



DIGITAL ACCESS TO SCHOLARSHIP AT HARVARD

Improving Sedative-Hypnotic Prescribing in Older Hospitalized Patients: Provider-Perceived Benefits and Barriers of a Computer-Based Reminder

The Harvard community has made this article openly available. [Please share](#) how this access benefits you. Your story matters.

Citation	Agostini, Joseph V., John Concato, and Sharon Inouye. 2007. Improving sedative-hypnotic prescribing in older hospitalized patients: Provider-perceived benefits and barriers of a computer-based reminder. <i>Journal of General Internal Medicine</i> 23(Suppl 1): 32-36.
Published Version	doi:10.1007/s11606-007-0238-9
Accessed	February 19, 2015 7:11:20 AM EST
Citable Link	http://nrs.harvard.edu/urn-3:HUL.InstRepos:4728500
Terms of Use	This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA

(Article begins on next page)

BRIEF REPORTS

Improving Sedative-Hypnotic Prescribing in Older Hospitalized Patients: Provider-Perceived Benefits and Barriers of a Computer-Based Reminder

Joseph V. Agostini, MD^{1,2}, John Concato, MD, MS, MPH^{1,2}, and Sharon K. Inouye, MD, MPH³

¹Clinical Epidemiology Research Center 151B, VA Connecticut Healthcare System, 950 Campbell Avenue, West Haven, CT 06516, USA;

²Department of Internal Medicine, Yale University School of Medicine, New Haven, CT, USA; ³Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Aging Brain Center, Hebrew SeniorLife, Boston, MA, USA.

BACKGROUND: Older adults are commonly prescribed sedative-hypnotic (SH) medications when hospitalized, yet these drugs are associated with important adverse effects such as falls and delirium.

OBJECTIVE: To identify provider-perceived benefits or barriers of a computer-based reminder regarding appropriate use of SH medications.

DESIGN: Qualitative study using semi-structured interviews.

PARTICIPANTS AND SETTING: Thirty-six house staff physicians at a university hospital.

MEASUREMENTS: Information was collected regarding the experiences of prescribing an SH using a computer order entry system with a reminder intervention. Clinicians were asked about their perceptions of the reminder and what they found most and least useful about it. Responses were analyzed using grounded theory methodology.

RESULTS: The 36 participants (including 29 interns) had prescribed an SH medication for a hospitalized patient over age 65 years. Three themes associated with benefits of a computer reminder were identified: increasing awareness of safety, including risk of delirium, falls, and general patient safety risks; usefulness of information technology; and the value of the educational content, including geriatric pharmacology review and nonpharmacologic treatment options. Barriers included the demands of the reminder with regard to time needed to read the reminder, the role of clinician experience with regard to preserving clinical autonomy, and the information content of the reminder, including its being too basic or not relevant for a particular patient. The mean satisfaction rating for the reminder was 8.5 (± 0.9 SD), with 10 indicating high satisfaction.

CONCLUSIONS: Improving decision support systems involves an understanding of how clinicians respond to real-time strategies encouraging better prescribing.

KEY WORDS: point-of-care systems; medical order entry systems; sedatives and hypnotics; aged; computers.

J Gen Intern Med 23(Suppl 1):32-6

DOI: 10.1007/s11606-007-0238-9

© Society of General Internal Medicine 2007

BACKGROUND

Sedative-hypnotic (SH) medication use in older adults is associated with potentially deleterious adverse effects, including increased risk of delirium, falls, over-sedation, and carry-over effects.¹⁻³ Despite these risks, one third or more of older patients are prescribed an SH drug during hospitalization.^{4,5} Use of these drugs is predominantly elective, based on the discretion of the prescribing physician, although SH drugs are not recommended as first-line therapies for insomnia in older adults.^{6,7}

Computerized systems could improve the quality of health care by providing data to physicians at the point of clinical care,^{8,9} and increasing the use of such systems has been shown to improve the safety of drug prescribing behavior.¹⁰⁻¹² Computer-based reminders, in particular, may play an important role to augment other ongoing quality improvement efforts to improve prescribing, such as clinical pharmacist consultations. We conducted a qualitative study to explore how clinicians made their prescribing decisions and to determine attitudes towards a computer-based reminder in routine practice that has been previously demonstrated¹³ to be effective for reducing inappropriate SH drug use.

