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Development of a clinical pharmacy model within a home nursing service using co-creation and participatory action research: the Visiting Pharmacist (ViP) project

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TITLE

Development of a clinical pharmacy model within a home nursing service using co-creation and participatory action research: the Visiting Pharmacist (ViP) project

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ABSTRACT

Objective

To develop a collaborative, person-centred model of clinical pharmacy support for community nurses and their medication management clients.

Design

Co-creation and participatory action research, based on reflection, data collection, interaction and feedback from participants and other stakeholders.

Setting

A large, non-profit home nursing service in Melbourne, Australia.

Participants

Older people referred to the home nursing service for medication management support, their carers, community nurses, general practitioners (GPs) and pharmacists, a multidisciplinary stakeholder reference group (including consumer representation) and the project team.

Data collection and analysis

Feedback and reflections from minutes, notes and interview transcripts from: project team meetings, clinical pharmacists' reflective diaries and interviews, meetings with community nurses, multidisciplinary stakeholder reference group meetings and in-depth interviews and focus groups with 27 older people, 18 carers, 53 nurses, 15 GPs, 7 community pharmacists.

Results

The model was based on best-practice medication management standards and designed to address key medication management issues raised by stakeholders. Pharmacist roles included direct client care and indirect care. Direct care included home visits, medication reconciliation, medication review, medication regimen simplification, preparation of medication lists or charts for clients and nurses, liaison and information sharing with prescribers and pharmacies and patient/carer education. Indirect care included providing

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medicines information and education for nurses and assisting with review and

implementation of organisational medication policies and procedures. The model allowed

nurses to refer directly to the pharmacist, enabling timely resolution of medication issues.

Direct care was provided to 84 older people over a 15-month implementation period.

Ongoing feedback and consultation throughout the implementation enabled the model to be

refined, enablers identified and challenges addressed.

Conclusions

A collaborative, person-centred clinical pharmacy model that addressed the needs of clients,

carers, nurses and other stakeholders was successfully developed. The model is likely to have

applicability to home nursing services nationally and internationally.

ARTICLE SUMMARY

Strengths and limitations of this study

- A co-design and participatory research approach, incorporating extensive and

  repeated consultation and feedback from home nursing clients, carers, nurses, general

  practitioners, pharmacists and other experts, was used to develop a model of clinical

  pharmacy support that addressed the needs of the home nursing service and its clients.

- Best practice standards and guidelines for medication management and clinical

  pharmacy services were used to underpin development of the model.

- The model was developed within a single, metropolitan, home nursing service, so

  further work is needed to determine its generalisability to other services and in

  particular to rural services.

- While feedback indicated that the model met stakeholders' needs, further studies

  should assess the impact on client outcomes and cost-effectiveness of the model.

Competing interests The authors have no conflicts of interest that are relevant to the content of this article.

Ethics approval This study was approved by the Royal District Nursing Service Research Ethics Committee and the Monash University Human Research Ethics Committee.

Data sharing statement Individual participant data for this study will not be available for sharing due to the requirements imposed by ethics. Other study materials such as protocols relating to the study implementation and evaluation will be shared upon request from the authors.

BACKGROUND

Home nursing services provide nursing and personal care to people in their own homes. A common reason for nursing support is to assist with medication management when a person is unable to manage their medicines independently, due to declining health or cognitive function.

People who receive medication management support from home nursing services are a group who are at significant risk of adverse medication events (AMEs).[1-4] They are typically older, frail, with multiple health problems and multiple medicines.[1,3,4] Often they have been recently hospitalised. They are frequently prescribed potentially inappropriate or high-risk medicines and experience a high rate of medication errors.[1,4]

The risk of medication errors in the home care setting may be greater than in hospitals and nursing homes because of the unstructured environment and barriers to interdisciplinary communication and teamwork.[5] For example, community nurses usually have no formal relationship and limited contact with clients' medical practitioners and pharmacies. There may be multiple prescribers and multiple pharmacies involved in the client's care. Prescribers and pharmacists may not see the client regularly, and it can be challenging for nurses to obtain and maintain accurate medication treatment authorisations (medication administration charts or other medication lists signed by a medical practitioner authorising the nurse to administer medicines or assist with medicine administration).[1] Clients (or their informal carers) may continue to administer some medicines or doses independently (e.g. between nurse visits).

Despite medicines management being a major component of home care business, and despite the high risk of medication errors and AMEs, home nursing providers usually do not employ pharmacists.[1,6,7] Clients do not routinely receive comprehensive medication reconciliation and review on admission to identify medication errors and potentially inappropriate or unnecessary medicines, or to simplify complex medication regimens.

Pharmacists can make a significant contribution to medication safety.[8] There is evidence that clinical pharmacy services can reduce medication-related problems, polypharmacy and

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AMEs, and may be cost-effective.[9-14] However, pharmacists are under-utilised in the home care setting. In Australia, although there is a government-funded medication review program for community-living people who are at risk of AMEs (the 'Home Medicines Review' [HMR] program),[15] there are a number of structural, professional and patient barriers that have resulted in poor uptake of HMRs.[13 16] Despite efforts over many years to increase HMR rates, including specifically in home nursing clients, uptake among high-risk individuals remains low.[1 17-20]

The aim of this study was to develop a collaborative, person-centered model of clinical pharmacy support for nurses and clients of a home nursing service in order to improve access to clinical pharmacy services, enhance interdisciplinary teamwork and help address problems with medication management and medication safety.

METHODS

Setting

The clinical pharmacy model was developed at a large, non-profit home nursing service in Melbourne, Australia between 2013 and 2015. As part of the development process, it was implemented at two sites within the organisation between September 2014 and December 2015. The sites employed 103 nurses who provided care to 2,534 clients, of whom 1,089 (43%) received medication management support.

Study design

Theoretical study framework

The study used a co-creation and participatory action research (PAR) approach to design, implement and refine the clinical pharmacy service model. Co-creation and PAR are approaches to research that include the active involvement of relevant stakeholders, including consumers, in order to understand their world and ensure that research outcomes are appropriate to identified needs.[21 22]

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Problems with existing community-based medication management, together with the need to design healthcare systems around patients' and health professionals' needs, influenced the choice to use a co-creation and PAR approach. The approach involved interaction and consultation with, and reflections from, participants and stakeholders before, during and after development of the model, along with prospective collection of data regarding uptake and implementation of the model.

The co-creation and PAR approach engaged stakeholders in design and implementation. It allowed the model to be responsive to the clinical environment, to ensure it would be useful, sustainable and transferrable.

Framework for development of the model

In addition to focusing on stakeholders' needs, development of the model took learnings from well-established, successful clinical pharmacy models in hospital and residential aged care settings. Components of the model were based on Australian standards of practice for clinical pharmacy, which define evidence-based clinical pharmacy activities that constitute best practice medication management. These include: medication reconciliation, medication review, input into medication care plans and provision of medicines information.[23] Australian guidelines for medication management in community settings and the Chronic Care Model were also used to guide aspects of the model.[24 25] The Chronic Care Model is a well-established, evidence-based framework for chronic care management and practice improvement that advocates a collaborative, person-centred approach to improve chronic disease management.[25]

The specific roles and methods of delivery were modified for the home nursing setting, based on stakeholders' input and feedback.

Participants

Eight health professionals and researchers with extensive experience in aged care and medication management led the development and implementation of the model (a community nurse/academic, a clinical pharmacist/academic, a community pharmacist/academic, two nurse managers and a sociologist). A purposively selected multidisciplinary stakeholder

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reference group was established that included: practising nurses, pharmacists and GPs, consumer and ethnic community advocates, community aged care and community nursing managers, government health department representatives and representatives from nursing and pharmacy professional societies. Two experienced consultant clinical pharmacists were employed (12 hours/week each) during the implementation phase. Other key participants were: older people referred to the home nursing service for medication management support, their carers (where relevant) and their community nurses, general practitioners (GPs) and community pharmacies.

