Prescribing and deprescribing in chronic kidney disease

CPD

Jo-Anne Manski-Nankervis,
Rita McMorrow, Craig Nelson, Shilpanjali Jesudason, Janet K Sluggett

Background
Chronic kidney disease (CKD) rarely occurs in isolation; multimorbidity is the norm. As a result, polypharmacy is common in people with CKD. Some medications are indicated to reduce the risk of cardiovascular disease and progression of CKD. In contrast, some medications may require dose reduction or cessation as a result of advancing stages of CKD.

Objective
The aim of this article is to describe broad principles of managing the challenges and necessities of polypharmacy in patients with CKD.

Discussion
Medications such as angiotensin converting enzyme inhibitors, angiotensin receptor blockers, statins and sodium–glucose co-transporter-2 inhibitors may reduce cardiovascular disease risk and/or reduce CKD progression, and their use should be balanced by likelihood of benefit. Medication cessation or dose reduction may be required to prevent medication accumulation, adverse medication events and kidney injury. Polypharmacy can be addressed with a collaborative Home Medicines Review and use of deprescribing tools, using a shared decision-making approach.

CHRONIC KIDNEY DISEASE (CKD) affects up to two million Australians, with 2500 commencing kidney replacement therapy each year and 14 diagnosed with kidney failure each day.[1,2] CKD is associated with increased cardiovascular disease (CVD) risk, and declining kidney function is associated with reduced health-related quality of life independent of other comorbidities.[3,4] However, CKD rarely occurs on its own. This means that multimorbidity and polypharmacy are the norm. While some medications are likely to optimise health outcomes, others may cause harm in isolation or in combination in people with CKD. In this article, the authors describe multimorbidity and polypharmacy in people with CKD, factors to consider when making prescribing decisions and tools to optimise prescribing. This discussion does not extend to people receiving renal replacement therapy.

Multimorbidity in people with CKD

Multimorbidity is typically defined as the co-occurrence of two or more chronic conditions,[5] and is the norm in people with CKD. A study of 1741 people with CKD stage 3 attending English general practices found that only 4% had no comorbidities, with the most common comorbidities being hypertension, painful conditions, anaemia, ischaemic heart disease, diabetes and thyroid disorders.[6] Multimorbidity in people with CKD is associated with higher rates of mortality, with risk increasing with the number of long-term conditions.[7] Multimorbidity is usually associated with polypharmacy.

Polypharmacy and CKD

Polypharmacy, defined in the community setting as taking five or more medications regularly,[8] is very common among older Australians. People with CKD may also receive care from multiple healthcare professionals, further compounding the risk of polypharmacy. Polypharmacy can increase the risk of drug–drug interactions, high medication doses, complex medication regimens, medication costs, medication non-adherence and lower quality of life. In a recent 24-month prospective study in relatively healthy older adults, a greater cumulative medication exposure was associated with a decrease in estimated glomerular filtration rate (eGFR) at follow-up.[9] Polypharmacy may be appropriate for some older people with CKD, but is linked with an increased risk of adverse outcomes such as hospitalisation, reduced cognition, falls and mortality.[10,11] While associations with harm are well-documented, models of care and interventions to reduce polypharmacy have limited evidence on patient outcomes,[12] although adverse medication withdrawal events appear to be rare.[10]

The prevalence of polypharmacy increases with progression of CKD, ranging from 62% in people with stage 1 CKD to 86% in those with stage 3b CKD.[13] A German study of people with moderate CKD found that antihypertensives and lipid-lowering medications were the most frequently used medication classes, consistent with Australian guideline recommendations for this cohort,[1] followed by diuretics, platelet aggregation inhibitors and urate-lowering therapy. Eight in 10 people with CKD were taking five or more medications, with two in 10 individuals prescribed more than 10 medications per day.[13] Factors associated with higher odds of polypharmacy were older age, higher body mass index, higher CKD stage, CVD, diabetes, hypertension and dyslipidaemia. A study using electronic medical record data from 392 Australian general practices found that the mean number of medications prescribed to people with CKD was 8.2, with 35% of patients prescribed at least one potentially inappropriate medication.[14]

Monitoring of CKD is important to guide prescribing decisions

Kidney Health Australia's *Chronic kidney disease (CKD) management in primary care* handbook provides recommendations for screening, monitoring and managing CKD on the basis of a 'traffic light' system that reflects the stage of CKD.[1]

CKD can lead to changes in medication pharmacokinetics by affecting absorption, distribution, metabolism and excretion as a result of reduced eGFR, proteinuria and subsequent hypoalbuminaemia, or fluid accumulation.[15] These factors should be considered when making prescribing and deprescribing decisions.

