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Medical students as agents of change: a qualitative exploratory study

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ABSTRACT

Background There is evidence that medical students have the potential to actively initiate, lead and bring about change through quality improvement within healthcare organisations. For effective change to occur, it is important that students are introduced to, and exposed to the value and necessity of quality improvement early in their careers. The aim of this study was to explore the perspectives and experiences of medical students and their mentors after undertaking quality improvement projects within the healthcare setting, and if such practice-based experiences were an effective way of building improvement capacity and changing practice.

Methods A qualitative interpretive description methodology, using focus groups with medical students and semi-structured interviews with academic and clinical mentors following completion of students' 4-week quality improvement projects was adopted.

Results The findings indicate that there are a range of facilitators and barriers to undertaking and completing quality improvement projects in the clinical setting, such as time-scales, differing perspectives, roles and responsibilities between students and multidisciplinary healthcare professionals.

Conclusions This study has demonstrated that quality improvement experiential learning can develop knowledge and skills among medical students and transform attitudes towards quality improvement. Furthermore, it can also have a positive impact on clinical staff and healthcare organisations. Despite inherent challenges, undertaking quality improvement projects in clinical practice enhances knowledge, understanding and skills, and allows medical students to see themselves as important influencers of change as future doctors.

INTRODUCTION

Batalden and Davidoff have suggested that, '*healthcare will not realise its full potential unless change making becomes an intrinsic part of everyone's job, every day, in all parts of the system*'.[1] Students have the potential to contribute actively to quality improvement (QI) in healthcare by initiating, leading and bringing about change within organisations.[2] Although a growing body of literature advocates the importance of embedding QI throughout undergraduate medical programmes,[3 4] there is currently little understanding about the best educational methods for achieving this. In contrast to traditional teaching styles, where QI is introduced in the standard classroom curriculum, there is growing interest in whether immersing students in QI projects within real-world health settings can help to foster individual learning and wider organisational change.[5]

Within the University of Dundee (UoD), Scotland, as part of the undergraduate curriculum, all students complete student selected components (SSC), as required by the UK General Medical Council.[6] The UoD gives second-year, third-year and fifth-year medical students the opportunity to complete the Institute for Healthcare Improvement Open School Practicum as one of their SSC options (an online course which takes health professionals and students through the process of conducting a local QI project).[7] Students complete their SSCs in 4-week blocks and work on a project in groups. They are supported by academic and clinical mentors to plan, conduct and evaluate an improvement project within a clinical setting and with a multidisciplinary team. Improvement work is identified through a network of consultants, clinical teams and the Patient Safety Team within NHS Tayside. Students submit their work to IHI, who award the IHI Improvement Practicum Certificate for satisfactory projects. In addition, the academic mentors complete a structured SSC assessment for each student on their presentation, which is delivered to the clinical team that focuses on the application of QI methods, team work and feedback from the clinical mentor. The success of the SSCs is evidenced by the publication of previous student projects.[8–10] Prior to undertaking their projects, students have already completed core classroom and simulation teaching on aspects of healthcare improvement in years 1 and 2 to set the scene for this work (table 1).

This paper shares the findings from a qualitative evaluation of this educational innovation to support undergraduate medical students to become change agents. It aimed to explore the barriers and facilitator for students completing their improvement project, how supervision supports students to become change agents and how hosting

Table 1 Dundee MBChB core curriculum components in healthcare improvement for years 1 and 2

Year	Curriculum content on healthcare improvement	Hours
1	Interprofessional education with nursing students on team working	3
1	Interprofessional education with nursing student on patient safety and person centredness	2
1	Introduction to human factors and systems engineering	2
1	Principles of safe medical practice: infection control; vital signs; communication; human factors; deteriorating patient	10
1	Application of systems thinking and non-technical skills to a clinical case	2
1	Reflective case discussion on General Medical Council outcomes for doctor as professional	2
2	Application of systems thinking to a long-term conditions	1
2	Application of decision making to long-term conditions	2
2	Family centred care	2
2	Reflective case discussion on General Medical Council outcomes for doctor as professional	2

student improvement projects may facilitate organisational change.[7]

METHODS

Study design and sample

Adopting a qualitative interpretive description methodology,[11] we conducted focus groups with medical students and semi-structured interviews with academic and clinical mentors following completion of students' 4-week QI SSCs. We purposively sampled medical students (second/third and fifth year) who had completed their 4-week QI projects within a single teaching acute hospital as well as the academic and clinical mentors. Potential participants were contacted by email, provided with written information about the study. All those who expressed an interest were included in the study.

