



Reducing harms from medicines in aged-care: findings from the ReMInDAR trial

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The project team thank the clients in aged care facilities who agreed to participate, the management and care staff and families of our contributing aged care trial sites, and the community pharmacists providing dispensary services to aged care sites. Without their ongoing contributions and assistance over the life of the trial, it would not have been possible.

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Logos of the institutions of the chief investigators are displayed. Thirty nine residential aged-care facilities from eleven organisations participated in the trial.

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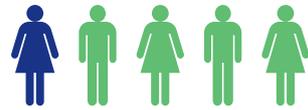
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Executive Summary

The ReMInDAR trial, funded under the Australian Government Department of Health Pharmacy Trial Program, was undertaken to test the effectiveness of a regular pharmacist service to reduce harms from medicines in aged-care.

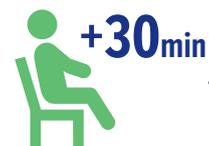
As a result of the trial we found:



Every month, one in five persons living in aged care had an adverse medicine event; of which 83% were preventable. Extrapolated nationally, this equates to 550,000 adverse medicine events annually in aged-care in Australia.



Up to 45% of participants had an emergency department or hospital admission during the year. Among those admitted, they had an average of 2 admissions per year.



Increasing anticholinergic and sedative medicine use was associated with clinically important deterioration for a participant. For every two additional sedative or anticholinergic medicines, there was a 30-minute increase in sedentary behaviour, while sleep worsened and activity levels decreased.

41%



Episodes of acute illness were frequent and pose a high risk situation for medicine-related problems. For example, gastroenteritis, nausea or vomiting affected 41% of participants. A quarter of individuals with this adverse event were also prescribed furosemide. Use of furosemide during episodes of gastroenteritis has the potential to exacerbate dehydration and associated harms including falls, confusion or kidney injury. When other medicines were considered, up to 50% of persons with acute illness were potentially at risk.



The pharmacists frequently identified harm as a problem; 50% of persons who received the pharmacist service had an adverse medicine reaction identified.



The service resulted in pharmacists making more recommendations to cease medicines than start them; 61% of recommendations were to cease or lower the dose compared with 29% to increase the dose or start a medicine. Consistent with the trial aim, sedative or anticholinergic medicines were the medicines most frequently suggested for cessation or reduction.



Use of sedative medicines was found to be a risk factor for future adverse medicine events.



The pharmacist service every two months is necessary, with over 60% of patients reviewed having a medication-related problem at each visit. The time to develop a new medication-related problem was between 8 and 16 weeks.



The service led to improved cognition; for every 8 residents that receive the service, one person would avoid a clinically-relevant cognitive decline over the year.

Introduction

The Reducing Medicine Induced Deterioration and Adverse Reactions (ReMInDAR) trial was funded by the Australian Government Department of Health Pharmacy Trial Program to test the effectiveness of a pharmacist service to reduce harms from medicines.¹ The need for services to improve medicine use in aged-care and reduce harms associated with inappropriate medicine use was highlighted in the Final Report of the Australian Royal Commission into Aged Care Quality and Safety:

“We heard numerous instances of inappropriate management of medication regimens. We heard about aged care staff members failing to administer medicines correctly or administering medicines but failing to ensure residents swallow them. We heard of failures to administer medicines at the correct time or in the correct dose, and of residents being administered incorrect medicines.”²

The ReMInDAR trial identified the extent of harms from medicines in residential aged-care in Australia, and the extent to which this harm is preventable. The trial also demonstrated the potential for benefit of providing a regular pharmacist service in aged-care to prevent harms from medicines.



The extent of harm from medicines in aged-care

Approximately 20% of residents in aged-care experienced a preventable adverse medicine event each month.

The ReMInDAR trial found harms from medicines in aged-care were frequent. As part of the data collection for the ReMInDAR trial, adverse events were retrieved from the residents' care records. Researchers searched for specified key words likely to be indicative of adverse events.

