IJPP INTERNATIONAL JOURNAL OF Pharmacy Practice

ROYAL PHARMACEUTICAL SOCIETY

IJPP
International Journal of
Pharmacy Practice

Research Paper

International Journal of Pharmacy Practice 2017, ••, pp. ••–••

Development and perceived effects of an educational programme on quality and safety in medication handling in residential facilities

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Keywords
continuing education; medication errors; patient safety; persons with disabilities; residential facilities

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doi: 10.1111/ijpp.12361

All authors had complete access to the study data that supported this publication.

Abstract

Objectives To develop and test an educational programme on quality and safety in medication handling for staff in residential facilities for the disabled.

Methods The continuing pharmacy education instructional design model was used to develop the programme with 22 learning objectives on disease and medicines, quality and safety, communication and coordination. The programme was a flexible, modular seven + two days' course addressing quality and safety in medication handling, disease and medicines, and medication supervision and reconciliation. The programme was tested in five Danish municipalities. Municipalities were selected based on their application for participation; each independently selected a facility for residents with mental and intellectual disabilities, and a facility for residents with severe mental illnesses. Perceived effects were measured based on a questionnaire completed by participants before and after the programme. Effects on motivation and confidence as well as perceived effects on knowledge, skills and competences related to medication handling, patient empowerment, communication, role clarification and safety culture were analysed conducting bivariate, stratified analyses and test for independence.

Key findings Of the 114 participants completing the programme, 75 participants returned both questionnaires (response rate = 66%). Motivation and confidence regarding quality and safety in medication handling significantly improved, as did perceived knowledge, skills and competences on 20 learning objectives on role clarification, safety culture, medication handling, patient empowerment and communication.

Conclusions The programme improved staffs' motivation and confidence and their perceived ability to handle residents' medication safely through improved role clarification, safety culture, medication handling and patient empowerment and communication skills.

Introduction

Vulnerable patient groups with multiple diseases, polypharmacy and low socio-economic position need professional support to secure optimal treatment. This includes minimizing the risk of medication errors.

In Denmark, approximately 15 000 adults reside in facilities for the disabled, either temporarily or permanently.[1] Such facilities accommodate people with mental and intellectual disabilities (52% of all residents) and people with severe mental illness (30% of all residents).[1]

Disabled people are the responsibility of the Ministry of Social Affairs and the Interior, and the facilities are regulated by the act of social services.[2] The municipalities are responsible for offering accommodation, training and care of the disabled and for supervising the facilities within the scope of this legislation. When staff conducts

healthcare services such as dispensing and administering medicines, the facilities also work under the healthcare act of the Ministry of Health and its guideline on uniform and safe handling of medicines.[3]

This vulnerable patient group has a low socio-economic position and low health literacy and often faces difficulties in communicating with healthcare professionals. Furthermore, their prevalence of somatic conditions, such as cancer, type 2 diabetes, cardiovascular diseases and chronic obstructive pulmonary disease is high compared to the general population, and such conditions often develop at an earlier age.[4–6] Multiple illnesses often imply a need for polypharmacy, leading to an increased risk of medication errors, and medication errors are frequently reported in these patients.[7–10]

As opposed to many other countries, most staff in Danish residential facilities for the disabled are social workers without healthcare training. The facility management is responsible for providing the necessary training in handling medicines. Such training is often unavailable or perceived not to be readily applicable, due to insufficient bridging of the professional worlds of medicine and pedagogy.[8] To a vulnerable patient group with a considerable risk of multimorbidity and polypharmacy, and often limited social, physical and/or intellectual resources, this constitutes a serious patient safety risk.

Only few intervention studies concerning medicine and medicines use in such facilities have been reported.[8,11] A Danish quality improvement service delivered by community pharmacies illustrated a significant need for tailored interventions on improved quality and safety of the medication use process,[8] including competence development of core staff.[8] A Dutch study tested the effect of an educational intervention delivered by pharmacists on medicines administered through enteral feeding tubes, which resulted in fewer administration errors.[12] Another Danish study tested an educational programme on medicines and medication handling delivered by community pharmacists.[13] The study revealed that a focus solely on changes in knowledge and attitudes was not sufficient to improve everyday practices in the facilities. Rather, a more systematic approach for competence development focusing on implementation of improvements in practice is needed.

