Digital Prescribing Reduces Errors on Many Levels

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WASHINGTON — Computerized prescribing could greatly reduce the number of medical errors, especially when it comes to adverse drug events, David Bates, M.D., said at a consensus conference sponsored by the American Association of Clinical Endocrinologists.

In his own health care research at Brigham and Women's Hospital in Boston, where he is chief of general medicine, Dr. Bates and colleagues looked at more than 10,000 medication orders and found 530 errors, an average of 1.4 per hospital admission. Included among those were 35 potential adverse drug events and 5 preventable adverse drug events.

These data suggest that "about 1 in 100 medication errors results in an [adverse drug event], and 7 in 100 have the potential to do so," said Dr. Bates, who also serves as medical director of clinical and quality analysis at Partners HealthCare, in Boston.

When do the errors occur? In another study, Dr. Bates and colleagues found that about half of prescribing errors (49%) occur at the ordering stage, followed by 26% at the administration stage, 14% at the dispensing stage, and 11% at the transcribing stage.

Although transcribing accounted for the smallest percentage of errors, it can still be a big problem. Dr. Bates showed a sample of a handwritten prescription for Avandia (rosiglitazone) that was mistakenly dispensed as Coumadin (warfarin). Such problems could be reduced or eliminated by the use of prescribing software, Dr. Bates said.

Computerized prescribing is the 'single most powerful intervention for improving medication safety.'

DR. BATES

Ambulatory care settings are particularly ripe for prescribing errors, for several reasons, he said. "There is a long feedback loop, because often you don't hear from patients for a long time, and there are limited resources and redundancy," he said. In addition, "the average primary care encounter is 12 minutes, and the average time to the first interruption is 18 seconds. And 75% of patients leave with unanswered questions."

He cited a study by Tejal K. Gandhi, M.D., and colleagues showing that of 661 outpatients, 162 (25%) had adverse drug events, for a total of 181 events. Of those, 13% were serious and 11% were preventable (N. Engl. J. Med. 2003;348:1556-64).

Computerized prescribing systems can reduce errors in several ways, Dr. Bates said:

- ▶ Preventing errors from occurring in the first place.
- ▶ Catching them more quickly after they have occurred.
- ▶ Tracking the errors themselves.
- ▶ Providing feedback.

Dr. Bates called computerized prescribing the "single most powerful intervention for improving medication safety to date" and noted that errors could be reduced by more than 80% in some situations.

However, computerized prescribing will only work if the people using it follow all the rules, he continued. For example, at Brigham and Women's Hospital, researchers looked at more than 7,700 drug allergy alerts that were issued by the computer over a 3-month period in 2002 and found that the alerts were overridden 80% of the time.

This may have been because only 6% of the alerts were triggered by an exact match between the drug ordered and a drug on the allergy list, Dr. Bates said.

In addition to drug allergies, a good computerized prescribing system should also alert physicians to drug-drug interactions, renal dosing issues, geriatric dosing issues, and dose ceilings, according to Dr. Bates. The system should also have a way to alert physicians to potentially fatal interactions.

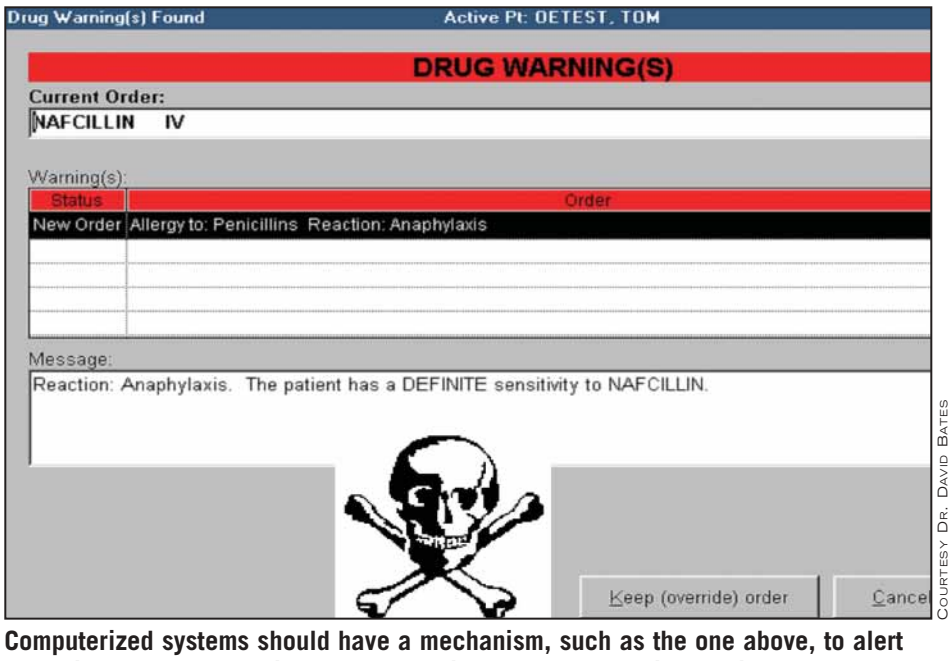
As to the future of computerized prescribing, Dr. Bates predicted a time when all physician drug orders would be sent electronically to the pharmacy, where the pharmacist would review them.