Based on the data collected, we found approximately 20% of residents experienced an adverse medicine event each month, and that over 80% of these events

were probably or definitely preventable. Falls, bleeding, bruising or dizziness accounted for the majority of the adverse medicine events (*Figure 1*). The ReMInDAR results are comparable to international literature which suggests between one in ten and one in five persons in aged-care experience an adverse medicine event serious enough to cause harm each month.³⁻⁵ If we extrapolate these results to the Australian population, this equates to over 500,000 adverse medicine events in aged-care annually.

The high number of adverse medicine events in aged-care and their preventability, as assessed by an independent clinical panel, demonstrates the need for a service to prevent adverse medicine events in aged-care.

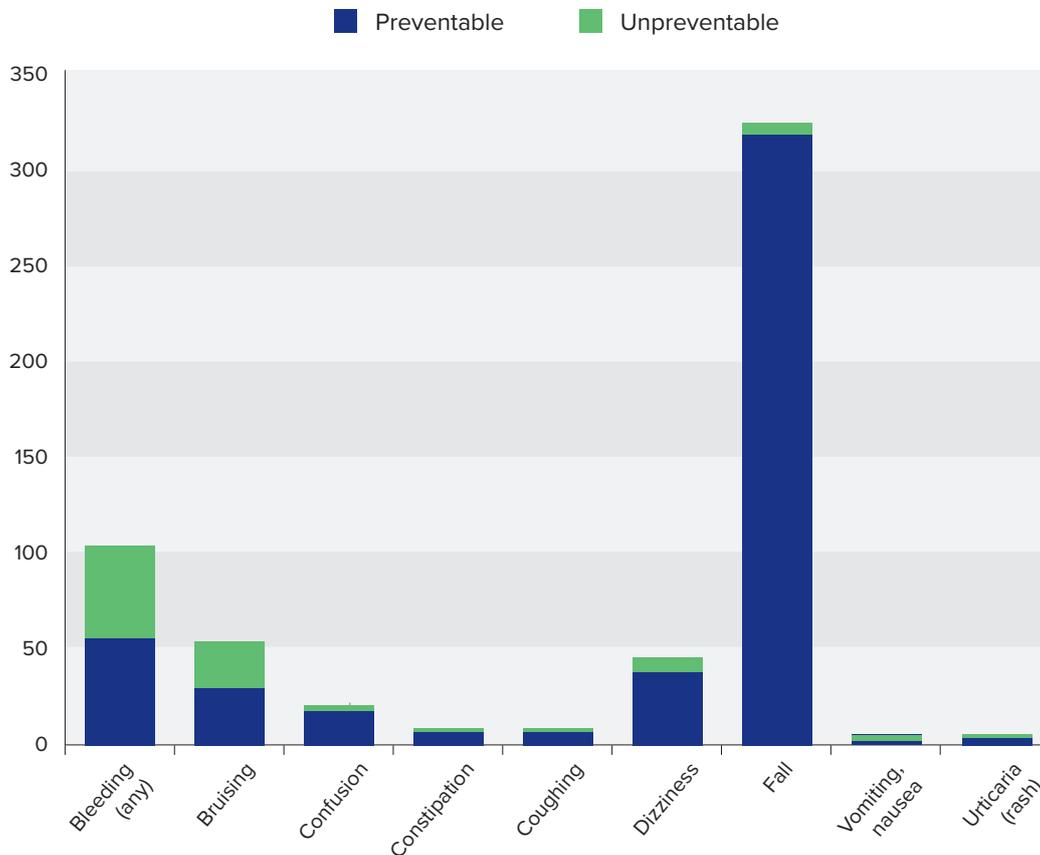


Figure 1. Number and type of adverse medicine events in the ReMInDAR cohort classified by the preventability of the event

High risk situations

Data collected during the ReMInDAR trial also highlighted some high risk situations with medicine use for people living in aged-care. In collecting data on adverse events, we found 41% of participants had an episode of gastroenteritis, nausea or vomiting.

While gastroenteritis is not usually considered a medicine related problem, we found a quarter of people who experienced gastroenteritis, nausea or vomiting were also prescribed furosemide. Furosemide is a diuretic that can increase the risk of dehydration during episodes of gastroenteritis. Dehydration increases the risk of other adverse events, including acute kidney injury, delirium or falls. Ideally, hold orders, i.e. an order not to administer the specified medicine during episodes of specified acute illnesses such as gastroenteritis, should be in place.

