

# Quality improvement education for medical students: a near-peer pilot study

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## Research article

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## Abstract

Background Quality improvement (QI) is an essential component of modern clinical practice. Front-line professionals offer valuable perspectives on areas for improvement and are motivated to deliver change. In the UK, all junior doctors are expected to participate in QI in order to advance to the next stage of their training. However, UK undergraduates receive no standardized training in QI methodology. This is perpetuated within medical schools by a lack of teaching capacity and competing priorities, and may lead to tokenistic engagement with future QI projects.

Methods We describe a near-peer teaching programme designed to introduce students to QI methodology. This programme was conceived and delivered in full by junior doctors and used existing resources to ensure high quality teaching content. 111 fifth-year medical students from the University of Cambridge were taught in interactive, participative workshops that encourage them to develop their own QI change ideas and projects. Core topics included the model for improvement, driver diagrams, stakeholder engagement, measurement for improvement and analysing and presenting data. Students completed surveys before and immediately after this intervention to assess their understanding of and confidence in utilizing QI methodology. Questionnaires were also completed by junior doctor tutors.

Results Analysis of questionnaires completed before and immediately after the intervention revealed statistically significant improvements in students' self-reported understanding of QI ( $p < 0.05$ ) and confidence in applying techniques to their own work ( $p < 0.05$ ). Students expressed a preference for QI teaching delivered by junior doctors, citing a relaxed learning environment and greater relevance to their stage of training. Tutors reported increased confidence in using QI techniques and a greater willingness to engage with QI in future.

Conclusions In this single-centre study, near-peer teaching produced significant improvements in students' self-reported understanding of QI and confidence in applying QI methodology. Near-peer teaching may constitute a sustainable means of teaching essential QI skills at undergraduate level. Future work must evaluate objective measures of student engagement with and competence in conducting QI.

## Background

Quality improvement (QI) is increasingly viewed as a crucial part of medical education, equipping junior doctors with the skills to enhance patient experience and outcomes, improve population health, and reduce per capita cost of healthcare (1). Medical students and junior doctors (practising doctors who have not yet completed specialist postgraduate training) have unique insights into the problems and opportunities within their organisations and how these might be met. However, many doctors fail to complete mandatory QI projects during their training (2), citing poor knowledge of methodology (3). This is unsurprising given the lack of standardized and universal undergraduate QI teaching at UK medical schools (4).

QI teaching in universities is hampered by competing priorities within medical curricula and a lack of faculty teaching capacity (4, 5). Theory-based teaching from 'senior QI experts' can seem irrelevant and insignificant when compared to the major priority of students and educators—developing the clinical knowledge and skills needed to succeed as a doctor. Students may not understand why QI should be a priority or how they can have an impact as architects of change.

Near-peer teaching - delivered by tutors who are close to students in terms of training and experience - offers advantages over traditional senior led teaching. Taught material can seem more applicable and relevant to students (6) and rolling models for student development into tutors can create sustainable teaching programmes (7). Tutors also benefit by developing teaching skills and consolidating their own knowledge (8). Quality assurance is an important consideration in these programmes, and development of teaching materials and oversight by senior clinicians and educators is recommended (9).

## Method

In order to address the unmet needs of undergraduate students, we developed a model in which junior doctors delivered near-peer QI workshops to fifth-year medical students at the University of Cambridge. We sought formal, structured written feedback from students and tutors with a view to improving subsequent iterations.

A three-hour QI workshop was developed by three Academic Foundation Trainee (AFT) doctors in their second year of postgraduate training, after attending QI workshops hosted by staff at Imperial College Healthcare NHS Trust (ICHT). The workshop was based on 'Tools for Change' resources designed by the ICHT QI team. These included electronic slides and resources to support basic practical exercises, such as playing cards and flipcharts. Interactivity and early career relevance were prioritized, with didactic teaching interspersed with activities designed to develop students' QI skills. All 276 fifth year students were invited to attend the workshops by senior faculty members at the medical school. These students had previously received formal training in basic plan-do-study-act (PDSA) cycles from senior members of University staff. Students were encouraged to bring change ideas to the workshops. Topics covered during the session are shown in Figure 1.

