashion, a grading system was used for CTEQ, but the positive differentiating line was 60% and negative differentiating line was 10% (Fig. 7).

If this grading was applied to Fig. 2, the junior doctors will be graded as Grade 1 because 7 of 9 (77%) questions were scored A by more than 60% of students. Consultants will be graded as Grade 8 because 6 of 9 (33%) questions were graded as Grade C by more than 10% of students.

Discussion

The ACTF program was established to provide opportunities for trainees to teach within a structured program and develop teaching portfolios that met the five domains of core values of professional standards of medical educators [11]. The domains are teaching and supporting learners, assessment and feedback to learners, educational research and evidence-based practice, educational management and leadership, and designing and planning of learning activities. The ACTFs were embedded within the education firm structures of the hospital. They were additional to the existing teaching faculty, and thus they added to, and did not deprive students of any experienced tutors. The students were exposed to the junior doctors in equal measures as consultants, on a weekly basis.

Consultants or permanent teaching faculties have been used for almost all of the validated questionnaires in the literature, and students have been the assessors, including both SFDP-26 and CTEQ [12]. Both questionnaires had questions assessing teacher role, giving feedback (supervisor role), supporter role, planner role and overall teaching effectiveness [13]. SFDP-26 is primarily for

giving feedback and for promotion and tenure [9, 13], and CTEQ is for the evaluation of faculty development and annual performance review [10, 13].

The findings in this study (Table 1) are similar to that by Iblher et al. [2], which found that house officers teaching medical students in emergency medicine had statistically significant better ratings in six of the eight domains of SFDP-26: learning climate, control of session, evaluation, feedback, promoting self-directed learning and the overall teaching effectiveness [2]. In our study, trainees had significantly better ratings in seven of eight SFDP-26 domains, the exception being 'promoting self-directed learning'. Similarly, trainees had significantly better ratings in seven of nine CTEQ domains (Fig. 2), the exceptions being 'is knowledgeable and analytic' and 'provides direction and feedback'.

A similar outcome was reported by Rashid et al. [3] using non-validated questionnaire, and they found that 73.2% of students stated that junior doctors delivered teaching who were comparable to consultants. However, their study was limited in scope to revision package, and comparison with consultants was not contemporaneous [3]. Rodrigues et al. [1] found that teaching medical students a specific skill of prescribing by junior doctors did not significantly improve the students' mock examination, again, there was no comparison with consultants [1].

However, the effectiveness of trainees as teachers is not universal [14, 15]. In the paper by Owolabi et al. [15] using a 65-question Likert scale Stanford Faculty Development Program Questionnaire (SFDPQ), the residents did not reach an optimal goal, that is the level of strongly agree or agree, in any of the domains. This finding was replicated by Afzal et al. [14] where the trainees only reached the optimal point in one domain, giving feedback. Neither paper put forward any reasons for the poor performances of the trainees, and there were no comparisons to the teaching faculty to gauge the severity of their shortcomings, or if that was the norm [14, 15].

Many factors influence the generalisability of validated questionnaires, including settings, seniority of students and the specialties where the questionnaires originated [13]. SFDP-26 was validated in general medicine [9], and CTEQ in gynaecology [10]. In this study, both consultants and trainees were from surgical and medical specialties, and the students were undergoing teaching in integrated medical and surgical specialties. Using the global assessment of overall teaching effectiveness, questions 9 and 26 of CTEQ and SFDP-26, respectively, the pattern of distribution of answers was similar between third- and fifth-year students (Fig. 3). Both groups were more favourable to trainees than consultants. The teaching environments, bedside or tutorials, did not make a difference to the distribution of responses to the questionnaires.

The effectiveness of trainees as teachers could be because their teaching is different from consultants or faculty, in that they tend to teach different things – bedside skills and patient management rather than factual knowledge [16]. Trainees are close enough to the students to understand the optimal approach for them to learn, and they are 'consciously competent' that they still can deconstruct performance on a clinical task and articulate the detailed steps to facilitate learning by novices and advanced beginners [16].

Intuitively, consultants are expected to have greater expertise and more knowledge than their trainees, but these findings and other studies show that there is more to teaching than expertise and knowledge [2, 17]. How knowledge of a teacher is assessed by a student is difficult, as is seen in this study that showed an equal distribution of responses for both groups in answer to question 5 of CTEQ, 'Is knowledgeable and analytic' (Fig. 2). In the original validation, 'is knowledgeable and analytic' correlated the least with the overall teaching effectiveness at 0.63 [10], and in our study, the correlation was similar (SCC 0.61; $P < 0.0001$).

In SFDP-26, the teacher's knowledge is subsumed in the domain, 'promoting self-directed learning' (questions 23–25) because students do not systematically distinguish between a teacher's fund of knowledge and how the teacher stimulates both learner's motivation and use of resources [9]. They went onto conclude that one important aspect of an effective teacher–learner partnership may not be so much providing factual information as it is providing an approach to learner's questions that allows learners to discover answers on their own [9].

In a qualitative analysis of written comments, young faculty tended to be more enthusiastic, convey greater enjoyment of teaching and relate well with trainees [17]. Excellent teaching transcends ordinary teaching, and it is characterised by inspiring, supporting, actively involving and communicating with students [18]. What makes a great teacher may depend less on acquisition of cognitive skills such as medical knowledge and formulating learning objectives, and more on inherent, relationship based, noncognitive attributes [18]. This preference for non-cognitive skills over knowledge is seen with the better ratings of general physicians than subspecialists, in a medical ward, using a validated questionnaire. In the qualitative part, non-specialist physicians received specific comments about their enthusiasm for teaching, ability to create a good learning climate, use of evidence-based medicine and rapport with patients and other team members [17]. In a review of 21 validated questionnaires, which included the two in this study, 14 domains of effective teaching were identified, and these did not include the knowledge base of teachers, but they included interpersonal and clinical teaching skills [12].

