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Training pharmacists to deliver a complex information technology intervention (PINCER) using the principles of educational outreach and root cause analysis

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Abstract

Objective To describe the training undertaken by pharmacists employed in a pharmacist-led information technology-based intervention study to reduce medication errors in primary care (PINCER Trial), evaluate pharmacists' assessment of the training, and the time implications of undertaking the training.

Methods Six pharmacists received training, which included training on root cause analysis and educational outreach, to enable them to deliver the PINCER Trial intervention. This was evaluated using self-report questionnaires at the end of each training session. The time taken to complete each session was recorded. Data from the evaluation forms were entered onto a Microsoft Excel spreadsheet, independently checked and the summary of results further verified. Frequencies were calculated for responses to the three-point Likert scale questions. Free-text comments from the evaluation forms and pharmacists' diaries were analysed thematically.

Key findings All six pharmacists received 22 h of training over five sessions. In four out of the five sessions, the pharmacists who completed an evaluation form (27 out of 30 were completed) stated they were satisfied or very satisfied with the various elements of the training package. Analysis of free-text comments and the pharmacists' diaries showed that the principles of root cause analysis and educational outreach were viewed as useful tools to help pharmacists conduct pharmaceutical interventions in both the study and other pharmacy roles that they undertook. The opportunity to undertake role play was a valuable part of the training received.

Conclusions Findings presented in this paper suggest that providing the PINCER pharmacists with training in root cause analysis and educational outreach contributed to the successful delivery of PINCER interventions and could potentially be utilised by other pharmacists based in general practice to deliver pharmaceutical interventions to improve patient safety.

Introduction

Studies have shown that medication errors, particularly those relating to prescribing errors or insufficient medication monitoring, are often a cause for potentially avoidable morbidity and mortality in primary[1,2] and secondary care.[3] With the majority of prescribing taking place in primary care, pharmacists working in general practices are well placed to identify and address these types of medication error, although the evidence for their effectiveness has been conflicting.[4–6]

However, more recently the results of the PINCER Trial, a large cluster randomised controlled trial, demonstrated that a complex pharmacist-led information technology-based intervention resulted in significantly reduced rates of clinically important and common medication errors within

Table 1 PINCER Trial pharmaceutical indicators (outcomes)

Patients identified to be at risk from hazardous prescribing or inadequate monitoring	Reason for inclusion
1 Patients with a computer-recorded history of peptic ulcer prescribed non-selective non-steroidal anti-inflammatory drugs (NSAIDs) and no proton pump inhibitor (PPI) cover (Primary outcome)	Commonly occurring and contraindicated by CSM
2 Patients with a computer-recorded diagnosis of asthma being prescribed a beta-blocker (Primary outcome)	Contraindicated by CSM
2a Patients with a computer-recorded diagnosis of asthma (and no history of coronary heart disease (CHD)) being prescribed a beta-blocker (Secondary outcome)	Contraindicated by CSM
3 Patients aged 75 years and older receiving long-term prescriptions for angiotensin-converting enzyme (ACE) inhibitors or loop diuretics without a recorded assessment of renal function and electrolytes in the preceding 15 months (Primary outcome)	Commonly occurring and consensus of expert opinion
4 Patients on combined oral contraceptives with a past history of venous or arterial thrombo-embolism (Secondary outcome)	Contraindicated by CSM
5 Patients stabilised on methotrexate therapy should have their full blood count (FBC) and liver function checked every 12 weeks (Secondary outcome)	Risk highlighted by NPSA
6 Patients treated with warfarin should have their International Normalised Ratio (INR) monitored at least every 12 weeks (Secondary outcome)	Commonly occurring and consensus of expert opinion
7 Patients on lithium therapy should have their lithium levels checked every 3 months (Secondary outcome)	Consensus of expert opinion
8 Patients on amiodarone should have their thyroid function checked before starting amiodarone, and every 6 months during treatment (Secondary outcome)	Consensus of expert opinion
9 Prescriptions for methotrexate should specify a weekly dosing interval (Secondary outcome)	Risk highlighted by NPSA
10 Patients prescribed amiodarone, should be on the lowest possible dose to avoid unnecessary toxicity (Secondary outcome)	Consensus of expert opinion