Figure 1

Teaching was delivered by 8 junior doctors, each with 1–5 years of postgraduate experience. All tutors had direct experience of participation in audit and QI projects and had either attended QI teaching sessions at ICHT or received training from the three AFT doctors piloting the initiative. Tutors were recruited from amongst the personal and professional networks of the three doctors designing the session. Tutors were encouraged to draw on their own experiences to deliver practical advice alongside theoretical concepts. In January 2019, 49 students were taught in two simultaneous workshops run by three junior doctors. In March, a further 62 students were divided into six groups and taught by seven junior doctors.

Students in both cohorts completed electronic pre- and post-workshop questionnaires which evaluated perceived usefulness and content of the workshops and invited suggestions for improvement. Questions relating to student confidence incorporated categorical Likert scales. Students were also invited to enter free-text responses to provide a more rounded assessment of their experience.

The workshops and evaluations were discussed in advance with, and supervised by, the senior doctor responsible for the delivery of the leadership and management curriculum and a member of the University of Cambridge Research Ethics Committee (REC). The ethical implications of the project were considered, and we received the opinion that a formal REC review was not required for this educational evaluation. Consent for the publication of anonymised, aggregated data from the evaluation was obtained from all students via the electronic questionnaires. Consent was withheld by one student whose data has been removed from the analysis.

## Results

Pre-session questionnaires were completed by 99/111 students (89%). Post-questionnaire responses were completed by 84/111 attendees (76%). Likert scales (rated 1 to 5 for 'No confidence' to 'Very confident') were analysed for significance using the Mann Whitney U test, with the null hypothesis of no increase in student confidence following the teaching session.

## Student Understanding of QI and Confidence in Using QI Techniques

Confidence in understanding of QI techniques increased following teaching ( $p < 0.05$ ), with mean Likert scores for the question 'How confident are you in your understanding of what QI is?' rising from 2.8 to 4.4 (Figure 2). Following the session, 98% of students reported being 'Fairly confident' or 'Very confident' in their understanding of QI.

Figure 2

Confidence in applying QI techniques also increased following teaching ( $< 0.05$ ), with mean Likert scores for the question 'How confident are you in applying QI techniques to your own project?' increasing from 2.3 to 4.1 (Figure 3). 93% of students reported being 'Fairly confident' or 'Very confident' in response to this question.

Figure 3

## Student Feedback

Only one third of students recalled any previous formal QI teaching. Students' prior expectations focused on gaining an understanding of QI, including how to practically carry projects out and how to fit them into their careers. Following the teaching, 81% said that the workshop would be a useful addition to their curriculum.

Students highlighted several positive factors, including the interactive teaching style, the licence for students to develop their own projects, and the mix of didactic teaching and group-based activities. Students suggested that the session could be shortened (though feedback was mixed with some requesting longer workshops) and positioned earlier within the medical school curriculum to enable early engagement with QI. Detail deemed to be superfluous by students attending the first session—such as the creation of Statistical Process Control charts—was removed before the second.

## Student Perceptions of Near-peer Teaching

Students were positive about being taught by junior doctors. 86% expressed a preference for being taught by junior doctors over 'senior QI experts' (Figure 4). Detailed feedback from students revealed that this preference was underpinned by the proximity of junior doctors to undergraduate level and greater appreciation of the relevance of quality improvement to students. Other reasons cited by students included near-peer tutors being 'more relatable', approachable and 'less daunting' and tutors' recent first-hand experiences of participation in QI within routine clinical practice. Some students commented that a mixture of junior doctors and 'senior experts' may be helpful when it came learning about and applying advanced QI techniques specific to their own projects.

Figure 4

## Tutor Feedback

The junior doctors who delivered the sessions unanimously agreed that participation in this programme had improved their confidence in teaching and their knowledge of QI techniques; that following these sessions they would be more likely to engage in and initiate QI initiatives; and that it would be beneficial for junior doctors to regularly engage in QI teaching. Tutors—all with prior experience of teaching medical students in clinical and non-clinical settings—also reported high levels of student engagement with this project.

## Discussion

This pilot project was well received by students, tutors and educators at the University. Analysis of pre- and post-workshop questionnaires completed by students demonstrated significant improvements in students' self-reported understanding of QI methodology and confidence in applying this to their own work. Students valued the interactivity and direct application of QI methodology to their own projects, with 86% expressing a preference for near-peer teaching, citing increased relevance to their stage of learning. Adapting established QI teaching resources and upskilling junior trainees through attendance at Trust QI workshops or through peer-to-peer teaching mitigated against significant change in teaching quality.