A systematic model for competence development used among pharmacists is the continuing pharmacy education instructional design model.[14,15] To our knowledge, this model has not previously been utilized for competence development of staff without healthcare training. However, we decided to test its applicability in a setting without healthcare training. The aim was to develop and test staff members' perceived effects of an educational programme for competence development of core staff at residential facilities.

Methods

Design of the educational programme

The design of the educational programme was framed by the continuing pharmacy education instructional design model developed by the learning theorist Christine M. Nimmo.[14,15]

As the first step in the continuing pharmacy education instructional design model,[14,15] a task and learning analysis was conducted based on official guidelines and interviews with leaders and staff from 14 residential facilities on their current level of knowledge, skills and competences regarding medicines, and perceived needs for further training. Subsequently, learning objectives were developed within three areas: disease and medicines, quality and safety, and communication and coordination. Learning objectives were defined at three levels: knowledge, skills and competencies according to the national qualification framework for lifelong learning.[16]

Variation across the residential facilities was considerable, especially regarding the residents' health issues, but also their need for support and ability to conduct self-care. To accommodate this variation, a flexible educational programme was designed which allowed tailoring according to the needs of the individual facility. For example, residents in some facilities had jobs, whereas in other facilities, most residents had extensive cognitive challenges, or extensive physical disability.

Choosing and designing the instructional delivery system comprised construction of predefined pedagogical principles, scheduling of the programme, design of teaching materials, e-learning modules, tools, tasks and assessments.

The programme design resulted in a 7-day basic programme for all participants combined with a 2-day session exclusively for participants with special responsibilities in relation to medicines (Table 1). Between teaching sessions, participants conducted self-tests, implemented the tools presented to them in previous sessions and prepared for the following session. The basic programme consisted of a mix of mandatory and elective disease-specific modules to tailor the programme according to medication-related problems experienced at the individual facilities. A description of the programme and the mandatory and elective modules is given in Table 1.

Selection of residential facilities

The educational programme was tested in five Danish municipalities representing each of the five Danish regions, both rural and urban areas. The municipalities

Table 1 Description of the educational programme with one-day or half-day sessions, and the tests and tasks between teaching sessions

	Morning session	Afternoon session
Basic programme (for staff dispensing and administering medicines)		
Day 1	Assessing tasks and learning needs	Quality and safety in medication management
Day 2	Medicines pedagogy and safety culture	Important bodily functions related to medicines use
Preparing and training	Self-tests Introduce the SBAR tool kit to colleagues and implement the tool kit Identify possible medication-therapy problems in residents using the introduced tool	
Day 3	Practical use of medicines	Optional disease-specific session[a]
Day 4	Psychiatric disorders (for facilities with residents with severe mental illnesses) OR Neurological disorders (for facilities with residents with physical and intellectual disabilities)	
Preparing and training	Self-tests Continue training of the SBAR tool kit Identify possible medication-therapy problems in residents using the introduced tool	
Day 5	Optional disease-specific session[a]	Optional disease-specific session[a]
Preparing and training	Self-tests Copy all guidelines on handling medicines and send to instructor	
Day 6	Safe use of medicines	
Preparing and training	Self-tests Develop/improve required guidelines for handling medicines Copy medication list of a resident with possible medication-therapy problems and send to instructor	
Day 7	Medication reconciliation	Medication supervision
Training	Self-tests Train medication reconciliation based on developed guideline Arrange 3 medication supervision sessions with the community pharmacy instructor	
Additional programme (for staff responsible for quality development)		
Preparing and training	Arrange audit training of quality routines with the community pharmacy instructor Copy all guidelines on handling medicines and send to instructor	
Day 8	Development and implementation of required guidelines	
Day 9	Managing implementation of safer work routines	
Training	Implementation of an improvement at the facility	