One day simple orders might be filled and dispensed from an ATM-like machine, he added.

In addition to all the safety issues, there is another reason physicians might want to consider electronic prescribing: More payers are starting to demand it, Dr. Bates said.

As an example, he cited the Leapfrog Group, an organization of 160 companies seeking to improve health care quality for their employees.

Leapfrog already uses computerized prescribing as a quality measure in the inpatient setting and is planning to include outpatient computerized prescribing in a new set of measures due out in 2006, Dr. Bates said. ■



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Computerized systems should have a mechanism, such as the one above, to alert prescribers about potentially fatal allergies and drug-drug interactions.

and a one-year study of once weekly FOSAMAX® (alendronate sodium) 70 mg) the rates of discontinuation of therapy due to any clinical adverse experience were 2.7% for FOSAMAX 10 mg/day vs. 10.5% for placebo, and 6.4% for once weekly FOSAMAX 70 mg vs. 8.6% for placebo. The adverse experiences considered by the investigators as possibly, probably, or definitely drug related in B2% of patients treated with either FOSAMAX or placebo are presented in the following table.

Osteoporosis Studies in Men
Adverse Experiences Considered Possibly, Probably, or Definitely Drug Related by the Investigators and Reported in ≥2% of Patients

	Two-year Study		One-year Study	
	FOSAMAX 10 mg/day % (n=146)	Placebo % (n=95)	Once Weekly FOSAMAX 70 mg % (n=109)	Placebo % (n=58)
Gastrointestinal				
acid regurgitation	4.1	3.2	0.0	0.0
flatulence	4.1	1.1	0.0	0.0
gastroesophageal reflux disease	0.7	3.2	2.8	0.0
dyspepsia	3.4	0.0	2.8	1.7
diarrhea	1.4	1.1	2.8	0.0
abdominal pain	2.1	1.1	0.9	3.4
nausea	2.1	0.0	0.0	0.0

Prevention of osteoporosis in postmenopausal women
The safety of FOSAMAX tablets 5 mg/day in postmenopausal women 40-60 years of age has been evaluated in three double-blind, placebo-controlled studies involving over 1,400 patients randomized to receive FOSAMAX for either two or three years. In these studies the overall safety profiles of FOSAMAX 5 mg/day and placebo were similar. Discontinuation of therapy due to any clinical adverse experience occurred in 7.5% of 642 patients treated with FOSAMAX 5 mg/day and 5.7% of 648 patients treated with placebo.
In a one-year, double-blind, multicenter study, the overall safety and tolerability profiles of once weekly FOSAMAX 35 mg and FOSAMAX 5 mg daily were similar.
The adverse experiences from these studies considered by the investigators as possibly, probably, or definitely drug related in B1% of patients treated with either once weekly FOSAMAX 35 mg, FOSAMAX 5 mg/day or placebo are presented in the following table.