While manufacturers' dosing recommendations for medications are often based on Cockcroft-Gault estimates, eGFR based on the Chronic Kidney Disease Epidemiology Collaboration equation is also a valid estimate and can be used to inform dosage decisions or whether medications are contraindicated.[16] For adults at each end of the spectrum in terms of size and height, it may be appropriate to use an uncorrected eGFR that is not normalised to a body surface area of 1.73 m^2.[17] Table 1 lists commonly prescribed medications that may require dose reduction or cessation. Additional information is available in resources such as the *Australian Medicines Handbook*, Therapeutic Guidelines and the approved product information.

Medications that may be of benefit in reducing progression of CKD or development of associated cardiovascular complications include angiotensin converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARB), statins and sodium–glucose co-transporter-2 (SGLT2) inhibitors in people with CKD both with and without diabetes.[1,18] Commonly prescribed medications that can adversely affect kidney function include nonsteroidal anti-inflammatory drugs (NSAIDs), cyclooxygenase-2 (COX-2) inhibitors, lithium, gentamicin, proton pump inhibitors, and the combination of an ACE inhibitor/ARB, diuretic and NSAID/COX-2 inhibitor.[1,19] Appropriately identifying and recording a diagnosis of CKD in the medical record can facilitate detection of potentially inappropriate prescribing by clinical decision support tools. Some electronic medical record systems will provide medication alerts when a medication that may be contraindicated or require dose adjustment is prescribed for a person with a coded diagnosis of CKD. It should be noted that these warnings often reflect the product information and may not reflect current guideline recommendations. For example, some electronic medical record alerts state that metformin is contraindicated in renal impairment, while resources such as the *Australian Medicines Handbook* advise this medication can be used with appropriate dose reduction in patients with creatinine clearance >15 mL/min.[20] Third-party tools that integrate with the electronic medical record to optimise safe prescribing are being developed.

Determining which medications are likely to be of benefit

Medication count (polypharmacy), and screening tools such as the American Geriatrics Society 2019 Updated Beers

Table 1. Commonly prescribed medications that may require dose reduction or cessation in people with chronic kidney disease*

Diabetes medications	Antimicrobial medications	Cardiovascular medications	Pain medications	Other
• Acarbose	• Famciclovir	• Apixaban	• Gabapentin	• Allopurinol
• Exenatide	• Trimethoprim	• Dabigatran	• Opioid analgesics	• Benzodiazepines
• Glibenclamide	• Valaciclovir	• Digoxin	• Nonsteroidal anti-inflammatory drugs	• Colchicine
• Gliclazide		• Fenofibrate	• Pregabalin	• Denosumab
• Glimepiride		• Rivaroxaban		• Lithium
• Glipizide		• Sotalol		
• Insulin		• Spironolactone		
• Metformin				
• Saxagliptin				
• Sitagliptin				
• Vildagliptin				

** Note that this is not an exhaustive list.*

Criteria and the Screening Tool of Older Persons' Prescriptions (STOPP) and Screening Tool to Alert doctors to the Right Treatment (START) can be used as a starting point to identify people with CKD who may benefit from a medication review (Table 2).[21,22]

Deprescribing involves 'discontinuing drugs that are either potentially harmful or no longer required'.[23] Prescribing and deprescribing decision making is not black and white and requires individual patient assessment, including consideration of multimorbidity, likely risks and benefits, and patient preferences. Medication review is ideally carried out by a general practitioner (GP) given their generalist expertise and role as coordinator of care, in collaboration with a pharmacist, and can be incorporated in annual health checks or as part of a GP Management Plan or Health Assessment. Medicare Benefits Schedule (MBS) items are available for Home Medicines Review (Item 900) and Residential Medication Management Reviews (Item 903) and recent program changes in April 2020 allow for up to two additional pharmacist follow-up services where clinically appropriate.

