VA Geriatric Scholars Program's Impact on Prescribing Potentially Inappropriate Medications

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ABSTRACT

OBJECTIVES: The Veterans Affairs (VA) Geriatric Scholars Program (GSP) is a workforce development program to enhance skills and competencies among VA clinicians who provide healthcare for older veterans in VA primary care clinics. An intensive geriatrics didactics (IGD) course is a core element of this professional development program. The objective of this study was to evaluate the impact of completing the IGD course on providers' rates of prescribing definite potentially inappropriate medications (DPIMs) based on Beers Criteria from 2008 to 2016.

STUDY DESIGN: We applied a longitudinal interrupted time series design to examine changes in DPIM prescribing rates for GSP participants before and after completing the IGD course.

METHODS: The time series was divided into two 12-month periods, representing the preintervention period (ie, 12 months prior to completing the IGD course) and the postintervention period (ie, 12 months after completing the IGD course), and populated with pharmacy dispensing data from the VA's Corporate Data Warehouse. An adjusted slope impact model was developed to estimate the postintervention change in the proportion of the dispensed medications identified as DPIMs.

RESULTS: After adjusting for case mix, we observed a statistically significant reduction in the proportion of DPIMs dispensed post IGD (slope change, 0.994; 95% CI, 0.991-0.997). This change in slope reflects a total decrease of 7971 DPIM dispensings during the postintervention period. This equates to an estimated 24 fewer DPIM dispensings per provider during the postintervention period.

CONCLUSIONS: Although the size of the effect was modest, we found that participation in the GSP IGD course reduced prescribing of DPIMs for older veterans.

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The Veterans Affairs (VA) Geriatric Scholars Program (GSP) is a workforce development program designed to enhance skills and competencies among VA clinicians who provide healthcare in primary care teams.[1] The GSP was created as a response to the Institute of Medicine's report on an aging America, which noted that the existing workforce was insufficient to meet the growing needs of expertise in care of older Americans.[2] The national supply of trained geriatricians does not meet the current or projected demand, and the deficit is greater in the VA.[1,3] Participation in the GSP is not mandatory. All of the Veterans Integrated Service Networks (VISNs) are invited to nominate eligible individuals to participate in the program. The number of nominees per VISN can fluctuate each year and is dependent on the program's approved budget. To be eligible, nominees must be employed at the VA and actively provide healthcare as a primary care clinician (eg, physician, physician assistant, advance practice nurse) or support a primary care team as a clinical pharmacist, social worker, or rehabilitation therapist. The GSP is a longitudinal program that includes 3 core components and then offers educational activities that are tailored to each clinician's self-identified gaps in education and training; these include webinars, self-directed web-based learning, clinical practicum experiences, and on-site team training. The core components include participation in an intensive geriatrics didactics (IGD) course (an accredited didactic education course and board review in geriatric medicine offered through several prominent universities), participation in a daylong quality improvement (QI) course, and initiation of a local QI project.

The IGD course addresses major geriatric syndromes and effective management of these syndromes, as well as the latest evidence in geriatric medicine, including promising practices and risks of new treatments. More specifically, the IGD course includes concepts of the comprehensive geriatric assessment, which is appropriate in geriatric specialty care as well as in nonspecialty care[4]; Assessing Care of Vulnerable Elders (ACOVE) through quality indicators for vulnerable elders 75 years or older[5]; and appropriate medication selection for older adults, with the goal of reducing adverse drug events. The standard of practice for appropriate prescribing taught

TAKEAWAY POINTS

Multifaceted educational outreach programs are a viable approach to influencing care processes and improving the quality of care administered.

