Prevalence of information gaps in the emergency department and the effect on patient outcomes

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Abstract

Background: Information gaps occur when previously collected information is unavailable to a physician who is currently treating a patient. In this study we measured the prevalence of physician-reported information gaps for patients presenting to an emergency department at a teaching hospital.

Methods: For 1002 visits to the emergency department made by 983 patients, we recorded all information gaps identified by the emergency physician immediately after the patient was assessed. When an information gap was present, the physician was asked to identify the required information, why it was required and how important it was to the patient's care. We reviewed the patient charts to measure severity of illness and to determine whether the patient was referred to the emergency department by a community physician. Multiple linear regression analysis was used to determine whether information gaps were associated with length of stay in the emergency department.

Results: At least 1 information gap was identified in 323 (32.2%) of the 1002 visits (95% confidence interval 29.4%–35.2%). Information gaps were associated with severity of illness, being significantly more common in patients who had serious chronic illnesses, those who arrived by ambulance, those who had visited the emergency department or had been in hospital recently, patients in monitored areas in the emergency department and older patients. Information gaps most commonly comprised medical history (58%) and laboratory test results (23.3%) and were felt to be essential to patient care in 47.8% of the cases. The presence of information gaps was not associated with admission to hospital. After adjusting for important confounders, including patient sex, previous hospital admissions, diagnosis and severity of illness, we found that stays in the emergency department were 1.2 hours longer on average for patients with an information gap than for those without one.

Interpretation: Information gaps were present in almost one-third of the visits to our emergency department. They were more common in sicker patients and were independently associated with a prolonged stay in the emergency department.

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Care may be fragmented if patients attend multiple sectors of the health system. The result may be "information gaps" if clinical information gathered by one health care provider is not communicated to others involved in a patient's care.[1] There is a perception that important patient information is not transferred between physicians who treat the same patient.[2–5] Information gaps have been extensively documented in patients discharged from hospital.[6–9]

Patients who present to emergency departments are especially susceptible to having information gaps. They usually are acutely ill, report quickly to the hospital at irregular hours, frequently visit multiple health care providers immediately before presenting to the emergency department and often go to the emergency department without their primary physician's knowledge.[10] These factors make it difficult for their primary physician to send information to the attending emergency physician.

Several studies have examined information gaps for patients presenting to emergency departments.[11–15] The proportion of patients arriving without any information from community physicians has ranged from 10%[12] to almost 75%.[13,14] In addition, Beveridge and Petrie[15] found that referral notes are frequently inaccurate. However, these studies measured potential information gaps, since it was unknown whether the missing information was necessary for the treatment of the patients in the emergency department. For example, a person's previous skin biopsy results would not be required for the treatment of his or her sprained ankle. Actual information gaps identified by attending physicians would be more useful to physicians and policy-makers than would potential information gaps.

In our study, we measured the prevalence of physician-reported information gaps (hereafter termed simply information gaps) for patients presenting to our emergency department. We recorded the types of information gaps identified and analyzed which patients were most likely to have them. Finally, we compared simple outcomes for patients with and those without information gaps.

Methods

We conducted this study at the Civic Campus of the Ottawa Hospital, a teaching hospital with emergency medicine training programs. About 55 000 patients visit the Civic Campus emergency department each year. Except for patients with major trauma or cardiac arrest, all people presenting to the emergency department are triaged by 2 nurses before they are

seen by the emergency physician. During the study period, an information system was introduced that provided online access to hospital-based laboratory and radiology test results as well as to information regarding hospital admissions at the Ottawa Hospital. The Ottawa Hospital Research Ethics Board approved the study.