Data collection

Two focus groups with 14 medical students were conducted, each lasted approximately 1–2 hours. Seven academic and clinical mentors took part in individual semi-structured interviews, either face-to-face or by telephone.[12] An experienced qualitative researcher who had no prior connection to the students or input into the curriculum collected all data. Informed consent, privacy and confidentiality of participants aligned with the UoD research ethics committee.

Data analysis

The focus groups and interviews were audio-recorded, transcribed verbatim and thematically analysed using an inductive qualitative data analysis framework.[13] This involved familiarisation with the data, development of a thematic framework, indexing data, devising a series of thematic charts and mapping and interpreting of data. NVivo 10 was used to facilitate an accurate, reliable and transparent data analysis process.[14] Trustworthiness and rigour is demonstrated through four constructs: credibility, transferability, dependability and confirmability.[15]

RESULTS

Eight second-year and third-year medical students, six fifth-year medical students, two academic mentors and five clinical mentors took part in the study. The students were involved in one of six improvement projects (table 2). All three of the year 2 and 3 projects were in anaesthetics and theatres and supported by the Head of Nursing and General Manager, which enabled follow-up about the changes at 6 months. Reports for each project are available on the IHI Open School Completed Practicum Projects website.[16]

The clinical mentors were senior medical staff and the academic mentors were experienced teaching staff with curriculum roles in QI. Participant's perspectives on medical students becoming change agents included barriers, facilitators and potential impact of the QI SSCs were categorised under three main inductively derived themes: 'time and the QI process', 'being a student versus being a change agent' and 'impact: now and in the future'.

Time and the QI process

Students described feeling challenged by the timescale they were allocated to identity a suitable project, implement a change and carry out an evaluation. Concerns included having insufficient time to familiarise themselves with their project, the clinical environment, learn the QI methodology they were adopting and implement meaningful change:

> Student 3: I don't think four weeks is long enough, because you can collect the data, you can identify changes that you want to make, you can't, I don't think that it's long enough to actually see any improvement that you've made, and certainly not enough with the IHI module, you had to do, make two changes and then monitor like, well like sort of collect data on improvements onto separate changes and I just don't think you can do that properly in four weeks. (Year 2/3)

In contrast, most clinical mentors believed the 4-week timescale encouraged students to stay focused and committed to addressing only one single clinical element, rather than '*solving everything*'.

Table 2 Improvement project titles with summary of changes and results

Project title	Summary of changes and results
April 2016, year 5 students in three teams	**End of project data**
1. Improving the management and satisfaction of medical and surgical boarded patients in the ear nose and throat wards (three students)	Patient experience and satisfaction survey and interviews were used to design and test a patient information card. Ward staff committed to ensure they are giving out these information cards to all boarders.
2. Using patient engagement to improve thromboembolism-deterrent (TED) stocking compliance in the acute surgical receiving unit (two students)	Designed and tested a data collection tool and education sheet for patients with TED stockings. Use of TED stockings at 48–72 hours postsurgery improved from 60% to 70%.
3. Venous thromboembolism prophylaxis and patient understanding in a medical ward (three students)	Designed and tested a patient information leaflet; introduced reminders at daily patient safety briefs. Patients receiving information improved from 30% to 50%.
May 2016, year 2 or 3 students in three teams	**Changes after 6 months**
1. Improving compliance with the sign in section of the WHO surgical checklist (three students)	Designed and tested posters in the anaesthetic room, a 'bundle' of all relevant documents and sticker reminders about the WHO checklist. Compliance with sign in improved from 30% to 80%. Changes maintained by theatre team.
2. Improving the monitoring of endotracheal and laryngeal cuff pressures (two students)	Introduced manometers into the West Block theatres, initiated a staff training programme and designed a reminder and information sheet for display in each theatre. Median compliance with pressure monitoring increased from 33% to 90%. Changes maintained by West Theatre team.
3. Improving the emergency theatre safety brief (three students)	Designed and tested a structured prompt to improve reliability with 10 items in the preoperative safety brief (SAFEST-TEAM). Median occurrence of safety briefs increased from 50% to 100% and material covered increased from 36% to 58%. Structured prompt maintained by emergency theatre team.

