What happens to my patients?
An automated linkage between
emergency department and mortality data

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ABSTRACT

A simple application linking mortality data from the Bureau of Vital Statistics with data from the emergency department information system is described. This application has been used to supplement the regular mortality review process, identify deaths of patients who left without being seen, and perform outcome studies looking at specified clinical conditions.

Key words: death; emergency department; patient discharge; quality assurance; left without being seen; LWBS; information systems

RÉSUMÉ

Une application simple reliant les données sur la mortalité du Bureau des statistiques vitales et les données du système d'information du département d'urgence de notre hôpital est décrite. Nous utilisons ce système pour suppléer à notre processus normal de revue de la mortalité, déterminer le nombre de décès parmi les patients qui ont quitté l'hôpital sans avoir été vus, et effectuer des études de résultats pour les patients en examinant des atteintes cliniques précises.

Introduction

Once a patient leaves the emergency department (ED), his or her outcome is generally unknown. The absence of follow-up information compromises quality assurance initiatives and impairs the ability to make positive system change. The ultimate outcome of interest is death. In order to capture mortality data after ED visits, a relationship was established with the provincial Bureau of Vital Statistics that has enabled the inclusion of patients discharged from the ED and those who left without being seen (LWBS) into the regular departmental death reviews.

Methods

The Nova Scotia Bureau of Vital Statistics computerized their records in 1997, making it possible to produce a machine-readable file of all deaths in the province. This file was initially generated for specific provincial agencies, including the Motor Vehicles Branch and the provincial health plan, and was subsequently made available to provincial hospital medical records departments. The Vital Statistics file is now delivered every few weeks on diskette. The Queen Elizabeth II (QEII) Health Sciences Centre Department of Emergency Medicine seized upon this as an opportunity to link provincial mortality data with their home-grown ED information system and identify patients who die after their ED visit.

Data available in the Vital Statistics file include patient name, address, birthdate and provincial Health Card (H-C) number, as well as date and place of death (but not cause of death). The matching process between the death file and

the ED database is carried out in two stages. The files are first matched using the provincial H-C number. Records so matched are considered "certain" because the provincial H-C number has proved almost 100% accurate and unique. Approximately one-third of Vital Statistics records have no H-C number. These cases are matched using a composite key of surname and birthdate. Such matches are considered "uncertain," and further identity verification is undertaken if the case is selected for mortality review.

An automated report, run each month prior to the death rounds, lists all patients who have died within 30 days of their ED visit. This list, which includes the ED presenting complaint and discharge diagnosis, is scanned manually, and cases that stand out as possibly unexpected or unusual are identified for subsequent review. This same matching process has been used to identify patients who died after leaving the ED without being seen, and to identify patients with specific conditions who died after ED discharge.

Results

The automated death-after-discharge list identifies, on average, 20 patients per month. Manual review of the list has proven essential because most cases identified by the matching process are actually expected deaths (e.g., cases of known terminal cancer or very elderly patients), hence not likely to merit individual review. Rapid manual review of the ED mortality list generally highlights 3 to 6 cases per month that justify full patient chart review (see Table 1 for examples). In many cases, chart review fails to uncover ED management problems; however, the process has identified a number of diagnostic errors and has turned up patients who subsequently died in other hospitals.

The review of LWBS patient mortality suggests that, while very rare (an average of 4 cases per year, from approximately 4000 LWBS patients/yr), such deaths are often particularly interesting. Table 2 shows some representative examples of patients who died after LWBS. The first patient, with rib pain, reinforces the finding by Campbell and Dingle[1] of the danger of rib fractures in the elderly.

Discussion

This ongoing linkage between mortality data and ED records has been in regular use in QEII's ED for 4 years and has proven both robust and efficient. Although technically simple, it appears to be a novel application. A MEDLINE search found only one other study that documented mortality outcomes after ED discharge. In this study, Kefer and colleagues searched 2665 medical examiner records and manually identified 42 patients who had died with 8 days of being discharged from the ED.[2] Although these authors obtained similar information to that described here, their data-capture strategy requires enormous effort and is not feasible as an ongoing quality assessment (QA) mechanism.

The database-linking strategy described here has also aided in tracking the outcomes of ED patients with specific conditions. For example, this process was used to assess 30-day mortality in a cohort of patients with community-acquired pneumonia who were discharged from the ED.[3] This method can be extended to longer-term studies, for

Table 1. Examples of patients who died within 30 days of being discharged from the emergency department (ED)

Age of patient	Discharge diagnosis	Outcome
90	Abdominal pain NYD	Two visits 3 days apart. Died at home 4 days after 2nd visit.
60	Pneumonia	Died at home 2 days after ED visit.
80	Uncomplicated face laceration	Died at home 7 days later.
30	Suicidal ideation secondary to alcohol intoxication	Died 1 day after ED visit.
60	Chest pain NYD	Discharged. Returned, was admitted and died 7 days later.
60	Back pain, unspecified	Discharged; readmitted to another hospital; died 24 days later.

NYD = not yet diagnosed

Table 2. Examples of LWBS patients who died within 30 days of having left the emergency department without being seen

Age of patient	Presenting complaint*	Outcome
70	Rib pain	Died at home 1 day later.
60	Headache	Died at home 3 days later.
30	Fever	Died at home 5 days later.
40	Weakness	Died at home 4 days later.
30	Suicidal thoughts	LWBS twice in one day. Died the next day.
50	Dehydration	Died at home 3 days later.

LWBS = left without being seen
*LWBS patients do not have a final emergency department diagnosis, therefore presenting complaint is shown instead.

example 1-year or 5-year mortality in ED chest pain patients, stratified by initial disposition. It has the added advantage of capturing all deaths, rather than just those registered by the Medical Examiner's Office. The choice of 30 days as the mortality window of interest was arbitrary, but it has proven worthwhile because a number of cases have been identified in which the gravity of the patient's condition was not initially appreciated and became apparent only in retrospect.

Limitations

The process described in this paper requires a minimal input of time but it is not, by itself, a definitive QA tool. Rather, it serves only as a rapid automated screen to identify, from over 50 000 discharged patients per year, a small number of cases worthy of further examination. Nor can it be considered exhaustive. Patients from outside the province, those with missing H-C numbers, and cases in which either surname or birthdate differ between the two data sources will be missed. However, in a previous database linkage study,[4] it was found that the combination of surname and birthdate captured 98% of common patients. Database reviews must be conducted a minimum of 3 months after the index ED visit because the Bureau of Vital Statistics may take up to this length of time to register a death. Finally, this method requires actual patient chart review for verification because data errors like miscoding of ED disposition or final diagnosis can generate the incorrect perception of ED management errors.

Conclusion

Linkage between Vital Statistics mortality data and ED information system data, with automated monthly reporting, provides a simple and rapid means of identifying patients who die after their ED visit. When combined with targeted record review, this is an important supplement to regular departmental mortality reviews and QA processes.

Competing interests: None declared.

References

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