

Effectiveness of simulated clinical teaching in general practice: randomised controlled trial

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ABSTRACT

INTRODUCTION: There are shortages in community-based general practice placements for medical students. Innovative ways to teach the skills required in general practice are needed.

AIM: To assess the effectiveness of 'simulated' general practice clinics using actors, compared with standard community-based general practice attachments in medical undergraduate education.

METHODS: Randomised controlled trial involving medical students. Outcome measures included self-reported knowledge, clinical confidence, communication skills, and attitudes within general practice assessed at baseline and after one week. Intervention students participated in 24 simulated consultations with actor-patients over four days. Control students spent four days working with community-based general practitioners and real patients.

RESULTS: Of 138 eligible medical students in the first clinical year, 128 (93%) participated and 106/128 (82%) completed the study. Those participating in simulated clinics improved in confidence in history-taking ($p=0.03$), communication skills ($p=0.04$), and ability to detect depression ($p<0.001$) compared with those undertaking community attachments. Those in community-based attachments felt more confident in managing upper respiratory tract infections ($p<0.001$), giving injections ($p<0.001$), screening in general practice ($p=0.03$) and managing illness in the patient's home ($p=0.04$). There was no difference between the groups in other measures.

DISCUSSION: Simulated clinics may assist with development of communication skills within the general practice consultation and may also be used to supplement community-based attachment with real patients. Even so, confidence in the management of common conditions and procedures improves more with real patients.

KEYWORDS: Medical education; patient simulation; primary health care; randomised controlled trial

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Introduction

Training in general practice traditionally requires a large number of clinical teachers in community practices. Furthermore, there are widespread shortages of general practitioners (GPs), internationally.¹ The rate of doctors starting in general practice is lower than the rate of those leaving, with United States medical student interest in general practice declining since 1997,² and almost one-third of currently practising GPs in New Zealand intending to retire or emigrate over the

next five years.³ At the same time, medical schools are increasing in size, with growing numbers of medical students requiring attachments in community-based general practices. It is becoming an increasingly difficult area to provide clinical attachments, requiring novel and effective alternatives to provide suitable general practice training, while encouraging more medical students to choose general practice as a profession in the future.

Different methods of teaching, such as the use of simulated consultations, may provide an environ-

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ment in which students can become skilled in their management of, and communication with, patients and in turn enhance patient outcomes. Simulated clinics may also enhance students' perception and knowledge of general practice as a career choice. Medical student experiences and attitudes have been shown to influence their choice of future career.¹

The use of direct feedback about communication styles to improve communication skills, and the use of simulated patients to hone and assess consultation skills, were originally suggested in the 1970s and 80s.⁴⁻⁶ Simulation-based medical education has been used for some time, particularly in the areas of teaching surgical procedures, advanced care life support training and improving consultation skills.⁴⁻⁶ Just as with surgical procedural skills and advanced care, the potential for harm to real patients is also reduced by 'practising' and developing techniques with simulated patients.⁶ This approach has sometimes been shown to be more effective in skills acquisition than traditional clinical education.⁷ Despite their use, few rigorous studies have been conducted assessing the effectiveness of simulated clinics or procedures.⁷ Simulated consultations have also been used to improve communication skills, and randomised controlled trials have compared simulated consultations using standardised patients with class-based learning.^{8,9} However, there are few trials that have compared simulated consultations with real patient consultations, particularly in the area of general practice. Therefore, we sought to assess the effectiveness of simulated clinics using actor-patients compared with community-based clinics with real patients in general practice undergraduate medical education. In particular, we aimed to assess the effect on communication skills, history taking, confidence in managing certain conditions, and attitudes to general practice.

Methods

Study design

A randomised controlled trial design was used.

Study population

Medical students completing a two-week rotation in urban general practice during 2010 in year 4

of a six-year undergraduate medical programme based in New Zealand were eligible to participate in the study. Year 4 students are in their first 'clinical' year, where approximately 50% of their time is spent on clinical attachments, both in hospitals and the community. Students spend two weeks in urban general practice and two weeks in rural general practice, in groups of approximately 35 students at a time, during five cycles over the academic year. One to two students are attached to each GP during the attachment, with two days of lectures interspersed. The current study was conducted during four of the five general practice rotations in 2010.

