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Exploring the past, present and future of care home medicine management systems: pharmacists' perceptions of multicompartment compliance aids

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Abstract

Objectives Medicines maintain and improve care home (CH) residents' health and therefore, it is imperative that CH medicine management systems are regularly evaluated to ensure they continually provide a high standard of care. Multicompartment compliance aid (MCA) medicine management systems are often used to assist United Kingdom CH staff with managing the large volume of medicines used by residents. This study aimed to identify the factors that led to the widespread adoption of MCAs into United Kingdom CHs, limitations associated with their current use and their relevance in the future.

Method In June and July 2014 semi-structured interviews were conducted with eight pharmacists who were purposively selected for their expertise in CH medicine management systems in the United Kingdom. A qualitative thematic approach was employed in the analysis of data.

Key findings Findings indicated that MCAs were introduced into CHs to address unsafe medicine administration practices and because of pharmacy commercial interest. Identified limitations included reduced staff alertness during medicine administration, restricted ability to identify medicines, and medicine wastage. Participants predicted continued use of MCAs in the future due to their perceived benefits of improved safety and efficiency, although some pharmacists recommended that they be removed and CH staff trained to administer medicines from original packaging.

Conclusion These findings can contribute towards information used by health care providers when deciding on the relevance of MCAs in their current medicine management systems. Additionally, they can contribute towards information used by policy makers when revising United Kingdom CH medicine management guidelines.

Keywords care homes; care of elderly people; health and social care; health services research; medicines management

Introduction

Care home (CH) resident health has been a continuing topic of discussion in the United Kingdom (UK).^[1,2] These often frail and vulnerable individuals are at risk of polypharmacy and have been shown to take a median of eight medicines.^[3] In UK CHs, multicompartment compliance aids (MCAs) are commonly used to assist staff with managing this large volume of medicines.^[3] MCAs organise medicines according to the day of the week and time of the day when they must be administered.

Rick Berman, an American pharmacist, developed MCAs in the mid-1970s.^[4] He packaged medicines into blister cards to assist nurses with medicine stock counts.^[4] MCAs first appeared in the UK in 1989 when they were introduced by a major pharmacy group.^[4] A limited number of early publications have described early MCA structures,^[4,5] their potential to be used as adherence aids,^[5] and their ability to reduce errors and time associated with CH medicine administration.^[6]

Pharmacists have been and are continually involved in debate concerning MCA use in CHs and have had significant input into recommendations to adopt MCAs. Pharmacists are also currently involved in supplying MCAs and providing guidance concerning their use.

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MCAs may be perceived to be a safer and more efficient method of medicine administration compared with administering directly from original packaging. However, there is limited literature supporting this and some studies have shown problems associated with their use, including medicine dispensing and administration errors.^[7–13] The Royal Pharmaceutical Societies (RPS) of England^[14] and Scotland^[15] have cautioned against the routine use of MCAs, calling for a need to review the value of their continued use,^[15] taking into account the evidence-base for the effectiveness of MCAs as one medicine adherence intervention amongst many.^[14] CH medicine management systems, including MCAs, should be regularly evaluated to ensure they continually provide a high standard of care in line with national guidance and standards, such as the goals of the Care Quality Commission (the independent regulator of health and adult social care in England).^[16]

The aim of this study was to identify pharmacists' perceptions of the factors that led to the widespread adoption of MCAs into UK CHs, limitations associated with their current use, and their relevance in the future of CH medicine management.

Methods

Sampling strategy

Purposive sampling targeted pharmacists who had an understanding of the medicine management issues that MCAs were designed to address and who were involved in decisions to adopt MCAs into UK CHs, as well as pharmacists who could comment on the limitations of MCAs in current practice. To produce a rich and varied data set, participants who practised in a diverse range of sectors were sampled, including research and evaluation, policies and practice, regulations and guidance, and commercial, hospital and community pharmacy. Participants were identified through professional networks of the research team, snowball sampling and identifying pharmacist leaders in the area of CH medicine management from pharmacy publications. The total number of participants who have an understanding of the research topics explored in this study is difficult to determine, for example, it is unclear how many pharmacists were involved in decisions to adopt MCAs into UK CHs. While a truly representative sample would be difficult to achieve, the sampling strategy was designed to identify key individuals with informed and diverse perspectives on the introduction and use of MCAs in CHs.