[a]Optional disease-specific sessions: Pain, ADHD, antipsychotics, cardiovascular diseases, diabetes, epilepsy, disorders of the gastrointestinal tract, substance abuse.

were selected based on their application for participation and independently selected two residential facilities: one accommodating residents with mental and intellectual disabilities and one accommodating residents with severe mental illnesses. The municipalities were asked to approach facilities with strong leadership, a mature patient safety culture and an innovative approach. The aim was to include facilities capable of implementing changes in their own practice and subsequently spreading local improvements using a systematic approach to achieve system-wide change. No other inclusion criteria were set up. The researchers were not otherwise involved in the selection of facilities.

Testing the educational programme

Based on the assumption that building local networks with expertise in quality and safety in medicines use is important for the exchange of knowledge, support and capacity building, we conducted the programmes locally with local instructors. Community pharmacists, quality managers/risk managers and substance abuse counsellors together with consultants from the Danish College for Pharmacy Practice delivered the programme. A mix of backgrounds amongst instructors was selected to bring together the pharmaceutical, therapeutic and regulatory expertise existing in the local area.

The 2-day session for participants with special responsibilities in relation to medicines was conducted nationally for all facilities to facilitate transfer of knowledge and expertise.

Community pharmacists recruited from the pharmacies delivering medicines to the facilities delivered the disease-specific sessions, sessions on practical use of medicines and sessions on medication reconciliation and supervision. The municipal risk/quality manager delivered the session on safe use of medicines and the substance abuse counsellors delivered the elective session on treatment of substance abuse. Consultants from the Danish College for Pharmacy Practice delivered the first one and a half-day sessions as well as the 2-day national session.

To support deliverance of such a complex programme, the community pharmacists received a 1-day preparatory seminar introducing them to the programme and the

pedagogical principles to use. They also received supervision from a consultant who developed the programme, predefined pedagogical principles and extensive instructional materials. Other instructors received instructional material and telephone guidance by one of the consultants developing the programme. The programme was tested between October 2013 and April 2014.

Evaluation of the staff members' perceived effects of the educational programme

The perceived effects of the programme were measured based on a questionnaire survey at baseline and end-point among the staff participating in the programme.

Both the baseline and end-point questionnaire included questions on the following:

- background characteristics of the staff member (age, sex, educational background, work experience)
- actions in at-risk situations related to medicines
- knowledge, skills and competences related to the 22 learning objectives on role clarification, patient safety culture, medication handling, patient empowerment and communication with healthcare professionals
- overall perceived relevance, motivation and confidence regarding handling medicines.

The remaining sections contained questions relating to the 22 learning objectives of the programme and were used to evaluate participant learning.

Participants were asked to rate to which extent they agreed with described scenarios on a 5-point Likert scale. Learning objectives and at-risk situations were rated on a scale from 1 = 'always', 2 = 'often', 3 = 'sometimes', 4 = 'rarely' and 5 = 'never'. Relevance, motivation, confidence and satisfaction were rated on a scale from 1 = 'to a very high degree', 2 = 'to a high degree', 3 = 'to some degree', 4 = 'to a lower degree' and 5 = 'to a much lower degree'.

Knowledge on the background of participants was used to test for differences in motivation and outcomes between professional groups.

Participants' response to a range of at-risk situations was used to evaluate their patient safety awareness (results are not reported in this article). At-risk situations were taken from an analysis of reported incidents to the Danish Patient Safety Database from residential facilities for the disabled.[17]

The end-point questionnaire included 13 additional questions regarding satisfaction with and perceived effects of the programme and eight open-ended questions regarding learning outcomes and suggestions for programme revisions.

The questionnaire was piloted with two nurses, one nurse-assistant and three social workers in a facility not participating in the study. Two researchers presented the study and the aim of the questionnaire and the pilot. All found the questionnaire easy to complete and questions relevant. The pilot only resulted in some words being changed to better reflect the vocabulary used in the facilities.

Questionnaires were coded with an ID number designated to each participant in order to match baseline and end-point questionnaires. The code breaker was only available to the researchers.