SAFEST-TEAM, Surgical summary; Anaesthetic summary; Fluids/fasting; Exposure/patient position; Sugars/diabetic control; Transfusion requirement/estimated blood loss; Thromboprophylaxis; Equipment check; Allergies; Microbiology—antibiotics required?

Clinical mentors suggested that a lack of confidence (rather than time) was an issue, particularly being in an unfamiliar environment. Clinical mentors described students feeling overwhelmed and taking time to settle in and stated that students with a good understanding of QI started their projects quickly and made good progress. The learning resources were useful in engaging students from the outset, which clinical mentors suggested mitigated initial concerns about time:

> CM4: Some of the students have had an opportunity to engage or undertake some of the modules from the IHI open school. This means they are certainly more up to speed and able to grasp some of the basics much quicker, and they're able to deliver and participate in the QI project at a much quicker pace than the students that haven't had that exposure before.

Many students, particularly those in year 5, echoed these comments about the learning resources, finding them a helpful source of QI information.

> Student 5: The fact that I actually had a reason to do it (IHI modules), and it was actually helping me, I realised it was helping then I actually did pay attention to it. I got something from it, so yeah it was worthwhile in the end. (Year 5)

One of the clinical mentors suggested that perceptions about QI work being too time-consuming were the product of wider cultural misconceptions in the organisation and stressed the importance of challenging these beliefs early in medical students' education:

> CM 1: Time is not the factor, because people tend to believe that measurement takes time, but measurement doesn't take time, you can measure yourself in five min, you measure your system process in probably half an hour. […] It is difficult for them (students) to lead themselves […] that's again a culture change, that how can you embrace the most junior member of your team and empower them to do things.

Several clinical and academic mentors noted that being supportive and providing clear and comprehensive guidance in a timely manner was key in ensuring students could complete their projects effectively and on time.

Being a student versus being a change agent

Several students felt a tension between 'being a student' and 'being an agent of change'. There was sometimes a disconnect between what students needed academically and had identified as being problematic during the data collection phase of their QI process, and what their

clinical mentors and teams identified as a problem. Many students did not feel they had the experience or credibility to challenge and influence decisions, especially when it was driven by their mentors:

> Student 1: […] I think to begin with we definitely were going more for what our clinical supervisor wanted. And we wrote down a list of everything they wanted and we started creating that and we started working on that and like creating all different tools and sending them to them and saying 'is this questionnaire good or shall we change it?' and then week two we've suddenly realised that all that we've been doing and what they want wasn't fitting […] and that's when we had to modify what we were doing clinically to fit into what we actually had to submit to get our grade. (Year 2/3)

Students stated that the clinical teams were more willing to be involved and engage with the project and them, if the team believed the project to be worthwhile. Other students stated that they were viewed as '*only medical students*' and believed clinical staff did not recognise them as credible change agents. As a result, some students found it challenging to gain staff support and 'buy-in', which impacted on the success of their project:

> Student 4: If you are anything less than fourth year, I don't think the nurses would even entertain the idea that you're going to try to do anything. You're never going to get people working with you, you're never going to get the full support of the staff, whereas at the end of the day they want to get their job done, they're not wanting a student to come along and tell them what to do. (Year 5)

Some clinical mentors maintained that students' perceptions about 'only being a student', and their self-doubt around their ability and efficacy as leaders and change agents were often unfounded. Mentors explained that staff within a clinical environment may have established assumptions about certain practices, and it is not until a student observes those practices for their project that they identify problems which have been overlooked:

> CM2: Quite often they come up with ideas as to how they think they could tweak something to make it and that maybe we hadn't realised was going to become an issue during it. So sometimes we assume certain things are happening and then because they are kind of observers and people revert to their own behaviour, being watched by people they don't realise they are being watched. They (the student) pick up on that actually maybe they are not doing checks that we thought they were doing or maybe a piece of equipment isn't being used as much as we thought it was.