- Deprescribing of potentially inappropriate medications is a central tenet of geriatric medicine.
- Knowing evidence-based alternative therapies is important prior to developing a deprescribing plan.
- Synergy must exist among the components of a workforce development program to enhance potential benefits.

during the IGD course is based on the American Geriatrics Society (AGS) Beers Criteria and alternative treatment recommendations supported by the National Committee for Quality Assurance and the Pharmacy Quality Alliance.[6,7] The AGS Beers Criteria contain explicit lists of potentially inappropriate medications (PIMs) to avoid in older adults. Training on the Beers Criteria is woven throughout the intensive multiday course. The GSP uses several university-sponsored courses, which also serve as board reviews for the added certification in geriatric medicine, as its core IGD course. Although content may vary somewhat based on the expertise of faculty at the various universities, the courses cover similar topics on evidence-based clinical practices, and GSP evaluators have shown that no significant differences exist among these courses as measured by knowledge outcomes of participants.[1,3,8,9]

A retrospective pre-post survey design study has examined the impact of the GSP on clinical behaviors and practices.[1] Authors reported that program participants were more likely to use evidence-based standardized assessments and relevant standards of care after participating in the GSP. However, that study was based on self-report, and further evaluation is needed through direct measurement to determine if care processes improved after participation in the GSP. The purpose of our study was to determine if participation in the GSP was associated with a change in providers' prescribing behaviors.

The primary objectives of our study were (1) to determine whether exposure to the GSP IGD course resulted in a lower rate of definite potentially inappropriate medications (DPIMs) dispensed in the year following the educational intervention compared with the year prior to attending the IGD course and (2) to examine these rate changes by therapeutic class in determining whether providers prioritized specific groups of medications after exposure to the GSP IGD course. DPIMs are medications that originate from the explicit list of PIMs for adults 65 years or older found in Table 2 of the AGS 2015 Beers Criteria.[6] However, DPIMs exclude medications from this list with conditional recommendation properties suggesting that the medication be avoided only for certain indications or for those with certain disease characteristics. Thus, DPIMs include medications from the 2015 Beers Criteria that prescribers should always avoid (ie, definitely inappropriate). The list of DPIMs we examined can be found in the **eAppendix Table** (available at **ajmc.com**). We also tested hypotheses for 2 secondary objectives, which included the examination of pre- to postintervention DPIM rate changes for (1) advanced-age veterans (ie, ≥75 years), reflecting ACOVE quality indicators as an IGD topic, and (2) by location of provider in a rural or urban clinic, a factor that has emerged in other evaluations of the GSP.[1]

METHODS

We applied a longitudinal interrupted time series (ITS) design that examined trends and slope changes of DPIM dispensing rates, pre- and post completion of IGD. The ITS design was used to explore the effect of the IGD course on DPIM rates while controlling for pre-existing trends. In this study, pre-existing trends represent the time series of DPIM dispensing rates prior to being interrupted by IGD (ie, underlying trend). Theoretically, had IGD not been implemented, then the pre-existing trend would in turn represent the expected trend. Thus, observed changes in the underlying trend, post intervention, represent the impact of completing the IGD course.

We identified all Geriatric Scholars who participated in an IGD course between September 1, 2008, and December 31, 2016, from data maintained by the GSP hub site at the VA Greater Los Angeles Healthcare System Geriatric Research, Education, and Clinical Center. The end date of the 4-day IGD course was used as the index date for each Geriatric Scholar. Medications dispensed 1 year prior to index (ie, completion of the IGD course) and 1 year after index represent the pre- and postintervention periods, respectively. We excluded clinicians not authorized to prescribe medication in a primary care setting (eg, social workers). Furthermore, providers who had not been practicing in the VA for at least 1 year prior to the index date were excluded. This ensured that there were no gaps in pharmacy dispensing records due to the provider not being employed by the VA during the preintervention period. In addition, we excluded patients who had cancer diagnoses, were transferred to a nursing home, or were receiving palliative care at any point during the study period. Pharmacy dispensing records were excluded for patients who were not 65 years or older at time of dispensing.

We used data available in the VA Corporate Data Warehouse (CDW). The CDW is a national repository composed of data from clinical and administrative systems, including patient health records, pharmacy records, and claims billed to the VA by community providers.[10] Evaluation is a major activity of all educational programs, and the Institutional Review Board at the VA Greater Los Angeles Healthcare System has determined that program evaluation is not human subject research.