Administration of questionnaires

The questionnaires were administered by the project team to the participants at baseline and after completion of the programme. The baseline questionnaires were administered and collected by the instructor at the first session. The end-point questionnaire was administered to facility managers at a joint seminar in May 2014 together with prestamped envelopes. Up to three reminders were sent to facility managers to improve response rate.

Data analysis

In the analyses, we dichotomized the variables of relevance, motivation, confidence and satisfaction so that the answers 'to a very high degree' and 'to a high degree' were categorized as positive outcomes (e.g. felt motivated) as opposed to 'to some degree', 'to a lower degree' or 'to a much lower degree' which were categorized as negative outcomes (e.g. did not feel motivated). Similarly, the variables of competencies in medication handling, patient empowerment, communication, clarification of roles and patient safety culture were dichotomized so that the answers 'always' and 'often' constituted positive responses, and the answers 'sometimes', 'rarely' and 'never' constituted negative responses.

Data were analysed with SPSS and medcalc.net. We calculated frequency tables comparing outcome status of participants before and after the educational programme for each question, and used a stringent P-value of 0.05 to denote statistical significance. Odds ratios, including 95% confidence intervals, were calculated excluding missing values. Only respondents who submitted both questionnaires were included in the analysis.

Ethics

No approval from ethical committees was necessary according to the Danish National Committee on Health Research Ethics, as questionnaire studies without human biological material or testing do not fall under the committee's definition of being health research.[18]

Participants were informed that data from the questionnaire would be published and that responses would be anonymous.

Results

Background characteristics of participants

A total of 114 staff members from 10 facilities participated in the educational programme. The analysis was based on the 75 respondents completing both the baseline and the end-point questionnaire (response rate = 66%). Most respondents were female (67 of 75, 89%), and the dominant position among the respondents was social worker (36 of 75, 48%), followed by a group with miscellaneous non-healthcare backgrounds (13 of 75, 17%), social and healthcare assistants (11 of 75, 15%), social and healthcare helpers (7 of 75, 9%), managers (7 of 75, 9%) and nurses (1 of 75, 1%). Their average work experience in residential facilities was 10.2 years (SD 7.6 years). Fifty-one of 75 participants (68%) worked in facilities for people with physical and intellectual disability.

Knowledge, skills and competences related to role clarification

Table 2 shows the proportion of respondents who felt that the programme clarified their role and responsibilities in handling medicines. This improved significantly for all four items representing this issue (OR between 5.13 and 13.66, $P < 0.05$).

Knowledge, skills and competences related to patient safety culture

Table 2 also shows the perceived effects on safety culture, including participants' perceived ability to prevent and deal with medication errors and perceived importance of such actions. For seven of the eight items, the perceived improvement in safety culture was significant (OR between 2.47 and 39.63, $P < 0.05$). Below are statements from participants:

> *All staff members now focus on medicines and its impact on the individual resident's safety and quality of life.*

> *We get together and get things cleaned up – talk about medication errors and align our instructions.*

> *I am more conscious about the different tasks related to safe use of medicines.*

Knowledge, skills and competences related to medication handling

Most participants (67 of 75, 90%) perceived that the programme had improved their ability to handle their residents' medication more safely. A participant wrote:

> *I have a greater understanding about the effects and side effects of the different types of medicines, and I am more familiar with incident reporting. Generally, I am better prepared for handling medicines.*

After the programme, significantly more respondents felt they had sufficient competences in handling medicines, administering different drug formulations, dealing with generic substitution and observing effects and side effects (OR between 3.55 and 29.65, $P < 0.05$). Participants wrote:

> *Importance of adverse drug reactions from medication. What we as staff can observe for. New knowledge on a lot of things.*

> *More interested in which medications residents' use and often recognize brand- names from the sessions.*

Their perceived ability to assist residents with clinical measurements such as blood glucose measurements did not increase significantly, perhaps reflecting that only three of 10 residential facilities chose the elective diabetes module (Table 1).