In contrast to the students' self-doubt, most clinical mentors asserted that clinical staff perceive the student to be a valuable part of the team during the period of their SSC.

It was evident that successful completion of projects and making improvements was a two-way process. Some clinical mentors reiterated that although it was crucial that they, and the clinical staff supported and guided the students throughout the process, it was equally important that students themselves, were self-motivated and engaged.

> CM2: It depends particularly on the individual students as well. Yes, I think there's a certain amount of independence they need for this kind of work which can be quite different to other areas of medicine which can be more spoon-fed than set in stone as to exactly what you are going to do. … the whole point really for improvement work is it does change, and it evolves and changes in the cycles of what they are doing. So they are kind of driving these cycles and we can't always predict exactly what is going to happen.

Impact: now and in the future

Although students articulated challenges implementing significant change, both because of time and their levels of influence, all felt satisfied and proud that they had accomplished some immediate improvements (however small) or had identified where improvements could be made in the future.

> Student 6: I think it's because we were able to see that just a tiny change could make a big difference, because I was trying to think initially like oh what can we do that would make this real improvement that we need, and I was just thinking we've only got four weeks, we can't come up, you can't change a like whole system in, you know, so that's why we thought we'll just make a couple o' changes see how they go, and change them if they don't work, go back to how they were and think of something else. (Year 5)

> Student 14: to be a part of the different ways you might help improve it for others, it turned out a lot better than I thought it would as well. (Year 2/3)

Clinical mentors recognised students as actively contributing to and impacting positively on the clinical environment:

> CM5: I think that particularly our nursing team have valued having them (QI projects) done and I suppose it's the way we've introduced it to them in that they're getting something out of the project as well. […] So yes, it's nice to have a student to come up with some ideas. Our particular department are actually quite good at engaging with students, we're quite small, we're like a family in a sense as we all know each other because of scale.

Students who had been able to make improvements were keen to publish their work, which could help with developments being sustained, or improved on. Clinical

mentors acknowledged that impact was not always easy to disseminate and suggested that more could be done to demonstrate to clinical teams and organisations the range and impact of the work being undertaken. To increase the impact for and on the organisation, student projects need to be coordinated more strategically:

> CM 5: They hopefully get quite a process that they can keep using in their medical careers. As to the really big changes made on the basis of the student projects, I would think it has a fairly low impact. Maybe lots of low impacts around an organisation means you just don't see it and maybe there's an unseen impact that is going on that I'm not aware of through those projects, but there's probably not enough of them and there's not a way of coordinating what they are doing and how that can actually be showcased as, for example, 'Look at what they're doing in cardiology. Why doesn't everybody do that?'

To raise students' status as change agents and to stimulate wider impact, the projects need to be publicised to senior staff outside of the immediate clinical teams. While there were some examples of this systematic, coordinated approach in place, it was not always consistent:

> CM 4: They are not just doing it as a project because they're students, this is something that the organisation has invested a lot of time and effort in and they're actually helping us deliver it as part of the global strategic picture for the organisation… sometimes people see it as students coming in to do a project so they don't really buy into it and just see it as another student coming in and doing another project for four weeks and then going away. Whereas if we say that this is actually helping a locally driven project by the organisation and the students are only supporting it for four weeks but it's here to stay and somebody else will be taking over in due course—sometimes it's a junior doctor that actually takes over or a junior pharmacist—and explain that a member of the front-line team will be taking over from the initial implementation by the students.