We included a nonrandom sample of patients who presented to our emergency department between June 12 and Aug. 2, 2002. During this period, one of us (A.S.) collected information for all patients visiting the emergency department in 4- to 12-hour shifts between 8 am and 8 pm. For each visit, this investigator also interviewed the attending emergency physician after his or her initial patient assessment (history-taking and physical examination). Physicians had a chance to discuss the case with secondary data sources (e.g., family members or friends) if they were available during the initial assessment. Physicians had access to ambulance reports, nurses' notes and the hospital's information system before the interview. They were then asked "For this patient, is there previously collected information that you need right now to which you do not [currently] have access?" If the physician answered Yes, the patient was classified has having an information gap.

If an information gap existed, the physician identified the required information, why it was required and how important it was to the patient's care. Importance was graded on a 3-point ordinal scale (1 = not essential but could help, 2 = somewhat important, 3 = very important or essential). Information gaps were counted only if the information had been collected before the patient's visit to the emergency department. For example, the unavailability of an ultrasound would be considered an information gap if the emergency physician thought that proper patient care depended on the ultrasound findings and he or she knew that the ultrasound had been done before the visit.

The interviews took place between 8 am and 8 pm, Monday to Friday, and took 1 minute on average to administer. None of the physicians refused to participate. In over 70% of cases, the interview occurred within 10 minutes after the emergency physician had assessed the patient. The primary diagnosis was elicited directly from the attending physician. Patients were excluded if they had been enrolled in the study within the week before their current visit. The investigator who collected the data and interviewed the physicians was trained in these tasks before the study period, and his observations were monitored during the study period.

After the interview, the investigator reviewed the emergency department chart to determine the patient's age, sex and chronic medical conditions. The Canadian Emergency Department Triage and Acuity Scale (CTAS) level[16] assigned by a triage nurse was used to measure the patient's severity of illness. This scale classifies cases into 5 levels, from "resuscitation" to "nonurgent," and has excellent reliability and agreement.[16] Also abstracted from the chart were the ambulance status (whether the patient arrived by ambulance) and the dates of the last visit to our emergency department and admission to our hospital. The investigator noted whether the charts contained a referral note or documentation of a phone call from a referring physician, and he reviewed nurses' notes to determine whether a community physician or a nursing home had referred the patient.

Using the emergency department's registration database, we determined whether any of the patients were admitted to the hospital and calculated the number of hours from patient registration to patient discharge. To determine the generalizability of our sample, we obtained the following information from the registration database: patient age and sex, treatment area in the emergency department, ambulance status, admission status and length of stay in the emergency department. Since the probability of information gaps could vary between treatment areas in the emergency department, we used indirect standardization[17] to adjust for our non-random sample and to calculate the overall prevalence of information gaps in our department.

We wanted sufficient statistical power to measure the prevalence of information gaps with a 95% confidence interval (CI) range of 6%. We estimated that the prevalence would be from 10% to 50%. Using the normal approximation of the binomial distribution,[18] we calculated that a sample size of 384 to 1067 patients (depending on the prevalence observed in the study) was needed to attain this precision. We chose a sample size of 1000.

We used the χ^2 test and Student's t-test to determine whether the information gaps were associated with categorical and continuous variables, respectively. Potentially significant variables ($p < 0.2$) were entered into a backward stepwise logistic regression model to determine which factors were significantly (2-sided $p < 0.05$) associated with information gaps. In addition, we used multivariate logistic regression analysis with backward variable selection to determine whether information gaps were associated with admission to hospital after adjustment for potentially significant confounders. Each logistic regression model had adequate calibration (Hosmer and Lemeshow goodness-of-fit statistic > 0.5).

We used multivariate linear regression analysis with backward variable selection to adjust for important confounders when associating information gaps with patient length of stay in the emergency department. Factors with a univariate association with this outcome ($p < 0.2$) were entered into the multivariate model and remained if significantly associated with the outcome (2-sided $p < 0.05$). For this analysis, we excluded patients who were admitted to the hospital, since such patients often wait in the emergency department for a hospital bed long after the decision to admit has been made. The multiple linear regression model had adequate fit ($F = 36.9$, $p < 0.001$; adjusted $R^2 = 0.20$) and satisfied regression assumptions, since model residuals appeared normally distributed. Associations between length of stay in the emergency department and independent variables did not change extensively when we repeated the analysis after log-transforming the outcome variable.