Outcome measures

Outcome measures consisted of self-rated knowledge, clinical confidence, communication skills, and attitudes to general practice assessed at baseline and after one week. Pre-existing questionnaires were used that had been used in previous years in a clinical assessment at the university to avoid tailoring questions to the content of the simulated consultations.

Intervention and control

Students in the intervention group participated in 24 consultations with actor-patients over four days. Cases were selected from a pool of 60 general practice cases, developed and peer-reviewed over the previous year by practising GP academics working at the university. Actors were trained by the academic GPs and by an actor experienced in teaching communication skills and providing feedback. Cases involved diagnoses and management of a variety of conditions seen commonly in general practice, such as respiratory, cardiovascular, diabetes, mental health, musculoskeletal, gastroenterological, gynaecological, renal, geriatric, and paediatric conditions. Physical examinations were undertaken, except for more personal examinations. Written results of examinations were handed to the student by the actor if the student completed or indicated they should complete the appropriate examination. Procedures such as injections were not undertaken in the simulated clinics.

Students completed the 20-minute consultations in groups of three (interviewer, documenter,

and observer). Feedback was given by student-observer and actor. Consultations occurred simultaneously in six different consultation rooms, where students rotated around four cases each half-day. A GP tutor was available to answer questions and conduct a one-hour group tutorial to cover clinical topics at the completion of each half-day.

Students in the control group spent four days working with community-based GPs and real patients. Students usually divide their time sitting in with the GP and with interviewing patients on their own prior to review with the GP that they are attached to for the week. The consultations are not standardised and students have variable case exposure depending on the real-life consultations that occur. Both groups attended common lectures on the first day. Following the trial week, the groups reversed attachments so both experienced simulated clinics and community attachments.

Randomisation and blinding

The students were randomly allocated to undertake the simulated clinics in the first or second week of their two-week general practice attachment. A researcher not involved in outcome assessment carried out computer-generated block randomisation using Stata 9.1. It was not possible to blind the students or assessors to allocation of randomisation.

Sample size calculations

Sample size calculations were not completed prior to the study because our sample size was determined by the size of the class. However, based on results from previous years, 126 students would allow adequate power to detect a 10–20% difference between the groups in all clinical confidence measures ($\alpha=0.05$, 90% power).

Analyses

Means and standard deviations of variables were calculated. Univariate analysis of variance (ANOVA) models were used to assess difference at follow-up, adjusting for baseline values. SPSS and SAS 9.2 statistical programs were used

WHAT GAP THIS FILLS

What we already know: Internationally there is a shortage of community-based general practice placements for students. Few studies have assessed the effectiveness of using 'simulated consultations' for medical education compared with using real patients in a community setting.

What this study adds: This randomised controlled trial found that simulated clinics using actors improved confidence in taking a history, self-perceived communication skills, and ability to detect depression compared with patient-based clinical attachments. Patient-based clinical attachment improved self-rated understanding of upper respiratory tract infections, giving injections, screening and managing patients in their own home, more than in simulated clinics with actors. Simulated clinics using actor-patients may provide a useful method to teach student consultation skills to compliment community attachments and relieve some of the demand for community placements.

to undertake analyses. Analyses were carried out on those who completed the whole trial. A sensitivity analysis was carried out including all participants, where no change was assumed from baseline for those who did not complete follow-up ('last value carried forward').

Ethical approval

Study assessments were voluntary and verbal informed consent was obtained prior to completing baseline assessment. The study was approved by The University of Auckland Ethics Committee in 2010 (Reference 2010/022).

