

EM ADVANCES

Patient adherence with emergency department referral to a cardiovascular evaluation and risk assessment clinic

Jeremy M. Wojtowicz, MD;* Shawn Dowling, MD;† Alykhan M. Nanji, MD;‡ D. Bruce MacLeod, MD†

ABSTRACT

Objective: Patient adherence with emergency department (ED) referral has not been well studied in Canada, and there are no Canadian studies assessing patient follow-up for evaluation of cardiovascular disease. Our primary objective was to determine the proportion of patients who adhered with an ED referral to a cardiac evaluation and risk assessment (CERA) clinic in Calgary, Alta. Secondary objectives included determining the final diagnoses and outcomes for patients attending CERA appointments. We also assessed the association between adherence and various system and patient factors.

Methods: A retrospective review of 385 patients who were referred to CERA from EDs in the study region between June 1, 2004, and Apr. 7, 2005, was performed. Hospital charts and the database at the medical examiner's office were reviewed for patients who did not attend their CERA appointment.

Results: The majority of patients (345/385, 89.6%) followed through with their referral to CERA. No deaths were identified from hospital records or from the medical examiner's office for nonadherent patients. Of the 315 patients who completed their follow-up, 225 (71.4%) were diagnosed with noncardiac or low-risk cardiac disease, whereas 90 (28.6%) were diagnosed with cardiovascular disease. The referring hospital was the only variable significantly associated with adherence with the referral ($p = 0.004$).

Conclusion: The great majority of patients referred to CERA from Calgary EDs were adherent with the referral. Future studies may identify factors impairing adherence that are amenable to intervention. Implementation of a referral model similar to the one used by CERA may improve adherence with attendance at other outpatient clinics.

Keywords: patient compliance, emergency medicine, cardiovascular diseases, chest pain

RÉSUMÉ

Objectif : L'adhésion des patients au rendez-vous de suivi fait par le médecin à l'urgence n'a pas été bien étudiée au Canada, et il n'y a pas d'études canadiennes qui évaluent l'adhésion des patients à une évaluation de maladies cardiovasculaires. L'objectif principal de cette étude était de déterminer la proportion de patients qui se sont rendus, à la demande d'un médecin d'urgence, à une clinique de Calgary, en Alberta, pour une évaluation cardiaque et une évaluation des risques

From the *Division of Emergency Medicine, McMaster University, Hamilton, Ont., the †Department of Emergency Medicine, Calgary Health Region, Calgary, Alta., and the ‡Cardiac Evaluation and Risk Assessment (CERA) Clinic, Calgary, Alta. *At the time of writing, from the Department of Emergency Medicine, Calgary Health Region, Calgary, Alta.

Submitted Apr. 28, 2007; Revised Dec. 7, 2007; Accepted Jan. 3, 2008

This article has been peer reviewed.

CJEM 2008;10(6):511-7

cardiaques (ÉCÉRC). Les objectifs secondaires étaient d'établir le diagnostic définitif et le pronostic des patients s'étant rendus à cette clinique pour une ÉCÉRC. Nous avons également évalué l'association entre divers systèmes et les facteurs liés aux patients et l'adhésion de ces derniers.

Méthodes : Nous avons réalisé une étude rétrospective de 385 patients qui ont été référés à la clinique d'ÉCÉRC dans la région de l'étude entre le 1er juin 2004 et le 7 avril 2005. On a examiné les dossiers des hôpitaux et la base de données du bureau du médecin légiste pour les patients qui ne se sont pas présentés à leur rendez-vous pour subir une ÉCÉRC.

Résultats : La majorité des patients (345 sur 385 ou 89,6 %) se sont rendus à la clinique pour subir une ÉCÉRC. Les dossiers des hôpitaux ou du bureau du médecin légiste ne signalaient aucun décès chez les patients n'ayant pas adhéré à la requête du médecin. Des 315 patients qui ont complété leur suivi, 225 (71,4 %) ont reçu un diagnostic de maladie non cardiaque ou de maladie cardiaque à faible risque, alors que 90 (28,6 %) ont reçu un diagnostic de maladie cardiovasculaire. L'hôpital de référence était la seule variable présentant un lien significatif avec l'adhésion à l'examen de suivi demandé par le médecin ($p = 0,004$).

Conclusion : La majorité des patients des salles d'urgence de Calgary référés à la clinique d'ÉCÉRC ont adhéré à la requête du médecin. De futures études pourront repérer les facteurs qui nuisent à l'adhésion et qui se prêtent à l'intervention. La mise en œuvre d'un modèle de référence semblable à celui utilisé par la clinique d'ÉCÉRC peut améliorer le taux d'adhésion dans d'autres cliniques externes.