Results

A total of 7470 patients visited our emergency department 8810 times during the study period. For our analyses, we included 1002 visits (11.4% of total visits) made by 983 patients (Table 1). Information was collected from 58 emergency physicians, who provided data for 1 to 61 different visits. We interviewed staff emergency physicians about 656 (65.5%) of the visits and residents about the remainder.

A broad range of patients was included in the study sample (Table 1). Overall, the characteristics of the 1002 visits made by the study sample were similar to the 8810 visits made by the entire patient population except that the study patients had a slightly higher mean age (52 v. 47), were more likely to have arrived by ambulance (25.2% v. 20.4%) and were more likely to require a bed during their stay in the emergency department (monitored 17.0% v. 13.0%; unmonitored 24.4% v. 18.7%).

Information gaps

At least 1 information gap was identified in 323 visits, for an overall prevalence of 32.2% (95% CI 29.4%–35.2%, Table 2). Information gaps were more common in cases involving elderly patients, patients with important chronic conditions, those who had visited the emergency department or had been admitted to the Ottawa Hospital within the 6 months before the study period, those with a higher CTAS level, patients brought in by ambulance and those in monitored areas in the emergency department (Table 2). Information gaps occurred in about half (50.6%) of the 170 visits by patients in monitored beds. The proportion of patients with information gaps identified by staff physicians did not differ significantly from the proportion identified by residents (31.4% v. 33.8%; $p = 0.43$), nor did they differ after the hospital information system was introduced to the emergency department (35.6% v. 31.4%; $p = 0.24$).

Table 1: Description of 1002 visits to the emergency department, by 983 patients, between June 12 and Aug. 2, 2002

Variable	No. (and %) of visits *n = 1002*
Patient factors	
Mean age (and SD), yr	52 (22)
Female sex	526 (52.5)
Chronic disease	
Hypertension	164 (16.4)
Coronary artery disease	120 (12.0)
Diabetes mellitus	84 (8.4)
Obstructive pulmonary disease	67 (6.7)
Atrial fibrillation	36 (3.6)
Visited emergency department in previous 6 mo	327 (32.6)
Admitted to study hospital in previous 6 mo	121 (12.1)
Visit factors	
Brought in by ambulance	252 (25.2)
CTAS acuity of illness level	
Resuscitation/emergent	101 (10.1)
Urgent	535 (53.4)
Less urgent	301 (30.0)
Nonurgent	65 (6.5)
Treatment area	
Monitored bed	170 (17.0)
Unmonitored bed	245 (24.4)
No bed	587 (58.6)
Patient referral	
Self-referred	869 (86.7)
Referred by community physician	98 (9.8)
Referred by nursing home	35 (3.5)
Primary acute diagnosis	
Head and neck	82 (8.2)
Cardiovascular	143 (14.3)
Respiratory	67 (6.7)
Gastrointestinal	72 (7.2)
Genitourinary	53 (5.3)
Obstetric or gynecologic	46 (4.6)
Rheumatologic	36 (3.6)
Psychiatric	64 (6.4)
Trauma	76 (7.6)
Fracture or sprain	166 (16.6)
Other	197 (19.7)
Outcome	
Admitted to hospital	157 (15.7)
Time in emergency department, mean (and SD)*	3 h 54 min (3 h 6 min)

Note: SD = standard deviation, CTAS = Canadian Emergency Department Triage and Acuity Scale.
*Excludes visits made by patients admitted to the hospital.