CSM, Committee of Safety of Medicines; NPSA, National Patient Safety Agency.

the primary care setting, compared with simple feedback.[7] This was a parallel-group, pragmatic, cluster trial in which 72 general practices in England were randomised to either (1) computer-generated feedback ('simple feedback') in which practices were asked to make changes to patients' medication in a 12 week period or (2) the pharmacist-led intervention comprising computer-generated feedback and dedicated pharmacist support over a 12 week period. Quest Browser software was used to search general practice computer systems to identify patients at risk of harm associated with 10 specific pharmaceutical indicators (outcomes) (Table 1). These pharmaceutical indicators (outcomes) were chosen because they are consistently associated with the most common medication errors resulting in serious morbidity,[8] and were detectable from general practice computer systems.

In this paper we describe the training package undertaken by pharmacists employed in the PINCER Trial and how training in the concepts of educational outreach and root cause analysis (RCA) was used to help the pharmacists deliver the intervention used in the trial. The paper also provides an evaluation of the pharmacists' responses to the training package and discusses the time implications involved.

The role of the PINCER Trial pharmacist

The PINCER Trial pharmacists were responsible for delivering all aspects of the intervention, including presenting the results of the computer-based searches to the general practitioners (GPs) and their practice staff, resolving medication errors in individual patients, identifying the underlying

causes of these medication errors and helping the practice to implement new medicines management systems to avoid future errors. It was therefore imperative that the pharmacists were effective at intervening, delivering and promoting change.

To achieve this, the pharmacists were expected to build relationships with GPs and other practice staff, and the importance of fostering good relations was emphasised throughout the training programme. A major focus of the pharmacist intervention within each practice was a feedback session where the pharmacist presented the results of the Quest Browser searches, and used the principles of educational outreach and RCA to facilitate changes to the day-to-day practice of healthcare professionals.

Educational outreach

Educational outreach (also known as educational visiting or academic detailing) has been referred to as a face-to-face educational visit by a trained person to a healthcare professional in their place of practice.[9] Educational outreach uses the principles of social marketing and aims to build relationships, meet needs, be convenient to the recipient and achieve behaviour change in healthcare professionals.

Soumerai and Avorn have described the essential stages of educational outreach as defining specific problems and objectives, market research, establishing credibility, targeting 'high potential' clinicians, involvement of 'opinion leaders', two-sided communication, promoting 'active learner' involvement, repetition and reinforcement, brief

Box 1 The process of educational outreach in the PINCER Trial

Defining specific problems and objectives	The specific problems to be discussed at the practice feedback session were defined by the outcomes and by the patients identified in the computer searches.
Market research	The amount of market research that was undertaken was limited although information was obtained on practice demographics, such as list size, number of GPs and clinical system, to ensure the pharmacists had some *a priori* knowledge of the practice in which they would be delivering the intervention.
Establishing credibility	Pharmacists were encouraged to introduce themselves at the start of the feedback session and provide a brief summary of their professional credibility by explaining their own background in clinical pharmacy and their affiliation with either the University of Manchester or University of Nottingham.
Targeting 'high potential' physicians	Pharmacists were asked to identify one individual in the practice with whom they could work closely while implementing changes. In effect, this person could be a 'high potential physician' or a senior member of the practice team.
Involvement of 'opinion leaders'	The PINCER Trial was a high-profile study and the Chief Investigator was a well respected GP and expert in medication error research. There were close links with key stakeholders in the Primary Care Trusts involved in the trial who helped champion the study.
Two-sided communication	Pharmacists were encouraged to present a balanced argument for each of the outcomes, giving reasons for and against changing practice. This helped the pharmacists maintain credibility and be prepared for any counter-arguments presented to them.
Promoting active learner involvement	Pharmacists were encouraged to question the healthcare professionals about their current clinical practice. This questioning aimed to identify knowledge gaps and attitudinal factors and stimulate learning.
Repetition and reinforcement	Pharmacists were encouraged to end the feedback session by re-enforcing the key findings from the computer searches and any action points agreed.
Brief graphic materials	Evidence-based summaries were prepared for each pharmaceutical indicator (outcome). These summaries provided information on the importance of each type of error along with current guidelines for good clinical practice. This information was given to a nominated member of the general practice (usually the practice manager).
Offering practical alternatives	Help was offered to take corrective action FOR individual patients with medication errors.
Selection and training of academic detailers	All pharmacists received the training as outlined in this paper.

graphic materials and offering practical alternatives.[10] The applications of the principles of educational outreach within the PINCER Trial are described in Box 1.