To facilitate co-design and refinement of the model, in-depth interviews and focus groups were conducted with convenience samples of clients, carers, nurses, GPs, community pharmacists and consultant pharmacists before, during and after implementation of the model. They were recruited from the older people and carers who had received medication management support from the home nursing service and health professionals who cared for people receiving medication management support. People with cognitive impairment or poor literacy in English were not excluded. Professional interpreters were used for non-English speaking older people /carers.

Data collection and analysis

Multiple data sources were used to inform the co-design, implementation and refinement of the model and describe outcomes of the development process:
- minutes from project team meetings (n=30);
- minutes from stakeholder reference group meetings (n=5);
- audit of medication management client records (n=100);[1]
- in-depth interviews and focus groups before, during and after implementation with older people (n=27), carers (n=18), community nurses (n=53), GPs (n=15), community pharmacists (n=7) and consultant pharmacists (n=2);
- notes from consultant clinical pharmacists' reflective diaries (n=2) and debrief meetings with the project team (n=4);
- case notes summarising individual clients' participation in the model and reasons for nurses' referral (n=84);
- notes from community nurses' clinical meetings (n=15); and

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- records of direct communication (e.g. email) to the research team from nurses and pharmacists (which was encouraged as a means of providing rapid feedback and resolution of issues during implementation).

At some meetings, case notes for selected clients (de-identified) were presented to generate discussion about the model, including success factors, enablers and challenges.

Data from these sources were used to identify issues and gaps in medication management processes, review functions, incorporate evidence-based strategies/approaches in the model, and continuously evaluate the model with respect to stakeholder acceptance and feedback, and ability of the model to address key issues and gaps in care. Detailed analysis of interview and focus group data and outcomes of pharmacist medication reviews is beyond the scope of this paper and will be reported elsewhere.

RESULTS

Stakeholder consultation and audit of medication management client records highlighted key issues that the model needed to address (**Table 1**). These issues helped inform development of the Visiting Pharmacist (ViP) model for home nursing clients. Ongoing feedback and consultation throughout the project enabled the model, and pharmacist roles, to be refined over time.

The clinical pharmacy model

Pharmacist roles identified throughout the project were broadly classified into direct client care and indirect client care (**Table 2**). Indirect care included activities that were not related to a specific patient and would be expected to improve medication management across a number of clients or the whole organisation. Direct care was any activity addressing the needs of a specific client. Most commonly this involved one or more home visits, medication reconciliation and comprehensive medication review, however there were occasions when client-specific issues were able to be addressed without a home visit.

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Communication between the pharmacists and community nurses

A challenge to the translation of hospital and residential care clinical pharmacy models to the home nursing setting was that community nurses are on the road visiting clients most of the time, and dispersed over a broad geographical area. Nurses were able to telephone the pharmacist if they had urgent questions about medication management. Non-urgent communication was through electronic messaging (secure organisational email network or documentation in clients' clinical records). Face-to-face contact was achieved through joint pharmacist-nurse client home visits and pharmacist attendance at nurses' clinical meetings.

Referrals for direct client care

The model enabled nurses to refer clients directly to the clinical pharmacist if the client had one or more medication-related risk-factors or problems (**Table 3**), or if the nurse had any other concerns about the client's medication management. Education, a written protocol and a referral form were provided to nurses to help them identify and refer suitable clients.

After obtaining verbal consent from the client or their carer, nurses completed a referral form and sent it to the clinical pharmacist via secure email. The form included client details, reason(s) for referral (free-text) and medication-related risk-factors or problems (tick-box) (**Table 3**). A letter was sent to the client's GP and community pharmacy notifying them that the referral had been made and informing them that they would receive verbal and/or written communication from the clinical pharmacist.

Medication review process

Prior to visiting the client's home, the pharmacist reviewed referral documents, collated information on the client's medicines use, and liaised with the community nurse and client/carer for a time to visit the client. Pharmacist home visits were usually conducted with the community nurse, to enable the nurse to introduce the pharmacist and participate in the discussion, however nurses usually did not stay for the entire pharmacist consultation. The pharmacist obtained a best-possible medication history (medication history confirmed using two or more sources), performed medication reconciliation, reviewed the way medicines

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were stored and used, reviewed the indication for each medicine to determine ongoing need and appropriateness, checked clients' administration technique if they were self-administering any medicines, provided education and answered questions.

Following the home visit, the pharmacist prepared a report that included an accurate medicines list, medication review findings and recommendations to address medication-related issues. The report was sent to the client's GP, community pharmacy, and community nurse. Where relevant it was also sent to other prescribers (e.g. specialist physicians). A patient copy of the medicines list was provided to the client and/or carer if appropriate.

If the nurses' medication treatment authorisation was not accurate, or there were medication changes as a result of the medication review, the pharmacist asked the GP to provide a new treatment authorisation or to sign the pharmacist-prepared list to enable it to be used as a treatment authorisation.

Follow-up after medication review

The pharmacist followed-up the report with telephone conversations with the client's GP, specialists and community pharmacist when necessary, to discuss issues and recommendations and ensure an updated, accurate treatment authorisation was provided to the community nurse. Where necessary the pharmacist provided follow-up to the client and carer, either by phone or with a second home visit.

Outcomes and medication changes were communicated to all parties involved in the client's medication management to ensure everyone was working from the same medication list, and that any medication changes made by the GP were implemented by the community pharmacy and home nursing service.

Medication review referral and uptake

Over the 15-month implementation period, 43 community nurses referred 96 medication management clients to the clinical pharmacy service. Eight-four (88%) referred clients (or their carer) received a pharmacist review. Their median age was 85.5 years (interquartile range [IQR] 77-89) and they used a median of 13 medicines (IQR 10-17). They had 74 GPs

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(from 56 different clinics) and used 49 different community pharmacies. Twenty-nine (34.5%) clients had medicines prescribed by one or more medical specialist(s) in addition to their GP.

The most common reasons for pharmacist referral specified by nurses on referral forms were to simplify complex medication regimens (35/84; 42%) and concerns about inaccurate, incomplete or multiple medication treatment authorisations (18/84; 22%).

On average, the clinical pharmacists spent a median of 4.8 hours (IQR 3.6–6.6; range 2.0−11.3 hours) per referred client. This included the home visit(s), preparation of medication lists and medication review reports, and follow up with clients, carers, prescribers, pharmacies and nurses to ensure issues were addressed. It excludes travel time for client home visits (median 39 minutes per client, IQR 20-70, range 10-150). The pharmacists spent an average of 1.0 hour per week providing indirect care.

Pharmacist competencies

Feedback from participants identified that the pharmacists required excellent interpersonal, listening, advocacy and communication skills, the ability to build trusting professional relationships and work effectively as a team, excellent assessment abilities, in-depth knowledge of pharmacology and medication management for older people, and strong leadership skills in order to provide person-centred care that met the needs of clients/carers, nurses, GPs and community pharmacies.

Organisational support and resources

Resources required to support the implementation of the clinical pharmacy model included access to office space, a mobile telephone, a fax machine, a computer with access to a range of medicines information resources, and a dedicated vehicle. The pharmacist also needed remote electronic access to clients' home nursing records, including correspondence from external providers such as GPs and hospitals, and ability to communicate securely by email with community nurses. Access to interpreters was also important.