Furosemide is not the only medicine that should be considered for temporary cessation during acute illness; when the full list of medicines is considered, up to 50% of people who got gastroenteritis, nausea or vomiting had medicines prescribed that might place them at risk of harms. We are not aware of the extent of use of hold orders in Australian nursing homes. Resources do exist in other countries to support hold orders.^{6,7} Further compounding the challenge for implementing hold orders is the method of medicine administration in aged-care. The majority of medicines are packaged in unit dose containers, which may create challenges for staff to accurately identify and remove medicines that should not be administered during episodes of acute illnesses.

Use of multiple medicines also places persons at risk of increased harm, particularly the use of multiple medicines with sedative or anticholinergic properties. Medicines with sedative or anticholinergic properties can affect mental acuity and cause drowsiness leading to less activity. In the ReMInDAR study, we used wrist worn activity monitors to detect each individual's sleep time and sitting time (or sedentary time), as well as the amount of time they spent undertaking light or moderate physical activity. We examined how an individual's activities were affected by changing medicine use over the course of the 12-month study. We found that the more sedative

Furosemide is a diuretic that can increase the risk of dehydration during episodes of gastroenteritis.

medicines a person took, the less time people engaged in physical activity and the more time they spent being sedentary. In addition, their sleep time decreased.

We were able to quantify the difference and found that when the sedative load is increased by two additional sedative medicines, people spend an extra 26 minutes per day being sedentary. An extra 30 minutes of sedentary time per day is known to be associated with finding it difficult to walk 400 meters in 15 minutes,⁸ and an extra one hour of sedentary time per day is associated with an increased risk of death.⁹ We also found in the ReMInDAR trial that the number of medicines with sedative properties that a person took increased the risk of a subsequent adverse medicine event.

Transitioning between hospital and the aged-care facility is also a vulnerable time for persons resident in aged-care. Over the course of the trial, 46% of participants had a visit to hospital recorded in the aged-care patient record. This frequency was confirmed by comparison of the hospital records data for residents of South Australia, which showed 45% had either a presentation to the emergency department or an admission to hospital over the one year period. On average, where people had a hospital event recorded in the aged-care patient record, there were two hospital events per person. Comparison with the hospital records for South Australia showed an average of two hospital admissions per person for those who were admitted. This increased to a median of three attendances if both admissions and emergency department attendances were considered.

The ReMInDAR service

The ReMInDAR trial aimed to reduce harms from medicines by providing a regular pharmacist service to residents of aged-care.

The ReMInDAR trial tested a pharmacist-led service to prevent medicine-induced deterioration and adverse medicine reactions among residents in aged care facilities. This was the first time internationally that the effect of a regular pharmacist service to prevent medicine harms had been tested. The ReMInDAR trial was undertaken in 39 aged care facilities in South Australia and Tasmania; 248 people living in aged-care participated. The pharmacists visited people living in aged-care every eight weeks for 12 months. The pharmacists were provided with tools and training to assist them to identify people suffering from side effects due to their medicines.

At each visit the pharmacist identified any changes in medicine use and any adverse events or new symptoms that the person was experiencing. The pharmacist measured the person's grip strength to see if there had been changes in the person's strength since the last visit. The pharmacists also used a tool to measure changes in mental acuity if they were concerned that a medicine had made people confused, and for some people the pharmacists assessed changes in their physical activity as measured by a wrist worn activity monitoring device. Based on this information the pharmacists then made an assessment of any problems or side effects the person was experiencing and developed a plan to resolve the problems or side effects that were identified.



What did the pharmacists find?

Over 60% of people visited by the pharmacist had a medicine-related problem identified at each visit.

Over the course of the year that the ReMInDAR trial was running, pharmacists made 575 visits to people living in the aged-care facilities. In total, 97% of the people visited by the pharmacist had at least one medicine related problem or new symptom. The pharmacists identified a total of 673 medicine-related problems or new symptoms. Over 60% of people visited by the pharmacist had a medicine-related problem identified at

each visit (*Figure 2*). Half of the people who received a visit by the pharmacists had developed a new problem by the next session, which was eight weeks later. These findings suggest that a pharmacist visit every two months is necessary to identify and resolve medicine-related problems promptly.