Information gaps were significantly more common among patients referred by a community physician or a nursing home than among those who were not referred (Table 2). This association persisted after adjustment for other significant factors (adjusted odds ratio [OR] 1.5, 95% CI 1.0–2.3), including patient age in decades (adjusted OR 1.2, 95% CI 1.1–1.3), CTAS level (adjusted OR 1.3, 95% CI 1.0–1.6), recent visit (within previous 6 months) to the emergency department (adjusted OR 1.5, 95% CI 1.0–2.0), and the need for a monitored bed (adjusted OR 2.3, 95% CI 1.4–3.6) or other bed (adjusted OR 2.0, 95% CI 1.4–2.3). After controlling for patient location in the emergency department (monitored bed, unmonitored bed or no bed) using indirect standardization, we found that 29.6% of the patients had an information gap.

Of the 323 visits with at least 1 information gap, 404 individual data elements were identified by the emergency physicians as being necessary for patient care (median of 1 per person, range 1–6). Historical information was the most commonly sought, in particular information about previous hospital admissions, previous physician assessments and past medical history (Table 3). We did not record the hospital from which information was required, but 31% of the patients with an information gap of hospitalization-related data had never been admitted to the study hospital, which indicated that such information was frequently required from other hospitals. Information was most commonly required for diagnostic purposes (Table 3). The physicians rated almost half of the information gaps as very important or essential to patient care. Of 170 cases in which patients were in monitored beds, 44 (25.9%) had at least 1 important or essential information gap.

Effect of information gaps on patient outcomes

Visits in which an information gap was identified were significantly more likely than those without an information gap to result in admission to hospital (24.8% v. 11.3%; $p < 0.001$). However, the association was no longer statistically significant (adjusted OR 1.3, 95% CI 0.9–1.9) after adjustment for patient age in decades (adjusted OR 1.3, 95% CI 1.1–1.3), CTAS level (adjusted OR 1.7, 95% CI 1.2–2.4) and the need for a monitored bed (adjusted OR 4.1, 95% CI 2.2–7.8) or unmonitored bed (adjusted OR 5.2, 95% CI 3.1–8.8).

Table 2: Factors associated with information gaps identified during visits to the emergency department*

Factor	Information gap; no. (and %) of visits† Yes *n = 323*	No *n = 679*	*p* value
Patient factors			
Mean age (and SD), yr	60 (20)	48 (21)	< 0.001
Female sex	179 (55.4)	347 (51.1)	0.2
Chronic disease			
Hypertension	61 (18.9)	103 (15.2)	0.13
Coronary artery disease	58 (18.0)	62 (9.1)	< 0.001
Diabetes mellitus	33 (10.2)	51 (7.5)	0.15
Obstructive pulmonary disease	22 (6.8)	45 (6.6)	> 0.2
Visited emergency department in previous 6 mo	129 (39.9)	198 (29.2)	< 0.001
Admitted to study hospital in previous 6 mo	53 (16.4)	68 (10.0)	0.004
Visit factors			
Brought in by ambulance	110 (34.1)	142 (20.9)	< 0.001
CTAS acuity of illness level			< 0.001
Resuscitation/emergent	50 (15.5)	51 (7.5)	
Urgent	193 (59.7)	342 (50.4)	
Less urgent	74 (22.9)	342 (50.4)	
Nonurgent	6 (1.9)	59 (8.7)	
Treatment area			< 0.001
Monitored bed	86 (26.6)	84 (12.4)	
Unmonitored bed	115 (35.6)	130 (19.2)	
No bed	122 (37.8)	465 (68.5)	
Patient referral			< 0.001
Self-referred	261 (80.8)	608 (89.5)	
Referred by community physician	44 (13.6)	54 (8.0)	
Referred by nursing home	18 (5.6)	17 (2.5)	
Primary acute diagnosis			< 0.001
Head and neck	16 (5.0)	66 (9.7)	
Cardiovascular	77 (23.8)	66 (9.7)	
Respiratory	32 (9.9)	35 (5.2)	
Gastrointestinal	31 (9.6)	41 (6.0)	
Genitourinary	25 (7.7)	28 (4.1)	
Obstetric or gynecologic	11 (3.4)	35 (5.2)	
Rheumatologic	12 (3.7)	24 (3.5)	
Psychiatric	29 (9.0)	35 (5.2)	
Trauma	8 (2.5)	68 (10.0)	
Fracture or sprain	21 (6.5)	145 (21.4)	
Other	61 (18.9)	136 (20.0)	
Outcome			
Admitted to hospital	80 (24.8)	77 (11.3)	< 0.001
Time in emergency department, mean (and SD)‡	5 h 12 min (3 h 24 min)	3 h 18 min (2 h 42 min)	< 0.001