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Stakeholder feedback

Feedback from clients, carers, community nurses, GPs and community pharmacists indicated the model was well accepted and addressed gaps in existing medication management processes. The model improved access to clinical pharmacist consultations and medication review by enabling nurses to obtain client consent and directly initiate a review instead of having to ask the GP to organise a HMR (**Table 4**).

Nurses reported that the clinical pharmacy model was able to address medication-related issues that frequently impacted on their ability to provide safe, high quality care, such as inaccurate or confusing treatment authorisations, complex medication regimens requiring multiple daily visits, and uncertainty regarding appropriateness of medicines and risk of adverse effects. They felt the pharmacists saved them time and sometimes reduced the number of daily nurse visits required by clients, by clarifying confusing and conflicting medication lists, simplifying medication regimens or changing dose-times and organising updated medication treatment authorisations.

Under the existing Australian HMR model community nurses are usually not made aware when a medication review is being conducted, nor consulted to obtain their insights into the clients' medication management and medication-related problems or to ascertain what issues or questions the nurses have with the client's medicines management. Nurses also do not receive a copy of the medication review report or an updated medicines list (**Table 4**). Nurses felt more engaged with the medication review process in the ViP model and felt they benefited more from it. They commented that the pharmacist was a valuable resource for them and their clients. They noted that they learnt a lot from doing joint visits with the pharmacist, and that the pharmacist had become a valuable member of the medication management team.

Most GPs were happy for a pharmacist medication review to be organised by the community nurse. They felt the model was a good way of ensuring that this high-risk client group received a review, noting that the more complex and time-consuming HMR process was a barrier for them otherwise making pharmacist referrals. However, a minority of GPs indicated they would have preferred to organise an HMR for the client.

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GPs were usually willing to engage with the pharmacist to address medication-related problems and to review and sign the pharmacist-prepared medication list (to enable it to be used as a medication treatment authorisation by the community nurses) or provide an alternative updated and signed list. However, some GPs were less cooperative, and the pharmacists reported spending considerable time trying to follow-up medication issues with some GPs. This variable level of engagement, however, was not unique to the pharmacists, as community nurses reported that they also regularly experienced the same. Nurses who participated in the ViP model felt that the GPs were more willing to engage with the pharmacist than with them about medication issues, and saw this as another benefit of the model.

Clients and carers reported that the pharmacist visit provided an opportunity for them to ask questions and increased their understanding of their medicines. Some reported that their medication regimen was simplified, saving them money and, sometimes, reducing the need for nurse visits by making it easier for them to take medicines independently. Some clients were not able to identify specific benefits, but were happy to receive the pharmacist service if it helped their nurses or doctors.

All stakeholders reported that a valuable aspect of the pharmacist's role was facilitating information-sharing and improving teamwork among members of the medication management team. The follow-up and ongoing support provided by the pharmacist, including repeat home visits if required, were considered by all stakeholder to be a strength of the model, as this enabled the pharmacist to assist with implementing changes to clients' medication regimens and medication management care plans, and helped ensure medication issues were resolved. This contrasts with the HMR model, in which lack of follow-up by the reviewing pharmacist was noted by stakeholders as a major limitation, resulting in medication-related issues not always being resolved (**Table 4**).

Enablers and challenges

A number of factors helped make development and implementation of the model a success. Stakeholder consultation and the use of co-design and PAR principles ensured stakeholders had input into, and ownership of, the model. The high level of support for the role from

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nurses and nurse managers, and their willingness to accept the pharmacist as a member of their team and facilitate the pharmacists' role contributed to its success. The appointment of two experienced pharmacists to the role, who were able to work with the project team and the nurses and other health professionals to develop the role and manage challenges, was also a success factor.

A challenge for the model was engaging GPs. As community nursing clients retain their usual GP, the consultant clinical pharmacists had to work with many different GPs. It was not possible to consult all GPs prior to implementing the model, so the pharmacists had to engage with a new GP almost every time they reviewed a client. The willingness of GPs to engage with the pharmacist varied. Over time, as the model becomes more established, and GPs become familiar with the service, this may become less of an issue.

A factor that may have impacted on GPs' willingness to engage was the absence of remuneration for time they spent reading medication review reports, taking phone calls from the pharmacist to discuss medication issues and reviewing/preparing/signing medication treatment authorisations. GPs could only receive payment if they had a formal consultation with the patient. This, however, is similar to what happens for home nursing clients outside of the ViP model, when GPs still need to provide community nurses with medication treatment authorities (and update them when there are medication changes) and address concerns or questions raised by nurses about their clients.

The main challenge to the sustainability of the model is the absence of a specific funding source for clinical pharmacy support within the home nursing sector. The Australian government's HMR program rules preclude its use for this type of model, so funding will need to come from other sources such as home and community care programs and the organisations providing home care.

DISCUSSION

This study describes the successful development of a collaborative, person-centred model of clinical pharmacy support for nurses and clients of a home nursing service that incorporates direct client care and indirect care (nurse support). The model targeted a group of

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community-dwelling older people known to be at high risk of medication-related problems and to have poor access to clinical pharmacy support.[1 17] The success of the model was demonstrated by high levels of acceptance and uptake of the pharmacists' role and its ability to meet stakeholders' needs.

A major strength of the study was the extensive stakeholder consultation, inclusion of consumers and other stakeholders in the co-creation of the model, and use of PAR to develop and refine the model. A weakness was that the model was developed and implemented within a single home nursing service, albeit one of the largest in Australia, so further work is needed to determine its generalisability to other services, and in particular to rural services.

Whilst there have been many previous studies describing pharmacist medication reviews in domiciliary or primary care settings,[26] this is the first that we know of that describes the development of a comprehensive clinical pharmacy model specifically for home nursing clients. The model differs from traditional domiciliary pharmacist models because it doesn't only focus on medication review. Instead it includes a range of clinical pharmacy roles, under-pinned by best-practice guidelines and standards, including direct client care and indirect care to address the specific needs of community nurses and their clients. Functionally the model has similarities with hospital 'ward pharmacist' models and nursing home consultant pharmacist models, in that a designated pharmacist delivers a range of clinical pharmacy and medication safety functions to support the service and its patients or clients.

The only related community-based models we identified in the published literature were pharmacist services delivered within home healthcare services in the USA,[7 27 28] and a domiciliary pharmacy service provided by a community health and social care service in the UK.[29] In the USA, Redit et al described a home healthcare pharmacist role that included a pharmacist home visit, medication reconciliation and medication review. Patients who received a pharmacist review were less likely to have a hospital admission or emergency room visit.[28] In the UK, Dilks et al described a visiting pharmacist service for complex older people who were often housebound.[29] An evaluation of the service suggested that it could reduce unplanned hospital admissions and was likely to be cost-saving.[29] Some of the pharmacist roles in these studies were similar to our model, but no information was provided regarding the framework or processes used to develop these models, nor the extent to which

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the pharmacists liaised with community nurses or whether the model included indirect care to support the work of community nurses.

Given the ageing population, increasing polypharmacy and complexity of medication management, increasing prevalence of AMEs in the primary care setting,[30] and increasing demand for home care support to delay the need for residential aged care, our model is likely to have applicability to home nursing services nationally and internationally.

The model has potential to reduce the risk of AMEs, however further research is needed to confirm its impact on client outcomes. Preliminary evidence suggests the model could be cost-saving to the health system, with a Return on Investment analysis, conducted by a health economist using data from the ViP pilot study together with published data on rates of AME and medication review outcomes, indicating that $1.54 could be saved for every $1 spent on the ViP model.[31] Savings were from reduced medication use, GP visits/consultations, hospitalisations and nurse visits. Further work is required to confirm the model is cost-effective and identify a sustainable funding model.

