

Use of a Medical Center's Computerized Health Care Database for Notifiable Disease Surveillance

ABSTRACT

The sensitivity of a medical center's inpatient and outpatient database to detect notifiable diseases was examined. Only 53 percent of inpatient and 7 percent of outpatient laboratory-confirmed cases of shigellosis, salmonellosis, giardiasis, and hepatitis were identified by an automated search for matching diagnosis codes. Reasons for lack of sensitivity include nonavailability of laboratory results at the time of diagnosis assignment, use of a standardized encounter form with limited preselected diagnosis codes, and pre-empting of the infectious disease diagnosis by other diagnoses. (*Am J Public Health* 1991; 81:637-639)

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Introduction

Most communicable disease surveillance systems in the United States are based on passive reporting by health care providers. Because these have major limitations, such as underreporting and reporting bias,^{1,2} investigators continue to search for alternative data sources. Promising among these are computerized hospital discharge databases. Although hospital discharge data have been used for disease surveillance,^{3,4} questions remain about their validity and sensitivity. This study examines the sensitivity of one medical center's computerized inpatient and outpatient tracking and billing system when used for notifiable disease surveillance. Also assessed was the medical center's completeness of notifiable disease reporting to the health department.

Methods

Lovelace Medical Center in Albuquerque, New Mexico is a 235-bed hospital and multispecialty group practice with eight "satellite" family practice and urgent care centers. During the study period August 1, 1986-July 31, 1987, Lovelace had approximately 10,000 inpatient admissions and 540,000 outpatient visits. A computerized billing system is used to record International Classification of Diseases, 9th Ed, Clinical Modification (ICD-9-CM)⁵ diagnosis codes, as well as demographic, diagnostic and billing information. Inpatient codes are assigned shortly after discharge by Medical Records Department staff, based on providers' documentation in discharge summaries and progress notes. Up to 30 diagnosis codes are captured by the system. Outpatient visit codes (both "scheduled" and "urgent care") are assigned at the time of the visit by the medical provider, using a standardized encounter form with pre-selected diagnostic codes. A maximum of three codes is allowed on the outpatient form.

To determine the sensitivity of the ICD-9-CM coding system and to determine the reporting rates to the health de-

partment, laboratory-identified cases of five notifiable diseases were used as the "gold standard." These included shigellosis, salmonellosis, giardiasis, and hepatitis A and B. Inpatient and outpatient databases were searched for matching ICD-9-CM codes, and cases of notifiable diseases reported by Lovelace personnel to the New Mexico Health and Environment Department (NMHED) were ascertained. To assess reasons for discrepancies among these data sources, medical record reviews were performed on cases that were laboratory-identified but not reported to the NMHED (n = 44) and cases that were laboratory-identified but not ICD-identified (n = 207). Forty-two of the former (two records not found) were reviewed. Due to resource limitations, a random sample of 60 (29 percent) of the latter cases were reviewed.

