

## Case Report

# Medication administration issues in residential aged care – four cases

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## ABSTRACT

Multiple morbidities with concomitant use of multiple medications are common in the elderly and the challenges of polypharmacy are recognized. An audit was undertaken over a 4 week period to identify any administration issues related to medications taken by residents at three aged care facilities. Polypharmacy was common amongst the 313 residents (90.1%). The majority of residents were female (73%), with a mean age of 85.8, and administered just over nine individual medications taken regularly (both prescription and over-the-counter). Of these, three administration issues were identified for four residents: off-label drug use; exceeding maximum daily doses by supplementary medications PRN (“as required”); and modification of dosage form (two residents). Nursing staff were advised of concerns and given suggestions for alternative approaches regarding the lack of evidence of efficacy of topical antimicrobials for chronic venous leg ulcers, the combination of two different paracetamol formulations resulting in a daily dose 990 mg greater than recommended (4 grams), and the inappropriateness of crushing controlled release medications. To the credit of busy staff in a challenging care environment, the percentage of administration related issues identified was very low (less than 1%). However, investigation of other potential medication-related issues including drug doses, dosing frequency, indication for use, and drug interactions were outside the limited scope of this study. These findings highlight the significant role pharmacists can play in identifying medications for which rationality of use is questionable. They also highlight the need for ongoing education of all health practitioners on a range of medication issues.

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## INTRODUCTION

Multiple morbidities with the concomitant use of multiple medications are common in the elderly.<sup>1</sup> Also recognized is that polypharmacy poses risks and challenges.<sup>2</sup> Although the term polypharmacy has numerous definitions<sup>3</sup> and several tools have been devised to assess its risks,<sup>4,5</sup> it is, of itself, not problematic if the prescribing is rational and the medications are administered carefully.<sup>2</sup> Various factors complicate the use of multiple medications in any patient; in this cohort, risks can be amplified.

1. Both drug-drug interactions and drug-disease interactions<sup>6</sup> may occur when patients use multiple medications. This can result in a poor drug response or increased risk of toxicity, and for either scenario, the worsening of an underlying medical condition.
2. Renal and hepatic functions generally decline with increasing age. This is important

as renal and hepatic clearance can affect the plasma concentration of some drugs or their active metabolites; hence a dose adjustment may be required. Decline in these functions should also be considered when medications known to cause hepatic or renal toxicity are prescribed for this vulnerable group.<sup>6</sup>

3. Dysphagia is more likely to be encountered with increasing age and can also be attributed to disorders, such as post-stroke, or to medications that induce hypo-salivation. Swallowing difficulties are often a prompt for carers to crush oral solid dosage forms for patients and this can be problematic if a modified release such as an enteric-coated tablet is involved.<sup>7</sup>
4. Genetic factors can also influence a patient's response to a medication and there is a growing body of knowledge in this field of pharmacogenomics.<sup>8</sup> Genetic polymorphisms in specific drug receptor targets, metabolic enzymes or transporters may influence the way a patient reacts to certain medications. Patients with known polymorphisms are candidates for individualised dosing regimens to optimise their response to treatment or to avoid toxicity.<sup>9</sup>
5. RACFs are staffed by registered nurses, enrolled nurses, and aged care workers, with medical practitioners visiting both regularly and on an "on call" basis. Prescriptions are written by the medical practitioners and local community pharmacists supply the medications. Medications are administered by registered nurses or enrolled nurses acting under their direction. Some, but not all, RACFs engage pharmacists on a consultancy basis, generally linked to their supply of the medications.

Ethics approval was granted by both the University of South Australia's Human Ethics Committee (approval number 0000031911) and the institutional ethics committee of the aged care organization to conduct a medication audit and two researchers, RAL and ESP, conducted the audit over a period of four weeks in 2015 at three facilities. Such audits are not a regular feature of the operation of RACFs in Australia. All medication records were paper-based and kept within secure areas in the facilities. The researchers were able to access these data with the cooperation of the registered nurses at three sites. All data were entered into Microsoft Excel<sup>®</sup> on a password-protected laptop.

The Anatomical Therapeutic Chemical (ATC) Classification System was used to assist in the analysis and collation of data.<sup>10</sup> The ATC classification system consists of codes outlining the therapeutic properties and chemical constituents, recognised globally through the specific classifications. Codes were assigned to all of the drugs administered to the residents.

