Medication safety in nursing home patients

David W Bates ,[1] Jonathan Zebrowski[2]

[1]Brigham and Women's Hospital, Boston, Massachusetts, USA
[2]Department of Psychiatry, Massachusetts General Hospital, Boston, Massachusetts, USA

Correspondence to
Dr David W Bates, Brigham and Women's Hospital, Boston, MA, 02120, USA; dbates@bwh.harvard.edu

Accepted 20 June 2022

Linked

► http://dx.doi.org/10.1136/bmjqs-2021-014280

Check for updates

© Author(s) (or their employer(s)) 2022. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Bates DW, Zebrowski J. *BMJ Qual Saf* Epub ahead of print: [please include Day Month Year]. doi:10.1136/bmjqs-2022-014791

Globally, societies are ageing, and elderly patients take many drugs. As such, medication safety has long been a major issue in long-term care. This group of patients has substantial comorbidity and typically takes many medications, some of which are poorly tolerated in the elderly.[1] This population also frequently suffers from memory impairment, and often cannot advocate for themselves effectively. Behavioural issues are frequent, and overuse of psychoactive drugs is common. In addition, electronic health record use is not as widespread as in acute care or ambulatory settings. The net impact is that many patients suffer adverse drug events (ADEs) in long-term care, and these events can cause major morbidity lasting weeks or months, yet at the same time be harder to detect than in other populations.[2] Most of the published studies in this area have come from Western countries such as the USA and UK, yet especially because care delivery systems and standards of practice vary dramatically by country, more evaluations are needed in other regions of the world.

The study by Ayani and colleagues[3] in this issue of *BMJ Quality and Safety* examining the incidence and nature of ADEs and medication errors in nursing homes in Japan is therefore a welcome and relevant addition to previous studies in long-term care. Somewhat surprisingly, falls were the most frequent symptom of ADEs, representing 40% of identified events in this study. This may be related to detection bias—all falls in nursing homes are tracked, while more subtle ADEs may be missed. However, the overall incidence of ADEs was much higher in this study at 36.4 ADEs per 100 resident-months than in two prior studies in the USA, which found rates of 1.9 and 9.8 ADEs per 100 resident-months.[4 5] These results have important implications for future research in this area, which should address what interventions including structural changes may be most effective for improving safety in this important healthcare sector.

To contextualise these findings, it is important to note that there are major differences between countries in terms of how older adults with daily care needs are managed, including what proportion of these patients are institutionalised. In the Netherlands, for example, the social systems are so strong that a very high proportion are cared for at home, though this has shifted toward more nursing facility care in recent years.[6] In China, there is a culture of caring for elders at home.[7] Almost 6% of Japan's elderly people are institutionalised: two-thirds in hospitals and a quarter in special homes for the aged.[8] Notably, a cross-national study found no relationship between the ageing status of a country and the number of nursing home beds.[9] Thus, work is needed to identify the best approaches for managing this group—it may be expected that more patients over time may be able to stay at home longer, given the development and availability of new technologies, though this remains to be demonstrated.

COMPLEXITIES OF MANAGING MEDICATION IN NURSING HOMES

Managing medications in the elderly and particularly in nursing homes has long been complex. Part of the issue is that about half[10] of nursing home residents suffer from Alzheimer's or other dementias; as a result, they may have challenging behavioural issues and are often not capable of managing their medications themselves.[3] Residents may also have difficulty advocating for themselves whether or not they suffer from cognitive impairment. At the same time though, nursing home patients often have multiple comorbidities and have elevated risk of medication adverse effects, and

BMJ Qual Saf: first published as 10.1136/bmjqs-2022-014791 on 5 July 2022. Downloaded from http://qualitysafety.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

they may see physicians relatively infrequently, as clinical staffing models vary widely between facilities.[11 12]

One of us (DWB) was involved in a large study of ADEs in this population in the USA early in his career.[5] That study was striking for two reasons: one was that patients had experienced adverse effects for remarkably long times before they were detected, often for several months. The presentation was frequently one of a non-specific decline in physical or mental functioning that was not recognised for a prolonged period of time, followed by rapid recovery after a specific drug was discontinued. This length of related disability represents a major opportunity for improvement. The second reason was simply getting permission to do the studies. Many nursing homes are for-profit in the USA, and the chains of homes were reluctant to allow researchers to identify problems—though the ones we worked with did so, to their credit.

