Optimizing Medication History Value in Clinical Encounters with Elderly Patients

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Abstract

Purpose: To develop geriatric-specific algorithms to identify potential issues with medication management for use in electronic prescribing systems, to develop CME modules to teach clinicians about how to use medication information to improve geriatric patient-provider communication, and to test the impact of these interventions.

Scope: The Institute of Medicine (IOM) report entitled "To Err is Human: Building a Safer Health Care System" reinforces the need for optimizing medication use in a population which is associated with polypharmacy and co-morbidities—the elderly population. An expert panel ranked pharmacologic management as the top condition in need of such targeting.

Methods: We developed algorithms to be used in electronic prescribing systems. We also developed four CME modules available on CD or via the website developed for this project. We recruited 34 doctors and randomized 33 to two intervention arms: algorithms in software (n=14) and algorithms in software and opportunity to complete the CME training modules (n=19). We surveyed patients, analyzed audio taped clinical encounters, and tracked electronic prescribing data.

Results: The findings from the physician focus groups indicated that evidenced-based treatment algorithms would be well received by primary care physicians. We learned that we needed to provide alternatives to potentially inappropriate medications to make it easier for physicians to change decisions at the point of prescribing. We found no changes in physician perceptions of electronic prescribing. We also found no differences in the patient perceptions of physician communication. Physicians overrode alerts often, and this did not vary by treatment arm.

Key Words: health information technology; elderly; medication information; electronic prescribing

Final Report

Purpose

E-prescribing with access to electronic medication history at the point of prescribing may assist physicians in more fully understanding adherence issues with older patients, thus promoting partnership with patients and empowering patients to participate in treatment decisions, and allowing patients to negotiate acceptable medication regimens that are more amenable to follow-through. Information regarding medication history provided by community pharmacy chain organizations in real-time, as well as the potential for communication from the pharmacy when a prescription has not been filled is *currently* available in some e-prescribing systems in select geographic locations. Stemming from our previous research, we hypothesized that to optimize improvements in quality of medication management during clinician office visits, clinicians need additional professional development to better use the electronic medication history in the clinical encounter. We also hypothesized that additional clinical informatics must be used in conjunction with the flow of detailed medication history, available via e-prescribing, to help guide and structure the clinician's approach to medication management in ambulatory settings.

The Specific Aims were:

1. To develop geriatric-specific algorithms to identify potential issues with medication management (e.g. polypharmacy, potentially inappropriate medication use, duplicative therapy, non-adherence) using community-pharmacy generated electronic medication history

2. For common issues identified by the algorithms developed in aim 1, to integrate the algorithms into electronic prescribing software *(triggering)*

3. To develop CME modules to teach clinicians how to improve geriatric patient-provider communication relating to medication management with the use of technology *(training)*

4. To test the impact of these interventions on clinician behavior using a randomized controlled trial with twoarms: a) delivery of *triggering* intervention; and b) delivery of *triggering and training* interventions

5. To develop a "tool-kit" of resources that includes developed intervention products for use by providers in ambulatory settings

Scope

This grant was conducted as part of the Ambulatory Care Setting: Improving Quality Through Clinician Use of Health IT initiative. The intervention developed sought to: 1) aid in the evaluation and prioritization of medication management issues (e.g. polypharmacy, non-adherence issues, potentially inappropriate medications) at the point of prescribing; 2) facilitate the incorporation of information regarding medication issues into the clinical encounter; 3) foster clinician-geriatric patient/caregiver communication regarding potential medication management issues; 4) promote the optimal integration of medication-history data at the point of prescribing; 5) assist clinicians in evaluating and monitoring complex medication regimens to assist in identifying, resolving and preventing medication-related problems; and 6) facilitate informed, shared decision-making and monitoring for medication-related problems. We hypothesized that the quality of medication management in clinician office encounters would be improved in physician practices receiving the intervention relative to practices without the intervention.

Background

Over the last century, a dramatic shift has occurred in the age distribution of the general population. By 2020, 16% of the population will be 65 years of age or older, and elderly over 80 years of age are expected to account for 3.7%.[1,2] Accompanying this rise in the elderly population is the increasing use of drug therapy in the management of chronic disease. Drug therapy is the primary approach to managing chronic disease in older adults. Polypharmacy may be the new paradigm for quality drug therapy in the elderly.[3] Over 85% of adults 65 years of age and older use prescription drugs on a regular basis,[4] and 55% of the elderly take three or more drugs on a regular basis.[5] Changing pharmacokinetics and pharmacodynamics[6] and inappropriate drug selection[7-9] can lead to complications in drug therapy, often manifested as an adverse drug event (ADE).