Recruitment

Participants were first approached via email and subsequent communication was then conducted via telephone and/or further emails. Informed consent was received via return email.

Ethical approval

Ethical approval was obtained from the University College London Research Ethics Committee.

Data collection instrument

Semi-structured interviews were conducted as they direct the conversation towards topics of interest to the research team while still allowing the interviewee to provide responses in their own terms.^[17] The interview schedule was developed by the research team and included questions that explored the factors that led to the widespread adoption of MCAs into UK CHs, limitations associated with their current use, and the relevance of MCAs in the future of CH medicine management. Face and content validity was assessed by the research team, which comprised three pharmacists who had experience in community and/or hospital and academic pharmacy. Two members of the research team have been extensively involved in qualitative and quantitative research exploring medicine use in CHs. Questions included (with a CH focus):

- What medicine management problems were MCAs designed to address (and how)?
- What were the perceived advantages of MCAs compared with existing medicine management systems?
- Did MCAs address the problems they were designed to?
- What are the limitations associated with current MCA use?
- How will MCAs be used in the future of medicine management (and suggestions to improve their use)?

Data collection procedure

The interviews were conducted in June and July 2014 in person or via telephone. The interviewer introduced themselves, the study, the interview purpose, and asked participants to describe their past and current involvement with CH MCAs. Questions from the interview schedule were then asked.

Data analysis

All interviews were audiotaped and transcribed verbatim. Data were managed using NVivo 10 (QSR International (Americas) Inc., Cambridge, MA, USA). The data were analysed using a thematic approach, which involved familiarisation with the raw data, identification of key themes as they emerged, defining and naming themes, formation of an initial coding frame, and indexation of the data to that coding frame.^[18] An iterative process was used to refine the coding frame and principles of constant comparison were employed in the interpretation of data. The coding frame was discussed among the research team along with quotes from the interview transcripts to ensure the validity and credibility of data analysis.

Results

Eight interviews were conducted with two male and six female pharmacists (average: 62 min, range: 38–99 min). Six interviews were conducted in person and two interviews were conducted via telephone. Participant area of prac-

tice/expertise is included in Table . Results presented later are derived from participant responses.

Factors that led to the widespread adoption of MCAs into UK CHs

Participants explained that CH staff often used makeshift medicine organisers to arrange resident's medicines into dosage intervals, before the widespread adoption of MCAs into UK CHs. Using a medicine record or original medicine container label (often labelled 'as directed'), medicines were removed from their original packaging and placed into ice-trays, bottle tops, egg cups, and small liquid medicine pots:

'... all the care staff [at CHs] arranged their own receptacle ... they took the medicines out of the [original] containers ... and they put them into say an ice tray ...' (P1)

Resident names were included on pieces of paper that were either placed in or affixed to these receptacles. CH staff perceived that this form of re-dispensing would ease and quicken medicine administration, allow them to carry smaller medicine volumes, reduce the likelihood of administering medicines from incorrect dosage intervals, and allow senior staff to ensure junior staff administered medicines accurately.

Pharmacists perceived this form of re-dispensing to be unsafe as it introduced an error-prone step into the medicine administration process. There was concern regarding inadequate medicine labelling and a lack of continuity between staff who prepared and later administered medicines. Some

pharmacists also perceived medicine management practices to be disorganised and unsafe due to rapid turnover of relatively unskilled staff and unsupportive CH infrastructure:

'I think it was fair to say it [medicine administration in CHs] was generally shambolic Many care homes were not purpose built, so they were old houses on many floors, so pushing around a medication trolley ... simply was not possible ... you'd find patients using other patients medications, you'd find confusion about who had been administered [medicines] and who'd not been administered ...' (P2)

Recommendations to address these medicine-related problems using MCAs

Pharmacists' recommendations to administer directly from original packaging stored in medicine trolleys were met with resistance as CH staff perceived that this would increase administration time and detract from the homely environment. Some pharmacists then suggested using pharmacy-prepared MCAs to increase their involvement in and control over CH medicine dispensing:

'... we're removing a step in the process [CH staff re-dispensing] that will reduce error ... we're shifting the responsibility for the preparation of the medicine in a form that can be given out, from the care worker [at the CH] to the pharmacist, getting the pharmacist more involved, more responsible and integrated into the needs of the care home and therefore we're ... making pharmacists I would say more central to it [CH medicine management].'' (P1)

The perception was that pharmacy-prepared MCAs could provide a safer and more convenient, efficient, accountable, professional and accurate medicine administration system. MCAs were considered to be portable, could provide a visual audit trail of medicines that had been administered, were supplied with administration records that were considered more accurate and reliable than previously used records, and could reduce confusion caused by inadequately labelled medicines. Pre-packed MCAs could simplify and reduce administration time, increase the chance that residents were administered medicines accurately and allow CH staff to undertake other duties:

'... I would be surprised if people's lives were not saved, I would be surprised if we killed fewer people, so the general safety aspect of medication handling improved ...' (P2)

Implementation and uptake of MCAs

It was explained that although CHs had neither requested a new system of medicine administration, nor had any publicly known medicine administration catastrophes recently occurred, MCAs were rapidly adopted:

'... I don't remember any massive report that came out and said all this dreadful stuff's happening in care

Table 1 Area of practice/expertise of participants

Participant	Area of practice/expertise
P1	A pharmacy research and teaching academic from an English university with experience evaluating CH medicine systems
P2	A pharmacist with experience providing regulatory advice and leadership in pharmacy services
P3	A consultant hospital pharmacist for older people, who had developed and implemented new services for older people in both hospitals and primary care
P4	A consultant hospital pharmacist for older people with community pharmacy experience, who provided professional leadership and developed innovative models to optimise medicine use in CHs
P5	A hospital pharmaceutical advisor with experience evaluating CH medicine systems
P6	A head of medicines management in National Health Service Commissioning Support, who coordinated and led investigations into CH safety issues and advised on CH safe systems
P7	A clinical pharmacist and director of a pharmaceutical organisation committed to improving medicine use and management in CHs
P8	A clinical hospital pharmacist with experience evaluating CH medicine systems and processes

CH, care home.

homes, quick shove it [medicines] all in an MCA ... it was about the commercial intent around “here’s a new bit of business let’s grab it” ...’ (P3)

Community pharmacists began providing MCAs to CHs on a large scale in the early 1990s after recognising that supplying MCAs could add value to their CH services, meet a gap for a professional CH medicine management system, and increase business. Uptake by CHs was encouraged through marketing campaigns, assurances of improved safety and reduced administration time, and the provision of free MCAs, medicine trolleys and related training.

It was explained that during this transition, some pharmacies lost their CH medicine supply business to MCA-supplying pharmacies, were only contracted to supply ad-hoc medicines, or felt compelled to supply MCAs. There was professional disagreement about whether pharmacists should provide MCAs without remuneration. Additionally, if urgent medicines were required outside the monthly MCA delivery and were supplied in unpredictable ways, CH staff would have to work outside a system they were used to and confusion could arise if multiple pharmacies supplied medicines to a single CH.

Limitations associated with the current use of MCAs

Impact on CH staff knowledge and skills

It was explained that CH staff may have difficulty identifying medicines if they are not administered directly from original packaging, potentially leading to dispensing errors going undetected if multiple medicines are packed within single MCA compartments, and being unable to accommodate resident requests to omit certain medicines.

It was felt that CH staff alertness during medicine administration may be compromised as MCA use could detach them from individual medicines administered. This could prevent clinical monitoring such as checking the resident’s pulse before administering digoxin, linking clinical problems to administered medicines such as low blood pressure with antihypertensives, or leading to unnecessary administration such as waking residents to administer sleeping tablets:

“... the nurse is not thinking [when administering medicines], they’re just doing a task and they’re just popping tablets out [of the MCA], all the tablets are just there in a blur ...” (P4)

CH staff may prefer and become used to administering medicines from MCAs leading to reluctance or forgetfulness regarding administering medicines in original packaging. Some pharmacists perceived that MCAs were not necessary if CH staff administered medicines as they are traditionally used to promote adherence in self-administering individuals:

‘... an MCA is something to aid a patient to comply with their medicines ... if you have a nurse who is trained, giving medicine, why do they need an MCA? ... The staff is the compliance aid ... they are the support mechanism to help the patient take their medicines ...’ (P4)

Impact on CH residents

There was concern that if only four dosage intervals are present in an MCA or if medicine administration times are fixed, more frequent or flexible dosing regimens may not be accommodated, preventing administration at optimal times for the resident. Additionally, if ‘when required’ medicines are packed into MCAs overtreatment could occur and MCAs may not include special instructions to guide administration of particular medicines or may not distinguish these medicines from other packed medicines.