The literature shows that educational outreach has been used in a variety of healthcare settings to change professional practice.[11–16] An updated Cochrane review, which included 69 studies involving more than 15 000 health professionals, assessed the effect of educational outreach on health professional practice or patient outcomes. The authors concluded that educational outreach alone, or when combined with

other interventions, had a relatively small but consistent positive effect on prescribing behaviour, but for other types of professional practice, such as providing screening tests, educational outreach provided small to moderate changes in practice, although the effects were varied.[9]

Root cause analysis

RCA is a retrospective, systematic review of an adverse incident that aims to identify what happened, how it happened

Box 2. The process of root cause analysis in the PINCER Trial

Step 1: Identify the scope of the incident and collect information	The specific incidents to be investigated were defined by the outcomes of the PINCER Trial and patients were identified using Quest Browser searches.
Step 2: Sort and map data	The data were presented as a series of tables in a Microsoft Excel workbook and gave names of patients identified as being potentially at risk for each of the outcomes.
Step 3: Problem identification and prioritisation	During the feedback meeting a brainstorming session with GPs and other practice staff was facilitated by the trial pharmacists to identify the underlying reasons for the potentially hazardous prescribing and medicines management issues.
Steps 4 and 5: Problem exploration and the identification of safety and quality improvements	GPs and other practice staff were encouraged by the pharmacists to explore the issues identified in step 3 in greater detail using the 'five whys'*, time permitting. This technique involves asking why something happens until the 'root cause' has been identified. At this stage of the process, the pharmacists helped the GPs and other practice staff to identify changes within their day-to-day practice which could help reduce the incidence of hazardous prescribing and medicines management issues.
Step 6: Generating the root cause analysis report, agreeing improvements for implementation and shared learning	At the end of the feedback session the pharmacists were responsible for summarising the key findings and agreeing an action plan stating who would be responsible for making the necessary changes discussed, along with timescales for delivery of the action plan.

*The five whys is a question technique that is used to explore the cause-and-effect relationships underlying a particular problem. By repeatedly asking the question 'why?' the aim is to determine the root cause of a problem. Identifying the problem's root cause may take fewer or more than five 'whys' and will depend on the complexity of the issue, but usually five iterations of asking why is sufficient to identify the root cause. This technique is often used as it is easy to learn and apply in practice and is a simple analysis tool as it can be completed without statistical analysis.[27]

and why. The analysis is then used to identify areas for change, and make recommendations for sustainable solutions to help minimise the recurrence of the incident in future.[17] It focuses on problems with the systems involved in adverse events, not on people.

RCA has been used in the nuclear power and aviation industries for a number of years to identify the underlying cause of disasters. The National Patient Safety Agency (NPSA) for England and Wales, the Joint Commissions on the Accreditation of Healthcare Organisation in the USA and the Queensland Health Patient Safety Centre and New South Wales Health in Australia have all adopted the RCA process to improve patient safety.[18,19] In 2007, the Royal Pharmaceutical Society issued a revised *Clinical Governance Framework for Pharmacist Prescribers*.[20] One recommendation of the framework was that 'prescribing' pharmacists should be considered in clinical risk management programmes, including RCA.

There is evidence that RCA is being used to help investigate the reasons behind critical incidents and medication errors in a number of different healthcare settings.[21–25] However, a recent review on RCA found that the literature on RCA effectiveness was limited but provided anecdotal evidence that RCA improved safety. The authors concluded that controlled trials that tested the RCA framework, along with cost–benefit analysis, were required to formally determine the effectiveness of RCA.[26]

RCA uses a variety of tools and techniques through different stages of investigation.[27] The application of the principles of RCA in the PINCER Trial is described in Box 2. Due to time limitations (the initial feedback session usually lasted 1 h) it was not always possible to conduct all stages.