Medication review includes considering whether a medication is potentially inappropriate (or no longer required) or if it is a consequence of a prescribing cascade (ie prescribed to address adverse effects associated with an another medication), and assessing its short and potential long-term impacts on health outcomes. Consideration of possible withdrawal effects or recurrence of the underlying

Table 2. Resources to facilitate deprescribing and communication with patients

Tool	URL	Organisation	Description
Chronic kidney disease (CKD) management in primary care	https://kidney.org.au/health-professionals/ckd-management-handbook	Kidney Health Australia	A list of medications that may need to be reduced in dose or ceased in people with CKD, as well as commonly prescribed medications that can adversely affect kidney function
Medications and kidney disease	https://kidney.org.au/your-kidneys/treatment/medications-kidney-disease	Kidney Health Australia	Consumer resources for medication management and sick-day management for people with CKD
The kidney failure risk equation	https://kidneyfailurerisk.com	Seven Oaks Chronic Disease Innovation Centre	Includes four- and eight-factor risk equations for progression to kidney failure and shared decision-making resources
RACGP aged care clinical guide (Silver Book): Polypharmacy	www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/silver-book/part-a/polypharmacy	The Royal Australian College of General Practitioners	A summary of polypharmacy, medications to use with caution in older people and links to tools including: • Beers Criteria • McLeod Criteria • START, STOPP • Medication Appropriateness Tool
Deprescribing resources	www.primaryhealthtas.com.au/resources/deprescribing-resources	Primary Health Network Tasmania	Consumer resources, deprescribing videos and deprescribing guides for mediations including opioids, nonsteroidal anti-inflammatory drugs, antihypertensives and antihyperglycaemics, including a summary of factors favouring continuation and deprescribing
Deprescribing resources	https://deprescribing.org/resources	Bruyère Research Institute	Deprescribing guidelines, infographics and videos to inform deprescribing of proton pump inhibitors, antihyperglycaemics, antipsychotics, benzodiazepines and cholinesterase inhibitors
Resources for safer medication use	www.pimsplus.org	• Department of Family Medicine at McMaster University • American Society of Consultant Pharmacists • TaperMD	Consumer information, product information, notes about risk and tapering guides
Patient decision aids	https://decisionaid.ohri.ca/AZlist.html	Ottawa Hospital Research Institute	A list of decision aids for medication and other management decisions
Shared decision making	www.safetyandquality.gov.au/our-work/partnering-consumers/shared-decision-making	Australian Commission on Safety and Quality in Health Care	Resources and training on shared decision making

health condition is also important when deciding whether to cease or taper the dose of the medication.[24] The Tangri risk equation can be used to calculate a two-year and five-year risk of progression to kidney failure. Shared decision-making resources that demonstrate the potential impact of blood pressure lowering, ACE inhibitor and SGLT2 inhibitor use may assist in guiding decision making.[25,26]

This may also be used to guide decision making where the risks may outweigh the long-term benefits of some medications. Shared decision making also plays a part in deprescribing, with most older adults and caregivers of older adults willing to have a medication deprescribed if recommended by their doctor, with qualitative work finding that a patient's regular GP was a strong influence in decisions to either continue or cease a medication.[27] Ongoing monitoring for possible withdrawal symptoms and re-emergence of symptoms of the original health condition are also suggested.

Tools that can aid deprescribing and optimising patient choice

Reducing exposure to potentially inappropriate polypharmacy has been identified as a national priority.[28] A number of tools can be used to guide deprescribing assessment and support shared decision making (Table 1). Most tools have been developed for use in older adults, although have broader application.

A word of caution

The International Group for Reducing Inappropriate Medication Use & Polypharmacy has published recommendations at both the individual patient and policy level to optimise prescribing decisions.[29] They caution about the use of guidelines and tools to inform decision making. These include:

- Older people are underrepresented in clinical trials. Older adults and those with later stages of CKD (eGFR <30 mL/min/1.73 m^2) are often excluded from trials.
- Single-disease models and incentivisation can result in potentially inappropriate treatment. A single-disease approach will result in polypharmacy; combinations of medications may negate the benefits of individual medication. Pay for performance for individual conditions and rigid guideline compliance may drive potentially inappropriate prescribing and polypharmacy.
- Decisions in older patients with complex health needs should routinely consider expected survival and quality of life, giving the highest priority to patient/family preferences. GPs, working in collaboration with pharmacists, are ideally placed to provide a holistic review of medications tailored to the individual, the likelihood of benefit from medication and patient preferences (Box 1).
- Employ mixed implicit and explicit approaches to identify potentially inappropriate polypharmacy. Tools can help to identify patients with CKD who could benefit from a closer examination of medication appropriateness and safety through a comprehensive medication review, but should not be used in isolation.[30]

Medication management strategies that accompany prescribing and deprescribing

The starting point for deprescribing involves ensuring an accurate and complete medication list is available, including non-prescription medicines.[28] Resources on medication reconciliation and taking a best possible medication history are available from the NPS MedicineWise website.