Polypharmacy may be masked by the absence of multiple medicine container triggers and MCAs may be used to manage large medicine volumes without attempting to address polypharmacy. Medicines may be wasted if MCAs are discarded when regularly administered medicines are refused, ‘when required’ medicines are not used or medication regimen changes occur. MCAs may also be routinely considered as a first-line adherence aid before other adherence strategies are tried and they may remove residents’ medicine taking skills, independence, and choice in what medicines to take if CH staff routinely administer all packed medicines:

“... once you start to get people who actually are responsible for their own medicines then it’s very disempowering to have everything in blister packs [MCAs] ...” (P3)

Impact on medicine errors, safety and the pharmacy

It was explained that pre-prepared MCAs may not be updated for medication regimen changes if CH staff forget or are unaware of changes, potentially leading to administration errors. Changes could be inefficiently handled if CH staff do not feel comfortable addressing changes themselves and instead rely on pharmacy staff to modify or supply new MCAs. MCAs may also be used by CH management to compensate for deficiencies in staff training and they may promote a false sense of security if CH staff perceive that medicine checking is not necessary or their responsibility:

‘... I think the care home staff tend to like the MCAs because the perception is that they are better and safer ...’ (P5)

Additionally, it was noted that MCA preparation increases pharmacy workloads with little or no corresponding increase in remuneration and pharmacists may not be involved in decisions concerning MCA appropriateness for individual residents.

The relevance of MCAs in the future of CH medicine management

Participants did not all share the same view regarding whether MCAs should be retained or removed in CHs of the future.

Pharmacists felt that MCAs would continue to be used in CHs with little change to existing practices as a significant catalyst for change and evidence of harm could not be identified, MCAs have been used for many years and were

favoured by CH staff, and change would have to overcome commercial pressure:

“... what would be the driver for change ... inertia is very strong especially where there’s a commercial advantage to that inertia ... we would need evidence to say that medicines administration is unsafe in the current MCA system ... we need some evidence of harm before we put money and effort into changing a system ...” (P3)

Some pharmacists recommended completely removing MCAs from CHs, storing medicines in resident rooms and training CH staff to administer from original packaging:

“... if we’re going to ask care home staff to administer medicines from original containers for example, we need to help them feel safe and empowered to do so, we need to help them not feel vulnerable ...” (P3)

It was suggested that MCAs could be recommended for self-administering residents with adherence difficulties, after first considering reminder charts, large-print labels and other adherence aids. Polypharmacy could also be addressed and medication regimens simplified to facilitate administration. CH staff could be educated on the advantages and disadvantages of MCAs and alternative systems of medicine administration. However, limitations associated with administering from original packaging would need to be addressed if MCAs were removed from CHs, such as the potential increase in administration time and funding needed for staff training and resident medicine storage facilities.

It was also suggested that MCAs could continue to be used as part of a wider system of medicine administration including pharmacist and prescriber medicine review, pharmacist and CH staff collaboration and consultation regarding MCA appropriateness in individually assessed residents, and remuneration for pharmacy supply:

“... I certainly don’t see multiple compartment aids as a thing that should be supplied by the pharmacist as a container and then washed their hands of ...” (P1)

“... an MCA can be useful so long as it’s part of a wider system of safety and review ...” (P6)

It was noted that MCAs may be of particular benefit when used for stable residents, who had simple medication regimens, which involved few changes and mostly solid medicines:

“... for patients who are very stable on their meds [medicines] ... who have poor cognitive function so they can’t be involved [in medicine administration], where you have a stable set of staff who’ve been there [at the CH] for a very long time ... and most of them [medicines] are swallowed oral dosage forms rather than liquids ... in that situation it could be entirely appropriate to have everything blister packed [in MCAs] ...” (P3)

It was suggested that national guidelines supported by authoritative bodies should be developed to guide CHs in deciding on optimal medicine management systems to suit their individual circumstances, rather than implementing a blanket rule concerning MCA use:

‘... in one home [CH] you might have some patients where it’s better for the patient to have it in their own boxes [original packaging] and some where it’s better for the staff to have it in the MCA ... what would be good would be to have some guidance that said “here are the factors that influence what the best way for you to administer medicines are, here are some examples of care homes who’ve chosen various different ways and why they have, so this gives you the tool to make an assessment in your own care home and then feel that you have a secure decision about what’s safe for you” ...’ (P3)

It was also suggested that all medicine management stakeholder views should be considered when evaluating the usefulness of MCAs:

“... if I put myself in the shoes of somebody who is administering a medicine ... if I’m a person who doesn’t have a medical background and may not have English as a first language, there are lots of reasons I don’t want to take responsibility for administering things [medicines] from original containers ... I fully understand people who say please give me the medicines all in a ready sealed box [MCA] so I don’t have to think about choosing them ... in a lot of care homes you’ve got a lot of people [residents] without capacity so they’re not able to support the carer in the choice of medicines, which puts the onus completely on the carer ...” (P3)

‘... you have to put yourself in the shoes of the pharmacist, “they’re [MCAs] a bloody pain to fill ... and no one’s paying me for it” ...’ (P3)

Discussion

This study identified that perceived unsafe medicine administration practices of using make-shift medicine organisers combined with commercial interest led to the widespread adoption of MCAs into UK CHs. Perceived limitations associated with their current use may have resident safety implications and should be considered when reflecting on the relevance of MCAs in the future of CH medicine management. No previously published study has provided an in-depth exploration to date of expert pharmacists’ perceptions regarding these issues. The findings of this study support the national recommendations^[14,15] to review and evaluate the continued use of MCAs.

In contrast to the literature outlining general limitations associated with using MCAs,^[19–22] this study describes MCA limitations of particular relevance to CHs. Limitations of inaccurate medicine administration^[7,23] and dispensing errors^[8–13] have also been found in the literature, as well as

a relationship between using MCAs and reduced medicine knowledge in patients.^[24,25] The potential to mask polypharmacy is of particular relevance to CH residents, where polypharmacy is often seen.^[26–34] However, limitations associated with administering directly from original packaging should also be considered^[35] along with literature showing that error-causing factors can be present despite the method of medicine administration.^[36]

The recommendation to educate CH staff to administer directly from original packaging is supported by literature showing that education is necessary to achieve change in CHs^[37] and that a transition from using MCAs to original packaging is feasible.^[19] Recommendations for greater pharmacist input and medicine review alongside MCA use is supported by literature showing that multidisciplinary CH interventions are effective models of delivery and pharmacist input can be beneficial in the CH setting.^[38–40] Checklists that form part of national guidelines outlining CH characteristics which would or would not facilitate MCA use could be developed, as has occurred in other healthcare settings where checklists have been used to good effect.^[41]

Currently, UK pharmacies are contracted by CHs to mainly supply medicines, which are usually provided in MCAs. However, there is an opportunity for pharmacists to use their skills and expertise to improve overall CH medicine management processes and the quality of care provided to residents.^[42] It has been recommended that pharmacists have greater responsibility for overall medicine use in CHs.^[7,42,43] Pharmacist-led medicine reviews have been shown to reduce medicine wastage and improve disease management in CH residents, as well as increase the involvement of residents in decisions concerning their medicine use.^[44] These suggestions are in-line with participant recommendations to continue to use MCAs in the future, as part of a wider system that incorporates pharmacist medicine review. Pharmacist involvement in CHs could also be extrapolated to involvement in the development of national guidelines to guide CHs in deciding on optimal medicine management systems, as suggested by study participants.