Going beyond the immediate clinical impact of the projects, the students also reflected on the impact that the experience had on their professional development, and thus the future of QI in the National Health Service:

> Student 4: I never would have pictured myself, I mean especially at the beginning, I would never have pictured myself saying 'I'm going to keep doing this […] It is good to see even as students that you can do—even if it's a very, very minimal change—you can make a bit of a change and the point being is that if we were to use that when we were actually doctors and we're there day in, day out, that's our job, we're there for four months or whatever, how much more of a change that potentially you could do'. (Year 5)

Many stated that their experiences of '*being thrown in at the deep end*' but having a clear framework to refer to in the IHI resources, empowered them to think about becoming effective change agents in the future. They frequently reflected on the additional QI skills they had gained, and believed this would positively impact on their future as effective change agents:

> Student 9: It gives you like an opportunity to develop a really important side of our career that we haven't really touched. I think it's made us better like, doctors of the future because we have just a bit more dimension, like thinking about things in a, but a different way. (Year 5)

The impact of the learning experience was summed up by one of the academic mentors, who highlighted the importance of experiential learning in helping students to understand the complexities of QI work in real contexts. She described how important it is for academic and clinical mentors to have good working relationships:

> FA2: I think probably initially they (students) think they're actually going to make vast improvements and when they actually start to work within the environment they realise that that may not be the case because of lots of factors, and I think starting to understand how complex things are and when things that they think are being done that aren't actually being done […] What makes it easier is putting the time in beforehand, for me that's an essential part. Building good relationships with the clinical supervisors, listening to what they want out of this and what will work for them.

Several students also drew on some elements of this and were mindful that due to the culture and attitudes, clinical staff can be resistant to change, which can impact on the progress of their project. However, through time and patience developing relationships and being sensitive to the demands of clinical staff, students could facilitative and foster engagement, and therefore achieve improvement.

DISCUSSION

The findings from this study demonstrate that there are a range of important facilitators and barriers to students undertaking and completing QI projects in a clinical setting. These are summarised in table 3. Both students and mentors were uniformly positive about the impact of their projects, although there were contrasting opinions around perceptions of time and the roles of students as agents of change.

Students perceived a lack of time to build on their theoretical learning about improvement methods at the same time as understanding and implementing change in a new clinical setting, which created anxiety and subsequent challenges in terms of completing their project. Those challenges notwithstanding, the evolving discussions

Table 3 Summary of facilitators and barriers

Factors	Facilitators	Barriers
Time and quality improvement process	Four-week timescale encourages students to remain focused. Completing online courses on models for improvement provides a structured framework and helps students to engage in the process more quickly. Setting clear expectations with students from the outset helps to make projects achievable and realistic within the timeframe. Multidisciplinary clinical team engagement while developing projects.	Competing priorities for students: their top priority is passing core modules for 'getting into next year', which can limit their enthusiasm for elective modules. Students lack confidence in unfamiliar clinical environment, particularly in second and third year. Students are not always sufficiently aware of the complexity of the clinical environment or the competing priorities for clinical staff.
Students as change agents	Students are valued within the clinical team as bringing fresh eyes and new ideas. Staff respond well to students who are self-motivated and enthusiastic.	Students lack experience and credibility to challenge and influence decisions. They perceive themselves to be '*only medical students*'.
Impact: now and in the future	For both student and mentors, even small changes make a difference. Sharing shared goals between the academic and clinical supervisors supports students and enables a balanced assessment of impact. Empowering students to think about becoming effective change agents in their future careers.	Efforts to communicate or disseminate project impact are limited.

between the students highlighted their satisfaction as to how much they could achieve and how much they had learnt and developed within the 4-week period. Bergh *et al* similarly highlight this issue, referring to it as 'transformative learning'. They found that when a student is challenged by QI within a real-world context, despite the anxiety it evokes, it inherently provides numerous experiences to stimulate transformative learning, personal growth and professional development.[5] While mentors acknowledged students were anxious about the timescale, they did not have the same concern, identifying students' lack of confidence as a barrier. Those views are consistent with a study exploring competence in QI among third-year medical students which found that while many students lacked confidence in their abilities and skills around QI methods at the start of their projects, student confidence increased over time, as did perceptions of the value of QI for individuals and the organisation.[17]

