EDUCATION AND TRAINING

Patient safety: helping medical students understand error in healthcare

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Objective: To change the culture of healthcare organisations and improve patient safety, new professionals need to be taught about adverse events and how to trap and mitigate against errors. A literature review did not reveal any patient safety courses in the core undergraduate medical curriculum. Therefore a new module was designed and piloted.

Design: A 5-h evidence-based module on understanding error in healthcare was designed with a preliminary evaluation using self-report questionnaires.

Setting: A UK medical school.

Participants: 110 final year students.

Measurements and main results: Participants completed two questionnaires: the first questionnaire was designed to measure students' self-ratings of knowledge, attitudes and behaviour in relation to patient safety and medical error, and was administered before and approximately 1 year after the module; the second formative questionnaire on the teaching process and how it could be improved was administered after completion of the module.

Conclusions: Before attending the module, the students reported they had little understanding of patient safety matters. One year later, only knowledge and the perceived personal control over safety had improved. The students rated the teaching process highly and found the module valuable. Longitudinal follow-up is required to provide more information on the lasting impact of the module.

Concern about adverse events has resulted in a raft of initiatives to reduce medical error.[1–3] To change the culture of healthcare organisations, the new generation of healthcare professionals should be taught about adverse events and how to trap and mitigate errors.[4–7] Effective error management is a core component of safety training for professionals in other industries such as aviation.[4] Although training is required for qualified professionals it should also be incorporated in undergraduate education.[7–10]

This paper describes the development and initial evaluation of a module on patient safety delivered as part of the core curriculum in a UK medical school. The module aimed to begin development of the required skill set for error management. At the time the module was planned there did not appear to be any patient safety/human error courses in the core undergraduate medical curricula. Our module was called ''Patient safety: understanding human error in health care''. Development was partly funded by the National Patient Safety Agency (NPSA), which awarded grants in 2004 to three UK medical schools to each design and evaluate a teaching programme on patient safety for undergraduates.

MODULE DEVELOPMENT AND DELIVERY

The aim of the module was to develop the knowledge, skills and attitudes that promote reduction of medical error and learning from error in healthcare to improve patient safety. Patient safety teaching needs to convey an understanding of the causes of adverse events and help develop skills to deal with error in healthcare settings. Graduates need to know how to reduce the occurrence of errors and also what to do when they make errors, when they witness an error or when they are told that someone else has made an error.

The faculty who designed and delivered the module comprised three anaesthetists, a physician, two industrial psychologists specialising in safety research and a clinical psychologist specialising in medical communication. The specific training needs (box 1) were determined from literature on the psychology of error,[11] in particular medical error leading to adverse events for patients.[12–15] To maximise the practical relevance of the course, the module focused primarily on the factors influencing adverse events and the skills required to deal with error, rather than a more theoretical course on safety and the psychology of workplace error.

Patient safety syllabi included in simulation centre courses[16 17] and postgraduate specialties[18] were examined to source relevant material on medical error and delivery of learning. Given the module's focus on the error component of adverse events, the module design was influenced by the simulation training on coping with medical error used by the Harvard Center for Medical Simulation[16] (trainees practise dealing with the consequences of errors occurring during simulated scenarios).

The module was introduced in the final year of the curriculum by which stage students have experience of a wide range of healthcare settings. The time allocated was 5 h for a group of 15 students, split into two sessions 3 days apart to encourage reflection. Several teaching methods were used to encourage student participation: whole class presentation and discussion, smaller discussion groups with student presentations, video and audio case studies, and role play. A website was set up to facilitate further student inquiry into patient safety (www.abdn.ac.uk/mrc/patient_safety).

OUTLINE OF THE MODULE

The following material was covered with a flexible order of delivery in response to facilitator/student interactions.

Session 1

Ubiquitous nature of error

Students and facilitators considered their own fallibility in general and then related this to healthcare practice. Reason's

Box 1 Patient safety: understanding human error in healthcare

Training needs: knowledge, skills and attitudes

Knowledge

- Definition of medical error
- Rates and types of adverse events in healthcare
- Error classification
- Contributing factors to medical error
- Overview of mechanisms for learning from error

Skills

- Recognition of error
- Dealing with error
- Reporting and learning from error
- Supporting others involved in error

Attitudes

- Focusing on cause rather than culprit
- Willing to learn from mistakes
- Being prepared to acknowledge and deal with error
- Being prepared to reflect on practice
- Trust and respect

Swiss cheese model was introduced.[19] An edited version of the video ''Intrathecal vincristine'' illustrated an adverse event and students identified the active and latent errors.[20] The whole group then had a discussion.