## CASE PRESENTATIONS

Polypharmacy,<sup>3</sup> based on a definition of five or more

individual medications daily, was common amongst the 313 residents (282 or 90.1%). The majority of residents were female (73%) with a mean age of 85.8. On average, residents were taking 9.2 regular medications (both prescription and over-the-counter), at varying frequencies. However, one resident had all medication ceased prior to the date of audit. Another was taking no prescription medications and only taking regular herbal and vitamin supplements (included in the data) and a third was only prescribed PRN medications (and hence recorded as zero regular medications). These data are shown in Table 1.

**Table 1.** Patient characteristics and polypharmacy status

No. of female residents (%)	229 (73)
No. of male residents (%)	84 (27)
Total number of residents	313
Mean age of residents (years)	85.8 (66-104)
Mean number of regular medications prescribed per resident	9.2 (0-26)
Total number of regular medications administered daily	2,881
Number of regular medications (defined as those administered daily) with administration issues	4
% regular medications with administration issues out of total number of regular medications	0.14
% of residents affected by a administration issue with a regular (daily) medication	1.3
Absolute count of individual (regular) medications per patient (%)	
0	2 (0.6)
1-4	29 (9.3)
5-9	155 (49.5)
10-14	94 (30.0)
15-19	26 (8.3)
20-24	6 (1.9)
≥25	1 (0.3)

In those taking regular medications, three administration issues were identified as of concern for four residents. These were related to the modification of dosage form (two residents), off-label drug use, and exceeding maximum daily doses by supplementary PRN ("as required") medications. These issues are detailed below.

**Resident 1**, a 67 year old female, and **Resident 2**, a 92 year old male, both had administration notes on their respective medication charts indicating that all of their medications needed to be crushed. Resident 1 was prescribed Efexor XR<sup>®</sup> 75 mg (venlafaxine) daily and Resident 2 was prescribed Palexia SR<sup>®</sup> (tapentadol) 50 mg at night.

**Resident 3**, an 85 year old female, was prescribed Panadol Osteo<sup>®</sup> at full dose (1,330 mg of paracetamol three times a day) as part of her regular medication. At the time of the audit, she was also prescribed 1,000 mg of paracetamol at night "as required" for treatment of pain.

**Resident 4**, an 89 year old female, was prescribed the

regular daily topical administration of a crushed oral sulfamethoxazole (800 mg)/ trimethoprim (160 mg) rubbed into her venous leg ulcer(s).

## DISCUSSION

Given the occurrence of polypharmacy being common in the elderly, it is unsurprising that polypharmacy occurred at the three aged care facilities at which these data were collected. Overall, considering the number of regular medications prescribed and administered at the facilities, the percentage of administration related issues identified was very low (less than 1%). This is to the credit of vigilant staff in an often challenging care environment. Despite this pleasingly low incidence of errors, the value of error detection for the individual clients would be undeniable, although nursing staff did not report to the researchers any adverse effects related to these specific events. These errors were not correlated with specific prescribers. However, this RACF group is serviced by a small number of medical practitioners from the one general practice. Recommendations to address the administration issues identified were discussed with the registered nurses in the relevant facilities and were as follows:

**Residents 1 and 2:** It is well recognized that controlled release medication should not be crushed. Doing so could lead to rapid release of the medication, thereby altering its pharmacokinetics,<sup>10</sup> and potentially leading to toxicity or prolonged periods of sub-therapeutic drug concentrations prior to the next dose.<sup>11</sup>

**Resident 1:** Venlafaxine (Efexor XR<sup>®</sup>) 75 mg capsule may be either opened and the coated pellets sprinkled on pureed food (for example, fruit or yoghurt) or dispersed in a small volume of water for administration.<sup>11</sup> This modification of dosage form would not affect the medication delivery because the pellets are not crushed.<sup>7</sup> Hence, advice was given that a suitable note be added to the resident's medication chart to ensure the medication is consistently administered appropriately.