Students also wrestled with the concept of being perceived as '*just a student*' rather than an integral part of the clinical team, which made them question their credibility and hindered their ability to undertake successful QI projects. This concern appeared to be more apparent among the year 2 and 3 students, perhaps due to having had less clinical exposure than the fifth-year students. Mentors attributed these anxieties to students not being able to adapt to the unpredictability of a clinical setting. Such unpredictability is discussed in the literature with an emphasis on flexibility being built into the preparation, design and delivery of any improvement intervention.[18] Involvement of students in improvement projects at an early stage exposes them to discrepancies and uncertainties between ideal and reality in clinical environments and asks them to challenge the 'non-ideal' reality of healthcare.[5] Additionally, systematically coordinating projects so that each student project builds on previous projects would provide the potential for greater clinical and organisational impact.

High-level engagement from clinical staff enabled students' ability to initiate, lead and bring about change. It is recognised that engaging medical students in QI and supporting them appropriately remains challenging for clinical staff due to varying perspectives and experiences.[19–21] However, in interviews, mentors clearly articulated instances where students identified issues which may have been previously overlooked by clinical staff working in that environment. Thus, students and clinical staff need to fully engage so that recommendations for change can be actioned and achieved.[2]

This study elucidated the barriers and facilitators to successful completion of QI projects by medical students from both the student and clinical and academic mentor perspectives. What is clear is that students can successfully become an integrated member of the clinical team and change practice. In participating in these projects, whether they directly change practice or not, students gain an insight into how much can be achieved in a short period of time and how much they can learn and develop. Students must be encouraged to become involved in learning opportunities in early stages of their training programme to introduce them to the clinical environment and the need for improvement. This could be achieved through service learning and the development of longitudinal QI programmes for students, which could include active participation, collaborative learning, social development and academic curriculum integration,

reflection and extended learning opportunities. Developing longitudinal QI programmes among medical students throughout the curriculum would allow students the time to learn from others, develop their own skills and knowledge in a safe manner and engage in already established QI programmes.[22 23] Such an approach would also go a long way to facilitate impact and potentially larger scale organisational change by aiding continuation of the QI programme across the medical student training programme, embedding a process of continuous improvement within clinical practice, and enabling a sustained improvement.[20 24]

A strength, and novel contribution of this study, which adds to the current body of literature was the inclusion of both the medical students and academic and clinical mentors as the sample, allowing a comparison of perspectives and experiences. This study was able to evidence that despite the challenges students faced, how and why supervision supported them in becoming important change agents. Again, the depth of this was achieved by eliciting mentor's perspectives and experiences. The study also enabled the generation of evidence about the impact of education on care processes within the clinical environment, which was only achieved by one of 10 studies in an integrative review of teaching QI to preregistration healthcare professionals.[25] Location of all three year 2 and 3 projects with the same clinical team and involvement of the Head of Nursing and General Manager enabled follow-up about sustainability at 6 months (table 2). This demonstrates the potential for larger scale organisational change that can be achieved in the future. A limitation of previous improvement projects (including the final year projects in table 2) was that we did not ask clinical teams to evidence the sustainability of the changes that were made. Additionally, there were a small number of participants who were all recruited from a single setting, and all clinical staff interviewed for this study held senior positions. It could be argued that more diverse views and experiences may have been reported if junior members of staff had been included.

CONCLUSION

As the complexity of healthcare and healthcare delivery continues to increase, it is vital that our future healthcare staff are prepared for the successful identification and implementation of improvement. This study has demonstrated that when supported appropriately, QI experiential learning can develop knowledge and skills among medical students and transform practice. Additionally, it can also have a positive impact on clinical staff and healthcare organisations. Finally, despite inherent challenges, embedding QI and QI projects in clinical practice enhances knowledge, understanding and skills and allows medical students to see themselves as important influencers of change as future doctors.

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Contributors PD, NG, VT and JB planned the study. JB undertook the interviews and focus groups. EB conducted the data analysis and interpretation. EB was responsible for the overall content of this paper. PD, NG, VT and JB provided feedback and comments regarding the content of this paper. EB submitted the paper.

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