The primary outcome was defined as the monthly proportion of DPIMs dispensed (ie, number of DPIMs dispensed divided by total number of medications dispensed) from all Geriatric Scholars who met inclusion criteria. Using the list of DPIMs found in the eAppendix Table, we classified and counted the number of monthly dispensings from all Geriatric Scholars that qualified as potentially inappropriate for each of the 24 months in the time

TABLE 1. Provider Dispensing Pattern: Crude Rates of DPIMs Dispensed Pre- and Post Intervention of an IGD Course by Characteristics of Patient Age and Provider Location

	Overall		Pre-IGD		Post IGD			
	DPIMs Dispensed N = 239,859		DPIMs Dispensed n = 119,612		DPIMs Dispensed n = 120,247			
	Mean	95% CI	Mean	95% CI	Mean	95% CI	RR	95% CI
All DPIM dispensings	6.59	6.57-6.62	6.68	6.65-6.72	6.51	6.47-6.54	0.973	0.966-0.981
DPIMs dispensed to patients 75 years or older	5.66	5.63-5.69	5.82	5.77-5.86	5.50	5.45-5.55	0.946	0.935-0.957
DPIMs dispensed by urban providers	6.37	6.34-6.41	6.49	6.43-6.54	6.26	6.21-6.31	0.965	0.954-0.977
DPIMs dispensed by rural providers	6.79	6.75-6.82	6.86	6.81-6.91	6.72	6.67-6.76	0.979	0.969-0.989

DPIM indicates definite potentially inappropriate medication; IGD, intensive geriatrics didactics; RR, relative risk.

series. DPIMs were identified individually in the CDW by generic drug name. All nonsteroidal anti-inflammatory drug (NSAID) dispensings were required to have a supply of greater than 30 days and a calculated quantity per day greater than or equal to 1 to appropriately represent chronic use. Furthermore, dose and dosage form were data elements that were also used where appropriate to identify dispensings that were required to reach a dose threshold to be considered potentially inappropriate or in cases where delivery method was relevant to medication safety (eg, mineral oil given orally vs topical). The list of DPIMs that we analyzed was also grouped into meaningful therapeutic classes, where possible. Doing so allowed us to examine DPIM rate changes by therapeutic class in determining whether providers prioritized specific groups of medications after exposure to the GSP IGD course. The denominator was unchanged when calculating the monthly proportion of DPIMs dispensed for each therapeutic class.

TABLE 2. Provider Dispensing Behavior: Estimated Slope Changes Post Intervention of an IGD Course by Characteristics of Patient Age and Provider Location

	Slope Change Post IGD[a]	95% CI	*P*
All DPIM dispensings[b]	0.994	0.991-0.997	<.001
DPIMs dispensed to patients 75 years or older[b]	0.996	0.991-1.000	.0521
DPIMs dispensed by urban providers[b]	0.995	0.990-0.999	.0190
DPIMs dispensed by rural providers[b]	0.994	0.990-0.998	.0014

DPIM indicates definite potentially inappropriate medication; IGD, intensive geriatrics didactics.

[a]Exponentiated beta coefficients.

[b]Adjusted for case mix by patient gender, patient age, and patient Healthcare Cost and Utilization Project Clinical Classifications Software count.