Nature of the problem in healthcare

Three subgroups considered packs of media and medical articles or personal experience and then reported on one of the following topics:

- the size of the problem in UK healthcare;
- cultural factors in healthcare which may influence patient safety;
- individual and system factors which may predispose to error.

More information on patient safety developments was given and terminology clarified according to the NPSA definitions.[5 21]

Situation in other high-risk domains

A video of flightdeck events immediately prior to an aeroplane crash initiated discussion on the influence of culture and behaviour on safety in other domains. The students were introduced to the principles of non-technical skills and crew resource management training to reduce error.[3 4]

Learning from the experience of others

The students examined examples of local and national reporting mechanisms and learning from error reporting.[22–26] Factors promoting or discouraging reporting were highlighted.

Session 1 closed with an audioclip of an account of the personal aftermath following a fatal adverse event.[27] The students were asked to reflect on this before session 2, which dealt with the aftermath of adverse events.

Session 2

What happens after healthcare errors?

The facilitators led discussion on the importance of recognising personal limitations, the need to act to minimise harm, seeking help and effective communication. The emotional costs following adverse events and availability of support systems for healthcare staff were considered.[28] Student questions often prompted discussion of legal issues and the role of the medical defence unions.

Disclosure of error

Communicating with patients and families was discussed (with reference to reports relating to the communication of medical error[29 30]). The last half of the session was devoted to role play and discussion of disclosure scenarios. The various scenarios required disclosure to patients, relatives or senior colleagues, supporting others and speaking up when others (including senior colleagues) are witnessed making errors.

The module closed with a summary and reference to the intention of further patient safety training in the foundation curriculum.[31]

EVALUATION

Method

A training course can be evaluated at several levels.[32] Given available resources, we assessed:

- the students' self-ratings of knowledge, attitudes and behaviour relating to error and patient safety before the module (and then tracking this 1 year later for those appointed to foundation programmes locally)
- a formative questionnaire completed by students at the end of the course (on the process of teaching and how it could be improved).

To measure the self-ratings of the students' knowledge, attitudes and behaviour regarding error and patient safety we designed a medical student patient safety questionnaire, as there were no existing instruments for this purpose. The first part ''General knowledge and feelings'' contained sections 1 and 2 which respectively rated level of knowledge about patient safety and what actions should be taken if an error occurred (scored from low (1) to high (5)). Section 3 asked the students how they would feel if they made an error. The second part contained sections 4–7, which were designed from Azjen's theory of planned behaviour,[33] which proposes that intentions to behave can be predicted from attitudes towards the behaviour, perceived behavioural control and subjective norms. These constructs were measured in relation to patient safety using six-item or seven-item scales with response options ranging from strongly agree (5) to strongly disagree (1).

To assess student reactions to the module an evaluation form derived from the standard medical undergraduate course evaluation documentation was completed immediately after the second session.

Results

The module was taught 11 times at the University of Aberdeen during the pilot year from September 2004 to June 2005. A total of 110 students attended.

The Medical Student Patient Safety Questionnaire was finalised by the fourth run of the module and completed by 70 students (64%) immediately before session 1. Results from this sample (averaged per subscale) indicate that before the module students report ''low'' or ''average'' understanding of patient safety issues and knowledge of actions to take if they witness an error. Approximately a year later, 38 of the first year

Table 1 Summary of students' responses before (n = 70) and foundation doctors' response 1 year after the pilot patient safety training module (n = 38) to the Medical Student Patient Safety Questionnaire

Subscale	Mean rating* Before training (n = 70)	Mean rating* After training (n = 38)	z Score	p Value
General knowledge and feelings				
1. Level of knowledge of patient safety (eight items), eg, different types of error, how to report an error	2.4	3.2†	−5.85	0.00
2. Knowledge of actions to take (six items), eg, I would know what to say if I made an error	2.6	3.5	−6.52	0.00
3a. Feelings about making errors part 1 (four items), eg, if I made an error I would expect to feel afraid	3.9	4.0†	−0.60	0.55
3b. Feelings about making errors part 2 (four items), eg, telling others about an error I made would be difficult	3.8	3.9†	−1.08	0.28
Theory of planned behaviour components				
4. Attitudes to patient safety (attitudes—six items), eg, If I keep learning from my mistakes I can prevent incidents	4.0	4.0†	−0.09	0.92
5. Safety at the workplace (social norms—six items), eg, the attitude of healthcare managers makes it difficult to report errors	3.2	3.1	−1.06	0.29
6. Personal influence over safety (perceived control—six items), eg, I don't know how to address people who have made a mistake	3.0	3.3	−3.38	0.00
7. Intentions regarding patient safety (intentions—seven items), eg, I plan to report any errors I make at my place of work	3.8	3.8	−0.77	0.44

*Rating scale: 1, low/disagree strongly; 2, medium low/disagree; 3, average/neutral; 4, medium high/agree; 5, high/strongly agree.
†These sections completed by 37 respondents

postgraduate doctors in the same region (29%) completed the same questionnaire. As the z scores in table 1 indicate, the scores on the two knowledge scales significantly improved 1 year later.