Osteoporosis Prevention Studies in Postmenopausal Women
Adverse Experiences Considered Possibly, Probably, or Definitely Drug Related by the Investigators and Reported in ≥1% of Patients

	Two/Three-Year Studies		One-Year Study	
	FOSAMAX 5 mg/day % (n=642)	Placebo % (n=648)	FOSAMAX 5 mg/day % (n=361)	Once Weekly FOSAMAX 35 mg % (n=362)
Gastrointestinal				
dyspepsia	1.9	1.4	2.2	1.7
abdominal pain	1.7	3.4	4.2	2.2
acid regurgitation	1.4	2.5	4.2	4.7
nausea	1.4	1.4	2.5	1.4
diarrhea	1.1	1.7	1.1	0.6
constipation	0.9	0.5	1.7	0.3
abdominal distention	0.2	0.3	1.4	1.1
Musculoskeletal				
musculoskeletal (bone, muscle or joint) pain	0.8	0.9	1.9	2.2

Concomitant use with estrogen/hormone replacement therapy
In two studies (of one and two years' duration) of postmenopausal osteoporotic women (total: n=853), the safety and tolerability profile of combined treatment with FOSAMAX 10 mg once daily and estrogen ± progestin (n=354) was consistent with those of the individual treatments.
Treatment of glucocorticoid-induced osteoporosis
In two, one-year, placebo-controlled, double-blind, multicenter studies in patients receiving glucocorticoid treatment, the overall safety and tolerability profiles of FOSAMAX 5 and 10 mg/day were generally similar to that of placebo. The adverse experiences considered by the investigators as possibly, probably, or definitely drug related in B1% of patients treated with either FOSAMAX 10 mg/day (n=157), FOSAMAX 5 mg/day (n=161), or placebo (n=159), respectively, were: *Gastrointestinal:* abdominal pain (3.2%; 1.9%; 0.0%), acid regurgitation (2.5%; 1.9%; 1.3%), constipation (1.3%; 0.6%; 0.0%), melena (1.3%; 0.0%; 0.0%), nausea (0.6%; 1.2%; 0.6%), diarrhea (0.0%; 0.0%; 1.3%); *Nervous System/Psychiatric:* headache (0.6%; 0.0%; 1.3%).
The overall safety and tolerability profile in the glucocorticoid-induced osteoporosis population that continued therapy for the second year of the studies (FOSAMAX: n=147) was consistent with that observed in the first year.
Paget's disease of bone
In clinical studies (osteoporosis and Paget's disease), adverse experiences reported in 175 patients taking FOSAMAX 40 mg/day for 3-12 months were similar to those in postmenopausal women treated with FOSAMAX 10 mg/day. However, there was an apparent increased incidence of upper gastrointestinal adverse experiences in patients taking FOSAMAX 40 mg/day (17.7% FOSAMAX vs. 10.2% placebo). One case of esophagitis and two cases of gastritis resulted in discontinuation of treatment.
Additionally, musculoskeletal (bone, muscle or joint) pain, which has been described in patients with Paget's disease treated with other bisphosphonates, was considered by the investigators as possibly, probably, or definitely drug related in approximately 6% of patients treated with FOSAMAX 40 mg/day versus approximately 1% of patients treated with placebo, but rarely resulted in discontinuation of therapy. Discontinuation of therapy due to any clinical adverse experience occurred in 6.4% of patients with Paget's disease treated with FOSAMAX 40 mg/day and 2.4% of patients treated with placebo.
Laboratory Test Findings
In double-blind, multicenter, controlled studies, asymptomatic, mild, and transient decreases in serum calcium and phosphate were observed in approximately 18% and 10%, respectively, of patients taking FOSAMAX versus approximately 12% and 3% of those taking placebo. However, the incidences of decreases in serum calcium to <8.0 mg/dL (2.0 mM) and serum phosphate to A2.0 mg/dL (0.65 mM) were similar in both treatment groups.
Post-Marketing Experience
The following adverse reactions have been reported in post-marketing use:
Body as a Whole: hypersensitivity reactions including urticaria and rarely angioedema. Transient symptoms of myalgia, malaise and rarely, fever have been reported with FOSAMAX, typically in association with initiation of treatment. Rarely, symptomatic hypocalcemia has occurred, generally in association with predisposing conditions.
Gastrointestinal: esophagitis, esophageal erosions, esophageal ulcers, rarely esophageal stricture or perforation, and oropharyngeal ulceration. Gastric or duodenal ulcers, some severe and with complications have also been reported (see WARNINGS, PRECAUTIONS, *Information for Patients,* and DOSAGE AND ADMINISTRATION).
Skin: rash (occasionally with photosensitivity), pruritus, rarely severe skin reactions, including Stevens-Johnson syndrome and toxic epidermal necrolysis.
Special Senses: rarely uveitis, rarely scleritis.

For more detailed information, please read the complete Prescribing Information.
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