

Advances in Geriatrics

Joseph Hanlon, PharmD, MS; Steven M. Handler, MD, PhD;
and Sherrie L. Aspinall, PharmD, MSc



Program to Improve Prescribing of Primarily Renally Cleared Oral Medications in Older Veteran Community Living Center Patients

Pharmacotherapy frequently is used for the treatment of medical problems in older veteran community living center (CLC) patients. Unfortunately, many of these drug therapies carry significant risks, including adverse drug reactions (ADRs). To our knowledge the only published study of ADRs in older VA CLC patients found that, over a 6-month period, 95 of 175 residents (54%) experienced an ADR.¹

Prescribing errors, especially of primarily renally cleared oral medications (such as digoxin, glyburide, and spironolactone), are commonly the cause of ADRs. A study by Papaioannou and colleagues (of 456 patients at 4 long-term care facilities in Canada) found that prescribing problems were common for 20 primarily renally cleared medications.² However, in a non-VA nursing home study, it was shown that computerized alerts at the time of electronic prescribing can improve dosing of primarily renally cleared medications.³

To address the problem of inappropriate prescribing of these medications at the VA Pittsburgh Healthcare System (VAPHS) in Pennsylvania, health professional faculty members from the VAPHS Geriatric Research, Education and Clinical Center (GRECC) and the VAPHS Center for Health Equity Research and Promotion implemented a 3-step approach. This approach involved compiling an agreed-upon list of medications and dosing recommendations for primarily renally cleared oral medications, determining the frequency of potentially inappropriate prescribing of these medications, and designing a quality improvement program geared toward improving the prescribing of these medications. Here, in greater detail, we describe each of the 3 steps of our approach.

DEVELOPING A CONSENSUS LIST

Developing a list of primarily renally cleared oral medications with dosing recommendations for various degrees of renal impairment is difficult, mainly

due to the conflicting recommendations that currently are available in reference materials and the medical literature. A recent study—reporting on the concordance between 4 different pharmacotherapy-information sources regarding dosing information for 100 primarily renally cleared medications—found wide discrepancies between the sources.⁴ Because of the significant variability, our research group conducted a comprehensive literature review to create an initial list of drugs and dosing recommendations for primarily renally cleared oral medications. We shared this list with a group of 6 physicians (2 from general internal medicine, 2 nephrologists, and 2 geriatricians). The group further advised us about including 45 dosing recommendations for 30 medications in a survey of 11 geriatric clinical pharmacists. Using a 2-stage Delphi Survey, the 11 geriatric clinical pharmacists were able to reach consensus on 26 dosing recommendations for 18 medications (Tables 1 and 2).⁵

Dr. Hanlon is a health scientist with the Geriatric Research, Education and Clinical Center (GRECC), VA Pittsburgh Healthcare System (VAPHS) in Pennsylvania and a professor in the Department of Medicine (Division of Geriatric Medicine), the Department of Epidemiology, and the Department of Pharmacy and Therapeutics at the University of Pittsburgh (UPitt) in Pennsylvania. **Dr. Handler** is a health scientist with the VAPHS GRECC and is an assistant professor in the Department of Medicine (Division of Geriatric Medicine) and the Department of Biomedical Informatics at UPitt. **Dr. Aspinall** is a health scientist with the VA Center for Medication Safety in Hines, Illinois, and is an associate professor in the Department of Pharmacy and Therapeutics at UPitt. Drs. Hanlon, Handler, and Aspinall also are all health scientists at the VAPHS Center for Health Equity Research and Promotion.

The VHA's Geriatric Research, Education and Clinical Centers (GRECCs) are designed for the advancement and integration of research, education, and clinical achievements in geriatrics and gerontology throughout the VA health care system. Each GRECC focuses on particular aspects of the care of aging veterans and is at the forefront of geriatric research and clinical care. For more information on the GRECC program, visit the Web site (<http://www1.va.gov/grecc/>). This column, which is contributed monthly by GRECC staff members, is coordinated and edited by Kenneth Shay, DDS, MS, director of geriatric programs for the VA Office of Geriatrics and Extended Care, VA Central Office, Washington, DC.



Table 1. Drugs to avoid in older adults with reduced estimated CrCl

Drug	Estimated CrCl, mL/min
Chlorpropamide	< 50
Colchicine	< 10
Glyburide	< 50
Meperidine	< 50
Nitrofurantoin	< 60
Probenecid	< 50
Propoxyphene	< 10
Spironolactone	< 30
Trimethoprim/sulfamethoxazole	< 15
Triamterene	< 30

CrCl = creatinine clearance.

DETERMINING THE EXTENT OF THE PRESCRIBING PROBLEM

Using combined information from the VA Pharmacy Benefits Management database, the National Patient Care Database, and the Minimum Data Set database, we were able to examine the prescribing of the above-mentioned 18 drugs in 1,304 patients, all of whom were aged 65 years or older and had stayed for 90 days or more at 1 of the 133 VA CLCs. We used the Cockcroft-Gault equation⁶ to estimate renal function, using creatinine clearance (CrCl) values—in the patients and then applied our agreed-upon dosing recommendations.

When we applied our consensus list of primarily renally cleared oral medications, we found that more than 1 in 10 older extended-stay patients in VA CLCs had potentially inappropriate prescribing.⁷ This study also identified that advancing age was associated with an increased risk of inappropriate dosing of primarily renally cleared oral medications. These results underscore the need for health professionals to be aware that a CrCl value within the laboratory reference range (“normal”) does not necessarily reflect normal renal func-

tion, especially in older patients due to age-related changes in lean muscle mass and turnover.

