Adverse events and patient safety in Canadian health care

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Patient-safety research has burgeoned in the United States and elsewhere, but researchers in Canada are only beginning to assess the safety of our health care system. Forster and colleagues[1] provide in this issue one of the first detailed assessments of the incidence of adverse events (AEs) in Canadian health care (see page 345). Their article is also one of the first reports anywhere to focus on the AEs that occur after discharge from hospital. The authors used methods that had been employed by Forster and a group of associates in a study at a US teaching hospital.[2] The results of these studies are very similar despite the differences in context.

AEs are unintended injuries or complications caused by health care management, not by the underlying disease process. Few experienced clinicians would be surprised to find that such problems can occur in the transition from hospital care to care at home and in the community. Forster and colleagues' results suggest, however, that these problems are far from unusual. Nearly one-quarter of patients discharged from the studied Canadian teaching hospital experienced an AE. Half of the AEs were judged to be either preventable or ameliorable. Preventable AEs are those that occur because clinicians did not follow accepted practice or the systems they relied on failed to offer appropriate information or resources. Some AEs are not preventable. An example is a rash after penicillin administration in a patient who has not previously had an allergic reaction to the drug. If, on the other hand, the patient had a history of allergy to penicillin, then the rash would be a preventable AE. Ameliorable AEs are ones whose severity would have been reduced had different actions been taken.

Information on AEs is critical to improving care. As Forster and colleagues note, many problems can emerge with the medications that patients take after discharge. Treatment with high-risk medications (e.g., warfarin, heparin, insulin and chemotherapeutic agents) needs to be carefully monitored. In some settings where numerous AEs have been noted with such drugs, quality-improvement projects have been carried out to identify ways to improve care, such as standardizing medication protocols and improving follow-up. Fairview Health System in Minnesota, for example, has used quality-improvement methods to reduce the variation in drug protocols and to improve the monitoring of anticoagulation therapy in stroke patients.[3] Such efforts require collaboration among physicians, nurses and pharmacists, an investment by the hospital in helping health care professionals use quality-improvement tools and community follow-up.

The evidence on AEs in hospitals has generated considerable interest and action. Forster and colleagues' results suggest that even greater problems may emerge after discharge. Whereas hospital-based studies in Britain,[4] New Zealand[5] and the United States[6] have suggested that 2.9% to 11.7% of adult patients in general hospitals experience one or more AEs, Forster and colleagues found that 23% of their sample had an AE after discharge. Although Forster and colleagues used interviews rather than chart reviews, their definition of AE was similar to those used in the inpatient studies. Thus, the risk of AEs may increase rather than diminish after discharge.

Most of the research on AEs has occurred in hospitals, where clinicians and health records are more accessible. Few studies have been done on patients in ambulatory or community settings. Forster and colleagues, by following patients discharged from hospital care, have identified that many problems can occur in the community, and they have provided tools that may prove useful for other researchers, clinicians and managers. Additional research is needed to examine these problems.

The results of this study also underline the critical nature of the transition from hospital-based care to community-based care. Problems in handoffs in care may occur more often in Ontario, where the organization of home and community services is separate from hospitals, than elsewhere in Canada. But handoffs are likely problematic in many regions. Research comparing the experience of patients in transition to community-based care under regional health authorities would be instructive. Evaluations of interventions to improve the transition are also needed.

The information that Forster and colleagues have gathered will be useful for improving performance in our system. In particular, their data highlight the need for close monitoring of patients during the postdischarge period, with special attention to drug therapy. Their report challenges us all to improve communication between professionals and to develop better methods for monitoring patients after hospital discharge.

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Death on the waiting list for cardiac surgery

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Long waiting lists for cardiac surgery are a problem for national health care systems,[1] and deaths among those waiting to be treated are a special cause for concern.[2,3] Priority is usually given to patients who are at above-average risk of dying.[4] The impact of such a policy can be illustrated by a simple compartment model (Fig. 1).

Suppose that N patients per year are added to the waiting list and S patients (some number less than N) are treated each year. If N and S are constant, and patients remain on the waiting list until they are treated or die, then a waiting list of size Q will result. Among patients on the waiting list, there will be $D = mQ$ deaths per year, where m is the death rate per patient-year. In this steady state (where inflow = outflow) $N = S + D$, $D = mQ$, and $Q = (N - S)/m$. T, the average waiting time before death or surgery, is Q/N.

For example, if $N = 1000$ patients per year, $S = 960$ patients per year, and $m = 0.1$ deaths per patient-year, then $Q = (1000 - 960)/0.1 = 400$ patients, $D = 0.1 \times 400 = 40$ deaths, and $T = 400/1000 = 0.4$ years or 146 days. From these calculations we can see that even a small difference between the number accepted for treatment and the number treated with available resources will result in a sizeable waiting list, since in calculating the size of the waiting list, the difference between N and S is multiplied by the reciprocal of m, a small number.

This model can be applied to any waiting list scenario that

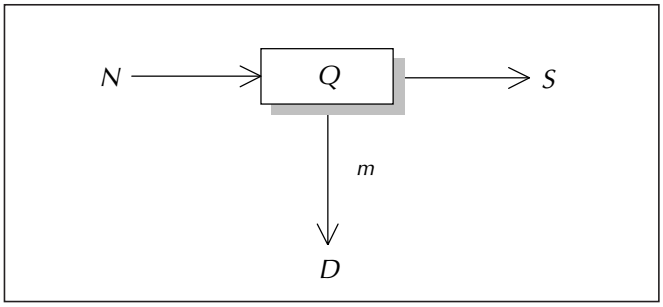

Fig. 1: A compartment model of a waiting list. *N* = the number of patients accepted for surgery each year, *Q* = the number waiting for surgery at any given time, *S* = the number who underwent surgery each year, *m* = the death rate per person-year among those waiting for surgery, *D* = the number of deaths each year among those awaiting surgery.

is in a steady state. Such steady states would occur in any large health care system in which the value for $N - S$ is constant.

Suppose now that the 1000 patients accepted each year for surgery comprise 2 groups: $N_1 = 300$ per year with mortality rate $m_1 = 0.24$, and $N_2 = 700$ per year with mortality rate $m_2 = 0.04$. The degree of priority given to one or the other of these 2 groups is determined by the allocation of the total available treatments, S per year, to each group, say S_1 and S_2 (such that $S_1 + S_2 = S$). If complete priority is given to the high-risk group, then all 300 high-risk patients will