The evidence to support improvements in appropriate medication management in elderly populations is not vast. Studies within North American ambulatory care settings using randomized controlled designs and targeting improvements in appropriate medication use among elderly populations were few and included a multidisciplinary drug regimen review, a computerized decision support system, a geriatric service, and educational interventions. A large study based in an HMO setting using a multifaceted, computerized decision support intervention with or without academic detailing showed no significant decline in inappropriate prescribing.[10] In a study involving 107 clinicians in ambulatory care settings, the rate of new prescriptions for inappropriate drugs declined, although no differences in the discontinuation of inappropriate medications was observed.[11] In an ambulatory care study in Quebec including 266 patients, a drug regimen review by a single interdisciplinary team (2 physicians, 1 pharmacist and 1 nurse) with written recommendations given to clinicians did not significantly alter inappropriate prescribing.[12] In a two year study including nine US primary care physician practices, a geriatric service intervention that included chronic care clinic visits with geriatrician, nurse, and pharmacist resulted in no significant improvements in the prescription of high-risk medications at 12 months. An intervention using a computerized decision support system offered more promise. Two trials that used education-type interventions among Canadian clinicians practicing in ambulatory settings appeared successful.[13,14] Both were very narrow in focus (one on

decreasing prescribing of long acting benzodiazepines; the other on adhering to osteoarthritis guidelines), but achieved change in the targeted prescribing behaviours.

Context

Most outpatient office visits result in prescription of at least one medication.[15] Over 1.3 billion new medications were prescribed during out-patient office visits with an estimated average number of 2.4 prescriptions per medication related office visit. Yet, data from US health maintenance organizations indicate that almost 30% of elderly patients continue to receive at least one potentially inappropriate medication.[16] The prescribing of inappropriate medications to the elderly in HMOs has not improved.

Settings

This study was conducted in physician office practices in the United States where e-prescribing physician software solutions that are certified on the SureScripts network were used.

Participants

Doctors were required to use either DrFirst or Cerner electronic prescribing systems. Doctors had to provide comprehensive care, report having at least 25% of their patient case mix over 65 years of age, and be willing to be randomized to either the triggers and training arm or the triggers only arm.

Incidence

The incidence of adverse drug events has been estimated to be 27.4% amongst community dwelling adults. The financial burden of preventable ADEs among Medicare recipients in the ambulatory setting is estimated to cost at least $887 million dollars per year.

Prevalence

In the US, 12% of the population is at least 65 years of age. Growth of the elderly population will occur in all racial and ethnic groups. The per capita health expenditure is five times higher for those aged 65 and older compared to persons under the age of 65. Elderly persons consume 31% of all medications prescribed.

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Methods

Study Design

Our research was grounded in Donabedian's theoretical framework for patient care evaluation.[17] Donabedian's framework—structure, process, outcome model of quality evaluation—recognizes, and moreover attributes agency to, health care "structures" (which include technology available to providers) and processes (activities involved in the prevention, diagnosis, and treatment) to patient outcomes. We conducted focus groups before launching the randomized trial.

Development of Triggers. We first reviewed the 2003 update of the Beers criteria drugs to identify potentially inappropriate medications (PIM) with all drugs initially being considered.[18] We identified medications that had well accepted concerns associated with their use including limited efficacy or safety concerns. We then conducted an email survey of 7 community pharmacists practicing in Rhode Island and Massachusetts. Three additional pharmacy faculty members with clinical and research expertise in geriatrics and one pharmacy faculty member with expertise in community pharmacy practice also reviewed the list. The pharmacists reviewed the list of 39 PIM from the Beers criteria to identify drugs that were not prescribed at their pharmacies (3 major US chain drug stores). With these data and preliminary analysis of electronic prescribing data, we reduced the list to 15 drugs. An extensive literature search was conducted to provide the basis for making alternative recommendations for PIM. The treatment algorithms were intended to serve as a quick reference for clinical decision-making. The recommendations were discussed by the scientific team, as well as three pharmacists with relevant expertise. We also developed adherence alerts for commonmedications used to treat chronic conditions (e.g. lipid lowering agents, antihypertensive agents and antidiabetic agents).