*An information gap occurred when previously collected information was unavailable to the physician caring for the patient in the emergency department.
†Unless stated otherwise.
‡Excludes patients admitted to hospital.

After the exclusion of visits by patients who were admitted to the hospital, visits by patients with an information gap were associated with a significantly longer stay in the emergency department than those by patients without such a gap (Table 2). After adjusting for significant factors, we found that information gaps were associated with prolonged stays in the emergency department (length of stay increased by 1.2 hours, 95% CI 0.7–1.6; $p < 0.001$) (Table 4). When we grouped information gaps by their level of importance, we found that those rated by the physicians as very important or essential were associated with the longest adjusted delay (stay increased by 1.5 hours [95% CI 1.0–1.9]); for information gaps rated as somewhat important the length of stay increased by 1.0 hours (95% CI 0.4–1.5), and for those rated as not essential but potentially helpful the stay increased by 1.0 hours (95% CI 0.4–1.6). As expected, sicker patients (e.g., those brought by ambulance and those with higher CTAS levels) had longer stays in the emergency department (Table 4).

Interpretation

Information gaps were identified in almost one-third of the visits to our emergency department and were most common among the sicker patients. The most common types of gaps were patient history and laboratory information. Almost half of the gaps were rated by the attending

Table 3: Characteristics of the information gaps identified by the emergency physicians

Characteristic	No. (and %) of information gaps *n = 404*
Type of missing information	
History	234 (57.9)
Hospital information	149 (36.9)
Previous physician assessment	37 (9.2)
Past medical history	37 (9.2)
Nursing home information	5 (1.2)
Procedural information	4 (1.0)
Other	2 (0.5)
Laboratory test results*	94 (23.3)
Medications	54 (13.4)
Imaging results†	19 (4.7)
Other	3 (0.7)
Decision for which information was required‡	
Diagnostic	299 (74.0)
Treatment	130 (32.2)
Disposition	157 (38.9)
Importance of information	
Very important or essential	193 (47.8)
Somewhat important	131 (32.4)
Not essential but potentially helpful	80 (19.8)

*Includes results of all blood work, microbiological tests, electrocardiograms and spirometric measurements.
†Includes rresults of adiography, ultrasonography, CT scanning and MRI scanning.
‡The percentages do not sum to 100 because information could be required for more than one type of decision.

emergency physicians as very important or essential to patient care. After adjustment for important confounders, we found that visits in which information gaps were identified were associated with significantly longer stays in the emergency department than were visits without such gaps.

Information gaps could deleteriously affect patients and the health care system. Deficient information about previous hospital admissions, physician assessments, laboratory results and drug therapies could result in faulty decisions and poor patient outcomes.[11] Information gaps have been associated with worse outcomes in other areas of patient care (unpublished data).[19–23] Their association with prolonged stays in the emergency department could lead to increased patient dissatisfaction[24] and overcrowding. The latter is an important issue for health care systems here and elsewhere[25–29] and has been associated with decreased quality of patient care.[30] Information gaps in the emergency department probably increase the direct costs of patient care because of the need to repeat tests and physician assessments.[31]

Our observation that information gaps were more common among patients referred to the emergency department by a community physician or nursing home than among patients without a referral is of particular concern. Referred patients should have information essential to their management sent to the emergency department in time for the patient's assessment. Better communication between community physicians or institutions and the emergency department could help to avoid problems associated with information gaps for such patients.