Harm from medicines was frequently identified, with the pharmacists finding that half of the people they visited had an adverse reaction at some time point over the year (*Figure 3*). In addition, half were found to have problems of over-treatment or under-treatment.

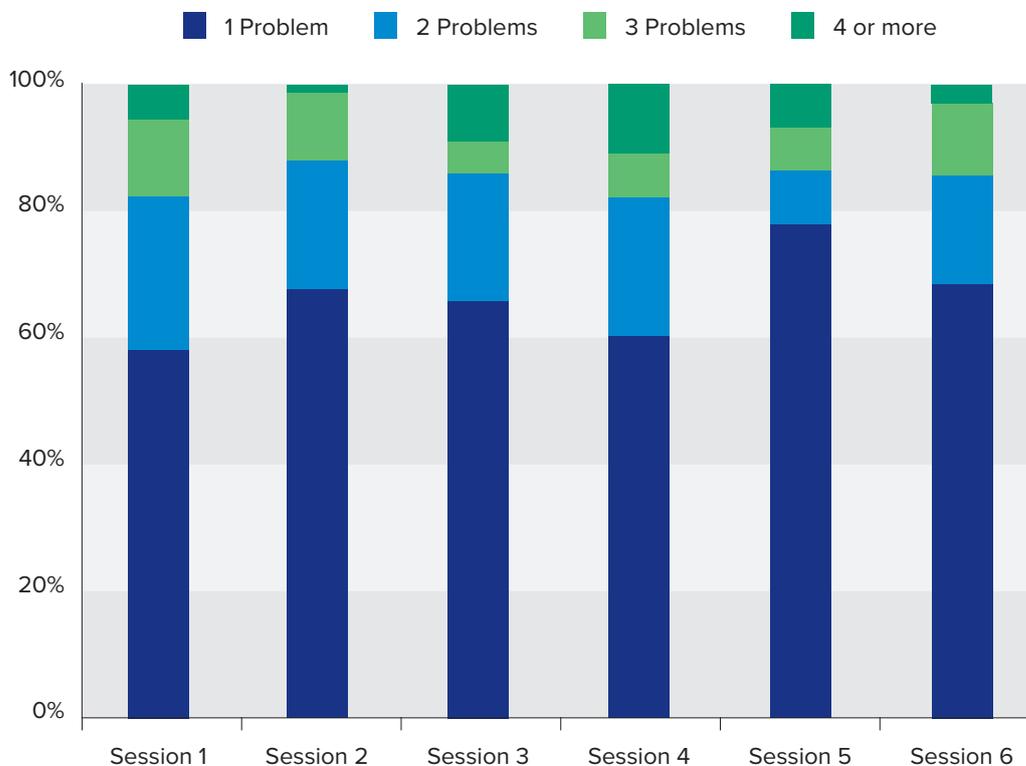


Figure 2. Number of problems or symptom reports per person per session

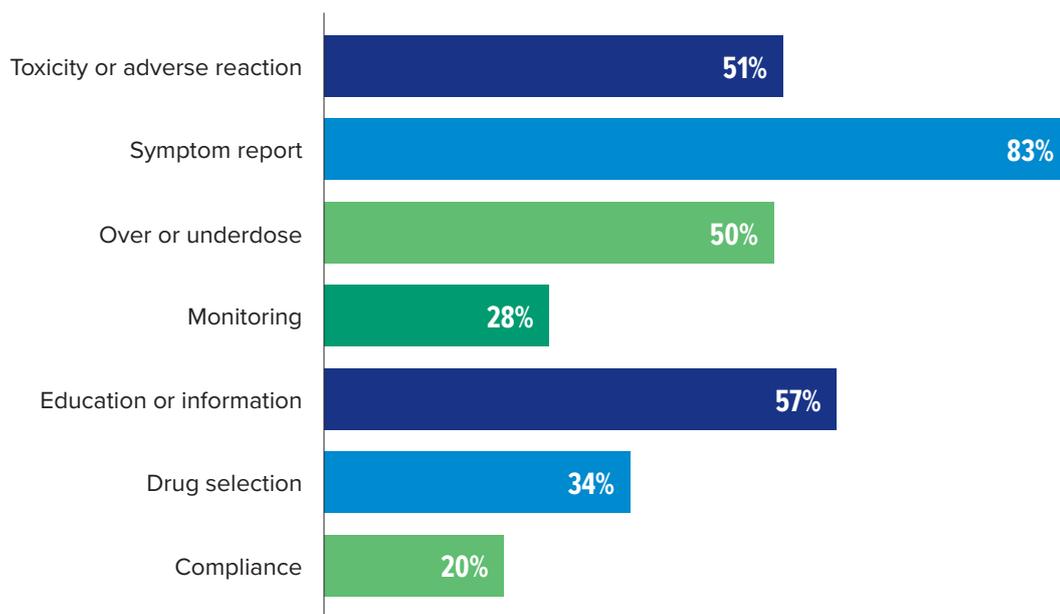


Figure 3. Proportion of the population with medicine-related problems identified

What actions did the pharmacists take?

61% of recommendations made by pharmacists were to cease or lower the dose of a medicine compared with 29% to increase the dose or start a medicine.

Consistent with the aim of the service, the pharmacists made many more recommendations to cease medicines than to start medicines; 61% of recommendations made by pharmacists were to cease or lower the dose of a medicine compared with 29% to increase the dose or start a new medicine. It was very often a sedative or anticholinergic medicine¹ that was suggested for cessation or reduction. The pharmacists also found that for 57% of the residents education and training was required to resolve problems; either education and training for the resident, or for the staff in the facility.

1. The medicines that accounted for over 60% of the recommendations for reduced use in ReMInDAR were opioids, antipsychotics, sedative medicines, antidepressants, anti-Parkinson agents, proton pump inhibitors, diuretics (predominantly furosemide), and statins.

Did the service reduce harms from medicines?

For every 8 people who received the pharmacist service, one person would avoid a clinically-relevant cognitive decline.