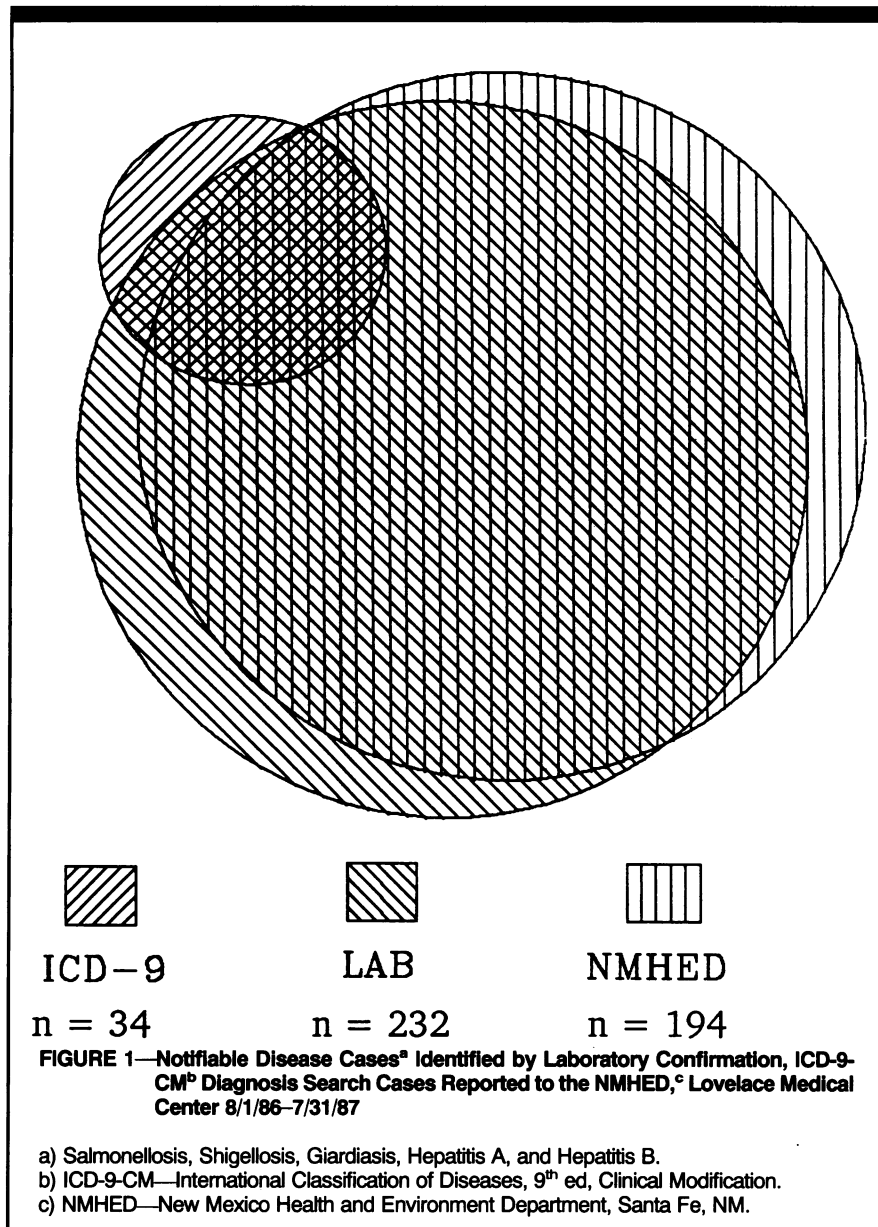
Attempts were made to review all non-laboratory-identified cases that were either identified by ICD-9-CM code search (n = 9) or reported to the NMHED (n = 6).

Results

Sensitivity of ICD-9-CM Diagnosis

Each of the three data sources yielded cases that would have otherwise gone undetected (Figure 1). Only about half the inpatient and only 7 percent of the outpatient laboratory-confirmed cases were identified by the matching ICD-9-CM codes (Table 1). However, the ICD-9-CM search identified nine cases—all among outpatients—which were not laboratory-confirmed. None of these were reported to the NMHED. One was a symptomatic contact of a known case, two were

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chronic or previously diagnosed cases, two were follow-up visits, and one was a case in which the diagnosis—based solely on symptoms—was questionable. (Three records were unattainable.)

Reporting to the Health Department

All inpatient cases and most outpatient laboratory-confirmed cases were reported to the NMHED. Six cases were reported that were not laboratory confirmed; these were symptomatic contacts of known cases or cases in which the diagnosis was based solely on symptoms.

Discussion

Notifiable disease surveillance based solely on ICD-9-CM diagnosis codes was not very sensitive.

In the outpatient setting, miscoding on the initial visit is partly explained by the fact that the laboratory diagnosis has not been established or confirmed. However, medical record review revealed that at the follow-up visit, when positive laboratory results were documented, matching ICD-9-CM codes were still not recorded in approximately half of the cases. Another explanation for the failure to assign appropriate ICD-9-CM codes was the bias introduced by the use of a standardized encounter form with a limited number of preselected diagnosis codes, some of which were nonspecific. The provider seldom uses the option of writing in a diagnosis other than those given on the form. Changes in the encounter form content or usage protocols would be needed before outpatient diagnosis codes would be useful for infectious disease surveillance.

Only half of the inpatient cases were detected by matching ICD-9-CM codes. Review of all the laboratory-identified cases not identified by ICD-9-CM revealed two main reasons for this discrepancy: 1) as with outpatient cases, laboratory results were not always available at the time of discharge, and 2) competing diagnosis; i.e., the infectious disease diagnosis was pre-empted by other diagnoses in complex cases. For example, one patient readmitted with multiple complications after cardiac surgery had 13 discharge diagnoses that did not include his nosocomially-acquired hepatitis B.