Conclusion

A collaborative, person-centred clinical pharmacy model in the home nursing setting that addressed the needs of clients, carers, nurses and other stakeholders was developed and is likely to have applicability to community nursing services nationally and internationally.

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Table 1. Key medication management issues affecting home nursing clients, identified by stakeholders and review of client data

- High prevalence of polypharmacy (5 or more medicines)
- Complex medication regimens sometimes necessitating multiple daily nurse home visits
- High prevalence of medication errors and other medication-related problems
- Difficulty obtaining, and maintaining, up-to-date medication treatment authorisations^ from prescribers
- Discrepancies between medication treatment authorisations and client's medicines (including pharmacy-packed dose administration aids)
- Lack of communication and sharing of medication information between prescribers, community pharmacies and community nurses
- Lack of clinical pharmacy support and access to medicines information and advice for community nurses
- Poor client access to community pharmacists due to poor mobility
- Very low rate of HMR, despite nurses' efforts to organise them through clients' GPs (due to barriers such as low GP acceptances of nurses' recommendations, and HMR requirements that: a) require GPs to see the patient to explain the process and obtain consent before initiating a pharmacist referral, b) do not allow community nurses to directly refer clients to an HMR pharmacist, and c) restrict the frequency of HMR)
- Lack of involvement of community nurses when a HMR occurs (nurses not informed when review occurs, not consulted about the client's medication management and not provided with copy of HMR report)

GP =General Practitioner; HMR = Home Medicines Review (Australian Government-funded, GP-initiated pharmacist medication review programme)

^ Medication treatment authorisations are medication administration charts or other medication lists or orders signed by a medical practitioner authorising the nurse to administer medicines or support clients' medicine self-administration.

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Table 2. Clinical pharmacist roles

Direct client care	Indirect client care
- Visiting clients in their homes (with the community nurse where practical) to review and discuss medicines management, identify medication-related problems and educate clients/carers on their medicines use; - Obtaining 'best-possible medication histories' (current medication list, verified using two or more sources); - Reconciling the best-possible medication history with current medication orders held by the home nursing service to identify and resolve discrepancies; - Working with clients' prescribers and community pharmacies to resolve medication-related problems, withdraw (deprescribe) unnecessary or inappropriate medicines and simplify medication regimens; - Liaising with prescribers and community pharmacies to update clients' medicines lists and community nurses' medication treatment authorisations^; - Providing advice to community nurses to optimise clients' medication management plans; - Answering client-specific medicines information questions from community	- Answering general medicines information questions from nurses - Providing nurse education regarding medicines and medication management - Developing medication information resources for nurses - Contributing to development or revision of organisational medication policies and procedures

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nurses and others;

- Following-up clients and/or community
  nurses, GPs, community pharmacies to
  ensure positive outcomes from
  medicine reviews (via telephone and/or
  repeat home visits where necessary).

^ Medication treatment authorisations are medication administration charts or other medication lists or orders signed by a medical practitioner authorising the nurse to administer medicines or support clients' medicine self-administration.

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Table 3. Medication-related risk factors and problems that could trigger a pharmacist referral

- ≥8 medicines

- ≥1 high or moderate risk medicines[#]

- >1 prescriber or pharmacy

- >1 medication treatment authorisations[^]

- Discharged from hospital in the past month

- Experiencing possible medicine side effects

- Recent medication error or incident

- Client or carer concerns about their medicines

- Nurse concerns about medication regimen (e.g. potentially inappropriate medicines, unclear/ambiguous medication orders, complex dosing regimen)

[#] High risk medicines: anticoagulants, chemotherapeutic agents excluding hormonal agents, immunosuppressant agents, insulins, levodopa, lithium, opiates; Moderate risk medicines: anticonvulsants, anti-infectives excluding topical agents, antipsychotics, benzodiazepines, digoxin, loop diuretics, oral hypoglycaemics, oral corticosteroids.

[^] Medication treatment authorisations are medication administration charts or other medication lists or orders signed by a medical practitioner authorising the nurse to administer medicines or support clients' medicine self-administration. Clients sometimes have multiple authorisations (e.g. a general practitioner [GP]-provided medicine list plus one or more letters from the GP, specialist or other prescriber indicating a medicine change).

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Table 4: Key differences between the home nursing clinical pharmacy model and the Australian Home Medicines Review (HMR) model*

Components	Home nursing clinical pharmacy model	Home Medicines Review model*
Referral process for medication review	Direct referral by community nurses	Requires nurse to request client's GP make a referral
Likelihood of review occurring following nurse referral/request	High	Low[#]
Timeliness of medication review	Rapid	Slow[#]
Home visit process	Home visit by the clinical pharmacist alongside community nurse	Home visit by the clinical pharmacist alone
Medication review	Addresses the medication management and information needs of the community nurse^ as well as the client/carer, GP and community pharmacist	Does not addresses the medication management and information needs of the community nurse^
Medication review report	Copy provided to GP, community pharmacy and community nurse	Copy not provided to community nurse
GP remuneration	GP only remunerated for standard patient consultations	GP receives additional remuneration for initiating the HMR and preparing a medication management plan
Post-medication review process	Follow up and ongoing support for clients, carers, community nurses and other health providers to ensure medication issues are resolved	No follow-up or ongoing medication management support available from the clinical pharmacist.
Indirect care	Community nurses able to contact clinical pharmacist for advice or assistance with medication management issues or questions as they arise	Not available

GP = General Practitioner

* Home Medicines Review (HMR): Australian Government funded pharmacist medication review program

Low uptake of HMR due to poor acceptance of community nurse requests for an HMR and programme restrictions on frequency of HMR; Delays due to need for GP to see the patient to obtain consent, then make referral to an HMR pharmacist

^ Information needs of the community nurse include: Assistance with clarifying or simplifying ambiguous or complex medication treatment authorisations and addressing discrepancies with clients' medicines; Targeted regimen simplification (where appropriate) to minimise home nursing visits; Assistance with sourcing updated medication treatment authorisations (signed by GP); Advice about medicines storage and administration; Advice about monitoring medication outcomes and adverse effects.

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Development of a clinical pharmacy model within an Australian home nursing service using co-creation and participatory action research: the Visiting Pharmacist (ViP) study

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TITLE

Development of a clinical pharmacy model within an Australian home nursing service using

co-creation and participatory action research: the Visiting Pharmacist (ViP) study

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ABSTRACT

Objective

To develop a collaborative, person-centred model of clinical pharmacy support for

community nurses and their medication management clients.

Design

Co-creation and participatory action research, based on reflection, data collection, interaction

and feedback from participants and other stakeholders.

Setting

A large, non-profit home nursing service in Melbourne, Australia.

Participants

Older people referred to the home nursing service for medication management, their carers,

community nurses, general practitioners (GPs) and pharmacists, a multidisciplinary

stakeholder reference group (including consumer representation) and the project team.

Data collection and analysis

Feedback and reflections from minutes, notes and transcripts from: project team meetings,

clinical pharmacists' reflective diaries and interviews, meetings with community nurses,

reference group meetings and interviews and focus groups with 27 older people, 18 carers, 53

nurses, 15 GPs, 7 community pharmacists.

Results

The model was based on best-practice medication management standards and designed to

address key medication management issues raised by stakeholders. Pharmacist roles included

direct client care and indirect care. Direct care included home visits, medication

reconciliation, medication review, medication regimen simplification, preparation of

medication lists for clients and nurses, liaison and information-sharing with prescribers and

pharmacies and patient/carer education. Indirect care included providing medicines

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information and education for nurses and assisting with review and implementation of organisational medication policies and procedures. The model allowed nurses to refer directly to the pharmacist, enabling timely resolution of medication issues. Direct care was provided to 84 older people over a 15-month implementation period. Ongoing feedback and consultation, in line with participatory action research principles, informed the development and refinement of the model and identification of enablers and challenges.