Knowledge, skills and competences related to patient empowerment

Compared with the level measured before the programme, the participants estimated that their patient empowerment skills increased. Significantly more respondents felt able to and confident assisting residents in safe use of medicines, motivating them to engage in their own treatment and paying attention to the interaction between medicines and quality of life (OR between 4.05 and 5.45, $P < 0.05$) (Table 2).

Knowledge, skills and competences related to communication with healthcare professionals

Also, significantly more respondents felt able to and confident communicating with healthcare professionals after the educational programme as compared to before, including a perception of having sufficient knowledge to engage in a dialogue with healthcare professionals and an ability to collaborate with them about safe use of medicines (OR 3.60 and 9.29, $P < 0.05$). A participant wrote:

Table 2 Learning objectives and measured changes in perceived competences in role clarification, safety culture, medication handling, patient empowerment and communication with healthcare professionals after participation in the educational programme

Theme	Learning objective of the programme and item of the questionnaire[a]	No. (%) of participants agreeing before the programme[b]	No. (%) of participants agreeing after the programme[b]	OR [95% CI]
Clarification of roles	Confident about his/her responsibility related to resident's medication	64 (85)	73 (97)	13.66 [1.72–108.73]*
	Confident about his/her role in relation to the resident's health and treatment	50 (67)	70 (93)	7.08 [2.53–19.82]*
	Aware of his/her responsibility for the resident's medication as delegated by the physician	64 (85)	73 (97)	5.73 [1.21–27.14]*
	Confident enough to say no when being uncertain about a medication-related task	55 (73)	70 (93)	5.13 [1.81–14.57]*
Safety culture	Ability to work according to current guidelines in the facility	68 (91)	75 (100)	14.37 [0.79–259.98]
	Conscious about the significance of working according to guidelines for safe handling of medicines	63 (84)	74 (99)	24.76 [1.42–431.14]*
	Culture where staff feels safe during the investigation following the registration of medication errors	41 (55)	58 (77)	2.47 [1.20–5.08]*
	Culture where staff feels safe communicating about medication errors	34 (45)	71 (95)	6.30 [2.02–19.64]*
	Culture where staff feels safe reporting medication errors	41 (55)	65 (87)	4.88 [2.16–11.04]*
	Knowledge on how reporting and analysing medication errors contribute to learning	38 (51)	67 (89)	8.53 [3.44–21.16]*
	Ability to prevent risks of medication errors	52 (69)	69 (92)	4.08 [1.52–10.94]*
	Sufficient knowledge to handle medication safely and without exposing himself/herself to unnecessary risks	59 (79)	75 (100)	39.63 [2.32–676.38]*
Medication handling	Ability to assist the resident with clinical measurements (i.e. blood sugar)	46 (61)	50 (67)	1.28 [0.64–2.55][c]
	Sufficient knowledge to observe relevant issues concerning the medication of the resident (i.e. side effects, lack of effect etc.)	28 (37)	61 (81)	6.62 [3.13–14.03]*
	Ability to manage different drug formulations (i.e. tablets, eye drops)	63 (84)	72 (96)	4.12 [1.12–15.78]*
	Ability to identify the correct medication even if it has been substituted with a cheaper alternative by the pharmacy	32 (43)	54 (72)	3.55 [1.76–7.15]*
	Necessary competencies to perform relevant tasks handling residents medication	52 (69)	74 (99)	29.65 [3.86–227.54]*
Patient empowerment	Sufficient knowledge to assist the resident in safe use of medicines	47 (63)	68 (91)	5.45 [2.18–13.62]*
	Ability to motivate the resident in engaging in his own treatment	45 (60)	61 (81)	4.05 [1.82–8.99]*
	Conscious about the role of medicines use in relation to the resident's quality of life	59 (79)	70 (93)	4.40 [1.38–13.99]*
Communication with healthcare professionals	Sufficient knowledge to engage in a dialogue with healthcare professionals about the disease(s) and medication of the resident	42 (56)	62 (83)	3.60 [1.69–7.68]*
	Ability to collaborate with healthcare professionals about safe use of medicines for the individual resident	54 (72)	71 (95)	9.29 [2.63–32.82]*

OR, odds ratio; CI, confidence interval.