Medicines can affect a range of physiological systems including cognition and physical function, both of which are contributors to frailty.¹⁰ Consistent with this, studies have shown that medicines may worsen frailty.¹¹⁻¹³ Frailty is a risk factor for adverse events including falls, delirium and hospitalisation.¹⁴ In addition, frail individuals have worse health outcomes than non-frail individuals.^{2, 15, 16} Once people are frail, they are also more vulnerable to adverse medicine reactions.¹⁷ The risk of developing an adverse medicine reaction in frail persons is double that of a non-frail person.¹⁸ The premise of the ReMInDAR trial was that by reducing medicine-induced deterioration we would reduce the potential for people to become frail and, thus, reduce the potential for adverse medicine events (Figure 4).²⁵

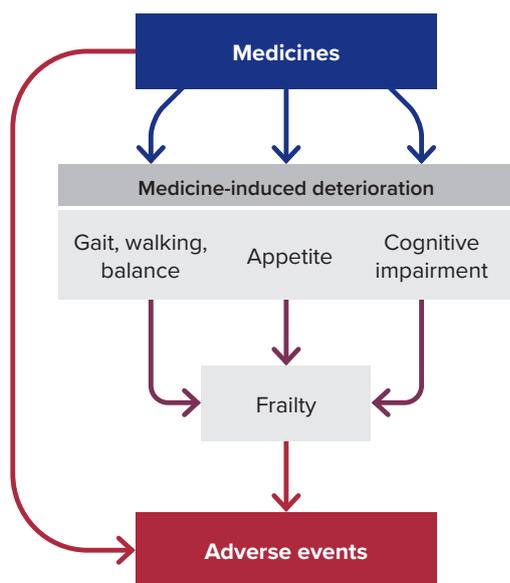


Figure 4. The relationship between medicines, medicine-induced deterioration, frailty and adverse events²⁵

To determine if the ReMInDAR pharmacist service improved participants' health, we measured the health of residents participating at the start of the trial, and again at both 6 and 12 months. We compared the results to a similar group of residents living in the same aged-care facilities who had not received the service. We tested whether the pharmacist service influenced the likelihood that a person became more frail and so we measured how frail each person was using a measure developed for this purpose. We found no difference in this measurement between people who were visited by the pharmacists and people who weren't.