After medication reconciliation and deprescribing, people with CKD may benefit from medication simplification strategies to reduce the complexity of the medication regimen.[21] The Medication Regimen Simplification Guide for Residential Aged CarE (MRS GRACE) tool has been applied in community and residential aged care settings to reduce tablet burden and number of medication dosing times.[31] For individuals who receive medications administered from a dose administration aid, communication with the community pharmacy and carers involved in medication administration may be required.

Follow-up education and provision of an updated medication list that describes the indication and anticipated duration of use or next review date for each medication can assist people who self-manage medications. Pharmacists can assist with providing these activities during a Home Medicines Review.

Conclusion

Multimorbidity and polypharmacy are the norm for people with CKD. Incorporation of regular, proactive medication review

Box 1. Case study

Max, aged 62 years, was recalled to his general practice for a review of his CKD, which is related to type 2 diabetes. Max's most recent eGFR was 44 mL/min/1.73 m^2 and his albumin:creatinine ratio was 4.2 mg/mmol, consistent with stage 3b CKD. His general practitioner is managing his CKD consistent with Kidney Health Australia's orange clinical action plan.[1] Max's blood pressure is 142/92 mmHg (consistently elevated) and HbA1c is 7.4%. On review of his medication list, Max reports regular use of ibuprofen for pain related to knee osteoarthritis. He purchases ibuprofen over the counter and rarely takes his blood pressure tablets because he does not remember to use them. He is not keen on taking medication.

Max's risk of progression to kidney failure in the next five years is low using the kidney failure risk equation (1.56%); however, his cardiovascular disease risk score is high using the cardiovascular disease risk calculator (>15% over five years). Max is motivated to reduce his cardiovascular disease risk, and decides to commence an ACE inhibitor and a statin. Using motivational interviewing, Max identifies that he can add an alarm to his smartphone to remind him to take his medication, and that he will participate in a group physiotherapy session to try to improve the pain and function in his knee. He agrees to cease ibuprofen because it can adversely affect his kidney function and trial paracetamol for pain relief. He is referred to the Kidney Health Australia and National Heart Foundation of Australia websites to learn more about CKD and cardiovascular disease risk. A review appointment is planned to discuss how Max is tolerating his medication, if his strategies to take them regularly is effective, and to review his diabetes management.

ACE, angiotensin converting enzyme; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; HbA1c, glycated haemoglobin

for people with CKD into general practice workflow can ensure that patients are prescribed medications that are likely to result in positive health outcomes while minimising adverse events.

Key points

- A focus on prescribing guided by disease-specific guidelines is likely to result in polypharmacy for people with CKD and multimorbidity.
- GPs, working in collaboration with pharmacists, are best placed to undertake a holistic review of medication use.
- Beers Criteria, START and STOPP are examples of tools that can assist medication reviews.
- Home Medicines Reviews (MBS Item 900) may be beneficial for people with CKD and polypharmacy.
- Identification and appropriate recording of CKD in electronic medical records can facilitate clinical decision support to optimise prescribing.

Authors

Jo-Anne Manski-Nankervis BSc (Hons), MBBS (Hons), CHIA, PhD, FRACGP, Lead, Data Driven Quality Improvement Theme, Department of General Practice, The University of Melbourne, Vic; General Practitioner, Parkville Precinct Medical, Vic

Rita McMorrow MB, BCh BAO, CHIA, FRACGP, Graduate Researcher, Department of General Practice, University of Melbourne, Vic; General Practitioner, Parkville Precinct Medical, Vic

Craig Nelson MBBS, PhD, FRACP, Clinical Services Director, Division of Chronic and Complex Care, Western Health Chronic Disease Alliance – Department of Nephrology, Western Health, Vic; Clinical Associate Professor, Department of Medicine Western Health, University of Melbourne, Vic