**Resident 2:** Tapentadol (Palexia SR<sup>®</sup>) 50 mg should not be crushed and the prescriber should be advised on the use of an alternative medication from the same therapeutic drug class as a replacement, to remove the risk of dose "dumping" and sub-therapeutic effects after administration.<sup>12</sup> Tramadol, available in an immediate release formulation, presents itself as a good alternative to the use of sustained release tapentadol for this resident. However, this adds to medication administration time and hence nursing time spent.

**Resident 3:** This combination of two different paracetamol formulations results in 990 mg greater than recommended daily dosing (maximum dose for paracetamol is 4 g every 24 hours). This is of particular concern considering the age of the resident, as hepatic function is usually compromised in the elderly. A greater propensity for acute liver damage leading to liver failure due to paracetamol overdose has been documented within this population.<sup>13</sup>

**Resident 3:** For this patient and many others who take paracetamol regularly, extra care must be taken to avoid inadvertent over-use due to introduction of "as required" paracetamol. If regular paracetamol is indicated, the medical practitioner must be advised of that no "as required" dosing should be ordered.

**Resident 4:** No available data could be located to determine the systemic absorption, toxicity, effect on wound healing and efficacy of oral sulfamethoxazole/ trimethoprim administered topically. Furthermore, a Cochrane review has established that there is insufficient evidence for efficacy of topical antimicrobials for healing chronic venous leg ulcers<sup>14</sup> and reservations had also been expressed earlier.<sup>15</sup> Hence, with no evidence available, the off-label use of this treatment could not be supported.<sup>16,17</sup>

**Resident 4:** Cadexomer iodine could be recommended as a topical preparation for chronic leg ulcer healing.<sup>14,15</sup> However, the healing rates with cadexomer iodine were no different to a paraffin gauze dressing or silver-impregnated dressing. Hence, use of either of these latter options was advised for this resident.

Other medication related issues can potentially occur with such a significant cohort of patients with multimorbidity and polypharmacy. However, it was outside the scope of this study to investigate any of: drug doses, dosing frequency, indication for use, drug interactions or other clinical factors that relate to the appropriateness of the medication/s for any resident. A more comprehensive audit could arguably be incorporated into the accreditation process for RACFs.

As this medication audit data was collected over a four week period, it is possible that other potential medication issues before and after the period of this audit may have been missed and that this finding was not typical of the situation generally. It was also later recognized that it would have been appropriate for the researchers to confirm with the registered nurses that study findings had been conveyed to the relevant prescribers.

In this study, administration issues were determined by pharmacy students working with pharmacy academics and the value of pharmacist oversight of medication use in healthcare was highlighted. In Western countries, patients with multiple morbidities including complex medication regimes are often residents in aged care facilities, indicating that, ideally, pharmacists would be an integral part of the care team in this setting. The extent of polypharmacy amongst aged care residents confirmed in this study serves as a reminder of the valuable role that pharmacists can play when tasked with identifying medications for which the rationality of use could be questioned.<sup>18</sup>

This study highlights however, that education of all health practitioners on crushing medications is important to improve the proportion of medications given safely. The Society of Hospital Pharmacists Australia publication '*Don't rush to crush*' now incorporated into MIMS Online<sup>11</sup>

is freely available and this education should be inculcated in care staff in the aged care setting, given the vulnerability of the patient cohort. Further, general upskilling of health practitioners on evidence-based wound care is urgently needed, not least to protect the value of antibiotics amid fears of a “post-antibiotic era”.<sup>19</sup> Overuse of a medication due to co-administration of two dosage forms has been highlighted here with paracetamol. However, there is a broader societal issue with transition from hospital to home (or aged care facility), augmented by the large number of drug formulations, both generic and branded, on the market.

Throughout the world in more affluent societies, the ageing of the population is well-documented.<sup>20,21</sup> Whether older citizens are cared for by family or in residential aged care as in this study, there is a need for their health professionals to be vigilant with medications for this growing cohort. As in healthcare more generally, prescribing and administration of medications is a highly fraught area of practice.<sup>22</sup>

## CONFLICTS OF INTEREST STATEMENT

All authors declare that they have no conflict of interest.