The students' anticipated (or experienced) feelings about making errors were predominantly negative (ie, feeling afraid, ashamed, guilty and upset) and attitudes to patient safety were generally very positive. This was still the case 1 year later. There was also evidence of strong intentions to engage in behaviours to enhance patient safety before and after the module (eg, 73% of students (51/70) indicated that they planned to report any workplace errors they make). Student reactions to the scales measuring subjective norms and perceived control were less positive, with a high proportion of neutral responses. For example 66% (46/70) of students were ''neutral'' on the item ''The attitudes of healthcare managers makes it difficult to report errors'' (subjective norm) and 64% (45/70) were ''neutral'' in response to the statement ''Even if the conditions are not optimal, I always manage to establish practices that ensure patient safety is not compromised'' (perceived control). One year later only the reactions to the scales measuring perceived control were significantly more positive (table 1).

The evaluation form designed to assess student reaction was completed by all students who attended the module (n = 110). The responses indicated high levels of satisfaction (table 2). Free text comments indicated that the most valuable features of the module were: disclosure role plays (n = 36), discussion of events after adverse incidents (n = 30), and the audio and video scenarios (n = 31).

Table 2 Students' responses to post-module evaluation questionnaire

Items	Median rating* (n = 110)
This training session met my needs	4
Instructors facilitated my understanding	5
Time devoted to the module was sufficient	4
Final year is an appropriate time for this teaching	5

*Rating scale: 1, disagree strongly, 2, disagree, 3, neutral, 4,agree; 5, strongly agree.

DISCUSSION

We have described the development, implementation and initial evaluation of a core module dealing with error to the final year medical curriculum. Besides the aim of facilitating understanding of error in healthcare, the module was designed to foster the development of the skills required to deal with error. It has been argued that the prevailing culture in medicine believes that error signifies incompetence, denies uncertainty and suggests a notion of absolute knowledge.[4 34] If educational measures are not designed with these barriers in mind progress may be slow. Since the development of this module, patient safety courses for undergraduate medical students in other countries have been described.[35 36] Interestingly, these courses also focus on student attitudes and skills relating to patient safety and error, rather than just knowledge. Like our module, curriculum developers have included role playing opportunities where students can practise disclosure of error and supporting others, and their course evaluation suggests that their students found this approach valuable. These modules have also been incorporated into the core curriculum.

The curriculum for education and training in the first 2 years after graduation in the UK (the foundation programme) specifies core competencies in patient safety.[31] This presents an opportunity to promote the knowledge, skills and attitudes required to raise the level of patient safety to a whole generation of UK medical graduates. However, postgraduate curricula must make appropriate links with the undergraduate years and the later specialist training.[9] The knowledge, skills and attitudes targeted in this undergraduate module—which challenges the assumption that only incompetent doctors make mistakes, and helps students become aware and tolerant of uncertainty[34]—seem to provide an excellent basis for the foundation programme. We have used the results from this pilot year to inform the design of the patient safety training for foundation doctors in the local region.

All curricular change requires evaluation. Changes in knowledge, skills and attitudes from any training will be influenced by other experiences over time. Continued tracking of the development of knowledge and attitudes to patient safety through the foundation years with the Medical Student Patient Safety Questionnaire will provide useful information in this regard. Typically over 85% of foundation doctors in this region are local graduates and so would have experienced this patient safety module. Our results and those from other countries

indicate that medical students do not have a high understanding of patient safety issues and underline the need for the development of such training.[35 36] Although our cohort reported positive attitudes to patient safety, reactions to the scales measuring subjective norms and perceived control were less so. The responses from this pilot year suggest that 1 year later knowledge about patient safety issues had increased and positive attitudes were reported. But the responses also indicate that foundation year 1 doctors find it difficult to use the skills to deal with patient safety despite the module style and content. We hope to see further improvement as these students gain experience of their working environment, and benefit from this and other patient safety training in the foundation years.[31] Our intention is to monitor this training and extend the scope of the course evaluation further into the postgraduate training years.

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