Junior doctors also benefited from involvement. Opportunities to develop skills in QI, teaching and leadership are valued alongside clinical skills as part of the post-graduate curriculum. Foundation doctors in particular are 'expected to acquire and develop the skills needed to deliver teaching and mentoring effectively' (10). The initiative encouraged development of both teaching and QI capability amongst trainees involved. The steady supply of motivated junior doctors at teaching hospitals across the UK suggests that this approach could be made sustainable.

This work would have been strengthened by repeat workshops and follow-up at 6–12 months to determine if improvements in subjective measures of student confidence were retained in the long-term. Similarly, evidence of behaviour change—such as subsequent improvements in student engagement with QI projects—would add weight to our approach. Unfortunately, our evaluation could not be extended due to limited resources and the academic and clinical commitments of tutors and organisers. This study is also limited by its single-centre setting; further work must be performed to validate near-peer QI teaching in other medical schools. Nonetheless, our approach has been endorsed by senior faculty members at the University of Cambridge, who have formally incorporated near-peer QI teaching into the undergraduate curriculum.

Near-peer workshops can provide students with an understanding of key skills relevant to their future careers and confidence in pursuing QI projects that form a compulsory component of post-graduate training. They can simultaneously provide teaching opportunities for junior doctors and ease pressures on overburdened University staff. Standards can be maintained by using materials developed by senior staff. Teaching should be introduced early in the medical curriculum to provide students with sufficient time to practise QI in a supported environment. Ongoing support with multiple workshops, named tutors and links to organisational QI within larger Teaching Hospitals would help to sustain student interest in and engagement with QI. Medical schools and curriculum designers can encourage efforts by incorporating QI into clinical placements and incentivizing participation.

## Conclusion

Engaging students in QI activities can be difficult, with competing educational priorities and a perception of difficulty in combining QI projects with clinical work. Given their involvement in compulsory QI projects, junior doctors are well placed to deliver relevant training, and will benefit by gaining teaching and leadership experience. We propose this well-received pilot of near-peer teaching as a model for undergraduate training in the UK.

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## Declarations

### Ethics Approval and Consent to Participate

The workshops and evaluations were discussed in advance with, and supervised by, the senior doctor responsible for the delivery of the leadership and management curriculum and a member of the University of Cambridge Research Ethics Committee (REC). The ethical implications of the project were considered, and we received the opinion that a formal REC review was not required for this educational evaluation.

The teaching course was advertised to participants through their course administrators. Students attended teaching workshops voluntarily, during which they were asked to complete an electronic questionnaire. This asked for consent for their anonymised, aggregated data to be used in an evaluation.

### **Consent for Publication**

Consent for the publication of anonymised, aggregated data from the evaluation was obtained from all students via electronic questionnaires. Consent was withheld by one student whose data has been removed from the analysis.

### **Availability of data and materials**

With the exception of data pertaining to one student who withheld consent for publication, all data generated during this study are included in the published article.

### **Competing interests – none declared**

### **Funding**

This study used materials developed by the Quality Improvement Team at Imperial College Healthcare NHS Trust. This study received no internal or external funding and all near-peer tutors participated in a voluntary capacity.

### **Authors' contribution**

EM, CC and MF conceived the teaching programme, adapted existing materials for use with medical students, and arranged and delivered the teaching sessions. MF wrote the first draft. CC, EM and RK reviewed and amended the draft. All authors have read and approved the manuscript.

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## **List Of Abbreviations**