Integration of Triggers in the Real-Time Electronic Prescribing Software. We attempted to implement the algorithms in two different electronic prescribing software systems: DrFirst and Cerner. We first met with the electronic prescribing software vendors to learn what specific medication data were available, and how the information was captured. The goal was to embed the alerts into the e-prescribing software such that seeing the alerts did not require additional effort for prescribers. The alerts appeared on the main prescribing screen and as such did not require the physicians to push extra buttons to see the alerts. The messages were relevant, concise, and consistent with the software display. This process required several iterations with the research team and the e-prescribing software vendors. We were unable to implement the adherence alerts in the Cerner system owing to the way the electronic medication history data were captured in their system.

Development of the CME Modules. Our multidisciplinary team created 4 evidence-based CMEs that coincided with the development of the alerts for the electronic prescribing software. We first decided on relevant content, and then performed an extensive review of the literature to make sure our training materials were evidence-based. We decided to offer the interventions in both CD format (using Articulate e-learning software) and the Web site (www.geriatricmedsafey.org) because we learned of limitations with broadband width when

testing the website from different computers and locations. The CMEs were reviewed and deemed acceptable for up to 6 Prescribed credit(s) by the American Academy of Family Physicians; 2 conformed to the AAFP criteria for evidence-based CME clinical content. To engage clinicians and make the content more interesting, we developed video vignettes to make specific points. We developed the material in an iterative fashion, getting feedback from clinicians and team members with each pass.

Physician Focus Groups. We conducted two focus group using purposive sampling to identify participants (attendees of the annual meeting of the Rhode Island Academy of Family Physicians (RIAFP) (n=11); DrFirst's RCopia software users from Massachusetts (n=6)). We reached saturation after conducting two focus groups. We prepared a core list of open-ended questions developed after a systematic review of the literature including questions about triggers and algorithms, general knowledge of the Beers criteria drugs, and workflow issues. We conducted a group method of data analysis known as immersion / crystallization.

Data Sources/Collection: Measures

We captured reports of the frequency of the alerts, as well as the extent to which physicians overrode the alerts. We also collected patient surveys before and after the intervention period to capture patient perception of medication related issues with their providers. At baseline and follow-up, we also requested that 5 clinical encounters per physician be audio recorded. We then used the MEDICODE tool to assess the quality of patient-provider interactions about medications. Coders first identified instances of medication discussions within the encounter. The codes classify medication characteristics (name, medication class, and status (active, new, former medication), theme (general information-10 items, knowledge of the drug-10 items, discussion of the prescription-14 items, and effects of the drug-6 items). For each, coders indicated the context of the discussion, themes discussed, specifying who (patient or clinician) contributed to the discussion (individual production, patient alone; individual production, physician alone; dialogue initiated by the patient or dialogue initiated by the physician). Through the evaluation of the quality of the interlocutor participation, dialogical roles were assigned. The coding scheme allowed us to capture the extent of contribution of each party to medication-related discussions during medical encounters. The dialogue ratio of the clinician–patient dyad with regard to each medication content theme was calculated by adding the values of the complementary roles played by the two parties for each instance of discussion of that theme and then by computing the average value for that theme. This average value is then transposed onto a 0–1 scale (monologue: values 0 to <0.5; dialogue: values 0.5-1). The preponderance of initiation measures the most predominant source of initiating on individual medication content themes. It was measured by subtracting the value of the clinician role from the value of the patient role for all instances of discussion of one given medication content theme and then by computing the average value for that medication content theme which can vary from −1 (patient always takes the initiative) to +1(clinician always takes the initiative). A 0 value indicates that both physician and patient took the initiative equally.

IOM Priority Areas

This study addressed the following IOM priority areas: diabetes, hypertension, and medication management.