DESIGNING A QUALITY IMPROVEMENT PROGRAM

We held a lecture and meeting with health care professionals (mostly physicians and registered pharmacists) who provide care at the 300-bed VA CLC in Pittsburgh, Pennsylvania. The above-mentioned information was presented to those in attendance, with a session held afterward to brainstorm possible solutions for improving the prescribing of primarily renally cleared oral medications. From this session, 4 potential solutions were agreed upon: (1) providing dosing charts in the clinical guidelines section of the computerized patient record system (CPRS), (2) distributing pocket dosing cards to CLC health care professionals, (3) providing dosing information at the time of prescribing in the CPRS, and (4) adding a place to record the estimated CrCl value and specific dosing recommendations of CLC patients (if the patients were taking any of the primarily renally cleared oral medications) to the monthly pharmacist drug regimen review note template.

To obtain further support and approval, we presented our information to the VAPHS Pharmacy and Therapeutics Committee, which approved the 4 potential solutions as well as dosing guidelines for 3 additional drugs (Table 3). Dosing cards were made and distributed to CLC health care professionals, and the same information was made available in the clinical guideline section of the CPRS. With the help of an information technology pharmacist, we added a message to the “blue text field” for the medication/orderable item in the CPRS for these specific medications. If the message was longer than 53 characters, then clicking on the blue text field would trigger a pop-up box that provides the full dosing information.

Once everything was completed and implemented, we reinserviced the health professional groups at the CLC and examined the rate of potentially inappropriate prescribing 1 year before and 1 year after the implementation of the program. We found that the rate of potentially inappropriate prescribing of 2 renally cleared oral medications (nitrofurantoin and levettiracetam) was reduced from 30.8% to 18.2%.

CONCLUSIONS

Hopefully, the description of our quality improvement project to address the problem with dosing primarily renally cleared oral medications in older adults will inspire other health care professionals to implement some or all 3 of the steps we took in their own facilities. In the future, we hope to submit a research proposal to VA Health Services Research and Development Service to receive funding for conducting a randomized controlled trial of this multifaceted intervention at other VA CLCs and examining the impact on health outcomes and cost. ●

Continued on next page

Continued from previous page

Table 2. Oral dosing of primarily renally cleared drugs in older adults

Drug	Estimated CrCl, mL/min	Maximum dosage, mg
Acyclovir (zoster)	<ul style="list-style-type: none"> • 10–29 • < 10 	<ul style="list-style-type: none"> • 800 every 8 hours • 800 every 12 hours
Amantadine	<ul style="list-style-type: none"> • 30–59 • 15–29 • < 15 	<ul style="list-style-type: none"> • 100 daily • 100 every 48 hours • 100 every 7 days
Ciprofloxacin	< 30	500 every 24 hours
Gabapentin	<ul style="list-style-type: none"> • 30–59 • 15–29 • < 15 	<ul style="list-style-type: none"> • 600 twice daily • 300 twice daily • 300 daily
Memantine	< 30	5 twice daily
Ranitidine	< 50	150 every 24 hours
Rimantadine	< 50	100 daily
Trimethoprim/sulfamethoxazole	15–29	1 double strength tablet every day
Valacyclovir (zoster)	<ul style="list-style-type: none"> • 30–49 • 10–29 • < 10 	<ul style="list-style-type: none"> • 1,000 every 12 hours • 1,000 every 24 hours • 500 every 24 hours

CrCl = creatinine clearance.

Table 3. Oral dosing of 3 additional primarily renally cleared drugs in older adults approved by the VAPHS Pharmacy and Therapeutics Committee

Drug	Estimated CrCl, mL/min	Maximum dosage, mg
Duloxetine	< 30	Avoid
Levetiracetam	<ul style="list-style-type: none"> • 50–80 • 30–50 • < 30 	<ul style="list-style-type: none"> • 500–1,000 every 12 hours • 250–750 every 12 hours • 250–500 every 12 hours
Tramadol	< 30	50–100 every 12 hours

VAPHS = VA Pittsburgh Healthcare System; CrCl = creatine clearance.

Author disclosures

The authors report no actual or potential conflicts of interest with regard to this column.

Disclaimer

The opinions expressed herein are those of the authors and do not necessarily reflect those of Federal Practitioner, Quadrant HealthCom Inc., the U.S. Government, or any of its agencies. This article may discuss unlabeled or investigational use of certain drugs. Please review complete prescribing

information for specific drugs or drug combinations—including indications, contraindications, warnings, and adverse effects—before administering pharmacologic therapy to patients.

REFERENCES

- Gerety M, Cornell JE, Plichta DT, Eimer M. Adverse events related to drugs and drug withdrawal in nursing home residents. *J Am Geriatric Soc.* 1993;41(12):1326–1332.
- Papaioannou A, Clarke JA, Campbell G, Bedard M. Assessment of adherence to renal dosing guidelines in long-term care facilities. *J Am Geriatr Soc.* 2000;48(11):1470–1473.
- Field TS, Rochon P, Lee M, Gavendo L, Baril JL, Gurwitz JH. Computerized clinical decision support during medication ordering for long-term care residents with renal insufficiency. *J Am Med Assoc.* 2009;302(4):480–485.
- Vidal L, Shavit M, Fraser A, Paul M, Leibovici L. Systematic comparison of drug information regarding adjustment of dose for renal function. *BMJ.* 2005;331(7511):263–266.
- Hanlon JT, Aspinall S, Semla T, et al. Consensus guidelines for oral dosing of primarily renally cleared medications in older adults. *J Am Geriatr Soc.* 2009;57(2):335–340.
- Cockcroft DW, Gault MH. Predicting creatinine clearance from serum creatinine. *Nephron.* 1976;16(1):31–41.
- Hanlon JT, Wang X, Handler SM, et al. Suboptimal prescribing of primarily renally cleared medications for older VA nursing home patients [abstract]. *J Am Geriatr Soc.* 2010;58:S87.