Our study may have underestimated the prevalence of information gaps. We sampled only patients who visited our emergency department between 8 am and 8 pm on weekdays. The chance that previously collected information would be sent to the emergency department is less likely for patients presenting during off hours, when regular physician offices are closed. Also, we defined "information gap" as previously collected information that was required for the patient assessment and to which the physician did not have access. If the physician was unaware that information had been previously collected, an information gap would not have been counted even if the data were required for the patient assessment.

Our study may have overestimated the prevalence of information gaps, for 2 reasons. First, because we surveyed physicians soon after the initial patient assessment, we did not account for information that may have become available afterward while the patient was waiting in the emergency department. For example, the chart for previous admissions to the study hospital could have become available after the initial assessment. Second, although we found that sicker patients (those with more serious chronic illnesses, those who arrived by ambulance, those who had visited the emergency department or had been in hospital recently, patients in monitored areas in the emergency department and older patients) were more likely than others to have an information gap, increased severity of illness may have increased the likelihood that the attending physician identified an information gap. Compared with the total population of patients who visited our emergency department during the study period, our study sample had a higher proportion of patients who required a bed (an indication of increased severity of illness). Therefore, the prevalence of information gaps in our study may have been higher than that in the total patient population. However, using indirect standardization to control for non-random sampling, we found a persistently high prevalence of information gaps (29.6% of patients).

We found that information gaps are common for patients presenting to the emergency department, that they occur more frequently for sicker patients and that they are independently associated with a prolonged stay in the emergency department. If information gaps are as prevalent and influential in other emergency departments, interventions such as online patient information systems could improve the process and outcomes of patient care.

Table 4: Independent effect of information gaps on length of stay in the emergency department*

Factor	Change in length of stay (and SE), h	*p* value
Patient factors		
Female sex	0.3 (0.2)	0.03
Admitted to study hospital in previous 6 mo	0.6 (0.3)	0.02
Atrial fibrillation	1.4 (0.4)	0.0015
Visit factors		
Brought in by ambulance	0.4 (0.2)	0.05
Higher CTAS acuity of illness level (v. 1 level lower)	0.5 (0.1)	< 0.0001
Monitored bed (v. no bed)	1.3 (0.3)	< 0.0001
Unmonitored bed (v. no bed)	1.3 (0.2)	< 0.0001
Information gap	1.2 (0.2)	< 0.0001

Note: SE = standard error.
*This analysis excluded patients who were admitted to the hospital ($n = 157$). Multivariate linear regression analysis was used to determine the effect of each factor on the mean length of stay in the emergency department, independent of all other factors listed in the table. Changes in length of stay that exceeded 0 indicate that the factor was associated with a prolonged stay in the emergency department.