Another issue is that choosing and managing medications in nursing home patients involve many tradeoffs. Increasing age is associated with decreased physiological reserve in general and increased susceptibility to cognitive side-effects of medications in particular.[13] In addition, emergence of a major medication side-effect could represent a direct adverse event or contribute to a subsequent adverse event such as a fall. One of the most widely cited references for this population, the American Geriatrics Society Beers Criteria, lists over 100 medications that may be contraindicated or used with caution in older adults.[14] The study by Ayani and colleagues[3] shows that many of the medications on this list were linked to adverse events in Japanese nursing facilities, further emphasising the challenges of pharmacology in this care setting. Some of these drugs should nearly always be avoided in this group, but many are—in the right circumstances—a reasonable option. For instance, both sedatives and atypical antipsychotics resulted in significant proportions of ADEs in Japanese nursing facilities; however, the indications for the original prescriptions were not described. For some patients with significant agitation that cannot be managed via other means, there may still be a risk–benefit tradeoff that warrants prescription of these medications in elderly populations; at the same time, it is likely that overall decreased exposure to these medications will result in fewer ADEs. The challenge, then, lies in supporting clinicians in making decisions about individual patients, and greater awareness of the prevalence of sedatives and antipsychotic-related ADEs may help inform the risk–benefit assessment at the bedside.

Not surprisingly, given the highest proportion of elderly worldwide, ADEs are a major problem in Japan in particular. The JADE group, which performed this study, has done a series of important studies evaluating the frequency and consequences of ADEs in Japan. They have demonstrated that ADEs are frequent and cause considerable harm in hospitalised patients, and outside the hospital as well.[15–17] The publication of the first JADE study on ADEs[15] was met with considerable fanfare in Japan and was front-page news in many parts of the country and the frequency of these problems surprised many in Japan. The current study represents another important contribution from this group, addressing an important and understudied sector, and providing more specific detail around the relatively high rates of medication-related harm in Japan that may stem from the degree of ageing in the population.

Figure 1 Ways medication safety may be improved in long-term care.

POSSIBLE AVENUES TO IMPROVE MEDICATION SAFETY IN LONG-TERM CARE

Looking forward, we believe several specific steps to improve medication safety could make care safer in older populations (figure 1). The first is adoption in long-term care of smart electronic health records which make it easy to track what medications people are taking, and which include more robust decision support to check for potential problems. In the USA, long-term care was not included as part of meaningful use, and adoption of electronic health records in this sector has lagged; this is an issue in most countries, even though this patient group in long-term care may stand to get particular benefit because of their complexity and comorbidities. A second step is broader adoption of tools like telemedicine which can make it easier to evaluate patients who are having either specific issues, or more general ones such as functional decline. Third, keeping patients at home if possible may not only improve quality of life but also lead to lower potential for ADEs via lower incidence of delirium, which is often precipitated or exacerbated by a move to an unfamiliar environment. Admittedly, this should be counterbalanced by some evidence that medication discrepancies increase for elderly patients cared for at home.[18 19] Lastly, broader adoption of non-pharmacological interventions to manage delirium and agitation in nursing facilities will also play a key role.[20]

Regarding the first step, electronic health records should be used routinely in nursing homes and for the elderly more broadly. These make it easy to track what medications a patient is taking and what medications have previously caused problems. In the not-too-distant future, it is likely that tools like artificial intelligence will be used to help clinicians pick the best option for an individual to manage a condition like

BMJ Qual Saf: first published as 10.1136/bmjqs-2022-014791 on 5 July 2022. Downloaded from http://qualitysafety.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

agitation.[21] The clinician would still make the choice, but such assistance would help in personalising recommendations for an individual, and perhaps even help in recommending monitoring and associated interventions such as fall prevention measures.