In this current study, the top three domains of CTEQ that correlated with the overall teaching effectiveness were 'enthusiastic and stimulating', 'establishes rapport' and 'is accessible', and the most correlated of SFDP-26 was 'learning climate'. From our findings and from the discussion earlier, one may argue that they explain why 30% of students were neutral, disagreed or strongly disagreed that consultants were essential to their clinical program (Fig. 5). However, this cannot be the entire reasons, as the responses to the feedbacks were skewed towards excellent/good, strongly agree/agree for both groups. There must be other reasons for this, and it needs further qualitative studies.

Overall, the trainees in this study were rated better than consultants by medical students. This study set out to evaluate if the ACTFs were as effective as clinical teachers as consultants, the main source of clinical training in the United Kingdom. It is arguable that this study had an inbuilt bias. Consultant teaching staff are unselected, and teaching is an expected part of their clinical and professional roles. Most clinical teachers have not been trained to teach [19]. On the other hand, the ACTFs were self-selected trainees interested in teaching and arguably more motivated. The 2-hour of teaching per week was over and above their clinical commitments, and quite a few of the trainees did their teaching sessions after their contracted hours. Motivation to teach predicted a student-centred teaching approach, and it is of paramount importance for promoting an adequate learning environment [20]. The bias notwithstanding, motivated trainees are effective clinical teachers of medical students.

A secondary objective of this study was the adaptation of the validated questionnaires for the purpose of trainee feedback. Effective feedback needs to meet three principles: a carefully designed evaluating system based on a validated quality assessment instrument, providing feedback that is useful for learning and creating acceptability of the evaluation system [21]. A useful feedback for learning needs to be honest, informative, recognisable and understandable, and it should invite reflection and decision-making [21].

CTEQ is used for faculty development, administrative decision-making and academic promotions, and faculty members and residents are given mean scores for each domain and for the overall clinical teaching effectiveness [10]. We adopted the CTEQ and used it as described, and in the format given to the trainees, a comparative overall score with their peers was given, as well as texts by the students, to aid formative assessments (Supplementary file 4). In the example, the ACTF was below the median overall score of the group. Whilst this gives a measure of position within a group, the domain scores are difficult to utilise in giving meaningful feedback.

The distribution of the responses was heavily skewed, and essentially, there were only three outcomes: excellent/strongly agree, good/agree and others, average/unsure, etc., and the two commonest responses were the first two. One can hardly say that a good teacher is average or poor. Similarly, the differences in the median scores for all domains of SFDP-26 were at most two in three domains (Learning Climate, Communication of goals and Evaluation) and one in three domains (Promoting understanding and retention, Feedback and promoting self-directed learning), and in two domains, the medians were equal (Control of sessions and the Global teaching effectiveness) (Table 1). Despite the closeness of the scores, the differences were all statistically significant except for promoting self-directed learning. Although this is useful as a research tool, it does not readily open itself as a focus of meaningful feedback to the individual.

When all 507 SFDP-26 and CTEQ responses are plotted as stacked bar charts (Figs. 6 and 7), a grading system was devised (Table 2). Grades 1–6 can only be for formative assessments and feedback as they are about the relative distribution of Strongly Agreed/Excellent and Agreed/Good compared to the database. Grades 7–10 can be used for summative assessments because if a large number of students are unsure or disagree about a large proportion of statements about someone's teaching, then there is a measurable cause for concern that is not apparent when comparing medians. In this study, more than 20% of students were unsure or disagreed with over a quarter of SFDP-26 questions of consultants compared to only 4% of questions of trainees. Owolabi et al. [15] using SFDPQ found that students were unsure of or disagreed with all domains whilst assessing junior doctors, and it was a similar finding in all but one domain by Afzal et al. [14].

To give structure to any teaching program, the formation of an academy of trained medical educators is important [22]. It enhances the quality of teaching by taking specific steps, such as establishing support, systematic documentation of teaching activities, prioritising educational activities, teaching performance assessment, effective feedback process, identifying areas for improvement and re-evaluation of career pathways, and ideally this should start at undergraduate level [22, 23]. Hierarchical social settings allow patient care and research to be prioritised above teaching [19], and in the absence of formal faculty development, clinical teachers are likely to continue learning how to teach on the job.

The ACTF program described in this paper formalises the teaching role of trainees, in order to provide a platform where they receive recognition and guidance on teaching skills. Our results support the findings of other studies that trainees are capable of delivering effective teaching to medical students and are not deemed to be

less proficient than consultants. Although the differences in the scores between consultants and trainee teaching and the perception of their respective usefulness to students need further qualitative studies, we have found the teaching by trainee doctors within a structured program to be a useful and well-received component of undergraduate teaching.

A similar program to the IAT [7] is needed for clinical educationalists with 10% of their time protected from clinical work. A structured program like the ACTF will be central, and it could feed into membership or fellowship of Academy of Medical Educators after fulfilling some defined criteria. Pathways for further developments could be fulltime teaching fellowships or higher medical education degrees. The ACTF program is adaptable to any settings.

Conclusion

Trainees are effective clinical teachers of medical students, and being part of the teaching structure of a hospital is beneficial to students, as almost near-peer mentors, and beneficial to the trainees in developing educational portfolios. A program like the ACTF allows for early experiences in teaching to be based on pedagogic principles. To embed such programs in the culture of junior doctors' training, it would need the same protection given to academic trainees such as the IAT, the flagship scheme of the NIHR, United Kingdom.

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The authors report no conflict of interest. There was no funding for this study.

Online only files

Supplementary file 1
Supplementary file 2
Supplementary file 3
Supplementary file 4

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