It is a strength that this study interviewed pharmacists who were experts in their field by a pharmacist who was knowledgeable on the discussion topic.^[17] However, this could also be considered a limitation as the choice of interviewer could introduce bias. This study also used an established methodology of examining past practices to inform the future of health care.^[45–50] Study limitations include the potential for participant responses to be affected by recall bias, the small sample size and analysing a combination of face-to-face and telephone interview data. However, in only two cases the participant preferred to be interviewed via telephone despite the interviewer offering to visit them in a convenient location. It is also a limitation that the total number of participants who have an understanding of the research topics explored in this study is difficult to determine; therefore, it is unknown whether participants are representative of the total possible sample of participants. However, participants were purposively sampled for their comprehensive knowledge of the research topics under investigation.

Some participants noted that the cautious views held towards MCAs by pharmacists in the general population may be influenced by the increased pharmacy workloads and lack of, or limited remuneration associated with MCA supply. As the views of some participants in this study may have been similarly influenced, future studies should explore CH staff perspectives to achieve a more balanced view of the relevance of MCAs in the future of medicine management. Quantitative evaluation of the safety and efficiency associated with MCA use in CHs,^[6] the use of MCAs in CHs that employ nurses or carers in medicine administration, and guidelines and training available to CHs regarding MCA use and medicine management could also be the focus of future studies. Lastly, resident perspectives should be explored to ensure they remain the central focus of all care decisions. There is a paucity of literature exploring residents' perspectives in medicine-related issues despite some studies conducted in the hospital setting.^[51–53] The National Institute for Health and Care Excellence (NICE) CH medicine management guidelines recommend that CH residents should be supported to make informed decisions about their medicines and to take their medicines themselves.^[54]

The findings of this study can contribute to existing literature informing health care providers, such as CH managers, who are deciding on the relevance of MCAs in their current medicine management systems, whether the original reasons behind MCA implementation align with current CH medicine management environments, the potential clinical significance of any impact resulting from limitations associated with their use, and the feasibility of recommendations outlined for the future. Additionally, these findings can contribute to existing literature informing policy makers, such as pharmacy,^[14,15] nursing^[55] and UK Government or other organisation guidelines,^[54,56–62] to provide a basis for refining UK CH medicine management guidelines. Guidelines can be refined to consider potential limitations associated with the use of MCAs and suggestions to improve their future use, as outlined in this study.

Conclusion

This study explored the factors that led to the widespread adoption of MCAs into UK CHs, limitations associated with their current use, and the relevance of MCAs in the future of CH medicine management. Participants identified limitations associated with the current use of MCAs, including impacts on CH staff knowledge and skills (e.g. medicine identification difficulties), impacts on CH residents (e.g. inflexible dosing regimens) and impacts on medicine errors, safety and the pharmacy (e.g. administration errors). However, they felt that MCAs would continue to be used in CHs of the future as a catalyst for change or evidence of harm has not been identified, MCAs are favoured by CH staff, and commercial pressures exist. These findings can contribute to information used by healthcare providers to evaluate how well MCAs have met their original objectives and in turn determine the potential usefulness or continued relevance of MCAs in their CH. Additionally, pharmacy, nursing and UK Government organisations can use these

findings to work towards providing more specific national direction regarding MCA use in CHs. Further research is needed to compare: the views of pharmacists with those of CH staff and residents; the views of nurses and carers, and CH staff working in residential and nursing environments; and the views shared by pharmacists working in different areas of practice.

Declarations

Conflict of interest

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

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Authors' contributions

All authors designed the study. Dr Gilmartin collected and analysed the data and drafted the initial manuscript. All authors prepared the manuscript for publication. All Authors state that they had complete access to the study data that support the publication.