METHODS

Description of original study A pre/post-intervention study¹³ was conducted to develop and evaluate a feasible point-of-care computer-based reminder that (1) provided a brief educational review of potential adverse effects of SH medications and (2) offered recommendations for a nonpharmacologic approach for insomnia in older adults. The reminder was incorporated

within an existing computer system (Eclipsys, Boca Raton, FL) at a large academic medical center (Yale-New Haven Hospital) that requires electronic entry of all laboratory tests, medications, and other patient care orders. The reminder was designed over 1 year, following input from several constituencies, including the pharmacy staff, hospital computer programmers, and Internal Medicine faculty.

When diphenhydramine or diazepam was ordered, a screen appeared that sought confirmation whether the indication for the order was for sleep. If so, a text reminder appeared on a new screen with several statements: "In older patients, confusion, delirium, falls, and ineffective sleep are associated with SHs. Their use is not recommended." The reminder then notified the physician of the patient's age with the statement: "Your patient is [age inserted] years old." The same screen also highlighted a nonpharmacologic treatment (i.e., a warm beverage) for insomnia. If diazepam or diphenhydramine were being ordered, and the nonpharmacologic treatment was not selected, then lorazepam or trazodone was suggested as more appropriate alternatives (with relatively fewer adverse effects). Alternatively, a prescriber could "back out" of the process and order no medication or continue to order the original medication selected, e.g., diphenhydramine.

In 95% of prescribing episodes during the year after activation of the computer reminder, "safer" ordering was observed, defined as a nonpharmacologic intervention or an order for lorazepam or trazodone (rather than for diphenhydramine or diazepam). In 5% of cases, users continued to order either diphenhydramine or diazepam for sleep in their older patients. (A 1-year follow-up period was chosen to assess a meaningful response because it was hypothesized that clinicians may be more likely to respond to a reminder in the first weeks or months of its use and "wane" thereafter). Overall, during the pre-intervention period, prescriptions for one or more SHs were ordered for 2,208 of 12,356 (18%) patients aged 65 years and older. In contrast, the combined prescription rate for the four drugs of interest during the post-intervention year was 1,832 of 12,153 (15%) patients, an 18% risk reduction ($p < 0.001$) in SH orders.

Current study After the computer-based reminder had been in place for 12 months, we used semi-structured interviews to collect data from house staff physicians on the medical or surgical service who, after having viewed a computer-based reminder, prescribed an SH medication to a patient aged 65 years and older. The interviews were conducted in person or over the telephone, on the morning after an SH was ordered (and after the reminder screen was recently viewed). Interviews were conducted by the principal investigator (JVA) and lasted 10 minutes or less. The first several interviews were audiotaped, with the interviewer also recording data on pencil and paper; all subsequent interviews were recorded on paper after the comparability of the data collection methods was verified. Comments were transcribed during the interview and verified for accuracy after the interview was completed.

Data collection included demographic and prescribing data (e.g., level of training, whether the clinician was providing cross-coverage), as well as clinicians' perspectives regarding barriers and facilitators to improving SH prescribing. The interview guide was focused on the reasons for prescription of an SH, clinician knowledge of SH use before admission, the

value of the reminder, and opportunities to improve the computer ordering process. The interview questions were semi-structured regarding participants' perceptions of the reminder and were followed with open-ended questions and probes (e.g., "Any other [benefits, barriers] of the reminder?"). In addition, satisfaction with the educational reminder was rated using a score from 0 to 10, with higher scores indicating a greater degree of satisfaction. Participants were no longer recruited when no new themes were elicited during interviews (i.e., the point of thematic saturation).

The institutional review board of the Yale School of Medicine approved the protocol. Themes were identified by open coding of the text relating to benefits and barriers of the reminder, which were then compared within and across interviews according to the constant comparative method of analysis.¹⁴ Codes were combined and synthesized into broader, recurrent themes based on consensus of two investigators (JVA, SKI) with further input from a third investigator (JC) producing the final version.

RESULTS

Thirty-six clinicians who had prescribed an SH were approached, and all agreed to be interviewed. Twenty-nine (81%) were interns in their first postgraduate year, and 23 (64%) were providing cross-coverage for a patient (Table 1). The most common indication for prescribing an SH was a patient requesting a sleeping medication; most physicians who ordered an SH did not know whether the patient had been taking the same drug at home. All participants acknowledged having read the reminder screen. Clinicians rated their overall satisfaction with the reminder with a mean score of 8.5 (± 0.9 SD), with 10 indicating high satisfaction. Scores did not differ based on postgraduate year of training or cross-coverage status of the physician (data not shown).