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References

1. Cook RI, Render M, Woods DD. Gaps in the continuity of care and progress on patient safety. *BMJ* 2000;320:791-4.
2. Gosbee J. Communication among health professionals. *BMJ* 1998;316:642.
3. Regan WA. Communications: doctors–nurse–patient triangle. *Regan Rep Nurs Law* 1983;23(8):1.
4. Buckingham JK, Gould IM, Tervitt G, Williams S. Prevention of endocarditis: communication between doctors and dentists. *Br Dent J* 1992;172(11):414-5.
5. Van Walraven C, Seth R, Laupacis A. Hospital discharge summaries infrequently get to post-hospitalization physicians. *Can Fam Physician* 2002;48:737-43.
6. Van Walraven C, Weinberg AL. Quality assessment of a discharge summary system. *CMAJ* 1995;152(9):1437-42.
7. Mageean RJ. Study of "discharge communications" from hospital. *BMJ* 1986;293:1283-4.
8. Geitung JT, Kolstrup N, Fugelli P. Written information from hospital to primary physician about discharged patients. *Tidsskr Nor Laegeforen* 1990;110(24):3132-5.
9. Haikio JP, Linden K, Kvist M. Outcomes of referrals from general practice. *Scand J Prim Health Care* 1995;13(4):287-93.
10. Burnett MG, Grover SA. Use of the emergency department for nonurgent care during regular business hours. *CMAJ* 1996;154(9):1345-51.
11. Kelly AM. A study of the content and clarity of general practitioner referral letters to an emergency department. *N Z Med J* 1993;106:363-4.
12. Crone P. Are preadmission general practitioner telephone calls of value? A study in communication. *N Z Med J* 1987;100:632-4.
13. Cooling N, Walpole B. General practitioner referrals to a department of emergency medicine. *Aust Fam Physician* 1992;21(5):621-8.
14. Barnes PK, Hoile RW. Emergency admissions to a general medical unit: a survey of the accompanying letters, with recommendations. *BMJ* 1969;4:424-5.
15. Beveridge T, Petrie JC. Transfer of information about intake of drugs by patients referred to medical units. *BMJ* 1972;2:37-9.
16. Beveridge R, Ducharme J, Janes L, Beaulieu S, Walter S. Reliability of the Canadian Emergency Department Triage and Acuity Scale: interrater agreement. *Ann Emerg Med* 1999;34(2):155-9.
17. Fleiss JL. The standardization of rates. In: *Statistical methods for rates and proportions*. 2nd ed. New York: John Wiley and Sons; 1981. p. 237-55.
18. Hirsch RP, Riegelman RK. Nominal dependent variables. In: *Statistical first aid: interpretation of health research data*. Boston: Blackwell Scientific Publications; 1992.
19. Branger PJ, van't Hooft A, van der Wouden JC, Duisterhout JS, van Bemmel JH. Shared care for diabetes: supporting communication between primary and secondary care. *Medinfo* 1998;9(Pt 1):412-6.
20. Montalto M, Harris P, Rosengarten P. Impact of general practitioners' referral letters to an emergency department. *Aust Fam Physician* 1324;23(7):1320-1.
21. Robertson CL, Kopans DB. Communication problems after mammographic screening. *Radiology* 1989;172(2):443-4.
22. Tierney WM, McDonald CJ, Martin DK, Rogers MP. Computerized display of past test results. Effect on outpatient testing. *Ann Intern Med* 1987;107(4):569-74.
23. Van Walraven C, Seth R, Austin PC, Laupacis A. The effect of discharge summary availability during post-discharge outpatient visits on readmission to hospital. *J Gen Intern Med* 2002;17:1-8.
24. Sun BC, Adams J, Orav EJ, Rucker DW, Brennan TA, Burstin HR. Determinants of patient satisfaction and willingness to return with emergency care. *Ann Emerg Med* 2000;35(5):426-34.
25. Sylvester R. NHS faces another bleak winter, says Milburn. *Daily Telegraph* [London] 2000 Nov 4.
26. Gibbs N. Do you want to die? The crisis in emergency care is taking its toll on doctors, nurses and patients. *Time* 1990;May 28;58-65.
27. Doherty L. Crowded hospitals diverting patients. *Morning Herald* [Sydney] 1998 Nov 3.
28. Andrulis DP, Kellermann A, Hintz EA, Hackman BB, Weslowski VB. Emergency departments and crowding in United States teaching hospitals. *Ann Emerg Med* 1991;20(9):980-6.
29. Derlet R, Richards J, Kravitz R. Frequent overcrowding in US emergency departments. *Acad Emerg Med* 2001;8(2):151-5.
30. Miro O, Antonio MT, Jimenez S, De Dios A, Sanchez M, Borras A, et al. Decreased health care quality associated with emergency department overcrowding. *Eur J Emerg Med* 1999; 6(2):105-7.
31. Wallace G. Information technology and telemedicine. *CMAJ* 2001;165(6):777-9.

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