Another problem has been getting individuals with a possible adverse effect evaluated in a timely way. Telemedicine could help greatly with this; if it appears that a patient is having a problem, the facility staff could alert a clinician who could then evaluate the situation and make appropriate corrections. This could short-cut some of the months-long delays in discontinuation of offending agents which have been observed in the past.[22]

One major improvement is likely to keep patients at home for longer than has been possible previously, by leveraging technology. Patients with cognitive impairment tend to do best in familiar environments. Technology could help in a variety of ways, ranging from medication dispensing to fall detection, to assessing how much food is in the refrigerator and whether it is being consumed.[23 24] Some patients who can no longer care for themselves will likely still need to be in institutions, but this number should be minimised.

Non-pharmacological interventions for delirium and agitation will also likely play a key role. It is possible that patients presenting with behavioural dysregulation in nursing facilities are managed primarily symptomatically by prescribing medications aimed at achieving decreased lability or even achieving a significant degree of sedation. Overuse of antipsychotic medications in particular has been rampant in the USA.[25] Studies demonstrate that use of these drugs is widespread.[26] This is a highly complex issue; difficult behaviours can be disruptive for other residents and are hard to control. However, the more robust approach to behavioural dysregulation, whether caused by delirium or other factors, should involve investigation of and mitigation of precipitating causes. Indeed, ongoing research into the management of delirium recognises the key role of diagnosing the underlying cause of the patient's acute confusional state and treating the underlying cause, with support of other non-pharmacological interventions before new medications are initiated.[27 28]

We conclude that problems with medications in the elderly will continue to be important and represent a major safety issue, especially in countries such as Japan, South Korea, the UK and the USA, which have increasingly ageing populations. Nonetheless, there are multiple strategies as we have outlined, which we believe are likely to be helpful in improving care for this group. Ongoing evaluation of which of these strategies are most impactful and how they can most effectively be implemented is essential.

Twitter David W Bates @dbatessafety

Contributors DWB drafted the article. Both authors edited it and are responsible for the contents.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests DWB reports grants and personal fees from EarlySense, personal fees from CDI Negev, equity from ValeraHealth, equity from Clew, equity from MDClone, personal fees and equity from AESOP, personal fees and equity from Feelbetter, equity from Guided Clinical Solutions and grants from IBM Watson Health, outside the submitted work. DWB has a patent pending (PHC-028564 US PCT) on intraoperative clinical decision support. JZ reports no disclosures.

Patient consent for publication Not required.

Ethics approval Not applicable.

Provenance and peer review Commissioned; internally peer reviewed.

ORCID iD
David W Bates http://orcid.org/0000-0001-6268-1540

REFERENCES

1 Dwyer LL, Han B, Woodwell DA, *et al*. Polypharmacy in nursing home residents in the United States: results of the 2004 national nursing home survey. *Am J Geriatr Pharmacother* 2010;8:63–72.
2 Handler SM, Wright RM, Ruby CM, *et al*. Epidemiology of medication-related adverse events in nursing homes. *Am J Geriatr Pharmacother* 2006;4:264–72.
3 Ayani N, Oya N, Kitaoka R, *et al*. Epidemiology of adverse drug events and medication errors in four nursing homes in Japan: the Japan adverse drug events (JADE) study. *BMJ Qual Saf* 2022;15. doi:10.1136/bmjqs-2021-014280. [Epub ahead of print: 21 Apr 2022].
4 Gurwitz JH, Field TS, Judge J, *et al*. The incidence of adverse drug events in two large academic long-term care facilities. *Am J Med* 2005;118:251–8.
5 Gurwitz JH, Field TS, Avorn J, *et al*. Incidence and preventability of adverse drug events in nursing homes. *Am J Med* 2000;109:87–94.
6 Alders P, Costa-Font J, de Klerk M, *et al*. What is the impact of policy differences on nursing home utilization? The cases of Germany and the Netherlands. *Health Policy* 2015;119:814–20.
7 Feng Z, Falkingham J, Liu X, *et al*. Changes in living arrangements and mortality among older people in China. *SSM Popul Health* 2017;3:9–19.
8 Yamada M, Arai H. Long-Term care system in Japan. *Ann Geriatr Med Res* 2020;24:3:174–80.
9 Ribbe MW, Ljunggren G, Steel K, *et al*. Nursing homes in 10 nations: a comparison between countries and settings. *Age Ageing* 1997;26:3–12.
10 FastStats - Alzheimers Disease. Available: https://www.cdc.gov/nchs/fastats/alzheimers.htm [Accessed 24 Apr 2022].
11 Ryskina KL, Song W, Sharma V, *et al*. Characterizing Physician Practice in Nursing Homes Using Claims-Based Measures: Correlation with Nursing Home Administrators' Perceptions. *Med Care Res Rev* 2021;78:806–15.
12 Kuo Y-F, Raji MA, Goodwin JS. Association between proportion of provider clinical effort in nursing homes and potentially avoidable hospitalizations and medical costs of nursing home residents. *J Am Geriatr Soc* 2013;61:1750–7.
13 Hailu BY, Berhe DF, Gudina EK, *et al*. Drug related problems in admitted geriatric patients: the impact of clinical pharmacist interventions. *BMC Geriatr* 2020;20.