Benefits

Three major themes for the benefits of the reminder system were identified (Table 2): awareness of patient safety risks

Table 1. Clinician and Prescribing Characteristics for the 36 Participating Physicians

Characteristic	N	%
House staff level		
Postgraduate year 1	29	80.6
Postgraduate year 2 or higher	7	19.4
Providing cross-coverage for patient	23	63.9
Reason for sedative-hypnotic prescription ^a		
Patient requested	22	61.1
Nurse requested	11	30.6
No reason	2	5.6
Other reason	12	33.3
Patient prescribed the same sedative-hypnotic used at home		
Don't know	29	80.6
Yes	3	8.3
No	4	11.1
Usefulness of the intervention (0, low; 10, high)		
Mean \pm SD	8.5 \pm 0.9	

^aSome participants cited more than one reason.

Table 2. Important Themes Relating to Benefits of and Barriers to use of a Computer-Based Reminder

Themes
Benefits
Heightened awareness of patient safety risks
Delirium
Falls
General patient safety risks
Usefulness of computers, information technology
Value of educational content of the reminder
Geriatric pharmacology review
Nonpharmacologic treatment options
Barriers
Demands of reading the reminder
The role of clinician experience
Information content of the reminder

(subthemes of delirium, falls, and general patient safety); usefulness of computer technology; and clinical value of receiving reminder information (subthemes of benefits of geriatric pharmacology review and benefits of a nonpharmacologic sleep treatment). The range of responses was similar based on level of training and whether the patient was being cross-covered (data not shown).

Awareness of Patient Safety Risks

Risk of delirium Clinicians commonly mentioned the value of recognizing risks of acute mental status changes and cognitive decline in older patients given SHs. Quotes included “delirious patients are difficult to manage,” “delirium is so harmful that it’s good to know,” and “no one likes to have to deal with...or get called for delirious patients.”

Risk of falls House staff recognized that falls are an important problem in hospitalized patients and reported that the computer reminder was helpful because “falls increase [length of] hospital stays,” and “I don’t want my patient to fall because he’s [already] unsteady now.”

General patient safety risks The reminder was reportedly useful in prompting clinicians to rethink indications for ordering a medication for sleep difficulty because of the potential patient safety risk. One participant noted that when called with an SH request, “Usually I just order something, now I thought about it.” Other quotes include “first do no harm, that is what we are taught,” and “if giving drugs makes them [older patients] stay longer due to complications, that’s bad for the patient and everyone.”

Usefulness of Computer Technology House staff discussed the benefits of having an available aide in the form of the computer. Quotations include “computers *should* be used to help doctors,” “I like using computers to help doctors be safer,” “I’m surprised that there aren’t more of these things [computerized reminders],” and “it makes me rethink in the middle of the night when I’m called [...]”

Value of Educational Content of the Reminder

Geriatrics pharmacology review Most participants reported that reviewing appropriate prescribing criteria for geriatric

patients was an important component of the computerized reminder. Quotes include “it reminded me of sensitivity of old patients to drugs,” “it made me lower the dosage of what I usually prescribe,” and “it made me think about the patient’s age and drug use.” One participant noted, “I called the nurse back to ask whether the patient took a sleeper [sleeping medication] at home,” after learning about the appropriateness of SHs in older patients, and another reported, “I forget about how geriatrics patients react to medications; it’s good to remind me.”

Nonpharmacologic treatment options Because the reminder included a prominent opportunity to order a nonpharmacologic treatment (warm beverage), clinicians had a feasible and easy method to bypass the use of traditional SH drugs. For example, “the tea idea is cool (although I didn’t do it),” or “I never used tea or warm milk before for sleep, although people do at home.”

Barriers

Three main barriers to appropriate prescribing (Table 2) were demands of reading the reminder; the role of clinical experience in deciding whether to prescribe an SH; and the information content of the reminder.

Demands of reading the reminder Clinicians’ concerns about the reminder generally focused on the time it took to read and the presence of an additional screen to review while prescribing. For example, the reminder was “just another screen to scroll through,” “takes too long to go through at first,” “clicking through screens was burdensome,” and “[it] slows me down.”

Role of clinical experience Some participants commented on the possible intrusiveness of the reminder in a general context and the erosion of clinicians’ prescribing autonomy. Comments included “if the patient needs sleep I can decide whether to order a drug or not,” and the reminder screen “makes [him/her] feel watched.” One participant felt that “clinicians should know side effects—don’t give a reminder for everything.”