[a]75 staff members answered the questionnaire before and after the educational programme and was included in the study on perceived effect. Each learning objective was also formulated as an item on the questionnaire. Each item was formulated as, for example 'I feel confident about my responsibility. . .'

[b]Number of participants agreeing to the item on the questionnaire before and after the educational programme. Participants rated their knowledge, skills and competences on a 5-point Likert scale with strongly agree and agree representing a positive outcome.

[c]Only three facilities (19 participants) chose the module about diabetes, which included training in blood glucose measurement.

*$P < 0.05$ statistically significant difference in odds ratio of the outcome measure before and after the programme with answers at baseline used as reference.

More certain about medicines and dispensing and interprofessional collaboration.

Overall perceived relevance, motivation and confidence regarding handling medicines

All 75 participants found it relevant to work with quality and safety related to medicines, and their motivation and confidence increased. Before the programme, 66 of 75 (88%) felt motivated, whereas 72 of 75 (96%) felt motivated after the programme (OR 4.91, $P < 0.05$). Significantly more respondents felt confident handling medicines after the programme [53 of 75 (70%) before compared to 71 of 75 (94 %) after the programme, OR 6.87, $P < 0.05$]. Participants wrote:

I am more certain, more confident, I know better how to act correctly.

I believe the programme was relevant, and answered a lot of things that I previously were in doubt about.

Confidence increased relatively more among social workers as compared to other positions [44 of 75 (58%) before, compared to 67 of 75 (89%) after the programme].

Discussion

The aim of this study was to utilize the continuing pharmacy education instructional design model to develop and test an educational programme for perceived competence development of core staff at residential facilities for the disabled. Results show that the programme improved staff's perceived ability to handle their residents' medication more safely through improved role clarification, safety culture, medication handling and patient empowerment and communication skills.

Discussion of methods

In the analyses, we chose to dichotomize the outcome variables in order to calculate odds ratios. This meant less sensitivity towards detection of changes in outcomes. We chose the dichotomization, as the purpose of the study was to reveal a distinction between a sufficient level and an insufficient level of quality and safety.

The municipalities actively applied for participation in the study and selected the participating facilities. It is therefore possible that we tested the programme in facilities with a more established safety culture than the average facility. The included municipalities and facilities are likely to be innovators when it comes to quality and safety improvement. This issue must be taken into consideration when transferring the results to other municipalities and facilities.

The instructors played an important role in motivating and engaging the participants in the programme. The programme was based on a structured model for competence development including pedagogical principles and teaching materials to be used, but if not delivered as intended, the possible effects of the programme would be compromised. Competence development requires pedagogical skills, but such skills were not a requirement for participation as instructors; thus, programme delivery may have varied across municipalities. However, we prioritized local anchoring of the programme to establish formal and informal partnerships between the residential facilities and local experts on quality and safety in medicines, as this may provide a basis for more extended collaboration in the future.

The programme had learning objectives concerning staff's abilities to support patient empowerment. However, we did not investigate patients' perceptions of their benefits from the programme, which could have produced important information.

We evaluated participants' motivation and confidence as well as perceived impact on quality and safety, but did not gather actual data on quality on safety. However, the participating facilities will be monitored the following year, during which they will report structured data to the research group on their practices on medication dispensing and administration, medication reconciliation, screening for potential medication-related problems and detected medication errors. Also, residents' medication charts will be analysed for changes in medicines use.

Discussion of results

Participants' motivation and confidence related to quality and safety in medication handling increased, as did their perceived knowledge, skills and competences regarding 20 of 22 learning objectives on clarification of roles, safety culture, patient empowerment, communication and medication handling. This suggests that the educational programme may improve staffs' competences, but also a great need for improving the quality and safety of medication handling in residential facilities for the disabled.