Rates of reporting of laboratory-confirmed cases to the NMHED were high. Current policy not only requires that reports of laboratory-confirmed cases are sent to the NMHED, but that salmonella and shigella species isolates are sent to the state scientific laboratory which, in turn,

TABLE 1—Inpatient and Outpatient Laboratory-Confirmed Diagnoses at Lovelace Medical Center: Percent Reported to NMHED^a and Detected by ICD-9-CM^b Codes August 1, 1986–July 31, 1987

	Reported to the NMHED ^a		ICD-9-CM ^b Search	
	Inpatient (%)	Outpatient (%)	Inpatient (%)	Outpatient (%)
Salmonella	3/3 (100)	53/54 (98)	2/3 (67)	3/54 (4)
Shigella	1/1 (100)	23/23 (100)	0/1 (0)	1/23 (4)
Giardia	2/2 (100)	25/44 (57)	1/2 (50)	3/44 (7)
Hepatitis A	4/4 (100)	39/55 (71)	3/4 (75)	3/55 (5)
Hepatitis B	9/9 (100)	29/37 (78)	4/9 (44)	6/37 (16)
TOTAL	19/19 (100)	169/213 (79)	10/19 (53)	15/213 (7)
TOTAL inpatient and outpatient	188/232 (81)		25/232 (11)	

^aNMHED—New Mexico Health and Environmental Department, Santa Fe, NM.

^bICD-9-CM—International Classification of Diseases, 9th Ed, Clinical Modification.

reports to the NMHED. The high rates of reporting of laboratory-confirmed cases documented in this study demonstrate that the system is working efficiently.

Connell, *et al*, have described the opportunities and hazards in the use for research of datasets designed and compiled for other purposes.⁶ Our study exemplifies such limitations. Although ICD-9-CM code assignments were not sensitive for detection and surveillance of the notifiable infectious diseases we chose for this study, they were congruent with the clinical picture and may have identified potential cases not detected by laboratory-based surveillance. Conditions whose diagnoses rely predominantly on clinical evidence (e.g., injuries) are likely to be more accurately identified by ICD-9-CM

code surveillance. Although further studies on the feasibility of inpatient and outpatient data systems for surveillance are needed, access to a dataset combining laboratory, inpatient, and outpatient information holds potential for disease surveillance. □

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ABSTRACT

We conducted a series of case-control studies to investigate the risks of 16 cancer types in relation to occupational physical activity. These studies were based on Missouri Cancer Registry data for 17,147 White male cancer patients registered between 1984 and 1989. Colon cancer risk was increased for both the moderate (odds ratio (OR) = 1.1; 95% confidence interval (CI) = 1.0, 1.3) and low (OR = 1.2; 95% CI = 1.0, 1.5) activity levels. Similar elevations were observed for prostate cancer at the moderate (OR = 1.1; 95% CI = 1.0, 1.3) and low (OR = 1.5; 95% CI = 1.2, 1.8) levels of activity, and for cancer of the testis at the low activity level (OR = 2.2; 95% CI = 1.3, 3.7). An opposite trend ($p < 0.01$) was noted for lung cancer, which showed decreased risk at the moderate (OR = 0.9; 95% CI = 0.8, 1.0) and low (OR = 0.8; 95% CI = 0.6, 0.9) activity levels. These associations suggest that further study of the relationship between physical activity and site-specific cancer risk is warranted. (*Am J Public Health* 1991;81:639-642)

Physical Activity on the Job and Cancer in Missouri

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Introduction

A growing body of evidence suggests an inverse relation between physical activity and risk of colon cancer. Recent studies,¹⁻¹¹ from diverse populations, have identified an association between occupational or recreational physical activity and colon cancer risk, although one report found no such relation.¹² Elevations in risk of colon cancer in relation to low physical activity have typically ranged from 20-100 percent.¹⁻¹¹

Few studies have evaluated the association between physical activity and other types of cancer. Recent findings suggest that physical activity may be associated with several cancer types including cancer of the stomach,⁸ prostate,⁹ and breast.¹⁰⁻¹³

To investigate the risks of various cancer types in relation to occupational physical activity, we conducted a series of case-control studies based on data from a statewide cancer registry.

Methods

Subjects were identified through the Missouri Cancer Registry for the time pe-

riod January 1984 through May 1989. The Registry is maintained by the Missouri Department of Health and has been collecting data on incident cancer cases from public and private hospitals since 1972. Hospital reporting has been mandated by law since 1984. Reporting procedures and validity issues have been discussed in more detail elsewhere.¹⁴

The current study involved a series of case-control studies that included White male cancer patients who were 20 years of age or older at the time of diagnosis. Men with cancer of ill-defined and unknown primary sites (*International Classification of Diseases for Oncology*¹⁵ (ICD-O) codes 195 and 199) were excluded. Selection was limited to White males due to the small

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