Conclusions

A collaborative, person-centred clinical pharmacy model that addressed the needs of clients, carers, nurses and other stakeholders was successfully developed. The model is likely to have applicability to home nursing services nationally and internationally.

ARTICLE SUMMARY

Strengths and limitations of this study

- A co-design and participatory research approach, incorporating extensive and repeated consultation and feedback from home nursing clients, carers, nurses, general practitioners, pharmacists and other experts, was used to develop a model of clinical pharmacy support that addressed the needs of the home nursing service and its clients.

- Best practice standards and guidelines for medication management and clinical pharmacy services were used to underpin development of the model.

- The model was developed within a single, metropolitan, home nursing service, so further work is needed to determine its generalisability to other services and in particular to rural services.

- While feedback indicated that the model met stakeholders' needs, further studies should assess the impact on client outcomes and cost-effectiveness of the model.

BACKGROUND

Home nursing services provide nursing and personal care to people in their own homes. A common reason for referral to home nursing services in Australia is to assist with medication management when a person is unable to manage their medicines independently, due to declining health or cognitive function. The level of support provided depends on the client's capacity to self-administer their medicines and the availability of other supports such as family carers. It ranges from monitoring medicine-taking, to prompting or assisting with self-administration of medicines, through to administering medicines from a locked box stored in the patient's home.

People who receive medication management support from home nursing services are a group who are at significant risk of adverse medication events (AMEs).[1-4] They are typically older, frail, with multiple health problems and multiple medicines.[1,3,4] Often they have been recently hospitalised. They are frequently prescribed potentially inappropriate or high-risk medicines and they experience a high rate of medication errors.[1,4]

The risk of medication errors in the home care setting may be greater than in institutional settings such as hospitals and nursing homes because of the unstructured environment and barriers to interdisciplinary communication and teamwork.[5,6] For example, community nurses usually have no formal relationship and limited contact with clients' medical practitioners and pharmacies. There may be multiple prescribers and pharmacies involved in the client's care. Prescribers and pharmacists may not see the client regularly, and it can be challenging for nurses to obtain and maintain accurate medication treatment authorisations (signed orders from a medical practitioner authorising the nurse to administer medicines or assist with administration).[1] Clients (or their family carers) may continue to administer some medicines or doses independently (e.g. between nurse visits).

In the USA it is mandated that clients referred to home healthcare services (which are similar to home nursing services in Australia) receive a medication review.[7] This is usually conducted by a nurse. In Australia, there is no such requirement and home nursing clients do not routinely receive a comprehensive medication review or medication reconciliation to

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identify treatment authorisation errors or potentially inappropriate medicines, or to simplify complex medication regimens.

Despite medicines management being a major component of home care business, and despite the high rate of medication errors and AMEs, home nursing providers usually do not employ pharmacists.[1 8 9] There is evidence that clinical pharmacy services can reduce medication-related problems, polypharmacy and AMEs, and may be cost-effective.[10-16] Clinical pharmacy services encompass a range of patient-focused services provided by pharmacists that aim to minimise the inherent risks associated with the use of medicines, ensure medicines are used appropriately and optimise health outcomes.[17]

One component of a clinical pharmacy service is medication review. In Australia, home nursing clients can receive a government-funded Home Medicines Review (HMR) if their general practitioner (GP) thinks they would benefit and makes a referral to an accredited pharmacist.[18] However there are a number of structural, professional and patient barriers that have resulted in poor uptake of HMRs.[14 19] Nurses and pharmacists cannot initiate a HMR, and despite efforts over many years to increase HMR rates, including strategies specifically targeting home nursing clients, uptake among high-risk individuals remains low.[1 20-23] Other limitations of the HMR program, in the context of home care, are that it is a one-off service and it does not provide broader clinical pharmacy support. Other clinical pharmacy services relevant to home nursing include review, reconciliation and updating of clients' medication treatment authorisations, medicines information and education for nurses, and development or review of organisational medication policies.

The aim of this study was to develop a collaborative, person-centered model of clinical pharmacy support for nurses and clients of a home nursing service in order to improve access to clinical pharmacy services, enhance interdisciplinary teamwork and help address problems with medication management and medication safety.

METHODS

Setting

The clinical pharmacy model was developed at a large, non-profit home nursing service in Melbourne, Australia between 2013 and 2015. As part of the development process, it was implemented at two sites within the organisation between September 2014 and December 2015. The sites employed 103 nurses and seven personal care workers who provided care to 2,534 clients, of whom 1,089 (43%) received medication management support (monitoring, prompting or assisting self-administration, or nurse administration of medicines).

Study design

Theoretical study framework

The study used a co-creation and participatory action research approach to design, implement and refine the clinical pharmacy service model. This is an approach to research that includes active involvement of relevant stakeholders, including consumers, in order to understand their world and ensure that research outcomes are appropriate to identified needs.[24][25] Problems with existing community-based medication management and the need to design healthcare systems around consumers' and health professionals' needs influenced the decision to use a co-creation and participatory action research approach. The approach involved interaction and consultation with, and reflections from, participants and stakeholders before and during development of the model, along with prospective collection of data during implementation of the model. The co-creation and participatory action research approach engaged stakeholders in both the design and implementation. It allowed the model to be responsive to the clinical environment, to ensure it would be useful, sustainable and transferrable.

Framework for development of the model

In addition to focusing on stakeholders' needs, development of the model took learnings from well-established, successful clinical pharmacy models in hospital and residential aged care settings. Components of the model were based on Australian standards of practice for clinical pharmacy, which define evidence-based clinical pharmacy activities that constitute best practice medication management. These include: medication reconciliation, medication review, input into medication care plans and provision of medicines information.[17] Australian guidelines for medication management in community settings and the Chronic Care Model

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were also used to guide aspects of the model.[26][27] Relevant sections of the medication management guidelines included administration of medicines, dose administration aids, medication lists, medication review and risk management.[26] The Chronic Care Model is a well-established, evidence-based framework for chronic care management and practice improvement that advocates a collaborative, person-centred approach to improve chronic disease management.[27] The specific roles and methods of delivery were modified for the home nursing setting, based on stakeholders' input and feedback.

Participants

Six health professionals and researchers with extensive experience in aged care and medication management led the development and implementation of the model (a community nurse/academic, a clinical pharmacist/academic, a community pharmacist/academic, two nurse managers and a sociologist). A purposively selected multidisciplinary stakeholder reference group was established to provide input into planning and implementation of the model, to ensure it met stakeholders' needs and was acceptable to all stakeholders. The reference group included: practising nurses, pharmacists and GPs, consumer and ethnic community advocates, community aged care and community nursing managers, government health department representatives and representatives from nursing and pharmacy professional societies. Two experienced consultant clinical pharmacists were employed (12 hours/week each) during the implementation phase. Other key participants were: older people (clients) referred to the home nursing service for any level of medication management support, their carers (where relevant) and their community nurses, GPs and community pharmacies.

To facilitate co-design and refinement of the model, in-depth interviews and focus groups were conducted with convenience samples of clients, carers, nurses, GPs, community pharmacists and consultant pharmacists before and during implementation of the model. Clients with cognitive impairment or poor literacy in English were included. Professional interpreters were used for non-English speaking older people /carers.