Information content of the reminder In a more specific context, some clinicians disagreed with the actual content of the reminder itself. These clinicians felt the reminder was “too simplistic,” or “the patient is already on [diphenhydramine] at home and has no side effects.” Because lorazepam was a recommended alternative medication to diphenhydramine and diazepam, some participants felt the reminder was incorrect: “I thought lorazepam caused delirium also.” One SH prescriber noted that “withdrawing sleep medications might harm the patient—screen didn’t say that.”

DISCUSSION

Although a computerized reminder system elicited both positive and negative feedback from participating house staff, they rated it highly overall, with a mean satisfaction rating of 8.5 on a 10-point scale. The use of computer-based decision support systems is likely to expand in the future and represents an

important tool in improving patient safety during the drug ordering process. The high degree of satisfaction with this system by the users holds substantial promise for designing future systems.

Our findings also confirm the results of several studies describing the effects of computer-based behavior changes. Although the educational content of the reminder tended to simplify the message, previous investigators have noted that directed messages received in real time (or at the point of order entry) work best.¹⁵ Some clinicians complained that the reminder was an additional screen to read at the time of ordering, suggesting that methods to incorporate the reminder into the workflow of the order entry process would be important to explore. One study using decision support tools in geriatrics found that clinical prescribing improved when recommended dosages and drug selections for psychoactive medications were seamlessly integrated into the ordering process.¹⁶ Few other studies, however, have reported on the use of computerized reminders in geriatrics.

A major strength of this study is the open-ended structure of the interview guide, which permitted participants to report both likes and dislikes of the reminder. Because participants had recently viewed the screen overnight while ordering an SH drug, we minimized recall bias. In addition, we interviewed house staff who write the majority of orders in the hospital and thus were intimately familiar with the existing strengths and weaknesses of the computerized order entry system. Responses of providers who prescribed an SH could not be compared to providers who were dissuaded by the reminder from ordering an SH because the latter group did not "leave information" in the computer records in the absence of a prescription.

A limitation of the study was that it was a convenience sample drawn from the staff of one teaching hospital with a large geriatrics program and with other ongoing geriatrics interventions, such as the Yale Hospital Elder Life Program.¹⁷ Most participants were house staff, which may limit generalizability of the results to all physicians, but we assessed the physicians who actually order the SH drugs in our hospital, in real time. Different perceptions of the utility of computer-based reminders may exist among various providers (e.g., community-based physicians) and in various settings (e.g., in nonteaching hospitals), such as lower levels of satisfaction or greater perceived barriers if attending physicians are the main prescribers. We also did not explore benefits and barriers from the perspectives of nurses, who often play a role in the decision to prescribe an SH. Whether the perceived benefits and barriers to use of this computer-based reminder are generalizable to other medication classes such as antibiotics or anticoagulants is unknown. In addition, the qualitative focus of this work does not yield estimates of the prevalence of specific responses regarding the benefits and barriers of the reminder, but rather reports on the range of answers that were elicited (until thematic saturation was reached).

Future iterations of this computer-based reminder should build on the findings of the current study and incorporate the point-of-care advantages of information technology used at the time of medication prescription. These efforts may complement overall quality improvement efforts, by aiming to improve outcomes of care, decrease medication errors, and minimize unnecessary prescribing; and doing so at minimal cost when computer systems are already in place.

The findings of this study also suggest several opportunities for improving the SH reminder in this study and perhaps other similar reminders. Linkages to medical literature and data supporting the recommendations described in the reminder may facilitate greater trust in the information content of the reminder, at least for those who seek more empirical evidence. Greater customization of the recommendation based on patients' real-time comorbidities and concomitantly prescribed drugs, or incorporation of a patient's cognitive status (e.g., presence of delirium or dementia symptoms), might be helpful to enhance clinicians' decisions to decide whether to prescribe an SH, yet still preserve their clinical autonomy. Finally, making the reminder screen(s) as short and focused as possible may address concerns about the time required to read the reminder itself. The computer ordering system in use at Yale-New Haven Hospital already includes required electronic ordering for all inpatient orders, and consequently, reminders should fit reasonably into the workflow of patient care. Other health care organizations, such as the Veterans Affairs Healthcare System, use reminders even more widely in inpatient and outpatient settings.¹⁸ Accordingly, building on the strengths and weaknesses of computer reminders in a variety of health care environments may enhance their overall usefulness as part of long-term quality improvement strategies.

In summary, understanding provider-perceived benefits and barriers to the use of information technology in the form of a computer-based reminder may facilitate better methods to ensure that vulnerable older patients are exposed to the safest and most rational use of medications.