The educational programme deals with one of the most dangerous stages in the medication management system, namely administration and monitoring of medicines[19] at the 'patient end' of the system, where errors occur to a, perhaps, large degree.[20] However, there is a shortage of studies on medication errors and interventions targeting these stages in residential care facilities for the disabled.[9] It also deals with communication and coordination

related to the patient's medication, which is another major aspect of patient safety.[21] In residential facilities for the disabled, patients are generally more vulnerable than the average patient, and rely on caregivers for support and guidance.[4–6,22] The programme significantly improved staffs' perceived ability to empower patients, but also their perceived abilities to observe the effects of medicines use and communicate such observations to healthcare professionals.[7] Our focus was on external communication with healthcare professionals, but the internal communication between colleagues and through record keeping is another important issue to ensure seamless handover and understanding between shifts and for institutional memory.

Even though most interventions target individual aspects of the prevention of medication errors, medication errors are often the results of the system that produce them, rather than of the individual aspect.[11,20,23] The developed educational programme targets the medication use process as well as the culture of the organization. The significant perceived effects of the programme are therefore likely to be attributed to this organizational focus.

An important part of the programme was facilitating a process where staff identified safety issues and barriers in the medication use process at their facility and set goals for quality and safety concerning medicines. This bottom-up approach presumably created a sense of local ownership to the organizational changes and facilitated successful implementation of improvements. The programme marked the beginning of journey reaching improved patient safety using the model for improvement. This model aims at reaching sustainable improvements through a structured focus on change management, local work procedures, forming of local teams and networks and a data-driven monitoring of progress.[24,25]

This study is, to our knowledge, the first to develop and test such a comprehensive educational programme on quality and safety around medicines for staff without healthcare training in residential facilities for the disabled. Traditionally, there is a gap between the paradigms of social workers and healthcare professionals. To motivate and engage participants, it was therefore important to design a programme which bridged the gap between the two paradigms. This implied a focus on role clarification, patient empowerment, the dualism between optimal symptom control versus side effects affecting quality of life as well, and the positive interaction between pedagogical and medical intervention. The overall positive effect of the programme may be attributed to its focus on bridging the professional worlds of medicine and pedagogy.

The educational programme was revised and made available to all municipalities in Denmark.

Conclusions

The continuing pharmacy education instructional design model was successfully used for developing an educational programme targeting staff without healthcare training at residential facilities. The programme improved staffs' motivation and confidence and their perceived ability to handle residents' medication safely through improved role clarification, safety culture, medication handling and patient empowerment and communication skills.

As residential facilities for the disabled accommodate some of the most vulnerable patient groups, the spreading of the programme may be an important means to ensure safe and effective use of medicines for these patients.

Declarations

Conflict of interest

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

Funding

This work was supported by the Association of Danish Pharmacies and the Danish Ministry of Health.

Acknowledgements

We wish to thank the municipalities, residential facilities and instructors for the enthusiasm and effort they invested in the study.

Authors' contributions

AM conducted the analyses, interpreted the results, drafted the manuscript, and approved the submitted manuscript. ME-S designed the study, conducted the analyses, interpreted the results, revised the manuscript, and approved the submitted manuscript. CR and LAT designed the study, interpreted the results, revised the manuscript, and approved the submitted manuscript.

