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PRACTICE

TEACHING CASE REPORT

Safe medication prescribing and monitoring in the outpatient setting

Case 1: A 35-year-old woman whose appearance tended toward dishevelment went to a walk-in clinic for treatment of an urticarial rash. She received a prescription for a month's supply of Zyrtec, but the pharmacist misread the name as Zyprexa. The rash persisted, so she returned to the pharmacy for her (single) refill. By coincidence, during this second course of medication she was admitted to hospital for treatment of community-acquired pneumonia; the staff there assumed that she had schizophrenia. The mistake eventually became apparent after she explained that she had been taking the Zyprexa (olanzapine) for only 2 months, for her rash. Fortunately, the only adverse effect of this unintended course of an antipsychotic agent was the persistence of the patient's untreated urticaria.

Case 2: When a 68-year-old man with type 2 diabetes exhibited mild but persistent hyperglycemia while taking 5 mg of Glucotrol XL daily, his physician increased the dose to 10 mg daily. Ten months later, his wife could not rouse him and called an ambulance. The paramedics obtained a finger-stick glucose reading of 1.8 μmol/L. Later, in the emergency department, his serum creatinine was recorded as 220 μmol/L. The last value, obtained 16 months before (when he began taking glipizide), had been 138 μmol/L.

Case 3: A 73-year-old woman taking Coumadin tripped and fell while walking her dog. Later that evening, she saw large bruises on her left hip and buttock. Radiography showed no hip fracture, but her international normalized ratio (INR), last checked more than a year before, was found to be 5.0.

The medication process can usefully be broken down into 5 stages: prescribing, transcribing, dispensing, administering, and monitoring. In hospitals, prescription and transcription problems account for roughly half of adverse drug events. In outpatient settings, however, monitoring problems may dominate.[1–4]

The single most important contraindication to any medication is the prescribing physician's lack of familiarity with it. Solutions to knowledge-base problems include access at the care location to up-to-date drug information, computerized decision support and increased involvement of clinical pharmacists. Important sources of transcription errors include medication names that are similar in appearance (as in case 1; another example is shown in Fig. 1), ambiguous abbreviations and missed decimal points.

The best solution to the problem of look-alike medication names, as in case 1, is to write both; for example, "Zyrtec (cetirizine)." Another option, since clinicians will not always remember both drug names, is to state the indication (e.g., "Zyrtec for rash" — which would be preferable to "urticaria" because the patient will understand "rash.")

Cases 2 and 3 involved medication monitoring. Unfortunately, these cases do not represent extreme aberrations from routine practice. In a study of the quality of pharmacologic care of elderly people,[4] the INR of 55% of patients was not measured within 4 days of the start of treatment with warfarin; it was not checked at least every 6 weeks in 47%. Among patients recently initiated on a treatment involving a diuretic or an angiotensin converting enzyme inhibitor, the serum of only about 35% had been checked for potassium and creatinine levels within 1 month.

Most clinicians probably recognize the need for monitoring those medications in the manner discussed. In practice, however, such factors can easily be overlooked amidst the competing demands for a clinicians' attention during busy office visits. In general, enjoinders to remember *X* or be more vigilant about *Y* offer poor protection against important safety problems. Checklists and reminder systems would almost certainly offer more consistent protection against the possibility of lapses in the supervision of medications. For instance, a protocol might be developed for displaying the date and result of the last INR check on the front of the chart or the note about the current visit by any patient taking warfarin. Similar reminder systems could prompt clinicians to check electrolytes at certain intervals when patients are taking diuretics or medications affected by renal function, such as oral hypoglycemic agents (case 2).

Electronic prescriptions and computerized decision support will even-

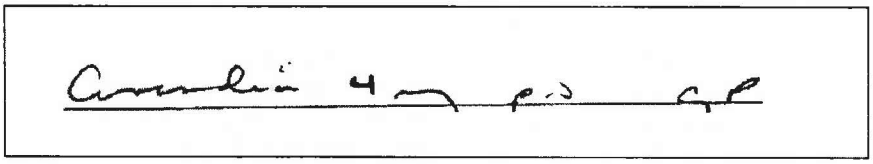

Fig. 1: Drug substitution errors can occur even when the drug names do not bear obvious similarities. This hastily written prescription for the diabetic medication Avandia (rosiglitazone) resembles Coumadin (warfarin); moreover, both medications are available in 4-mg tablets. Many examples of such confusions have been reported to the US Food and Drug Administration and the Institute for Safe Medication Practices, which provided permission to reproduce this figure from the 2000 July 26th issue of *Medication Safety Alert!* (available: www.ismp.org/msaarticles/a072600safety.html).