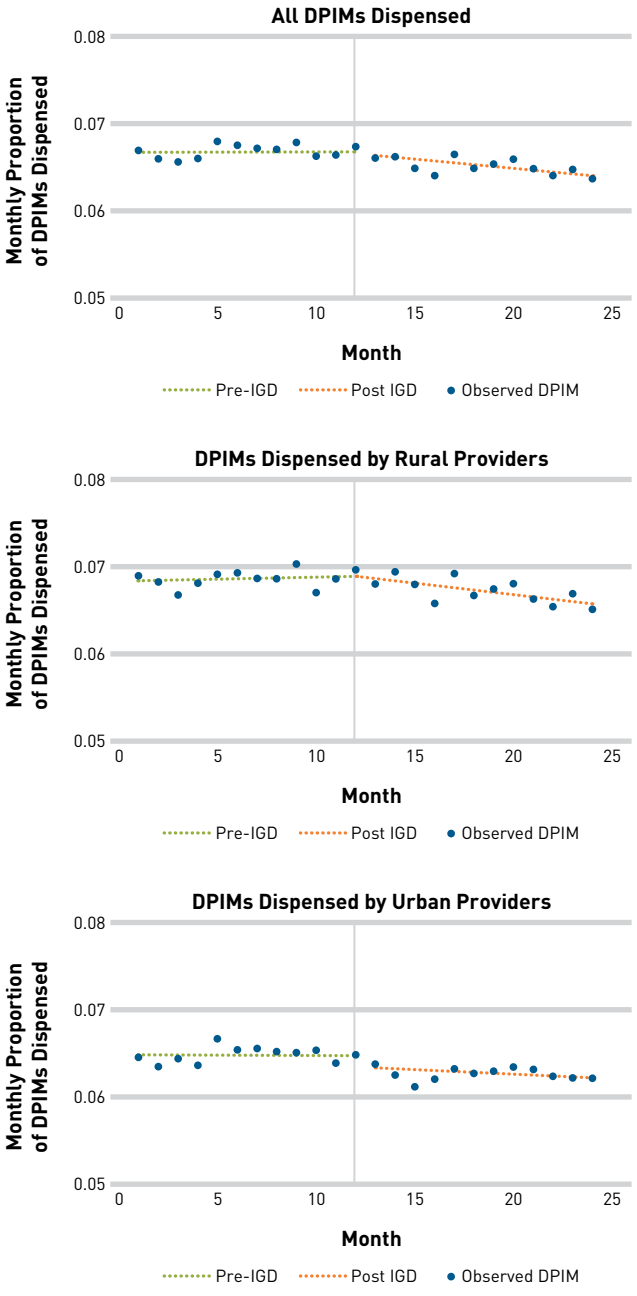
Statistical Analysis

Overall crude rates of DPIMs dispensed were calculated for the complete time series and for the pre- and postintervention periods. Crude rates were analyzed for the complete cohort and for the secondary objective subpopulations. Relative risk (RR) estimates were calculated to compare crude rate differences between the pre- and postintervention windows.

Poisson regression was used to estimate the change in the trend of the outcome post intervention. Deprescribing and optimization of appropriate medication is a multistep process that requires the provider to perform a comprehensive medication history, identify PIMs, determine whether identified PIMs can be ceased, and work with the patient in planning a withdrawal regimen.[11] Furthermore, patients play an important role in their own health and may be reluctant to stop a medication. Due to the time that this complex process may require and because it must be completed for each patient, we hypothesized that IGD would produce a gradual change in the gradient of the trend. Thus, we modeled the potential effect of IGD on the outcome using a slope impact model. We did not include a lag period in the slope impact model, as we believed that GSP participants would begin the process of appropriate medication optimization immediately after completing the IGD course.

The finalized slope impact model was adjusted on patient gender, average patient age, and average patient Healthcare Cost and Utilization Project (HCUP) Clinical Classifications Software (CCS) count. HCUP CCS was used to count unique, unduplicated single-level diagnosis categories using *International Classification of Diseases, Ninth Revision* and *International Classification of Diseases, Tenth Revision* codes reported in the outpatient, inpatient, and purchased-care CDW data domains. To meet the primary objective of this evaluation, the adjusted slope impact model was used to estimate the change in the trend of the monthly proportion of DPIMs dispensed to veterans 65 years or older post completion of the IGD course. The slope change, post intervention, was also estimated by therapeutic class. In pursuit of our secondary objectives, the adjusted slope impact model was used in estimating the change in DPIM dispensing rates for the following 3 subpopulations: patients dispensed medication from providers assigned to urban clinics, patients dispensed medication from providers assigned to rural clinics, and patients considered to be vulnerable elders at time of dispensing (ie, ≥75 years). SAS version 9.4 (SAS Institute; Cary, North Carolina) was used in performing all statistical analyses.

FIGURE 1. Plots of Statistically Significant Slope Changes Post IGD Course



DPIM indicates definite potentially inappropriate medication; IGD, intensive geriatrics didactics.

RESULTS

Of the 639 Geriatric Scholars who participated in the IGD course during the study period, 341 (53.4%) remained in the study after applying the provider-level exclusion criteria. We identified a total of 111,637 patients for whom 1,789,521 medications were dispensed during the preintervention period. The aggregated totals during the postintervention period were 111,958 patients for whom 1,848,416 medications were dispensed.