Limitations

Several limitations of this approach were brought to light by this project. Each is described briefly. *Data streams*: The data streams on which our algorithms ran were not 100% accurate or complete. Thus, we needed to address this caveat with the providers. Additional challenges included recruiting physicians into the study. We ended up needing to engage with two software vendors to reach our target physician recruitment. One of the vendors (Cerner) did not capture medication history in a way that we could actually apply our medication adherence alerts to. The data appeared in a PDF which we could not manipulate. This issue may have diluted the intervention effect. The protocol may have been too burdensome for very busy providers. Engaging clinicians in research remained our biggest problem. As such, we do not know the extent to which our findings are generalizable to all clinical practices.

Results

Principal Findings

From the focus groups, we learned that physicians claimed that that triggers and evidenced-based treatment algorithms incorporated into their electronic medical record system would be useful in their practice. The physicians clearly indicated that the triggers had to be carefully designed to promote efficiency and reduce redundancy. Physicians were frustrated receiving triggers and alerts regarding information that they were well aware of. They also reported that alerts were often repetitive because of the frequency of the condition among patients or because the alert came up every time they saw particular patients. The physicians reported that they did not want to keep getting alerts claiming that they had prescribed inappropriately when in fact they had made a specific decision to treat the patient with a particular drug. We learned from the focus groups that suppressing alerts for renewals of medication combinations that patients were currently taking and tolerating, as well as for alerts related to medications that were used for short-term courses of therapy would be wise. The physicians also indicated that having medication-related triggers on the computer at the time of the visit would aid them in counseling patients who were non-adherent with their medication therapy. The physicians were not specifically aware or knowledgeable of the term, *Beers criteria drugs*, although they recognized that the drugs were older and less commonly prescribed.

Outcomes

We recruited 35 physicians. Two physicians dropped out of the study before completing the baseline protocol. Of the remaining, 19 were randomized to receive the training and 14 received

just the triggers. Among physicians randomized to the triggers and training arm of the study, 94.4% completed all four modules of the training. We observed no differences by treatment arm in the physician survey data. Among the physicians randomized to the training, on average 4 audio recordings were completed and 25 patient surveys. Among physicians randomized to the triggers only, 4.9 audio recordings were completed and 27 patient surveys were completed on average. We observed that overrides to alerts were common and did not vary by treatment arm. The figure below shows the baseline values of the Medicode analysis, as well as follow-up values for physicians in the triggers only arm (yellow circle, no CME) and physicians in the triggers and training arm (red circle, CME). In most cases, the physician was an information provider - with little change observed owing to the intervention. Further, the physician was most likely to initiate the dialogue and this did not change statistically through the intervention period.

Figure 1. Dialogue ration and preponderance of initiation for selected themes
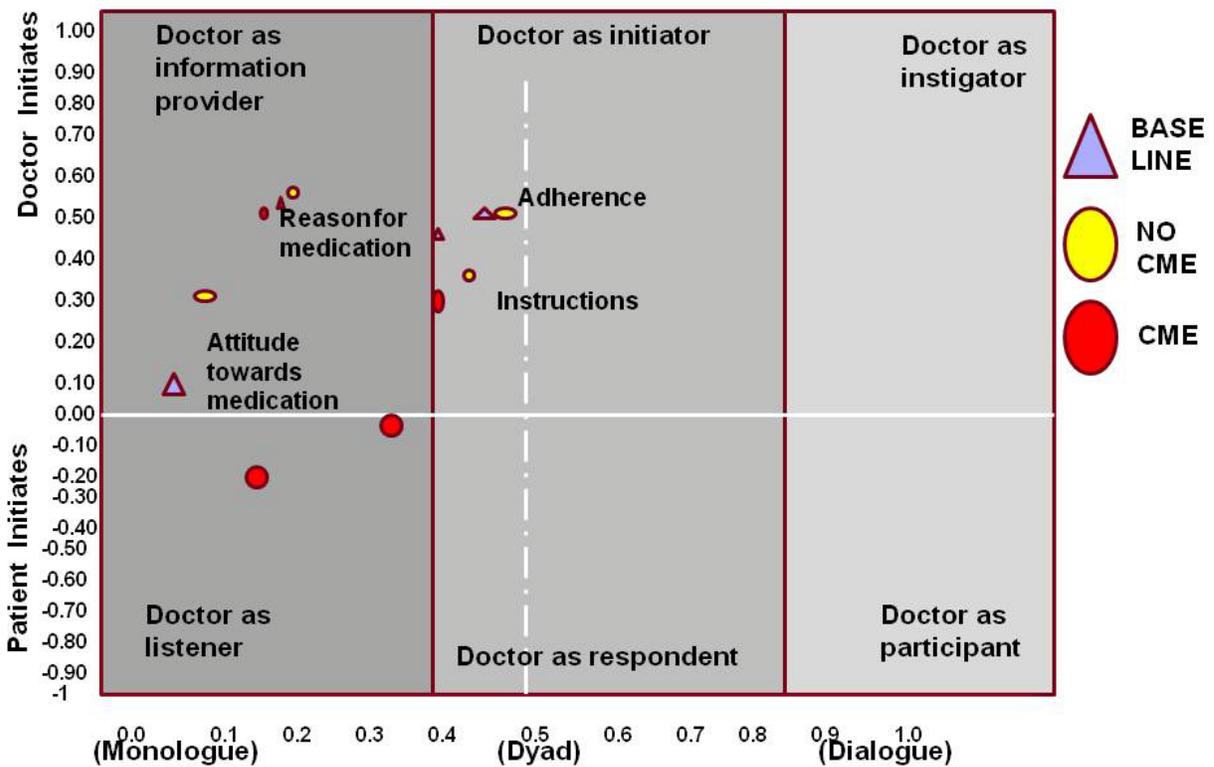
Patient Reported Experience with Care