The rationale for this paper is derived from the fact that while health service literature describes either educational outreach or RCA as a tool to change professional behaviour, we believe that the PINCER Trial is the first time that key principles from both tools have been used together for the same aim. For this reason, we set out to document and evaluate the training provided to the pharmacists to understand which aspects of the training the pharmacists felt were helpful in delivering the PINCER intervention, as these insights will be crucial to allow for successful implementation outside the setting of a trial.

Methods

Ethical approval for the PINCER Trial was obtained from the Nottingham 2 Research Ethics Committee (reference number 05/Q2404/26) on 15 March 2005.

Trial pharmacists

Six pharmacists were employed to deliver the intervention in the PINCER Trial. The posts were advertised nationally. Three of the pharmacists had previous experience of working as primary care pharmacists, and the other three had limited or no experience of working in a general practice setting, having worked predominantly in community or secondary care settings. Further details can be found in Table 2.

Training package

The training package was developed by the research team to help the PINCER Trial pharmacists deliver the intervention. The training sessions consisted of a combination of trial-specific and generic elements. The trial-specific elements, which were delivered by the research team, included a general induction to the PINCER Trial, along with an introduction to the pharmaceutical indicators (outcomes) used in the PINCER Trial. The generic elements mainly comprised training on the concepts of RCA, educational outreach and role play for pharmacists to practise feeding back results from the Quest Browser searches using the principles of educational outreach and RCA. Further generic training sessions on clinical coding, data quality and interpreting practice data were delivered by a member of the Primary Care Information Services (PRIMIS) team (www.primis.nottingham.ac.uk) and, as such, were not tailored directly to the needs of the PINCER Trial pharmacists. To maximise learning opportunities, a 30 min question-and-answer session was provided at the start of each training day to give the pharmacists the opportunity to ask questions arising from the previous day's training. In addition, a 1 h session entitled 'applying this to the PINCER Trial' was held at the end of each PRIMIS-led training session. Table 3 details the topics covered in each of the five training sessions held.

Four of the training sessions were held at the University of Nottingham. The last training session was held in a Nottingham GP practice. Refreshments and lunch were provided for each training session.

An evaluation form was included in the training session packs, which were sent to the pharmacists prior to each training session. Pharmacists were asked to complete an evaluation form immediately after each training session to inform any future roll-out of the training package. The evaluation forms were anonymous. The evaluation form sought to elicit views on a number of factors such as the content and timing of the pre-training material provided and the pace of training, the venue and their expectations of the training using a three-point Likert scale. A copy of the evaluation form can be found in Appendix 1. The pharmacists were also asked to keep a reflective diary to capture their views on the training package, along with their experiences of delivering the intervention. The findings of delivering the intervention are reported elsewhere.[28]

Data analysis

Data from the evaluation forms were entered onto a Microsoft Excel spreadsheet (Version 2003) by SR, independently checked and the summary of results further verified by other

Table 2 Characteristics of the PINCER Trial pharmacists

Pharmacist	Age range at start of training (years)*	Year of registration	Post-registration qualification(s)	Pharmacy background at start of training*	Previous primary care experience
1	25–30	After 2000	Diploma in community pharmacy	Community†	No
2	31–35	1995–2000	Diploma in community pharmacy	Primary care††	Yes
3	31–35	1990–1994	Diploma in clinical pharmacy; Masters in Public Health**	Primary care††	Yes
4	31–35	1995–2000	Diploma in clinical pharmacy; MSc Clinical Pharmacy; PhD	Primary care††	Yes
5§	40–45	1985–1989	Diploma in management studies	Community†	No
6	40–45	1985–1989	None	Community†	No

*July 2006.

**Was being undertaken at the start of the PINCER Trial.

†Community pharmacists are mainly, but not exclusively responsible for procurement, storage, dispensing, advising and distributing medicines (both prescription and over the counter) in a community pharmacy setting.

††Primary care pharmacists work with GP/family practices on a whole range of issues related to prescribing, such as formulary development, ensuring evidence-based prescribing practice, running specific clinics and providing education and advice on therapeutics.

§Pharmacy background predominantly in secondary care, had recently started working in community pharmacy at the start of the PINCER Trial.