AFT – Academic Foundation Trainee

ICHT – Imperial College Healthcare NHS Trust

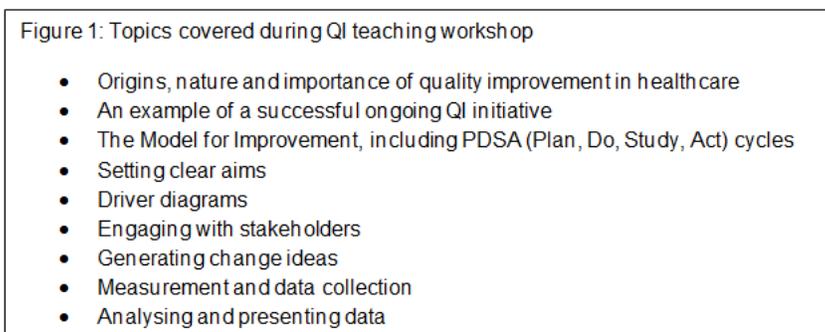
PDSA – plan-do-study-act

QI – quality improvement

REC – Research Ethics Committee

UK – United Kingdom

## **Figures**



**Figure 1**

Topics Covered in QI Near-Peer Teaching Workshop

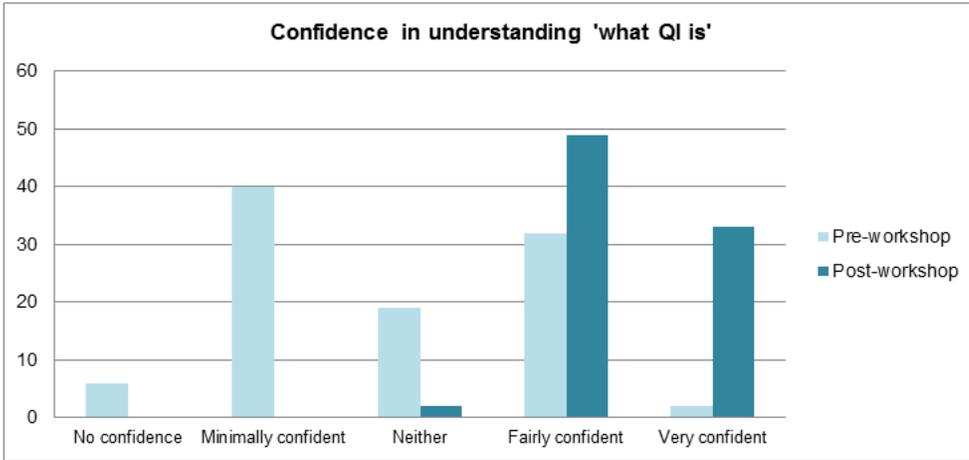


Figure 2

Students Understanding of QI

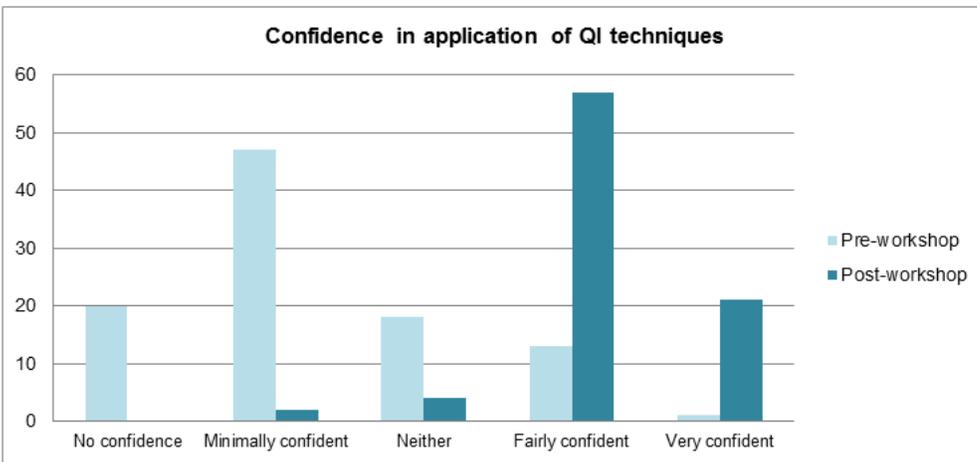


Figure 3

Students Confidence in Applying QI Methods

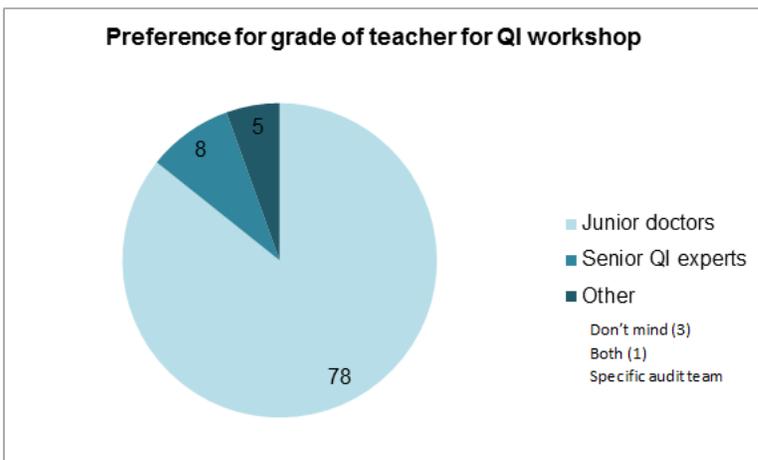


Figure 4

Student Preferences for Teacher Type