BMJ Qual Saf: first published as 10.1136/bmjqs-2022-014791 on 5 July 2022. Downloaded from http://qualitysafety.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

14 By the 2019 American Geriatrics Society Beers Criteria® Update Expert Panel. American geriatrics Society 2019 updated AGS beers Criteria® for potentially inappropriate medication use in older adults. *J Am Geriatr Soc* 2019;67:674–94.
15 Morimoto T, Sakuma M, Matsui K, *et al*. Incidence of adverse drug events and medication errors in Japan: the JADE study. *J Gen Intern Med* 2011;26:148–53.
16 Noguchi C, Sakuma M, Ohta Y, *et al*. Prevention of medication errors in hospitalized patients: the Japan adverse drug events study. *Drug Saf* 2016;39:1129–37.
17 Sakuma M, Kanemoto Y, Furuse A, *et al*. Frequency and severity of adverse drug events by medication classes: the JADE study. *J Patient Saf* 2020;16:30–5.
18 Devik SA, Olsen RM, Fiskvik IL, *et al*. Variations in drug-related problems detected by multidisciplinary teams in Norwegian nursing homes and home nursing care. *Scand J Prim Health Care* 2018;36:291–9.
19 Molist-Brunet N, Sevilla-Sánchez D, Puigoriol-Juvanteny E, *et al*. Individualized medication review in older people with multimorbidity: a comparative analysis between patients living at home and in a nursing home. *Int J Environ Res Public Health* 2022;19:3423.
20 Woodhouse R, Burton JK, Rana N, *et al*. Interventions for preventing delirium in older people in institutional long-term care. *Cochrane Database Syst Rev* 2019;4:CD009537.
21 Syrowatka A, Song W, Amato MG, *et al*. Key use cases for artificial intelligence to reduce the frequency of adverse drug events: a scoping review. *Lancet Digit Health* 2022;4:e137–48.
22 Berard C, Di Mascio T, Montaleytang M, *et al*. Telemedication reviews to optimize medication prescription for older people in nursing homes. *Telemed J E Health* 2021;2. doi:10.1089/tmj.2021.0288. [Epub ahead of print: 24 Dec 2021].
23 Hein A, Winkelbach S, Martens B, *et al*. Monitoring systems for the support of home care. *Inform Health Soc Care* 2010;35:157–76.
24 Majumder S, Aghayi E, Noferesti M, *et al*. Smart homes for elderly Healthcare—Recent advances and research challenges. *Sensors* 2017;17:2496.
25 Introcaso D. The never-ending misuse of antipsychotics in nursing homes. *Health Affairs* 2018 https://www.healthaffairs.org/do/
26 Moyo P, Corneau E, Cornell PY, *et al*. Antipsychotic initiation and new diagnoses excluded from quality-measure reporting among veterans in community nursing homes contracted by the Veterans health administration in the United States. *Int J Methods Psychiatr Res* 2022;31.
27 Ryan SL, Kimchi EY. Evaluation and management of delirium. *Semin Neurol* 2021;41:572–87.
28 Roden M, Brent Simmons B. Delirium superimposed on dementia and mild cognitive impairment 2015;126:129–37.

BMJ Qual Saf: first published as 10.1136/bmjqs-2022-014791 on 5 July 2022. Downloaded from http://qualitysafety.bmj.com/ on April 20, 2024 by guest. Protected by copyright.