Only 17% of patients reported seeing just one doctor in the past 12 months. Forty four percent reported taking six or more medications a month. Thirty seven percent reported forgetting to take their medications. Twenty-three percent reported needing help taking their medications. Sixty percent reported that their doctors make them bring all of their medications to their visits, with 58% reporting that the doctor goes over their medications at every visit. Fifty-five percent reported that their doctors go over specific medications not to skip. Seventy-six percent reported their doctors were very courteous. Seventy-one percent reported their doctors

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were very understanding. Sixty-nine percent said their doctors explained things very well. Seventy-seven percent said their doctors were very easy to understand. Seventy-five percent said their doctors listened very well and 67% said the doctor spent as much time with them as they needed. Seventy five percent said they are extremely satisfied with their doctor. Eighty-nine percent said it was very easy to understand what a new medicine was for. Fifty-nine percent of patients indicated that doctors explained at every visit about new medications, 60% reported that doctors asked about problems with medications at every visit, and 56% reported asking about adherence at every visit. Seventy-five percent indicated that their primary doctor knew about all other medications prescribed by other doctors.

Receipt of Appropriate Care for Treatment and Management of the IOM's Priority Areas

Our study was not designed to estimate the receipt of appropriate care for the treatment and management of the IOM priority areas.

Other Outcomes

Analyses of physician survey data (pre versus post) did not reveal any statistically significant changes in the physician's perspectives of the electronic prescribing software. These analyses were likely underpowered to show any differences. Further, analyses of the patient surveys also did not reveal any statistically significant differences in patient perceptions of medication related communication with their providers.

AHRQ Desired Outcomes

This project did not evaluate the extent to which patients were able to access reports of ambulatory care quality and safety for their providers, the percent of eligible patients within the practices that they partner with who have access to their personal health information, including medication therapy, and/or customized decision support, patients' access to and utilization of quality measurement reports of their providers, and the percent of ambulatory clinicians within the practices that they partner with who routinely use measurement tools to evaluate their patient's experience.

Discussion

With respect to the required outcome measures for the RFA, the team was unable to ascertain whether patients are able to access reports of ambulatory care quality and safety for their providers, or the percent of eligible patients within the practices that they partner with who have access to their personal health information, including medication therapy and customized decision support. The team was also unable to determine patients' access to and utilization of quality measurement reports of their providers and the percent of ambulatory clinicians within the practices that they partner with who routinely use measurement tools to evaluate their patient's experience.

Conclusions

Integrating specific alerts relevant to geriatric patients into electronic prescribing is technically feasible. We have the capabilities to provide targeted messages about adherence and potentially inappropriate medications at the point of prescribing in real-time. This project has demonstrated that we are able to integrate the approach into electronic prescribing systems using both medication history, as well as active medications in the electronic medical records. We also demonstrated that evidence-based CMEs relating to prescribing in older adults are valued and useful to practicing clinicians. Offering multiple modalities for the delivery of the CMEs increased the likelihood of CME completion. We found that integrating triggers did not change the patient perception of communication with their clinicians, nor did it significantly change the provider perceptions of their e-prescribing software. We also found that completion of the evidence-based CMEs did not reduce the common occurrence of over-riding the alerts.