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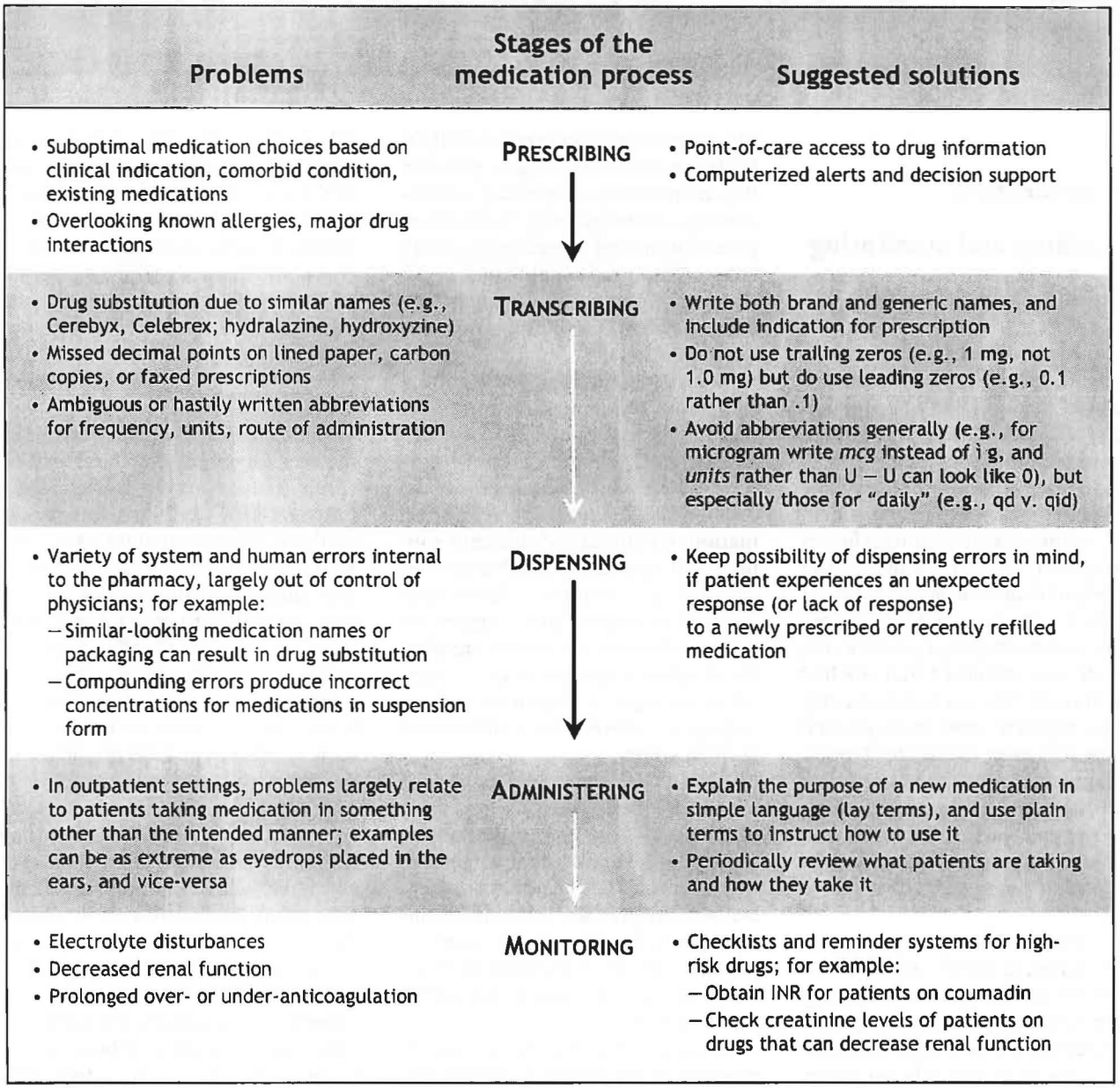

Fig. 2: Problems that commonly arise during the 5 stages of the medication process, and proposed solutions. Various studies address specific problems and solutions, but the single best reference for understanding and preventing medication errors remains *Medication Errors*,[1] edited by Michael R. Cohen, president of the nonprofit Institute for Safe Medication Practices.

tually provide more effective protection against errors at the prescription, transcription and monitoring stages (Fig. 2). Meanwhile, simple rules for writing clear orders will prevent many medication errors. Clinicians can also improve their medication monitoring by adding checklists or designing simple reminder systems around high-risk drugs such as anticoagulants, antidiabetic medications and diuretics.

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REFERENCES

1. Cohen MR, editor. *Medication errors: causes, prevention, and risk management.* Sudbury (MA): Jones and Bartlett; 2000.
2. Gandhi TK, Weingart SN, Borus J, et al. Adverse drug events in ambulatory care. *N Engl J Med* 2003;348:1556-64.
3. Gurwitz JH, Field TS, Harrold LR, et al. Incidence and preventability of adverse drug events among older persons in the ambulatory setting. *JAMA* 2003;289:1107-16.
4. Higashi T, Shekelle PG, Solomon DH, et al. The quality of pharmacologic care for vulnerableolder patients. *Ann Intern Med* 2004;140: 714-20.