Results

Of the 173 year 4 medical students at the university in 2010, 138 took part in the four general practice attachments that offered simulated and real clinical attachments on alternating weeks over the duration of the trial. All were invited to participate in the trial and 128/138 (93%) consented and completed baseline assessments. Sixty-three students were randomised to intervention and 65 to control. Baseline characteristics were similar, with 51% male in both groups. At one-week follow-up, 106/128 (82%) completed the assessments (Figure 1).

There were improvements in most variables in both groups over the week. Those participating in simulated clinics with patients played by

actors improved in confidence in taking a history ($p=0.03$), communication skills ($p=0.04$), and ability to detect depression ($p<0.001$) significantly more than those in community attachments with real patients (Table 1). Those in the community attachment felt more confident in managing upper respiratory tract infections ($p<0.001$), giving injections ($p<0.001$), screening in general practice ($p=0.03$), and managing illness in the patient's home ($p=0.04$) compared with those undertaking simulated clinics, by the end of the week (Table 2). There was no significant difference between the groups in self-assessed ability to manage anxiety, emergencies, long-term diabetes or cardiovascular risk, nor in knowledge of services, attitudes to a patient-centred approach, quality of care in general practice or interest in general practice as a career.

Results were similar when analyses were undertaken assuming no change from baseline in those that did not complete follow-up, although differences in confidence in history taking ($p=0.06$) and knowledge about screening in general practice ($p=0.07$) no longer reached statistical significance (see the appendices in the web version of this paper).

Discussion

Main findings

There are few randomised controlled trials of different teaching methods in medical education, yet this trial was relatively easily incorporated into the curriculum. Our results indicate that simulated clinics resulted in students feeling more confident about their communication and history-taking skills compared with those learning in community-based attachments with real patients. Conversely, confidence in the management of common conditions and procedures improved more with community attachments with real patients. There appears to be a useful place for supplementing community-based attachments with simulated clinics in general practice training of medical students.

Strengths and limitations

To our knowledge, this study was the first randomised controlled trial of simulated clinics compared with community-based clinics in general practice. There was a high participation rate (93%) of students, and 82% completed follow-up assessments. These high rates ensure good generalisability of results to medical students undertaking their first clinical year.

One methodological limitation of the study was that the questionnaire that was used was one that had been used for several years for academic purposes in the general practice attachment. However, the reliability and validity of the tool had not been checked for the purposes of research. Validated tools or more objective or patient-based outcomes would have added weight to these findings. However, over a short clinical attachment, it would be difficult to detect a difference in patient outcomes, although knowledge

Figure 1. Flow diagram of students through randomised controlled trial of simulated clinics versus community-based clinics in general practice