Significance

Electronic prescribing technically is the direct computer-to-computer transmission of prescriptions from physician office to community pharmacy. On January 1, 2006, the Medicare Modernization Act (MMA) initiated "Part D" of the Medicare program, which provides coverage for prescription drugs through private insurance plans. While e-prescribing is not a requirement of the Medicare Prescription Drug, Improvement and Modernization Act of 2003 (MMA),[19] stipulations included in Section 1860D-4(e) of the Social Security Act require that prescriptions transmitted electronically comply with final uniform standards adopted by the Secretary under an electronic prescription drug program. E-prescribing adoption is increasing in the US owing to the Medicare Modernization Act of 2004.[20]

Implications

Electronic prescribing has potential to both enhance and interfere with clinician-patient communication. On the positive side, e-prescribing can provide clinicians with information for patient education, accurate medication history information, information about cost and insurance coverage, and information about whether patients pick up their medicines so that a conversation about barriers and solutions to adherence problems may ensue. Although e-prescribing provides the potential for greater information at the point of prescribing, providers may need to be trained to both access and use this information effectively to realize hypothesized improvements in patient-centered medication management. Further, in the absence of e-prescribing software, clinicians lack easily accessible information about insurance coverage. Theoretically, the availability of formulary and benefit information at the point of prescribing may stimulate prescription cost discussions between patients and providers. Although e-prescribing may not increase the frequency of communication, it may prompt specific kinds of communication while enhancing the quality of communication based on real-time detailed drug information. Yet, the introduction of computer hardware (hand-held, portable or desk top) into the exam room may become a barrier to effective communication, interfering with patient provider eye contact and interpersonal connection. Although computer use associated with electronic medical records reportedly leads to more information exchange, more education, and more counseling,[21] the

extent to which the hypothesized potential of e-prescribing in offering opportunities for earlier and enhanced clinician-patient communication about their medication use has not been evaluated.

Inclusion of AHRQ Priority Populations

Our project specifically sought to address one of AHRQ's priority populations. The intervention sought to improve prescribing in elderly patients. The CME modules were developed to train physician's specifically about prescribing related issues for elderly patients. We also surveyed elderly patients about their perceptions of communication about medications with their providers.

Table 1. Inclusion enrollment report

Study Title:	Optimizing Medication History Value in Clinical Encounters with Elderly Patients
Total Enrollment:	1353
Protocol Number:	HM11648
Grant Number:	AHRQ 1R18 HS017150

Part A. Total enrollment report: number of subjects enrolled to date (cumulative) by ethnicity and race

	Females	Males	Unknown or Not Reported	Total
Ethnic Category: Hispanic or Latino	25	24	0	49
Ethnic Category: Not Hispanic or Latino	701	445	19	1165
Ethnic Category: Unknown (individuals not reporting ethnicity)	75	43	21	139
Ethnic Category: Total of All Subjects*	801	512	40	1353
Racial Categories: American Indian/Alaska Native	6	5	0	11
Racial Categories: Asian	5	8	0	13
Racial Categories: Native Hawaiian or Other Pacific Islander	1	2	0	3
Racial Categories: Black or African American	266	101	9	376
Racial Categories: White	460	350	12	822
Racial Categories: More Than One Race	0	0	0	0
Racial Categories: Unknown or Not Reported	63	46	19	128
Racial Categories: Total of All Subjects*	801	512	40	1353

Part B. Hispanic enrollment report: number of Hispanics or Latinos enrolled to date (cumulative)

	Females	Males	Unknown or Not Reported	Total
Racial Categories: American Indian or Alaska Native	0	0	0	
Racial Categories: Asian	0	0	0	
Racial Categories: Native Hawaiian or Other Pacific Islander	1	0	0	1
Racial Categories: Black or African American	3	3	0	6
Racial Categories: White	14	17	0	31
Racial Categories: More Than One Race	0	0	0	
Racial Categories: Unknown or Not Reported	7	4	0	11
Racial Categories: Total of Hispanics or Latinos**	25	24		49

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List of Publications and Products

Website

www.geriatricmedsafety.org

CME Materials

Available on request.

Publications

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