Data collection and analysis

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Multiple data sources were used to inform and capture the co-design, implementation and refinement of the model:

- minutes from project team meetings (n=30);
- minutes from stakeholder reference group meetings (n=5);
- audit of medication management client records prior to model development (n=100);[1]
- in-depth interviews and focus groups with older people (n=27), carers (n=18), community nurses (n=53), GPs (n=15), community pharmacists (n=7) and consultant pharmacists (n=2) before and during implementation;
- notes from consultant clinical pharmacists' reflective diaries (n=2) and debrief meetings with the project team (n=4);
- case notes summarising individual clients' participation in the model and reasons for nurses' referral (n=84);
- notes from community nurses' clinical meetings (n=15); and
- records of direct communication (e.g. email) to the research team from nurses and pharmacists (which was encouraged as a means of providing rapid feedback and resolution of issues during implementation).

At some meetings, case notes for selected clients (de-identified) were presented to generate discussion about the model, including success factors, enablers and challenges.

Data from these sources were used to identify issues and gaps in medication management processes, review functions, incorporate evidence-based strategies/approaches in the model, and continuously evaluate the model with respect to stakeholder acceptance and feedback, and ability of the model to address key issues and gaps in care. Thematic analysis of interview and focus group data and analysis of outcomes from pharmacist medication reviews is beyond the scope of this paper. Pharmacists prospectively recorded time spent delivering clinical pharmacy services using a log sheet.

RESULTS

Stakeholder consultation and audit of medication management client records prior to developing the clinical pharmacy model highlighted key issues that the model needed to address (**Table 1**). These issues helped inform development of the Visiting Pharmacist (ViP)

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clinical pharmacy model for home nursing clients. Ongoing feedback and consultation throughout the project enabled the model, and pharmacist roles, to be refined over time.

The clinical pharmacy model

Pharmacist roles identified throughout the project were broadly classified into direct client care and indirect client care. Direct care was any activity addressing the needs of a specific client. Most commonly this involved one or more home visits, medication reconciliation and comprehensive medication review, however there were occasions when client-specific issues were able to be addressed without a home visit. Indirect care included activities that were not related to a specific patient and would be expected to improve medication management across a number of clients or the whole organisation. Clinical pharmacist roles are summarised in Table 2, and the model is contrasted with the Australian HMR program in Table 3.

Communication between the pharmacists and community nurses

Community nurses spend most of their time on the road visiting clients, and are dispersed over a wide geographical area. This makes communication and teamwork more challenging than it is in hospital and residential care settings. In our model nurses telephoned the pharmacist if they had urgent questions about medication management. Non-urgent communication was through electronic messaging (secure organisational email network or documentation in clients' clinical records). Face-to-face contact was achieved through joint pharmacist-nurse client home visits and pharmacist attendance at nurses' clinical meetings.

Referrals for direct client care

The model enabled nurses to refer clients directly to the clinical pharmacist if the client had one or more medication-related risk-factors or problems or if the nurse had any other concerns about the client's medication management (**Table 4**). Education, a written protocol and a referral form were provided to nurses to help them identify and refer suitable clients.

Direct client care without home visit

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Direct care without a home visit included answering client-specific medicines information questions from nurses (e.g. can a dose-time be changed from evening to morning to reduce the number of nurse visits), liaising with prescribers to address issues with medication orders (e.g. to clarify a confusing or conflicting order, or simplify a complex regimen) and liaising with community pharmacists to resolve discrepancies in dose administration aids.

Direct client care with home visit

The process for pharmacist home visits was as follows. The community nurse obtained verbal consent from the client or their family carer for the pharmacist visit and a referral form was sent to the clinical pharmacist via secure email. The form included client details, reason(s) for referral (free-text) and medication-related risk-factors or problems (tick-box) (**Table 4**). A letter was sent to the client's GP and community pharmacy notifying them that the referral had been made and informing them that they would receive verbal and/or written communication from the clinical pharmacist.

Prior to visiting the client's home, the pharmacist reviewed referral documents, collated information on the client's medicines use, and liaised with the community nurse and client/carer for a time to visit the client. Pharmacist home visits were usually conducted with the community nurse, to enable the nurse to introduce the pharmacist and participate in the discussion, however nurses usually did not stay for the entire pharmacist consultation. The pharmacist obtained a best-possible medication history (medication history confirmed using two or more sources), performed medication reconciliation, reviewed the way medicines were stored and used, reviewed the indication for each medicine to determine ongoing need and appropriateness, checked clients' administration technique if they were self-administering any medicines, provided education and answered questions.

Following the home visit, the pharmacist prepared a report that included an accurate medicines list, medication review findings and recommendations to address medication-related issues. The report was sent to the client's GP, community pharmacy, and community nurse. Where relevant it was also sent to other prescribers (e.g. specialist physicians). A patient copy of the medicines list was provided to the client and/or carer if appropriate. If the nurses' medication treatment authorisation was not accurate, or there were medication changes as a result of the medication review, the pharmacist asked the GP to provide a new

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treatment authorisation or to sign the pharmacist-prepared list to enable it to be used as a treatment authorisation.

The pharmacist followed-up the report with telephone conversations with the client's GP, specialists and community pharmacist when necessary, to discuss issues and recommendations and ensure an updated, accurate treatment authorisation was provided to the community nurse. Where necessary the pharmacist provided follow-up to the client and carer, either by phone or with a second home visit.

Outcomes and medication changes were communicated to all parties involved in the client's medication management to ensure everyone was working from the same medication list, and that any medication changes made by the GP were implemented by the community pharmacy and home nursing service.

Direct care home visit referrals

Over the 15-month implementation period, 43 community nurses referred 96 medication management clients to the clinical pharmacists. Eight-four (88%) referred clients received a pharmacist medication review and medication reconciliation. Of these, 82 required a pharmacist home visit. Seventy-three (89%) home visits were made in conjunction with a nurse, and 9 (11%) were made by the pharmacist alone. Eleven (13%) clients received a second pharmacist home visit. The clients' median age was 85.5 years (interquartile range [IQR] 77-89) and they used a median of 13 medicines (IQR 10-17). They had 74 GPs (from 56 different clinics) and used 49 different community pharmacies. Twenty-nine (34.5%) clients had medicines prescribed by one or more medical specialist(s) in addition to their GP. The most common reasons for pharmacist referral specified by nurses on referral forms were to simplify complex medication regimens (35/84; 42%) and concerns about inaccurate, incomplete or multiple medication treatment authorisations (18/84; 22%).

Clinical pharmacists reported spending a median of 4.8 hours (IQR 3.6–6.6; range 2.0−11.3 hours) per referred client. This included home visit(s), preparation of medication lists and medication review reports, and follow up with clients, carers, prescribers, pharmacies and nurses to ensure issues were addressed. It excludes travel time for client home visits (median 39 minutes per client, IQR 20-70, range 10-150).

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Indirect care

The pharmacists reported spending a median of 1.0 hour per week providing indirect care. This included answering medicines information questions, attending meetings with nurses, providing education to nurses and reviewing organisational medication management policies. They also spent a median of 1.0 hour per week on administrative tasks such as emails and non-clinical meetings.

Stakeholder feedback during implementation

Feedback from clients, carers, community nurses, GPs and community pharmacists who participated in the study indicated the model was well accepted and addressed gaps in existing medication management processes. Nurses reported that the model improved access to clinical pharmacist consultations and medication review by enabling them to obtain client consent and directly initiate a review instead of having to ask the GP to organise a HMR (**Table 3**).

Nurses reported that the clinical pharmacy model was able to address medication-related issues that frequently impacted on their ability to provide safe, high quality care, such as inaccurate or confusing treatment authorisations, complex medication regimens requiring multiple daily visits, and uncertainty regarding appropriateness of medicines and risk of adverse effects. They felt the pharmacists saved them time and sometimes reduced the number of daily nurse visits required by clients, by clarifying confusing and conflicting medication lists, simplifying medication regimens or changing dose-times and organising updated medication treatment authorisations.