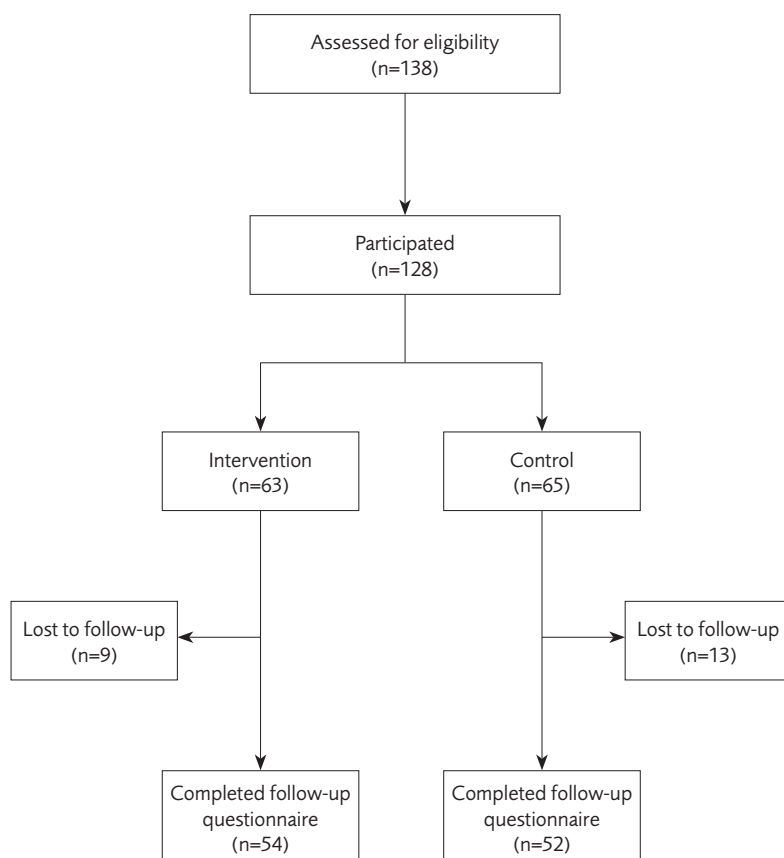


Table 1. Difference between students' self-rated knowledge of services, confidence, attitudes and communication skills in general practice following one week of simulated clinics using actor-patients and pre-determined cases compared with one week of community practice with real patients

Variable [†]	Intervention baseline n=63	Intervention follow-up n=54	Control baseline n=65	Control follow-up n=52	p-value [‡]
Knowledge of services to patients in community	3.8 (1.4)	5.7 (1.6)	4.0 (1.4)	5.8 (1.6)	0.99
Confidence in taking a history	5.5 (1.5)	6.8 (1.3)	5.7 (1.4)	6.2 (1.8)	0.03*
Ease of taking a patient-centred approach	6.3 (1.3)	6.9 (1.4)	6.0 (1.2)	6.8 (1.4)	0.85
Communication skills	5.8 (1.3)	6.8 (1.2)	5.7 (1.3)	6.2 (1.7)	0.04*
Ability to detect depression	6.0 (1.4)	7.2 (1.2)	6.2 (1.4)	6.2 (1.9)	<0.001*
Quality of care of general practitioner compared with hospital specialist care	6.3 (1.2)	6.8 (1.3)	6.1 (1.3)	7.1 (1.3)	0.15
Interest in general practice	5.3 (2.4)	5.7 (2.4)	5.3 (2.2)	5.8 (2.5)	0.82

* Significant at $p < 0.05$

† Univariate analysis of variance comparing follow-up values and adjusting for baseline values including only those that completed follow-up.

‡ Mean (standard deviation) presented.

Likert scales from 1–9 were used. The statements at the maximum score corresponding to the variables above were as follows: 'I know about **all** services available to patients in the community'; 'I am **very** confident in taking a history and examining patients'; 'A patient-centred approach to the management of illness is **easy**'; 'I have **excellent** communication skills'; 'I **can** tell when patients are depressed'; 'Compared with hospital specialists, general practitioners **take excellent care** of their patients'; 'I am **very interested** in being a general practitioner'

Table 2. Difference between experience and confidence in managing conditions and skills in general practice following one week of simulated clinics using actor-patients and pre-determined cases compared with one week of community practice with real patients

Variable [†]	Intervention baseline n=63	Intervention follow-up n=54	Control baseline n=65	Control follow-up n=52	P-value [‡]
Anxiety	2.8 (0.6)	3.0 (0.5)	2.9 (0.6)	3.1 (0.6)	0.54
Upper respiratory tract infection	2.0 (0.6)	2.5 (0.7)	2.0 (0.7)	3.0 (0.6)	<0.001*
Giving injections	2.1 (0.7)	2.2 (0.8)	2.3 (0.8)	3.3 (0.9)	<0.001*
Screening in general practice	2.5 (0.6)	3.0 (0.6)	2.6 (0.6)	3.2 (0.5)	0.03*
Managing illness within the patient's own home	2.3 (0.6)	2.4 (0.6)	2.2 (0.5)	2.6 (0.7)	0.04*
Emergencies in general practice	1.8 (0.6)	2.4 (0.7)	1.9 (0.7)	2.5 (0.8)	0.54
Long-term management of the diabetic patient	2.7 (0.6)	3.1 (0.6)	2.8 (0.5)	3.2 (0.5)	0.63
Identification of cardiovascular risk and management of risk	3.1 (0.5)	3.4 (0.6)	3.0 (0.6)	3.4 (0.5)	0.72

* Significant at $p < 0.05$

† Univariate analysis of variance comparing follow-up values and adjusting for baseline values. Including only those that completed follow-up.