Table 3 The PINCER Trial pharmacist intervention training programme

Training session	Topic	Rationale for topic	Trial-specific or generic training	Duration of training
1	Introduction to PINCER Trial	Understanding why the PINCER Trial was being undertaken and the format of the intervention	Trial-specific	45 min
1	What is clinical research?	To emphasise the importance of accurate data recording for clinical trials	Generic	45 min
1	Introduction to pharmaceutical indicators (outcomes)	Clinical and health service research evidence for why the 10 pharmaceutical indicators (outcomes) were chosen in the PINCER Trial; an important facet of academic training	Trial-specific	1 h
1	Introduction to human error theory	The use of RCA, one aspect of human error theory, would help the pharmacist identify why system errors are occurring in a GP practice	Generic	1 h 30 min
1	Introduction to educational outreach	The use of educational outreach would help the pharmacist deliver educational information to healthcare professionals	Generic	1 h 30 min
2	Quality data and data outcomes	Emphasise the importance of accurate data recording within patient records, introduce the types of problems which pharmacists might encounter and how to overcome them	Generic data analyst training	3 h
2	System types	Introduce the pharmacists to different general practice systems	Generic data analyst training	1 h
3	Clinical coding	Help pharmacists understand clinical coding systems, how mistakes can happen and how to avoid them	Generic data analyst training	4 h 30 min
4	Data analysis, interpretation and feedback	Help pharmacists to interpret practice data	Generic data analyst training	3 h
4	Role play	Provide an opportunity for pharmacists to practise using the principles of educational outreach and RCA	Generic	2 h
5	Introduction to Quest Browser	Show the pharmacists how to access the data on the pharmaceutical interventions (outcomes)	Trial-specific	45 min
5	Results of Quest Browser searches	Help the pharmacists interpret the data outputs on the pharmaceutical interventions (outcomes)	Trial-specific	1 h 15 min
5	Pharmacist record form	Show the pharmacists how to complete forms which record their activity within the practice during the intervention period	Trial-specific	1 h

RCA, root cause analysis.

members of the research team (SS and RH). Frequencies were calculated and presented as summary tables. Free-text comments from the evaluation forms and the pharmacists' diaries were thematically coded and grouped according to emergent themes.

Results

All six pharmacists received 22 h of training. This comprised 17 h and 15 min of generic training and 4 h and 45 min of trial-specific training, provided over five training sessions. The time allocated to the different components of the training sessions is shown in Table 3.

Twenty seven out of 30 (90%) evaluation forms were completed. Details of the responses from the evaluation forms for each of the training sessions can be found in Table 4. It can be seen that in four out of the five training sessions the pharmacists who completed an evaluation form indicated that they were satisfied or very satisfied

with the various elements of the training package. The feedback was more positive for the training received on training sessions one, four and five, which included training on the concepts of RCA, educational outreach and the role-play session. Training was deemed to be unsatisfactory to one pharmacist on one occasion due to a noisy venue and the pre-reading material not being sent in adequate time.

Free-text comments from the evaluation forms and the views recorded in the pharmacists' diaries substantiated these findings.

Pharmacists' views on educational outreach and RCA training

In training session 1 (where the concepts of educational outreach and RCA were taught) very positive comments from the pharmacists were given:

Table 4 Evaluation of PINCER Trial pharmacist intervention training package

Question		Training session 1			2*			3†			4‡			5§		
Q2.	In terms of the pre-training information, how satisfied were you with:	Dissatisfied	Satisfied	Very Satisfied	Dissatisfied	Satisfied	Very Satisfied	Dissatisfied	Satisfied	Very Satisfied	Dissatisfied	Satisfied	Very Satisfied	Dissatisfied	Satisfied	Very Satisfied
Q2a.	the content of material sent?	0	3	3	1	1	0	0	3	2	0	5	0	0	3	2
Q2b.	the timing of material sent?	0	4	2	1	1	0	0	3	2	0	5	0	0	3	2
Q3.	How satisfied were you with these aspects of the training?															
Q3a.	pre-training arrangements	0	4	2	1	1	0	0	4	1	0	4	1	0	3	2
Q3b.	training materials/handouts	0	3	3	1	3	0	0	3	2	0	4	1	0	3	3
Q3c.	venue/refreshments	0	3	3	0	3	1	0	2	3	0	3	2	0	4	2
		Failed	Satisfied	Exceeded	Failed	Satisfied	Exceeded	Failed	Satisfied	Exceeded	Failed	Satisfied	Exceeded	Failed	Satisfied	Exceeded
Q4.	To what extent did the training:															
Q4a.	match your expectations?	0	4	2	0	4	0	0	3	2	0	6	0	0	4	2
Q4b.	meet the training objectives?	0	4	2	0	4	0	0	4	1	0	6	0	0	4	2
Q4c.	help your understanding?	0	3	3	0	3	1	0	3	2	0	3	3	0	4	2
Q4d.	contain sufficient detail and examples ?	0	3	3	0	3	1	0	3	2	0	3	3	0	3	3
		Not at all	Satisfactory	Very satisfactory	Not at all	Satisfactory	Very satisfactory	Not at all	Satisfactory	Very satisfactory	Not at all	Satisfactory	Very satisfactory	Not at all	Satisfactory	Very satisfactory
Q5.	Was the training:															
Q5a.	presented professionally?	0	1	5	0	1	3	0	1	4	0	3	3	0	2	4
Q5b.	relevant?	0	0	5	0	1	3	0	3	2	0	3	3	0	2	4
Q5c.	sufficiently interactive ?	0	0	6	0	1	3	0	2	3	0	1	5	0	2	4
		Too slow	About right	Too fast	Too slow	About right	Too fast	Too slow	About right	Too fast	Too slow	About right	Too fast	Too slow	About right	Too fast
Q6.	Was the pace of the training:	0	6	0	0	4	0	0	5	0	0	6	0	0	6	0

*Training session 2: two pharmacists did not evaluate Q2a, Q2b and Q3. Only four pharmacists completed an evaluation form.
†Training session 3: one pharmacist did not evaluate Q2a and Q2b. Only five pharmacists completed an evaluation form.
‡Training session 4: one pharmacist did not evaluate Q2a, Q2b, Q3a, Q3b, and Q3c.
§Training session 5: one pharmacist did not evaluate Q2a, Q2b, and Q3a.

An excellent day which has made me feel very excited and positive about the job. (Pharmacist 2, evaluation feedback for training session 1)

The content and delivery was excellent and the clinical knowledge will benefit my work. (Pharmacist 1, evaluation feedback for training session 1)

The main benefits cited from this training session were that the concepts of educational outreach and RCA had increased the pharmacists' confidence at delivering key messages, along with having the ability to use the concepts in their other pharmacy posts:

Useful to learn about [educational outreach] and to think about how you can use educational outreach when delivering information to GPs, both in the trial and in my other practice pharmacist job. (Pharmacist 4, diary extract regarding training session 1)

I feel more confident and competent in delivering key messages. (Pharmacist 3, evaluation feedback for training session 1)

Pharmacists' views on undertaking role play

The role play that the pharmacists undertook in training session 4 was viewed positively and considered necessary to successfully carry out the intervention:

Practising root cause analysis was very helpful. (Pharmacist 5, evaluation feedback for training session 4)

Getting feedback on performance in role play was helpful. (Pharmacist 2, evaluation feedback for training session 4)

One pharmacist in particular believed it was imperative that pharmacists were given the opportunity to undertake role play using the principles of RCA and educational outreach before using it on GPs:

It was quite daunting to have to do the role plays but probably the most useful part of the training. . . . I think we will need to have the opportunity to try and use human error theory [referring specifically to RCA, one aspect of human error theory] and educational outreach in practice role plays before being let loose on GPs! (Pharmacist 4, diary extract regarding training session 4)

Pharmacists' views on the other areas of the training programme

The sessions on clinical research (in training session 1), along with data analysis and interpretation (in training session 4),

were deemed too long by pharmacists and perhaps not specific enough for the trial's objectives:

The clinical research section could possibly be shorter, allowing more time for more relevant areas. (Pharmacist 5, evaluation feedback for training session 1)

Aim less at data quality facilitators and more at us. (Pharmacist 2, evaluation feedback for training session 4)

Likewise, in training session 2, where different GP clinical computer systems were discussed, this was perceived as useful but feedback indicated that pharmacists would have found the session more useful if they had had the opportunity to gain practical experience on the different clinical systems:

It would have been more useful to have had practical experience as at the moment it is hard to visualise what the different systems are capable of. My concern is when undertaking discussions with GPs I will not have much idea of what their system is capable of and how solutions may be sought. (Pharmacist 4, diary extract regarding training session 2)

It would have been nice to have more interactive sessions i.e. hands-on or exercises. (Pharmacist 1, evaluation feedback for training session 2)

Whereas the training session on clinical codes (covered in training session 3) was seen as useful, there were comments that it was quite long and pharmacists questioned whether they required this information in the depth that was provided:

Read coding [a clinical coding system used in UK general practice] will benefit me when I begin the trial. (Pharmacist 1, evaluation feedback for training session 3)

It was useful to have some background to Read/clinical codes, though I'm not sure the whole day was needed. (Pharmacist 4, diary extract regarding training session 3)

Pharmacists commented that they would have preferred more practical training in its place. This was particularly apparent during the final training session (training session 5), which was held at a local GP practice.

Improving the pharmacists' training package

In terms of how the training package could be improved, the overarching message from the pharmacists was that there should have been more opportunities for hands-on practical experience of working with the GP clinical systems. The

opportunity to gain more practical experience on the GP clinical systems was indicated by pharmacists throughout the training sessions:

> More hands on experience of EMIS [Egton Medical Information System Limited, a primary care clinical software programme) for those not familiar with it. (Pharmacist 2, evaluation feedback for training session 3)

> It was very useful to have the chance of looking at the computer. (Pharmacist 4, evaluation feedback for training session 5)

> IT training – possible inclusion of working software to work through. (Pharmacist 6, evaluation feedback for training session 4)

Pharmacists also expressed a desire to have more opportunities to practise the concepts of educational outreach and RCA in a role play scenario, as these were deemed to be the most important aspects of the training package.

> More role play opportunity possibly at the expense of 'technical aspects', e.g. data extraction etc. (Pharmacist 6, evaluation feedback for training session 4)

Discussion

Main findings

These findings would suggest that the training the pharmacists received, which included the principles of educational outreach and RCA, resulted in the pharmacists feeling more confident and competent in effectively delivering the trial intervention to bring about change. The pharmacists also felt the skills that they learned to deliver the PINCER intervention would be beneficial in their pharmacist roles outside of the PINCER Trial to deliver key prescribing information to GPs and their practice staff.

Strengths and limitations

Overall, the training package used to deliver the intervention was very thorough and consisted of well-thought-out training materials, with each component of the training package being delivered by people with considerable knowledge and experience in the area. The training provided also allowed the PINCER pharmacists the opportunity to practise what they had learned through role plays and ask questions.

The demographics of the pharmacists attending the training sessions also varied, with a range of professional experiences within primary and secondary care settings, years qualified and qualifications. All training sessions had full attendance and were evaluated well by the pharmacists completing evaluation forms.

However, we acknowledge that there are some limitations to this work. The training was delivered to only a small number of pharmacists and could have been strengthened by a greater number of pharmacists undergoing the training. Although the evaluation forms were anonymous, due to the small number of pharmacists attending the training session they may have feared they would have been identified, possibly eliciting a more positive evaluation of the training than was the case. Feedback on the sessions was evaluated by the research team as opposed to being evaluated independently which would have made the evaluation more rigorous. Likewise, a more balanced five-point Likert scale would have been preferable. However, due to the small number of participants, a relatively simple three-point scale was chosen to indicate levels of satisfaction with the training. In four of the six training sessions data collection was incomplete, with three pharmacists not completing an evaluation form and four pharmacists not evaluating all the questions on the form. Although we did not conduct a follow-up evaluation of the training after intervention delivery, this was explored in the PINCER Trial nested qualitative study.[28]

The evaluation of the training programme showed that the pharmacists would have liked more time for role play and that the generic elements were not tailored quite enough to the intervention. We also acknowledge that time in general was a limiting factor and this did mean we could not always go into the depth we would have liked to. For example, it would have been beneficial to have had more hands-on-time with the clinical systems for those pharmacists not familiar with them.