Acknowledgments: This research was supported by a Merck/American Federation for Aging Research Award in Geriatric Clinical Pharmacology and a VA Health Services Research Career Development Award (JVA). This work is supported in part by Grant K24AG00949 (SKI) and the Claude D. Pepper Older Americans Independence Center at Yale University School of Medicine (P30AG21342) from the National Institute on Aging. Dr. Inouye is supported in part by grant R21AG025193 from the National Institute on Aging and by the Milton and Shirley F. Levy Family Chair. The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs.

Conflict of Interest: None disclosed.

Corresponding Author: Joseph V. Agostini, MD; Clinical Epidemiology Research Center 151B, VA Connecticut Healthcare System, 950 Campbell Avenue, West Haven, CT 06516, USA (e-mail: joseph.agostini@yale.edu).

REFERENCES

1. **Leipzig RM, Cumming RG, Tinetti ME.** Drugs and falls in older people: a systematic review and meta-analysis: I. Psychotropic drugs. *J Am Geriatr Soc.* 1999;47:30-9.
2. **Gray SL, Lai KV, Larson EB.** Drug-induced cognition disorders in the elderly: incidence, prevention and management. *Drug Saf.* 1999;21:101-22.
3. **Gurwitz JH, Field TS, Avorn J, et al.** Incidence and preventability of adverse drug events in nursing homes. *Am J Med.* 2000;109:87-94.
4. **O'Reilly R, Rusnak C.** The use of sedative-hypnotic drugs in a university teaching hospital. *CMAJ.* 1990;142:585-9.

5. **Meissner HH, Riemer A, Santiago SM, et al.** Failure of physician documentation of sleep complaints in hospitalized patients. *West J Med.* 1998;169:146–9.
6. **Lenhart SE, Buysse DJ.** Treatment of insomnia in hospitalized patients. *Ann Pharmacother.* 2004;35:1449–57.
7. **McDowell JA, Mion LC, Lydon TJ, Inouye SK.** A nonpharmacologic sleep protocol for hospitalized older patients. *J Am Geriatr Soc.* 1998;46:700–5.
8. **Shea S, DuMouchel W, Bahamonde L.** A meta-analysis of 16 randomized controlled trials to evaluate computer-based clinical reminder systems for preventive care in the ambulatory setting. *J Am Med Inform Assoc.* 1996;3:399–409.
9. Institute of Medicine. *Crossing the quality chasm: a new health system for the 21st century.* Washington, DC: National Academy Press; 2001.
10. **Evans RS, Pestotnik SL, Classen DC, et al.** A computer-assisted management program for antibiotics and other antiinfective agents. *N Engl J Med.* 1998;338:232–8.
11. **Bates DW, Teich JM, Merchia PR, Schmiz JL, Kuperman GJ, Spurr CD.** Effects of computerized physician order entry on prescribing practices. *Arch Intern Med.* 2000;160:2741–7.
12. **Chertow GM, Lee J, Kuperman GJ, et al.** Guided medication dosing for inpatients with renal insufficiency. *JAMA.* 2001;286:2839–44.
13. **Agostini JV, Zhang Y, Inouye SK.** Use of a computer-based reminder to improve sedative-hypnotic prescribing in older hospitalized patients. *J Am Geriatr Soc.* 2007;55:43–8.
14. **Strauss A, Corbin JM.** *Basics of qualitative research. Techniques and procedures for developing grounded theory.* Thousand Oaks, CA: Sage Publications; 1998.
15. **Bates DW, Kuperman GJ, Wang S, et al.** Ten commandments for effective clinical decision support: making the practice of evidence-based medicine a reality. *J Am Med Inform Assoc.* 2003;10:523–30.
16. **Peterson JF, Kuperman GJ, Shek C, Patel M, Avorn J, Bates DW.** Guided prescription of psychotropic medications for geriatric inpatients. *Arch Intern Med.* 2005;165:802–7.
17. **Inouye SK, Bogardus ST Jr, Baker DI, Leo-Summers L, Cooney LM.** The Hospital Elder Life Program: a model of care to prevent cognitive and functional decline in older hospitalized patients. Hospital Elder Life Program. *J Am Geriatr Soc.* 2000;48:1697–706.
18. **Demakis JG, Beauchamp C, Cull WLR, et al.** Improving residents' compliance with standards of ambulatory care: results from the VA Cooperative Study on Computerized Reminders. *JAMA* 2000;284:1411–6.