As shown in **Table 1**, while the overall mean rate of DPIMs (n = 239,859) dispensed during both pre- and postintervention windows was 6.59%, a decrease was observed to 6.51% post IGD from 6.68% pre-IGD (RR, 0.973; 95% CI, 0.966-0.981). Decreases were also observed for the subanalyses of DPIMs dispensed among the 75 years or older (RR, 0.946; 95% CI, 0.935-0.957), rural (RR, 0.979; 95% CI, 0.969-0.989), and urban (RR, 0.965; 95% CI, 0.954-0.977) subpopulations post IGD.

Adjusted ITS estimated slope changes are shown in **Table 2**. After adjusting for patient gender, average patient age, and average HCUP CCS count, we observed a statistically significant change in slope, indicating a more aggressive reduction in the overall monthly proportion of DPIMs dispensed post IGD (slope change, 0.994; 95% CI, 0.991-0.997). A change in slope produces a cumulative effect as time passes, with the maximum reduction of DPIM dispensings occurring at month 12 of the postintervention period. The observed change in slope reflects a total decrease of 7971 DPIM dispensings during the postintervention period. This equates to an estimated 24 fewer DPIM dispensings per provider during the postintervention period. A borderline significant change in slope was also observed when examining dispensings for the subpopulation 75 years or older (slope change, 0.996; 95% CI, 0.991-1.000). The strength of the effect of the intervention was similar between rural providers (slope change, 0.994; 95% CI, 0.990-0.998) and urban providers (slope change, 0.995; 95% CI, 0.990-0.999). Plotted graphs of the estimated slope changes found to be statistically significant are shown in **Figure 1**.

Figure 2 summarizes the estimated slope changes for each of the DPIM therapeutic categories analyzed. We observed statistically significant slope changes post IGD for the following DPIM therapeutic categories: insulin (slope change, 0.979; 95% CI, 0.967-0.990), nonbenzodiazepine hypnotics (slope change, 0.985; 95% CI, 0.973-0.996), NSAIDs (slope change, 0.992; 95% CI, 0.985-0.996), and disopyramide (slope change, 1.231; 95% CI, 1.018-1.488). All statistically significant slope changes observed by therapeutic category, except for disopyramide, resulted in more aggressive negative slopes. The disopyramide finding should be interpreted with caution as the modeled slope change estimate was based on an insufficient number of dispensings (pre-IGD, 56 dispensings; post IGD, 50 dispensings).

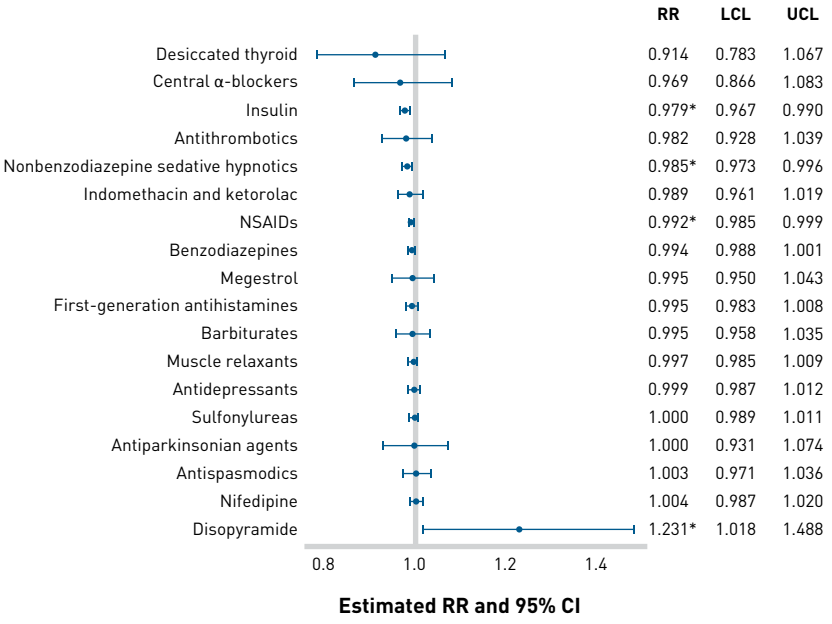
DISCUSSION

We found that participation in the GSP IGD course reduced prescribing of DPIMs to veterans 65 years or older. Appropriate prescribing to older veterans is important in reducing the risk of mortality, hospitalization, and emergency department (ED) utilization.[12] The IGD course heavily emphasizes deprescribing of PIMs, as that is a central tenet of geriatric medicine. However, completion of the IGD course may not be solely responsible for the change in prescribing that we observed. During the QI workshop, Geriatric Scholars are

welcomed as "ambassadors for change" and are further empowered to adopt the best practices of care that they were educated on during the IGD course. Thus, our observed findings may be a result of synergistic effects produced by both the IGD and QI courses. The initiation and completion of the local QI project may also have had some impact on the change in prescribing of PIMs that we observed. However, fewer than 15% of the QI projects completed by Geriatric Scholars focused on medication safety.

