

# Drug-Related Problems — Much Ado about Something

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A drug-related problem exists when a patient experiences a disease or symptoms related to drug therapy.<sup>1</sup> In their model of pharmaceutical care, Strand and colleagues<sup>1</sup> defined 8 categories of drug-related problems:

- The patient has a medical condition requiring drug therapy (a drug indication) but is not receiving a drug for that indication.
- The patient has a medical condition for which the wrong drug is being taken.
- The patient has a medical condition for which too little of the correct drug is being taken.
- The patient has a medical condition for which too much of the correct drug is being taken.
- The patient has a medical condition resulting from an adverse drug reaction.
- The patient has a medical condition resulting from a drug–drug, drug–food, or drug–laboratory interaction.
- The patient has a medical condition as a result of not receiving the prescribed drug.
- The patient has a medical condition as a result of taking a drug for which there is no indication.

Drug-related problems have become a major public health issue in North America. They are responsible for staggering annual rates of morbidity and mortality and are associated with enormous costs to the health-care system. Which health-care professionals are in the best position to influence this important problem? Can pharmacists exert an impact on the magnitude of drug-related problems? Can hospital pharmacists make a difference?

## THE MAGNITUDE OF THE PROBLEM

Johnson and Bootman's landmark 1995 work<sup>2</sup> estimated that problems associated with prescription drugs were responsible for approximately 198 815 deaths each year in the United States — roughly 545 deaths *daily*. This is the mortality equivalent of 2 jumbo

jets crashing every day. Imagine the public outcry that would ensue if 2 large airplanes fell out of the sky each day! One can envision the urgent call for airline industry reform that would result.

In addition to their appraisal of mortality, Johnson and Bootman estimated that the annual costs of death and illness related to prescription drugs were approximately US\$77 billion in the ambulatory setting in the United States. Components of this annual cost included US\$47 billion for admissions to hospital, US\$14 billion for admissions to long-term care facilities, US\$7.5 billion for physician visits, US\$5 billion for emergency room visits, and US\$2 billion for additional prescriptions. To put this total into perspective, it is higher than the costs associated with diabetes (US\$45 billion) or obesity (US\$46 billion) and well over half the cost associated with cardiovascular diseases (US\$117 billion). A recent recalculation of these figures incorporating the cost of drug-related problems in nursing home residents and hospital inpatients suggested that the cost associated with drug-related morbidity and mortality in the United States may exceed US\$100 billion.\* Canadian data are lacking, but is there reason to believe that the population-adjusted numbers would be much different?

As hospital pharmacists, our primary focus is on patients who have been admitted to hospital. How often do drug-related problems result in such admissions? Johnson and Bootman estimated that 11% to 28% of



\*J. Lyle Bootman, PhD, Dean, College of Pharmacy, University of Arizona, Tucson, Arizona, personal communication, October 4, 2000.

all hospital admissions in the United States may be associated with drug-related problems.<sup>2</sup> In a Canadian meta-analysis of reports from 49 hospitals or hospital groups in industrialized countries around the world, including Canada, it was estimated that approximately 5% of all hospital admissions were due to adverse drug reactions, primarily adverse effects and “excessive effects”.<sup>3</sup> As many as 23% of admissions associated with adverse drug reactions resulted from noncompliance. The reason that the incidence of admissions due to adverse drug reactions estimated in the meta-analysis<sup>3</sup> was lower than that estimated by Johnson and Bootman<sup>2</sup> is probably the fact that the Canadian meta-analysis evaluated all categories of drug-related problems,<sup>2</sup> not just adverse drug reactions.

What about patients who have already been admitted to hospital? Are drug-related problems an issue for these patients? In a matched case-control study in a tertiary care hospital,<sup>4</sup> the rate of adverse drug events was 2.43 per 100 hospital admissions. Among patients who experienced an adverse drug event, the in-hospital mortality rate was 3.5%, compared with 1.05% among patients who did not experience an adverse drug event ( $p < 0.001$ ). Furthermore, the length of the hospital stay was significantly longer for patients in whom adverse drug events occurred (7.69 days versus 4.46 days,  $p < 0.001$ ), and the mean cost of the hospital stay was higher (\$10 001 versus \$5355,  $p < 0.01$ ). The investigators estimated that, after adjustment for matching variables, the occurrence of an adverse drug reaction was associated with an increase of 1.91 days in the length of stay and an increase of \$2262 in hospital costs. The odds ratio for the increase in the risk of death among patients who experienced an adverse drug event was 1.88 (95% confidence interval 1.54 to 2.22,  $p < 0.001$ ).