We also measured changes in mental acuity. For this measure, we found there was a difference between groups, with people who received the pharmacist service less likely to have a deterioration in their cognition. We found that for every 8 people who received the pharmacist service, one person would avoid a clinically-relevant cognitive decline.

We also examined other health outcomes for the residents including changes to their strength, weight, quality of life, physical activity and adverse events. We did not find any differences in these outcomes that we could attribute to the service. We found there was a difference over time in the proportion of people who had a fall in the group who had a visit from the pharmacist compared to the group who did not receive a visit, however, this measure was not statistically different, thus we cannot infer an effect. However, consistent with this difference, we also found physical activity levels were slightly better in the group who received visits from the pharmacist, but once again, these were not statistically different so we cannot infer an effect.

Case studies from participants in the trial showed that for some individuals the service was transformative.



Barbara's² spirit improved and she was once again able to complete the cognitive assessments

Barbara had returned from the hospital after recently having a stroke with a large number of new medications. Barbara was still feeling very unwell after her stroke, was having trouble swallowing her medication and could no longer complete the cognitive assessments for the ReMInDAR trial which she had been able to complete prior to her stroke. Her mood was very low.

The ReMInDAR pharmacist reviewed and reconciled Barbara's medicine and identified medicines which had been ceased in the hospital but were still on the medication chart in the facility. The pharmacist discussed Barbara's concerns with her GP and as a result Barbara was taken off many of her tablets, the dose was reduced for some medications and some of her medications were changed to liquid forms. Barbara's spirit improved and she was once again able to complete the cognitive assessments.

Betty² felt dizzy and complained of weight gain

The ReMInDAR pharmacist noted that Betty's dose of pregabalin was increased from 225 mg twice a day to 300 mg twice a day due to pain in her right foot. She had also been given temazepam (10 mg at night) to aid with sleep. Betty felt dizzy and complained of weight gain. Her weight had increased by 5.5 kg within a month. The pharmacist discussed with Betty the potential for pregabalin to cause these side effects and the possibility of reducing the pregabalin dose, however Betty was reluctant to reduce the dose due to her pain.

Four weeks later, Betty had a fall. Within six days, Betty had another fall in the bathroom and was admitted to the hospital. Betty had two further falls and stated she was 'losing strength' in her legs. She was still on the same medicine regimen; in addition, she had started perindopril 40 mg daily. Upon the pharmacist's recommendation, the doctor decreased Betty's pregabalin dose from 300 mg twice a day to 250 mg twice a day. Betty had not had any falls and her pregabalin dose was further reduced to 75 mg twice a day. Betty indicated she would like to further decrease the pregabalin dose if she can, as long as her pain was under control.

² Name changed

Did people living in aged-care like the service?

The people who received the service were overwhelmingly welcoming of having a pharmacist service.

"I have never seen a pharmacist since coming here, and I've been here for 5 years, so thank you for doing this."

"Nobody here can help me with my medicines. Nobody explains to me why I need to pay for these medicines. Can you please help?"

The pharmacists indicated that the residents they reviewed were often very interested in their assessment results and keen to know if there had been any changes to their results since the previous assessment.

"[Resident] was pleased (clearly very delighted) to know that her cognition score was the same as previous, as her family are expressing concerns that she is more 'forgetful' lately."

Did the pharmacist service affect costs within the health system?

We examined how much the service cost to implement and whether there was a difference in overall costs of health services used by people who received the pharmacist service and people who did not. For costs to Medicare, such as doctors' visits and diagnostic tests, we found no difference in health costs between the two groups. Similarly, we did not find a difference in costs for hospital visits. The pharmacist service appeared to result in lower prescription costs for participants resulting in a 23% reduction in annual prescription costs, however, this too was not statistically significant. This finding is consistent with previous studies¹⁹⁻²⁴ and consistent with our findings that the majority of recommendations made by the pharmacist were to cease medicines or to reduce the dose.



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