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## REFERENCES

- Vrdoljak D, Borovac JA. Medication in the elderly - considerations and therapy prescription guidelines. *Acta Med Acad.* 2015;**44**:159-68.
- Wallis KA. Learning from no-fault treatment injury claims to improve the safety of older patients. *Ann Fam Med.* 2015;**13**:472-4.
- Gnjidic D, Hilmer SN, Blyth FM, Naganathan V, Waite L, Seibel MJ, et al. Polypharmacy cutoff and outcomes: five or more medicines were used to identify community-dwelling older men at risk of different adverse outcomes. *J Clin Epidemiol.* 2012;**65**:989-95.
- Ong GJ, Page A, Caughey G, Johns S, Reeve E, Shakib S. Clinician agreement and influence of medication-related characteristics on assessment of polypharmacy. *Pharma Res Per.* 2017;**5**:e00321.
- Price M, Davies I, Rusk R, Lesperance M, Weber J. Applying STOPP guidelines in primary care through electronic medical record decision support: randomized control trial highlighting the importance of data quality. *JMIR Med Inform.* 2017;**5**:e15.
- Preston CL, editor. *Stockley's Drug Interactions.* London: Pharmaceutical Press; 2016, p. 1840.
- Mangoni AA, Jackson SH. Age-related changes in pharmacokinetics and pharmacodynamics: basic principles and practical applications. *Br J Clin Pharmacol.* 2004;**57**:6-14.
- Gowan J, Roller L. Crushing medications: dose delivery challenges for people with impaired swallowing. *Aust J Pharm.* 2010;**91**:50-4.
- Manson LEN, van der Wouden CH, Swen JJ, Guchelaar HJ. The Ubiquitous Pharmacogenomics consortium: making effective treatment optimization accessible to every European citizen. *Pharmacogenomics.* 2017;**18**:1041-5.
- WHO Collaborating Centre for Drug Statistics Methodology. International language for drug utilization research ATC/DDD. *WHO Collaborating Centre for Drug Statistics Methodology* 2018. Accessed on 26<sup>th</sup> April 2018 at: <https://www.whocc.no/>
- Lee JW, Aminkeng F, Bhavsar AP, Shaw K, Carleton BC, Hayden MR, et al. The emerging era of pharmacogenomics: Current successes, future potential, and challenges. *Clin Genet.* 2014;**86**:21-8.
- MIMS. Integration of don't rush to crush content into MIMS Online. *MIMS Online* 2013. Accessed on 26<sup>th</sup> February 2018 at: <http://www.mims.com.au/newsletter/201304/Crush.pdf>
- Downey CE, Thakerar A, Kirsa S. Don't rush to crush: audit of modification to oral medicines for patients with swallowing difficulties. *J Pharm Pract Res.* 2015;**45**:146-51.
- Schmidt LE. Age and paracetamol self-poisoning. *Gut.* 2005;**54**:686-90.
- O'Meara S, Al-Kurdi D, Ologun Y, Ovington LG, Martyn-St James M, Richardson R. Antibiotics and antiseptics for venous leg ulcers. *Cochrane Database Syst Rev.* 2014;(1):CD003557.
- Lipsky BA, Hoey C. Topical antimicrobial therapy for treating chronic wounds. *Clin Infect Dis.* 2009;**49**:1541-9.
- Gazarian M, Kelly M, McPhee JR, Gaudins LV, Ward RI, Campbell TJ. Off-label use of medicines: consensus recommendations for evaluating appropriateness. *Med J Aust.* 2006;**185**:544-8.
- Gheewala PA, Peterson GM, Curtain CM, Nishtala PS, Hannan PJ, Castelino RL. Impact of the pharmacist medication review services on drug-related problems and potentially inappropriate prescribing of renally cleared medications in residents of aged care facilities. *Drugs Aging.* 2014;**31**:825-35.
- World Health Organization. WHO's first global report on antibiotic resistance reveals serious, worldwide threat to public health. *World Health Organization* 2014. Accessed on 7<sup>th</sup> February 2018 at: <https://www.who.int/mediacentre/news/releases/2014/amr-report/en/>
- World Health Organization. Facts about ageing. *World Health Organization* 2014. Accessed on 7<sup>th</sup> February 2018 at: <http://www.who.int/ageing/about/facts/en/>
- Andrews GR. Promoting health and function in an ageing population. *BMJ.* 2001;**322**:728-9.
- Wallis KA, Andrews A, Henderson M. Swimming against the tide: Primary care physicians' views on deprescribing in everyday practice. *Ann Fam Med.* 2017;**15**:341-6.