Similar to the GSP, another multifaceted educational QI program has been successful in reducing the prescribing of PIMs within the VA. Enhancing Quality of Provider Practices for Older Adults in the Emergency Department (EQUiPPED) is a multicomponent initiative that combines education, clinical decision support (ie, order sets), and individual provider feedback in an effort to improve appropriate prescribing to older veterans discharged from the ED.[13] EQUiPPED has been implemented at 4 urban VA medical center EDs. Findings of a pre- and postintervention study showed that all 4 sites significantly reduced the prescribing of PIMs after implementation.[13] Thus, our findings in combination with the reported positive impact of the EQUiPPED program would suggest that the implementation of multifaceted educational outreach and development programs is a viable approach to influencing prescribing behavior that will lead to safer prescribing to older veterans.

FIGURE 2. Estimated Slope Changes by DPIM Therapeutic Category Post IGD Course[a]



DPIM indicates definite potentially inappropriate medication; LCL, lower confidence limit; NSAID, nonsteroidal anti-inflammatory drug; RR, relative risk; UCL, upper confidence limit.

*P <.05.

[a]Meprobamate, ergoloid mesylates, isoxsuprine, pentazocine, mineral oil, and meperidine were not reported on in this figure due to insufficient sample sizes.

The GSP IGD course appeared to have a significant impact on the prescribing rates of select DPIMs. Significant slope changes post IGD were observed for the following DPIM therapeutic categories: insulin, nonbenzodiazepine hypnotics, and NSAIDs. For each of these medication subgroups, slope direction remained negative and became significantly more aggressive post IGD. We believe that 3 factors likely played an influential role in the selection of these DPIMs by the Geriatric Scholar as initial targets for intervention: prescribing frequency, medication familiarity, and the existence of evidence-based alternative therapies, including nonpharmacologic approaches. For instance, orally administered NSAIDs are some of the most commonly used medications and well-known suitable alternatives exist, including topical applications (eg, capsaicin, diclofenac, lidocaine) and acetaminophen.[7] Likewise, providers are likely to be very familiar with nonbenzodiazepine hypnotic use, such as zolpidem, among their patient panel. After zolpidem was added to the VA national formulary in 2008, prescribing rates of nonbenzodiazepine hypnotics tripled.[14] The literature suggests that policy-driven deprescribing efforts of benzodiazepines has led to widescale use of nonbenzodiazepine hypnotics.[15] Fortunately, many nonpharmacologic approaches, such as cognitive behavioral therapy and circadian interventions, have been shown to be effective in treating insomnia.[7,16] Furthermore, these DPIMs are often used to treat symptoms of disease and not biological mechanisms of disease; thus, potential consequences as a result of a change in therapy may have been viewed more favorably in comparison with those of other DPIMs.

Strengths and Limitations

The primary strength of this study was the ability to perform a formal evaluation of an educational outreach program that has been implemented nationally. This allowed for our analyses to be supported by more than 3 million pharmacy dispensings and well over 100,000 patients. This increases the stability of our results and improves the generalizability of our findings, clearly describing the usefulness of the GSP across the VA. To further assist in measuring the impact of the GSP, we used an ITS approach, which is arguably the next best approach for examining the effects of interventions when randomization is not possible.[17]