References

- McMurdo MET, Witham MD. Health and welfare of older people in care homes. *Br Med J* 2007; 334: 913–914.
- Donald IP et al. Care home medicine in the UK – in from the cold. *Age Ageing* 2008; 37: 618–620.
- Gordon AL et al. Health status of UK care home residents: a cohort study. *Age Ageing* 2014; 43: 97–103.
- Sprey SL. Monitored dosage systems. *Pharm J* 1995; 254: 767–770.
- Corlett AJ. Aids to compliance with medication. *Br Med J* 1996; 313: 926–929.
- Rivers PH, Poston JW. Evaluation of a controlled dosage medication system. *Pharm J* 1985; December 14: 787–789.
- Allred DP et al. *Care Home Use of Medicines Study (CHUMS)*. United Kingdom: The School of Pharmacy University of London, University of Leeds, University of Surrey, 2009.
- Carruthers A et al. Accuracy of packaging of dose administration aids in regional aged care facilities in the Hunter area of New South Wales. *Med J Aust* 2008; 188: 280–282.
- Gerber A et al. Quantification and classification of errors associated with hand-repackaging of medications in long-term care facilities in Germany. *Am J Geriatr Pharmacother* 2008; 6: 212–219.
- Gilmartin JF-M et al. Medicines in Australian nursing homes: a cross-sectional observational study of the accuracy and suitability of re-packing medicines into pharmacy-supplied dose administration aids. *Res Social Adm Pharm* 2013; 9: 876–883.
- Hussainy S et al. How accurate are manually prepared dose administration aids in residential aged care facilities? A pilot investigation. *Aust Pharm* 2012; 31: 320–325.
- Gilmartin JF-M et al. Towards improving dose administration aid supply: a quality improvement intervention aimed at reducing dispensing errors. *Int J Clin Pharm* 2013; 35: 1152–1160.
- Gilmartin JF-M et al. Exploring factors that contribute to dose administration aid incidents and identifying quality improvement strategies: the views of pharmacy and nursing staff. *Int J Pharm Pract* 2014; 22: 407–414.
- Royal Pharmaceutical Society. Improving patient outcomes – the better use of multi-compartment compliance aids. Great Britain, 2013.
- Royal Pharmaceutical Society Scotland. Improving pharmaceutical care in care homes. Edinburgh, 2012.
- Care Quality Commission. Annual report and accounts 2013–14. United Kingdom, 2014.
- Qu SQ, Dumay J. The qualitative research interview. *Qual Res Account Manage* 2011; 8: 238–264.
- Pope C et al. Qualitative research in health care. Analysing qualitative data. *Br Med J (Clin Res Ed)* 2000; 320: 114–116.
- Morrison C. Care homes: the move away from using monitored dosage systems. *Pharm J* 2014; 292: 394–395.
- Elliott RA. Appropriate use of dose administration aids. *Aust Prescr* 2014; 37: 46–50.
- Bhattacharya D. Indications for multi compartment compliance aids (MCA) – also known as monitored dosage systems (MDS) – provision. Norwich, Norfolk: University of East Anglia, 2005.
- Tandy C, Bamford L. Medication compliance aids. *Eur Geriatr Med* 2010; 1: 314–316.
- Allred DP, Standage C. Medication errors in care homes. *Nurs Times* 2011; 107: 14–15.
- Kwint H-F et al. Medication adherence and knowledge of older patients with and without multidose drug dispensing. *Age Ageing* 2013; 42: 620–626.
- Bell JS et al. Multidose drug dispensing and optimising drug use in older people. *Age Ageing* 2013; 42: 556–558.
- Bronskill SE et al. Exploring variation in rates of polypharmacy across long-term care homes. *J Am Med Dir Assoc* 2012; 13: 309.e15–309.e21.
- Morley JE. Polypharmacy in the nursing home. *J Am Med Dir Assoc* 2009; 10: 289–291.
- Onder G et al. Polypharmacy in nursing home in Europe: results from the SHELTER study. *J Gerontol A Biol Sci Med Sci* 2012; 67: 698–704.
- Onder G et al. Polypharmacy and mortality among nursing home residents with advanced cognitive impairment: results from the Shelter Study. *J Am Med Dir Assoc* 2013; 14: 450.e7–451.2.
- Tamura BK et al. Factors associated with polypharmacy in nursing home residents. *Clin Geriatr Med* 2012; 28: 199–216.
- Tamura BK et al. Outcomes of polypharmacy in nursing home residents. *Clin Geriatr Med* 2012; 28: 217–236.
- Vetrano DL et al. Polypharmacy in nursing home residents with severe cognitive impairment: results from the SHELTER Study. *Alzheimers Dement* 2013; 9: 587–593.
- Duerden M et al. Polypharmacy and medicines optimisation. Making it safe and sound. London: The King's Fund, 2013.
- The Model of Care Polypharmacy Working Group. Polypharmacy guidance October 2012. Scotland: NHS Scotland, The Scottish Government, 2012.
- Allred DP et al. The influence of formulation and medicine delivery system on medication administration errors in care homes for older people. *BMJ Qual Saf* 2011; 20: 397–401.
- Barber ND et al. Care homes' use of medicines study: prevalence, causes and potential harm of medication errors in care homes for older people. *Qual Saf Health Care* 2009; 18: 341–346.
- Nolan M et al. The role of education and training in achieving change in care homes: a literature review. *J Res Nurs* 2008; 13: 411–433.
- Burns E, Nair S. New horizons in care home medicine. *Age Ageing* 2014; 43: 2–7.
- Fowells A, Jankovic S. New MCA guidance rings the changes. *Pharm J* 2013; 291: 104–105.
- Branford D, Butterfield L. Pharmacists should provide services to vulnerable care home residents. *Pharm J* 2014; 292: 81.
- Haynes AB et al. Changes in safety attitude and relationship to decreased postoperative morbidity and mortality following implementation of a checklist-based surgical safety intervention. *BMJ Qual Saf* 2011; 20: 102–107.
- Royal Pharmaceutical Society. Pharmacists improving care in care homes. England, 2014.
- Allred D et al. How pharmacy can improve medicines use in care homes. *Br J Clin Pharm* 2010; 2: 12–14.