‡ Mean (standard deviation) presented.

Questions were multi-choice (1–4) with responses including (or similar):

1. I have never heard of this
2. I have heard of this but am not confident of the clinical features of this
3. I have some understanding of the diagnosis and management of this
4. I have a clear understanding of the appropriate diagnosis and management of this.

of specific diagnostic and management skills could have been assessed. Clinical knowledge would be difficult to compare after only one week, as experiences of students vary considerably. Another limitation was the short duration of the intervention and study. Assessment of long-term effects of different modes of teaching on student learning would be useful. Another important limitation is variable case exposure between the groups. Improvement in particular skills, such as injection administration, would depend on whether the student was exposed to this procedure.

Compared with the literature and implications for future teaching

Other studies have also found that patient feedback is useful in the development of communication skills¹⁰ and that standardised patients can provide more useful feedback than real patients, although students feel that real patients are more authentic.¹¹ Good communication skills are related to better outcomes such as patient satisfaction, adherence to therapy, symptom resolution, and control of risk factors such as blood pressure and blood sugar.^{12,13}

In addition, previous studies have suggested that simulated consultations may be used to help improve knowledge. For example, a previous randomised controlled trial of an adolescent medicine workshop found that standardised simulated patients were effective in improving medical students' knowledge and skills compared to those students who did not participate in the workshop.⁹ These improvements were found immediately following the teaching and at end-of-year assessments.⁹ Another randomised controlled trial, which assessed the educational effectiveness of electronic 'virtual' patients and standardised patients in teaching clinical skills, found equivalent improvements in performance and diagnostic ability.¹⁴ A review of the strengths and weaknesses of real and simulated patients in the teaching of skills to medical students found only one study directly comparing simulated patients and real patients as an educational resource.¹⁵ Students and teachers both perceived the simulated patient encounters were more instructive.¹⁵

While our study found that community-based attachments improved confidence in procedures such as giving injections more than simulated clinics, a recent meta-analysis found that simulation-based medical education with 'deliberate practice' produced better procedural skills outcomes than traditional clinical medical education.⁷ The reason our results found the opposite was because our simulated clinics did not include injection procedures or home visits, which were more likely within a community attachment. While simulated clinics can upskill medical students in specifically selected procedures due to practice and repetition, the community-based attachments provide a broader base of experiences and procedures in a more opportunistic way. Both systematic and opportunistic learning strategies are required in medical education.

When compared with class-based learning of group discussion, simulated consultations using standardised patients have been found to be more stressful for students, but also more enjoyable, more stimulating, and closer to actual clinical experiences in a recent randomised controlled trial.¹⁶ Simulated consultations have been said to improve competence of consultation skills, which should improve performance in actual day-to-day consultations.⁴

Other forms of patient simulation, such as artificial human patient simulations for emergency and anaesthetic interventions, and electronic virtual patient simulations for clinical skills and surgical learning have also been found to be effective in the acquisition of critical assessment and management skills when compared with more conventional methods of teaching.¹⁷⁻²⁰ Interestingly, one randomised controlled trial found that improvements in performance and diagnostic abilities were similar when virtual cases or 'real' standardised patients were used in a continuing medical education setting.¹⁴

The cost-effectiveness of simulated clinics in medical education is difficult to assess.²¹ However, some studies of postgraduate specialty simulation training have shown that simulated clinics can be run relatively cost-effectively while improving patient safety, particularly when simulating high-risk, low-frequency events.²²

Conclusions

Simulated clinics using actors in general practice teaching appear to be effective in improving confidence in communication and history taking and may be useful to enhance community-based general practice attachments. However, real clinical attachments are still important to promote clinical knowledge and confidence and to gain the exposure to a broad range of conditions and practical skills required for clinical practice.

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COMPETING INTERESTS

None declared.