Wider discussion

This training package was designed specifically for the PINCER Trial, a robust randomised controlled trial that demonstrated a statistically significant difference for each of the three primary pharmaceutical indicators (outcomes) at the main 6 month assessment in the pharmacy-led intervention group of practices.[7] It could easily be shortened for wider primary care pharmacy use, by excluding the topics specific to the PINCER Trial (see Table 3). It is unlikely that excluding the trial-specific elements would reduce the expected benefits of the training as the most positive comments were in relation to the generic topics. This would allow flexibility in the training package and help ease the time constraints that pharmacists often face. The evaluation of the training package highlighted the fact that pharmacists believed receiving more hands-on experience of the GP clinical systems and opportunities to undertake more role play would have been useful and this should be considered for future roll out.

On commencing the PINCER Trial, three of the PINCER pharmacists were already working as primary care pharmacists, and so had prior knowledge and experience of how to use GP clinical systems along with a general insight to how GP

practices work. It is possible that having this expertise is advantageous in undertaking this type of intervention but it would appear that it is not imperative, as the results of the PINCER Trial showed.[7]

Conclusions

The training evaluation showed that the use of the key principles of educational outreach combined with RCA resulted in the pharmacists feeling more confident and competent in effectively delivering the PINCER Trial intervention. It is therefore possible that the provision of this type of training could have a much wider application in helping pharmacists have a more proactive day-to-day role in helping GP practices identify key system failures in relation to prescribing safety and in turn improve outcomes in a wide range of pharmaceutical interventions. We suggest that these principles should be incorporated into pharmacy practice, particularly in the primary care setting. The future of the PCT primary care pharmacist is changing and commissioning groups and private companies who will be taking on this role will need to think about the training needs and provision of training for pharmacists delivering interventions in GP practices.

Declarations

Conflict of interests

The Author(s) declare(s) that they have no conflicts of interest to disclose.

Authors' contributions

All Authors state that they had complete access to the study data that support the publication. SS handled data analysis of pharmacists' training evaluation and led on manuscript preparation; SR was involved with trial design and coordination, design and delivery of training, data analysis of training evaluation and manuscript preparation; RH was part of trial design, design and delivery of training, data analysis of training evaluation and manuscript preparation; CJM was involved with trial design, design of training and manuscript preparation; and AJA was involved with trial design, was the chief investigator of PINCER Trial, and took part in design and delivery of training and manuscript preparation.

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Appendix 1 PINCER pharmacist training evaluation form

PINCER pharmacist training evaluation

To evaluate our training programme it would be of help if you could complete this evaluation form. The form is anonymous, although we would like information about your professional background.

Please answer all questions by placing a tick in a box or by commenting in the space provided.
1. Please tick which best describes your professional background:

Academic researcher or lecturer	☐	Community pharmacist	☐
Hospital pharmacist	☐	PCT Pharmacist	☐
Other (please specify):	☐		

2. In terms of the pre-training information, how satisfied were you with:

	dissatisfied	satisfied	very satisfied
a) the content of material sent?	☐	☐	☐
b) the timing of material sent?	☐	☐	☐

Comments:

3. How satisfied were you with these aspects of the training?

	dissatisfied	satisfied	very satisfied
a) pre-training arrangements	☐	☐	☐
b) training materials/handouts	☐	☐	☐
c) venue/refreshments	☐	☐	☐

Comments:

4. To what extent did the training:

	failed	satisfied	exceeded
a) match your expectations?	☐	☐	☐
b) meet the training objectives?	☐	☐	☐
c) help your understanding?	☐	☐	☐
d) contain sufficient detail and examples?	☐	☐	☐

Comments:

5. Was the training:

	not at all	satisfactory	very satisfactory
a) presented professionally?	☐	☐	☐
b) relevant?	☐	☐	☐
c) sufficiently interactive?	☐	☐	☐

Comments:

6. Was the pace of the training:

too slow	about right	too fast
☐	☐	☐

Comments:

7. How could the training content and delivery be improved?
8. To what extent will this training help your future work?
9. Do you think you may have any future training or support needs relating to the topics covered today?
10. Do you have any other comments?

Please return the form to:

Dr Sarah Rodgers, Pincer Trial Co-ordinator, Division of Primary Care, 13th Floor, Tower Building, University Park, Nottingham NG7 2RD

Thank you for taking the time to complete this evaluation.