Nurses noted that under the existing Australian HMR model they are usually not aware when a medication review is conducted, nor consulted to obtain their insights into the clients' medication management and medication-related problems or to ascertain what issues or questions the nurses have with the client's medicines management. Nurses also do not receive a copy of the medication review report or an updated medicines list (**Table 3**). Nurses therefore felt more engaged with the medication review process in the ViP clinical pharmacy

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model and felt they benefited more from it. They commented that the pharmacist was a valuable resource for them and their clients. They noted that they learnt a lot from doing joint visits with the pharmacist, and that the pharmacist had become a valuable member of the medication management team.

Most GPs who were interviewed were happy for a pharmacist medication review to be organised by the community nurse. They felt the model was a good way of ensuring that this high-risk client group received a review, noting that the more complex and time-consuming HMR process was sometimes a barrier for them making pharmacist referrals. However, a minority of GPs indicated they would have preferred to organise an HMR for the client.

The clinical pharmacists reported that GPs were usually willing to engage with them to address medication-related problems and to review and sign the pharmacist-prepared medication list (to enable it to be used as a medication treatment authorisation) or provide an alternative updated and signed list. However, some GPs were less cooperative, and the pharmacists reported spending considerable time trying to follow-up medication issues with some GPs. This variable level of engagement, however, was not unique to the pharmacists, as community nurses reported that they also regularly experienced the same. Nurses who participated in the ViP clinical pharmacy model felt that the GPs were more willing to engage with the pharmacist than with them about medication issues, and saw this as another benefit of the model.

Clients and carers reported that the pharmacist visit provided an opportunity for them to ask questions and increased their understanding of their medicines. Some reported that their medication regimen was simplified, saving them money and, sometimes, reducing the need for nurse visits by making it easier for them to take medicines independently. Some clients reported reduced side effects (e.g. drowsiness) and better function following changes to their medication regimen. Others were not able to identify specific benefits, but were happy to receive the pharmacist service if it helped their nurses or doctors.

All stakeholders reported that a valuable aspect of the pharmacist's role was facilitating information-sharing and improving teamwork among members of the medication management team. The follow-up and ongoing support provided by the pharmacist, including repeat home visits if required, were considered by all stakeholder to be a strength of the

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model, as this enabled the pharmacist to assist with implementing changes to clients'
medication regimens and medication management care plans, and helped ensure medication
issues were resolved. This contrasts with the HMR model, in which lack of follow-up by the
reviewing pharmacist was noted by stakeholders as a major limitation, resulting in
medication-related issues not always being resolved (**Table 3**).

Pharmacist competencies

Feedback from participants identified that the pharmacists required excellent interpersonal,
listening, advocacy and communication skills, the ability to build trusting professional
relationships and work effectively as part of a team, excellent assessment abilities, in-depth
knowledge of pharmacology and medication management for older people, and strong
leadership skills in order to provide person-centred care that met the needs of clients/carers,
nurses, GPs and community pharmacies.

Organisational support and resources

Resources required to support the implementation of the clinical pharmacy model included
access to office space, a mobile telephone, a fax machine, a computer with access to a range
of medicines information resources, and a dedicated vehicle. The pharmacist also needed
remote electronic access to clients' home nursing records, including correspondence from
external providers such as GPs and hospitals, and ability to communicate securely by email
with community nurses. Access to interpreters was also important.

Enablers and challenges identified

A number of factors helped make development and implementation of the model a success.
Stakeholder consultation and the use of co-design and participatory action research principles
ensured stakeholders had input into, and ownership of, the model. The high level of support
for the role from nurses and nurse managers, and their willingness to accept the pharmacist as
a member of their team and facilitate the pharmacists' role contributed to its success. The
appointment of two experienced pharmacists to the role, who were able to work with the
project team and the nurses and other health professionals to develop the role and manage
challenges, was also a success factor.

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A challenge for the model was engaging GPs. As community nursing clients retain their usual GP, the consultant clinical pharmacists had to work with many different GPs. This is illustrated by the fact that the 84 clients referred to the clinical pharmacy service had 74 different GPs. It was not possible to consult all GPs prior to implementing the model, so the pharmacists had to engage with a new GP almost every time they reviewed a client. The willingness of GPs to engage with the pharmacist varied.

A factor that may have impacted on GPs' willingness to engage was the absence of remuneration for time they spent reading medication review reports, taking phone calls from the pharmacist to discuss medication issues and reviewing/preparing/signing medication treatment authorisations. GPs only received payment if they had a formal consultation with the patient. This, however, is similar to what happens for home nursing clients outside of the ViP model, when GPs still need to provide community nurses with medication treatment authorities (and update them when there are medication changes) and address concerns or questions raised by nurses about their clients.

The main challenge to the sustainability of the model is the absence of a specific funding source for clinical pharmacy support within the home nursing sector. The Australian government's HMR program rules preclude its use for this type of model, so funding needs to come from other sources such as home and community care programs and the organisations providing home care.

DISCUSSION

This study describes the successful development of a collaborative, person-centred model of clinical pharmacy support for nurses and clients of a home nursing service that incorporates direct client care and indirect care (nurse support). The model targeted a group of community-dwelling older people known to be at high risk of medication-related problems and to have poor access to clinical pharmacy support.[1 20] It delivered a range of clinical pharmacy services based on best practice standards and guidelines for clinical pharmacy and medication management. Although a form of clinical pharmacy support was already available in Australia, via the HMR program, previous research[1 20] and stakeholder consultation

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indicated that the HMR model was not able to address the needs of this patient group and the nurses supporting their medication management. The new model enabled timely access to clinical pharmacist advice and medication review to address medication issues, and facilitated communication and information sharing between the home nursing service, prescribers and community pharmacies. The success of the new model was demonstrated by high levels of uptake and acceptance of the pharmacists' role by all stakeholders, and its ability to meet stakeholders' needs.

A major strength of the study was the extensive stakeholder consultation, inclusion of consumers and other stakeholders in the co-creation of the model, and use of participatory action research to develop and refine the model. Limitations were that the model was developed and implemented within a single home nursing service, albeit one of the largest in Australia, and the study was not designed to measure the effect of the model on clinical and humanistic outcomes. Further work is therefore needed to determine generalisability of the model to other services, in particular to rural services, and impact on client outcomes. Time spent by pharmacists delivering the service were self-recorded and may be an under- or over-estimate.

Whilst there have been many previous studies describing pharmacist medication reviews in domiciliary or primary care settings,[28] there is very little literature describing the development or implementation of comprehensive clinical pharmacy services specifically for home nursing or home healthcare clients.[29] Our model differs from traditional domiciliary pharmacist models because it doesn't focus only on medication review. Instead it includes a range of clinical pharmacy roles including direct client care and indirect care to address the specific needs of community nurses and their clients. Functionally the model has similarities with hospital 'ward pharmacist' models and nursing home consultant pharmacist models, in that a designated pharmacist delivers a range of clinical pharmacy and medication safety functions to support the service and its patients or clients.

Given the ageing population, increasing polypharmacy and complexity of medication management, increasing prevalence of AMEs in the primary care setting,[30] and increasing demand for home care support to delay the need for residential aged care, our model is likely to have applicability to home nursing services nationally and internationally. Whilst community nurses play an important role in identifying and resolving medication-related

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problems for their clients, the complexity of modern pharmacotherapy means that they increasingly require support from clinical pharmacists, whose core expertise is reviewing medication management to ensure safe and appropriate use of medicines. Increasingly home nursing services are using staff with lesser training in pharmacology and therapeutics (e.g. enrolled nurses and personal care workers) for some medication management activities, further underscoring the need for pharmacist support. This need has been recognised in hospitals and nursing home settings, with widespread implementation of clinical pharmacist roles. But in the home care setting these roles are uncommon..