This study has a few limitations. First, we examined only the lowest level of exposure to the GSP, the initial didactic course, and did not include other elements of the program—that is, its other core components or elective longitudinal educational activities in which some Scholars may have participated in the first 12 months of their individualized learning plan. This approach was taken to maximize sample size and does not consider potential dose

effects of educational activities or other contextual factors. Second, elements are lacking from our analysis that, if added, may have increased the strength of the observed effects. For example, we did not consider conditional PIMs from the 2015 Beers Criteria in our analysis (ie, drug–disease and drug–drug interactions), and we did not attempt to modify the definition of the outcome throughout the study period to reflect the version of Beers Criteria at time of index. Some notable additions to the list were made during the 2012 and 2015 updates. For example, short-acting insulin was added during the 2012 update.[18] Therefore, Geriatric Scholars who participated in the program earlier in the study period may not have prioritized PIMs that were not identified as such until the 2012 or 2015 updates. Lastly, in 2014, the VA launched a national Hypoglycemia Safety Initiative aimed at educating providers on the risks of overtreating diabetes, suggesting that insulin therapy should be stopped if a veteran 65 years or older has a glycated hemoglobin level less than 7.5%.[19] This event may have influenced Geriatric Scholars to target insulin as a therapeutic treatment of importance prior to modifying their prescribing habits. Thus, this initiative should be recognized as an unmeasured potential time-varying confounder. ITS studies are typically not affected by confounding variables that remain relatively constant, but they can be affected by time-varying variables that may change more rapidly.[17] Because this event overlapped with our study period, there is the potential for it to influence the observed effect. However, overlap between the aforementioned VA initiative and the IGD intervention would have occurred for only a portion of the GSP enrollees, as Geriatric Scholars were indexed at time of exposure to the IGD course throughout a 9-year study period, starting in 2008.

CONCLUSIONS

The GSP IGD curriculum has contributed to improving care across VA primary care clinics. Primary care providers who participate in the GSP are taking the knowledge gained from the IGD course and modifying how they prescribe medication to older veterans. Further investigation is warranted in examining the independent and synergistic impacts of other GSP components, in particular the QI course and QI project, on prescribing rates of DPIMs. ■

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eAppendix Table. List of Definite Potentially Inappropriate Medications (DPIMs)

Therapeutic Class/Drug Name
First-Generation Antihistamines
Brompheniramine
Carbinoxamine
Chlorpheniramine
Clemastine
Cyproheptadine
Dexchlorpheniramine
Dimenhydrinate
Diphenyrdhamine
Doxylamine
Hydroxyzine
Meclizine
Promethazine
Triprolidine
Antiparkinsonian agents
Benztropine
Trixhexyphenidyl
Antispasmodics
Atropine
Belladonna alkaloids
Clidinium chlordiazepoxide
Dicyclomine
Hyoscyamine
Propantheline
Scopolamine
Antithrombotics
Dipyridamole (excludes extended release combination with aspirin)
Ticlopidine
Central alpha blockers
Guanabenz
Guanfacine
Methyldopa
Disopyramide
Nifedipine (immediate release)
Antidepressants
Amitriptyline
Amoxapine
Clomipramine
Desipramine
Imipramine
Nortriptyline
Paroxetine

Protriptyline
Trimipramine
Barbiturates
Amobarbital
Butabarbital
Butalbital
Mephobarbital
Pentobarbital
Phenobarbital
Secobarbital
Benzodiazepines
Alprazolam
Estazolam
Lorazepam
Oxazepam
Temazepam
Triazolam
Clorazepate
Chlordiazepoxide
Clonazepam
Diazepam
Flurazepam
Quazepam
Meprobamate
Nonbenzodiazepine, sedative hypnotics
Eszopiclone
Zolpidem
Zaleplon
Ergoloid mesylates
Isoxsuprine
Desiccated thyroid
Insulin (sliding scale)
Megestrol
Sulfonylureas
Chlorpropamide
Glyburide
Mineral oil (given orally)
Meperidine
NSAIDs (chronic use, given orally)
Aspirin (>325 mg/d)
Diclofenac
Diflunisal
Etodolac
Fenoprofen
Ibuprofen

Ketoprofen
Meclofenamate
Mefenamic acid
Meloxicam
Nabumetone
Naproxen
Oxaprozin
Piroxicam
Sulindac
Tolmetin
Indomethacin
Ketorolac
Pentazocine
Muscle relaxants
Carisoprodol
Chlorzoxazone
Cyclobenzaprine
Metaxalone
Methocarbamol
Orphenadrine