Shilpanjali Jesudason MBBS, PhD, FRACP, Staff Specialist Nephrologist, Central and Northern Adelaide Renal and Transplantation Service, Royal Adelaide Hospital, SA; Clinical Associate Professor, Department of Medicine, University of Adelaide, SA

Janet K Sluggett BPharm (Hons), GDipClinEpi, PhD, AACPA, FSHP, GAICD, Senior Research Fellow, University of South Australia, UniSA Allied Health and Human Performance, Adelaide, SA; Affiliate Post-doctoral Researcher, Registry of Senior Australians, South Australian Health and Medical Research Institute, Adelaide, SA; Adjunct Research Fellow, Centre for Medicine Use and Safety, Faculty of Pharmacy and Pharmaceutical Sciences, Monash University, Vic

Funding: None.

Competing interests: JMN is supported by a Medical Research Future Fund (MRFF) Next Generation Clinical Researchers Program – TRIP Fellowship (APP1168265). RM reports grants from Australian Rotary Health PhD Scholarship, during the conduct of the study. JKS is supported by a National Health and Medical Research Council (NHMRC) Early Career Fellowship (grant number APP1156439). JKS has received research grants and/or consultancy funds from the NHMRC Cognitive Decline Partnership Centre, MRFF, Dementia Australia Research Foundation, Yulgilbar Foundation, AAG Research Trust, Dementia Centre for Research Collaboration, Australian Academy of Science, Australian Government Aged Care Quality Agency, Australian Association of Consultant Pharmacy Pty Ltd, and the Pharmaceutical Society of Australia. JKS is a pharmacist accredited to perform collaborative medication reviews.

Provenance and peer review: Commissioned, externally peer reviewed.