References

1. StatBankDenmark [Internet] (2012). *Statistics Denmark*. http://dst.dk/en/Statistik/emner/sociale-ydelser/sociale-ydelser-til-voksne, archived at http://www.webcitation.org/6gWISZUst (accessed 26 February 2016).
2. *Act on social services*. Copenhagen: Ministry of Social Affairs and the Interior, 2015 [in Danish].
3. *Act on prescibing and handling of medicines*. Copenhagen: Ministry of Health, 2015 [in Danish].
4. Krahn GL *et al.* A cascade of disparities: health and health care access for people with intellectual disabilities. *Ment Retard Dev Disabil Res Rev* 2006; 12: 70–82.
5. De Winter CF *et al.* Overweight and obesity in older people with intellectual disability. *Rev Res Disabil* 2012; 33: 398–405.
6. Heald A. Physical health in schizophrenia: a challenge for antipsychotic therapy. *Eur Psychiatry* 2010; 25(Suppl. 2): S6–S11.
7. Sabaté E. *Adherence to Long-Term Therapies. Evidence for Action*. Geneva: WHO, 2003.
8. Thomsen LA *et al.* Improving safety in the medicines use process for disabled persons in residential facilities. Results from a pilot study. *J Biosafety Health Educ* 2014; 2: 114. doi:10.4172/2332-0893.1000114
9. Van den Bemt PM *et al.* Drug administration errors in an institution for individuals with intellectual disability: an observational study. *J Intellect Disabil Res* 2007; 51(Pt 7): 528–536.
10. Aronson JK. Medication errors: what they are, how they happen, and how to avoid them. *QJM* 2009; 102: 513–521.
11. Olaniyan JO *et al.* Safety of medication use in primary care. *Int J Pharm Pract* 2015; 23: 3–20.
12. Idzinga JC *et al.* The effect of an intervention aimed at reducing errors when administering medication through enteral feeding tubes in an institution for individuals with intellectual disability. *J Intellect Disabil Res* 2009; 53: 932–938.
13. Thomsen LA *et al.* Medicin og medicinhåndtering. Evaluering af et kompetenceforløb for medarbejdere på botilbud [Medication and medication handling – evaluation of a pharmacy-delivered educational programme for staff at residential facilities]. Hillerød: Pharmakon, 2015. [report in Danish].
14. Nimmo CM. Developing training materials and programs: creating educational objectives and assessing their attainment. In: Nimmo CM *et al.* eds. *Staff Development for Pharmacy Practice*. Bethesda, MD: ASHP - American Society of Health-System Pharmacists, 2000: 65–119.
15. Nimmo CM. Developing training materials and programs: facilitating learning in staff development. In: Nimmo CM *et al.* eds. *Staff Development for Pharmacy Practice*. Bethesda, MD: ASHP - American Society of Health-System Pharmacists, 2000: 119–149.
16. Referencing the Danish Qualifications Framework for Lifelong Learning to the European Qualifications Framework. Copenhagen: The Danish Evaluation Institute, 2011. http://english.eva.dk/publications/referencing-the-danish-qualifications-framework-for-lifelong-learning-to-the-european-qualifications-framework, archived at http://www.webcitation.org/6gWJXCuw9 (accessed 26 February 2016).
17. Knudsen P. [Medicines use in residential facilities and other facilities for people with handicap]. Copenhagen: Danish Patient Safety Authority, 2013 [report in Danish].
18. *Guideline on Application for Health Research* [internet]. The National Committee on Health Research Ethics, 2014. http://www.dnvk.dk/forskere/~/media/Files/cvk/vejledning%202014/PDFudgave%202014%20vejledning%20DOK1355342.ashx, archived at http://www.webcitation.org/6kW7YxSso (accessed 14 September 2016) [in Danish].
19. Avery A *et al.* Safer medicines management in primary care. *Br J Gen Pract* 2002; 52: S17–S22.
20. Garfield S *et al.* Quality of medication use in primary care – mapping the problem, working to a solution: a systematic review of the literature. *BMC Med* 2009; 7: 50. doi:10.1186/1741-7015-7-50
21. Kennedy AG *et al.* Evaluation of a modified prescription form to address prescribing errors. *Am J Health Syst Pharm* 2011; 68: 151–157.
22. O'Dwyer M *et al.* Pharmacists' medicines related interventions for people with intellectual disabilities: a narrative review. *Int J Clin Pharm* 2015; 37: 566–578.
23. Leape LL *et al.* Systems analysis of adverse drug events. ADE Prevention Study Group. *JAMA* 1995; 274: 35–43.
24. Lipsky M. *Street-Level Bureaucracy. Dilemmas of the Individual in Public Services*, 30th Anniversary Expanded Edition. New York: Russel Sage Foundation, 2010.
25. Langley GJ *et al. The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*, 2nd edn. San Francisco: Jossey-Bass, 2016.