The only related home care-based clinical pharmacy models we identified in the published literature were services delivered within some home healthcare services in the USA,[9 31-33] and a domiciliary pharmacy service provided by a community health and social care service in the UK.[34] In the USA, Redit et al described a home healthcare pharmacist role that included pharmacist home visits, medication reconciliation and medication review. The pharmacist also contributed to development of medication-related health service policies and nurse education.[29] Patients who received the pharmacist review were less likely to have a hospital admission or emergency room visit than those who did not.[32] In the UK, Dilks et al described a visiting pharmacist service for complex older people who were often housebound.[34] An evaluation of the service suggested that it could reduce unplanned hospital admissions and was likely to be cost-saving.[34] Some of the pharmacist roles in these studies were similar to our model, but little information was provided regarding the framework or processes used to develop these models and the extent to which the pharmacists liaised with community nurses and provided indirect care.

Our model has potential to reduce the risk of AMEs, however further research is needed to confirm its impact on client outcomes. Preliminary evidence suggests the model could be cost-saving to the health system, with a Return on Investment analysis, conducted by a health economist using data from the ViP pilot study together with published data on rates of AME and medication review outcomes, indicating that $1.54 could be saved for every $1 spent on the ViP clinical pharmacy model.[35] Savings were from reduced medication use, GP visits/consultations, hospitalisations and nurse visits. Further work is required to confirm the model is cost-effective and identify a sustainable funding model.

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Conclusion

Using co-design and participatory action research, a collaborative, person-centred clinical pharmacy model for the home nursing setting was developed to address the needs of clients, carers, nurses and other stakeholders. The model is likely to have applicability to community nursing services nationally and internationally.

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Table 1. Key medication management issues affecting home nursing clients, identified by stakeholders and review of client data

- High prevalence of polypharmacy (5 or more medicines)
- Complex medication regimens sometimes necessitating multiple daily nurse home visits
- High prevalence of medication errors and other medication-related problems
- Difficulty obtaining, and maintaining, up-to-date medication treatment authorisations^ from prescribers
- Discrepancies between medication treatment authorisations and client's medicines (including pharmacy-packed dose administration aids)
- Lack of communication and sharing of medication information between prescribers, community pharmacies and community nurses
- Lack of clinical pharmacy support and access to medicines information and advice for community nurses
- Poor client access to community pharmacists due to poor mobility
- Very low rate of HMR, despite nurses' efforts to organise them through clients' GPs (due to barriers such as low GP acceptances of nurses' recommendations, and HMR requirements that: a) require GPs obtain client consent then initiate a pharmacist referral, b) do not allow community nurses to directly refer clients to an HMR pharmacist, and c) restrict the frequency of HMR)
- Lack of involvement of community nurses when a HMR occurs (nurses not informed when review occurs, not consulted about the client's medication management, and not provided with a copy of the HMR report or updated medication orders)

GP =General Practitioner; HMR = Home Medicines Review (Australian Government-funded, GP-initiated pharmacist medication review programme)

^ Medication treatment authorisations are signed orders from a medical practitioner authorising the nurse to administer medicines or support clients' medicine self-administration.

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Table 2. Clinical pharmacist roles

Direct client care	Indirect client care
- Visiting clients in their homes (with the community nurse where practical) to review and discuss medicines management, identify medication-related problems and educate clients/carers on their medicines use; - Obtaining 'best-possible medication histories' (current medication list, verified using two or more sources); - Reconciling the best-possible medication history with current medication orders held by the home nursing service to identify and resolve discrepancies; - Working with clients' prescribers and community pharmacies to resolve medication-related problems, withdraw (deprescribe) unnecessary or inappropriate medicines and simplify medication regimens; - Liaising with prescribers and community pharmacies to update clients' medicines lists and community nurses' medication treatment authorisations^; - Providing advice to community nurses to optimise clients' medication management plans; - Answering client-specific medicines information questions from community	- Answering general medicines information questions from nurses - Providing nurse education regarding medicines and medication management - Developing medication information resources for nurses - Contributing to development or revision of organisational medication policies and procedures

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nurses and others;

- Following-up clients and/or community nurses, GPs, community pharmacies to ensure positive outcomes from medicine reviews (via telephone and/or repeat home visits where necessary).

^ Medication treatment authorisations are signed orders from a medical practitioner authorising the nurse to administer medicines or support clients' medicine self-administration.

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Table 3: Key differences between the home nursing clinical pharmacy model and the Australian Home Medicines Review (HMR) model*

Components	Home nursing clinical pharmacy model	Home Medicines Review model*
Referral to pharmacist	Direct referral by community nurses	Requires nurse to request client's GP make a referral
Likelihood of pharmacist review following nurse referral/request	High	Low[#]
Timeliness of pharmacist review	Rapid	Slow[#]
Home visit process	Home visit by the clinical pharmacist alongside community nurse	Home visit by the clinical pharmacist alone
Medication review	Addresses the medication management and information needs of the community nurse[^] as well as the client/carer, GP and community pharmacist	Does not addresses the medication management and information needs of the community nurse[^]
Medication review report	Copy provided to GP, community pharmacy and community nurse	Copy not provided to community nurse
GP remuneration	No remuneration other than for standard patient consultations or other Government-funded items including case conference with pharmacist and nurse	GP remunerated for initiating the HMR and preparing a medication management plan
Post-medication review follow-up and support	Follow up and ongoing support for clients, carers, community nurses and other health providers to ensure medication issues are resolved	No follow-up or ongoing medication management support available from the clinical pharmacist.
Ad hoc advice about clients' medication management	Community nurses able to contact clinical pharmacist at any time for advice	Not available
Indirect care	As summarised in Table 2.	Not available

GP = General Practitioner

* Home Medicines Review (HMR): Australian Government funded pharmacist medication review program

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Low uptake of HMR due to poor acceptance of community nurse requests for an HMR and programme restrictions on frequency of HMR; Delays due to need for GP to see the patient to obtain consent, then make referral to an HMR pharmacist

^ Information needs of community nurses may include: Assistance with clarifying ambiguous or complex medication treatment authorisations and addressing discrepancies with clients' medicines; Targeted regimen simplification (where appropriate) to minimise home nursing visits; Assistance with sourcing updated medication treatment authorisations; Advice about medicines storage and administration; Advice about monitoring medication outcomes and adverse effects.

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Table 4. Medication-related risk factors and problems that could trigger a pharmacist referral

- ≥8 medicines

- ≥1 high or moderate risk medicines[#]

- >1 prescriber or pharmacy

- >1 medication treatment authorisations[^]

- Discharged from hospital in the past month

- Experiencing possible medicine side effects

- Recent medication error or incident

- Client or carer concerns about their medicines

- Nurse concerns about medication regimen (e.g. potentially inappropriate medicines, unclear/ambiguous medication orders, complex dosing regimen)

[#] High risk medicines: anticoagulants, chemotherapeutic agents excluding hormonal agents, immunosuppressant agents, insulins, levodopa, lithium, opiates; Moderate risk medicines: anticonvulsants, anti-infectives excluding topical agents, antipsychotics, benzodiazepines, digoxin, loop diuretics, oral hypoglycaemics, oral corticosteroids.

[^] Medication treatment authorisations are signed orders from a medical practitioner authorising the nurse to administer medicines or support clients' medicine self-administration. Clients sometimes have multiple authorisations (e.g. a general practitioner [GP]-provided medicine list plus one or more letters from the GP, specialist or other prescriber indicating a medicine change).

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