44. Andalo D. Pharmacists offer a clinical service to vulnerable care home residents. *Pharm J* 2014; 292: 313–314.
45. Kenny T *et al.* A PIL for every ill? Patient information leaflets (PILs): a review of past, present and future use. *Fam Pract* 1998; 15: 471–479.
46. Mannion R, Davies HT. Reporting health care performance: learning from the past, prospects for the future. *J Eval Clin Pract* 2002; 8: 215–228.
47. Hammick M. Interprofessional education: evidence from the past to guide the future. *Med Teach* 2000; 22: 461–467.
48. Hamlin RB. Embracing our past, informing our future: a feminist re-vision of health care. *Am J Occup Ther* 1992; 46: 1028–1035.
49. Kadry B *et al.* Anesthesia information management systems: past, present, and future of anesthesia records. *Mt Sinai J Med* 2012; 79: 154–165.
50. Kabat-Zinn J. Mindfulness-based interventions in context: past, present, and future. *Clin Psychol Sci Pract* 2003; 10: 144–156.
51. Furlong S. Do programmes of medicine self-administration enhance patient knowledge, compliance and satisfaction? *J Adv Nurs* 1996; 23: 1254–1262.
52. Manias E *et al.* Self-administration of medication in hospital: patients' perspectives. *J Adv Nurs* 2004; 46: 194–203.
53. Deeks PA, Byatt K. Are patients who self-administer their medicines in hospital more satisfied with their care? *J Adv Nurs* 2000; 31: 395–400.
54. National Institute for Health and Care Excellence. Managing medicines in care homes. United Kingdom, 2014.
55. Nursing and Midwifery Council. Standards for medicines management. London, 2010.
56. NHS Oxfordshire Clinical Commissioning Group. Good practice guidance E: monitored dosage systems (MDS) in care homes. England, 2013.
57. Care Quality Commission. Guidance about compliance – essential standards of quality and safety. London, 2010.
58. Marriott M *et al.* Guidance on the use of monitored dosage systems (MDS). England, 2010.
59. Monitored Dosage System Task and Finish Group. Guidelines for the use of Medicine Compliance Aids. England, 2012.
60. Steering Group on Improving the Use of Medicines. Improving the use of medicines for better outcomes and reduced waste – an action plan. United Kingdom, 2012.
61. Centre for Policy on Ageing. Managing and administering medication in care homes for older people – a report for the project: 'Working together to develop practical solutions: an integrated approach to medication in care homes'. United Kingdom, 2012.
62. East and South East England Specialist Pharmacy Services. Supporting older people in the community to optimise their medicines including the use of multi compartment compliance aids (MCAs) – a resource to help health and social care organisations to work together to optimise patient care. England: East and South East England Specialist Pharmacy Services, 2013.