Unquestionably, the issue of drug-related problems is of profound significance to society in terms of morbidity, mortality, admissions to hospital, and health-care costs.

## WHAT CAN PHARMACISTS DO?

Can pharmacists influence the drug-related problems experienced by our patients? Can we improve patient care outcomes related to drug therapy?

Leape and colleagues<sup>5</sup> investigated the impact of a pharmacist on the incidence of preventable adverse drug events in a cardiac intensive care unit in a large urban teaching hospital. They compared the incidence of such adverse drug events before and after the addition of a pharmacist to the patient care team in the unit and found that the rate of preventable adverse drug

events was reduced by 66% after the pharmacist began attending rounds with the team.

Smythe and colleagues<sup>6</sup> evaluated the impact of a pharmacist on the incidence of adverse drug events in hospital inpatients. A pharmacist-based system for the provision of pharmaceutical care was implemented in a medical progressive care unit (a step-down unit for the medical intensive care unit). The incidence of adverse drug events was significantly lower following implementation of this pharmacist-based system, and there was a reduction in the length of stay in the medical progressive care unit (from  $6.0 \pm 5.6$  days to  $4.8 \pm 3.7$  days [mean  $\pm$  standard deviation],  $p = 0.05$ ).

Such evidence supporting the ability of pharmacists to reduce the incidence of drug-related problems and to improve outcomes related to drug therapy is abundant. Pharmacists have been shown to improve clinical outcomes in patients with a wide variety of disease states, including hypertension, hyperlipidemias, diabetes mellitus, and conditions requiring anticoagulation, to name just a few. In addition, on a broader scale, provision of clinical pharmacy services in hospitals has been associated with improvements in patient outcomes. In a study of clinical pharmacy services in 1029 US hospitals, multivariate regression analysis revealed that the following specific pharmacy services were each associated with reductions in mortality rates: collection of medication histories on admission, provision of drug information, clinical research, and pharmacist participation on a cardiopulmonary resuscitation team.<sup>7</sup> Mortality rates in hospitals have been shown to decline as the number of pharmacists per occupied bed increases.<sup>8</sup> Finally, provision of clinical pharmacy services has been associated with a significant reduction in the cost of caring for hospital patients.<sup>9</sup>

## IT'S OUR OPPORTUNITY AND OUR RESPONSIBILITY

With our expertise in the identification, prevention, and management of drug-related problems, pharmacists are the health-care professionals who are in the best position to influence the incidence and impact of such problems. The evidence shows that we can do it. It is our obligation as pharmacotherapy experts to take responsibility for patient outcomes related to drug therapy. If we in our profession are not willing to assume responsibility for ameliorating a societal problem of this magnitude, another health-care profession most certainly will.



Not only is it our responsibility, but this should be considered a tremendous opportunity for the advancement of our profession. Pharmacists, individually and collectively, should leap at this chance to implement systems for the identification, prevention, and management of the drug-related problems defined in the pharmaceutical care model.<sup>1</sup> As hospital pharmacists, we must talk to our patients, obtain medication histories, participate in patient rounds with medical teams to provide input regarding drug selection, dosing, and monitoring, and provide discharge counselling. Hospital pharmacy systems must provide pharmacists with the opportunity to perform these activities and must reward them for doing so. Faculties and colleges of pharmacy must provide curricula that train new pharmacists to identify, prevent, and manage drug-related problems and to accept responsibility for outcomes related to drug therapy. Colleges of pharmacy and professional pharmacy organizations should provide educational programs to confer this training and inculcate this philosophy in practicing pharmacists and should exert leadership in promoting and advancing the role of the pharmacist in the prevention and management of drug-related problems.

Drug-related problems are a major public health problem in North America. Pharmacists have an opportunity and a responsibility to reduce their incidence and impact. Let's stop those planes from falling from the sky.

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