Correspondence to:
jomn@unimelb.edu.au

References

1. Kidney Health Australia. Chronic kidney disease (CKD) management in primary care. 4th edn. Melbourne, Vic: Kidney Health Australia, 2020.
2. Australian Institute of Health and Welfare. Australia's health 2018. Australia's health series no. 16. Canberra, ACT: AIHW, 2018.
3. Park JI, Baek H, Jung HH. CKD and health-related quality of life: The Korea National Health and Nutrition Examination Survey. Am J Kidney Dis 2016;67(6):851–60. doi: 10.1053/j.ajkd.2015.11.005.
4. Kidney Health Australia. State of the nation 2015. Kidney health week: Chronic kidney disease in Australia. Melbourne, Vic: Kidney Health Australia, 2015.
5. Johnston MC, Crilly M, Black C, Prescott GJ, Mercer SW. Defining and measuring multimorbidity: A systematic review of systematic reviews. Eur J Public Health 2019;29(1):182–89. doi: 10.1093/eurpub/cky098.
6. Fraser SD, Roderick PJ, May CR, et al. The burden of comorbidity in people with chronic kidney disease stage 3: A cohort study. BMC Nephrol 2015;16:193. doi: 10.1186/s12882-015-0189-z.
7. Sullivan MK, Rankin AJ, Jani BD, Mair FS, Mark PB. Associations between multimorbidity and adverse clinical outcomes in patients with chronic kidney disease: A systematic review and meta-analysis. BMJ Open 2020;10(6):e038401. doi: 10.1136/bmjopen-2020-038401.
8. Masnoon N, Shakib S, Kalisch-Ellett L, Caughey GE. What is polypharmacy? A systematic review of definitions. BMC Geriatr 2017;17(1):230. doi: 10.1186/s12877-017-0621-2.
9. Ernst R, Fischer K, de Godoi Rezende Costa Molino C, et al. Polypharmacy and kidney function in community-dwelling adults age 60 years and older: A prospective observational study. J Am Med Dir Assoc 2020;21(2):254–59.e1. doi: 10.1016/j.jamda.2019.07.007.
10. Reeve E, Thompson W, Farrell B. Deprescribing: A narrative review of the evidence and practical recommendations for recognizing opportunities and taking action. Eur J Intern Med 2017;38:3–11. doi: 10.1016/j.ejim.2016.12.021.
11. Niikawa H, Okamura T, Ito K, et al. Association between polypharmacy and cognitive impairment in an elderly Japanese population residing in an urban community. Geriatr Gerontol Int 2017;17(9):1286–93. doi: 10.1111/ggi.12862.
12. Johansson T, Abuzahra ME, Keller S, et al. Impact of strategies to reduce polypharmacy on clinically relevant endpoints: A systematic review and meta-analysis. Br J Clin Pharmacol 2016;82(2):532–48. doi: 10.1111/bcp.12959.
13. Schmidt IM, Hübner S, Nadal J, et al. Patterns of medication use and the burden of polypharmacy in patients with chronic kidney disease: The German chronic kidney disease study. Clin Kidney J 2019;12(5):663–72. doi: 10.1093/ckj/sfz046.
14. Castelino RL, Saunder T, Kitsos A, et al. Quality use of medicines in patients with chronic kidney disease. BMC Nephrol 2020;21(1):216. doi: 10.1186/s12882-020-01862-1.
15. Lea-Henry TN, Carland JE, Stocker SL, Sevastos J, Roberts DM. Clinical pharmacokinetics in kidney disease: Fundamental principles. Clin J Am Soc Nephrol 2018;13(7):1085–95. doi: 10.2215/CJN.00340118.
16. Stefani M, Singer RF, Roberts DM. How to adjust drug doses in chronic kidney disease. Aust Prescr 2019;42(5):163–67. doi: 10.18773/austprescr.2019.054.
17. Bell JS, Blacker N, Leblanc VT, et al. Prescribing for older people with chronic renal impairment. Aust Fam Physician 2013;42(1–2):24–28.
18. Heerspink HJL, Stefánsson BV, Correa-Rotter R, et al. Dapagliflozin in patients with chronic kidney disease. N Engl J Med 2020;383(15):1436–46. doi: 10.1056/NEJMoa2024816.
19. Al-Aly Z, Maddukuir G, Xie Y. Proton pump inhibitors and the kidney: Implications of current evidence for clinical practice and when and how to deprescribe. Am J Kidney Dis 2020;75(4):497–507. doi: 10.1053/j.ajkd.2019.07.012.
20. Australian Medicines Handbook. Metformin. Adelaide, SA: AMH, 2021. Available at https://amhonline.amh.net.au/auth [Accessed 10 February 2021].
21. Bell JS, McInerney B, Chen EY, Bergen PJ, Reynolds L, Sluggett JK. Strategies to simplify complex medication regimens. Aust J Gen Pract 2021;50(1–2):43–48. doi: 10.31128/AJGP-04-20-5322.
22. 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(4):674–94. doi: 10.1111/jgs.15767.
23. Liacos M, Page AT, Etherton-Beer C. Deprescribing in older people. Aust Prescr 2020;43(4):114–20. doi: 10.18773/austprescr.2020.033.
24. Potter K, Page A, Clifford R, Etherton-Beer C. Deprescribing: A guide for medication reviews. J Pharm Pract Res 2016;46(4):358–67. doi: 10.1002/jppr.1298.
25. Tangri N, Grams ME, Levey AS, et al. Multinational assessment of accuracy of equations for predicting risk of kidney failure: A meta-analysis. JAMA 2016;315(2):164–74. doi: 10.1001/jama.2015.18202.
26. Chronic Disease Innovation Centre. The kidney failure risk equation. Winnipeg, MB: CDIC, 2021. Available at https://kidneyfailurerisk.com [Accessed 10 February 2021].
27. Reeve E, Low LF, Hilmer SN. Beliefs and attitudes of older adults and carers about deprescribing of medications: A qualitative focus group study. Br J Gen Pract 2016;66(649):e552–e60. doi: 10.3399/bjgp16X685669.
28. Australian Commission on Safety and Quality in Health Care. Medication without harm – WHO global patient safety challenge. Australia's response. Sydney, NSW: ACSQHC, 2020.
29. Mangin D, Bahat G, Golomb BA, et al. International Group for Reducing Inappropriate Medication Use & Polypharmacy (IGRIMUP): Position statement and 10 recommendations for action. Drugs Aging 2018;35(7):575–87. doi: 10.1007/s40266-018-0554-2.
30. Steinman MA, Fick DM. Using wisely: A reminder on the proper use of the American Geriatrics Society Beers Criteria®. J Am Geriatr Soc 2019;67(4):644–46. doi: 10.1111/jgs.15766.
31. Chen EY, Sluggett JK, Ilomäki J, et al. Development and validation of the Medication Regimen Simplification Guide for Residential Aged Care (MRS GRACE). Clin Interv Aging 2018;13:975–86. doi: 10.2147/CIA.S158417.