Introduction

Cardiovascular disease is the leading cause of death among Canadians, accounting for 74 626 deaths in 2002. The economic impact of this disease is substantial, costing the Canadian health care system in excess of \$18 billion annually.¹ Given the consequences of cardiovascular disease in Canada, optimal recognition and management of the associated conditions is imperative.

Patients often present to the emergency department (ED) with chest pain or other symptoms that are potentially attributable to cardiovascular disease. For many patients the etiology of the chest pain can be determined; however, for some patients the cause is not easily identified. Patients in this latter group are often referred for additional investigations. The Cardiac Evaluation and Risk Assessment (CERA) Clinic is an outpatient clinic located in Calgary and is staffed primarily by general internists. During the study period, CERA evaluated approximately 370 patients per month, of which 10% were referred from local EDs and 90% were referred by community physicians. Patients are assessed at CERA urgently, semiurgently or nonurgently, based on the referring physician's assessment, and additional investigations are performed as needed.

Previous studies have shown that adherence with ED referrals for outpatient follow-up is poor, ranging from 26% to 54%.²⁻⁶ The only Canadian study to examine patient adherence with ED referral found that 82% attended their appointments when referred to gynecology, urology, plastic surgery or orthopedic surgery outpatient clinics.⁷ We were unable to find any Canadian studies assessing adherence

with follow-up for evaluation of cardiovascular disease.

Our primary objective was to determine the proportion of patients who adhered with the ED referral to a cardiovascular evaluation and risk assessment clinic. Secondary objectives included determining the final diagnoses and outcomes for patients attending CERA appointments. We also assessed the association between adherence and various system and patient factors.

Methods

Study design

A retrospective review of patients referred to CERA from local EDs in the study region was performed. We estimated that 384 patients adherent with ED referral to CERA were needed for a 95% confidence interval (CI) (standard deviation 3). CERA estimates the adherence rate to be 93%. To ensure an adequate sample size we assumed an adherence rate of 90%. Ethical approval was obtained from the Research Ethics Board at the University of Calgary. Patients attending CERA were asked to sign a consent form at the time of their initial visit to the clinic, granting permission to have their records reviewed for research purposes. Patients were eligible for inclusion if this form had been signed. No additional consent was required by the Research Ethics Board.

Eligibility criteria and variables to extract were established a priori. Patients who were referred to CERA from any of the 3 adult EDs in Calgary and for whom CERA had received the referral were included in our study. Patients were excluded if the referral was incomplete, if they were referred by a family physician or if they did not

consent to having their chart reviewed for research purposes. Hospital records and the medical examiner's database were reviewed for any nonadherent patients.

Data collection

The following variables were extracted from patient charts: attendance at the scheduled appointment, the reason for not attending appointment (i.e., no-show, called to cancel, rescheduled and attended, rescheduled and did not attend, admitted to hospital), patient age, patient sex, the referring hospital (i.e., Foothills Medical Centre [FMC], Peter Lougheed Centre [PLC], Rockyview General Hospital [RGH]), the location of patient residence by city quadrant, the date the referral was received at CERA, the date of the CERA appointment, the ED diagnosis, the CERA diagnosis, the referral type (i.e., urgent, semiurgent or nonurgent), whether the patient was able to be contacted to book an appointment, the investigations arranged, the interventions required and the final patient outcome (i.e., incomplete follow-up, noncardiac disease or cardiac disease). Additional variables collected for patients who did not attend

their appointment included the following: assessments in ED after referral to CERA, the hospitals visited, the ED diagnosis, whether the patient was admitted to hospital, admission and discharge dates, the discharge diagnosis, the occurrence of death and the cause of death.

Data analysis and statistics

Data was entered into a Microsoft Excel database (Microsoft Corp.) and transferred to Stata version 9.0 and SAS version 9.1 (SAS Institute) for statistical evaluation. Descriptive statistics were generated, along with 95% CIs for proportions of particular interest. χ^2 analysis (using Fisher exact test when appropriate) was performed to determine whether adherence with the referral was associated with age, sex, the referring hospital, the location of the patient's residence, the interval between the referral and the appointment, the referral type and whether the patient could be contacted. χ^2 testing was also used to assess whether the referral type was associated with either the interval from the referral to the appointment or the final outcome.

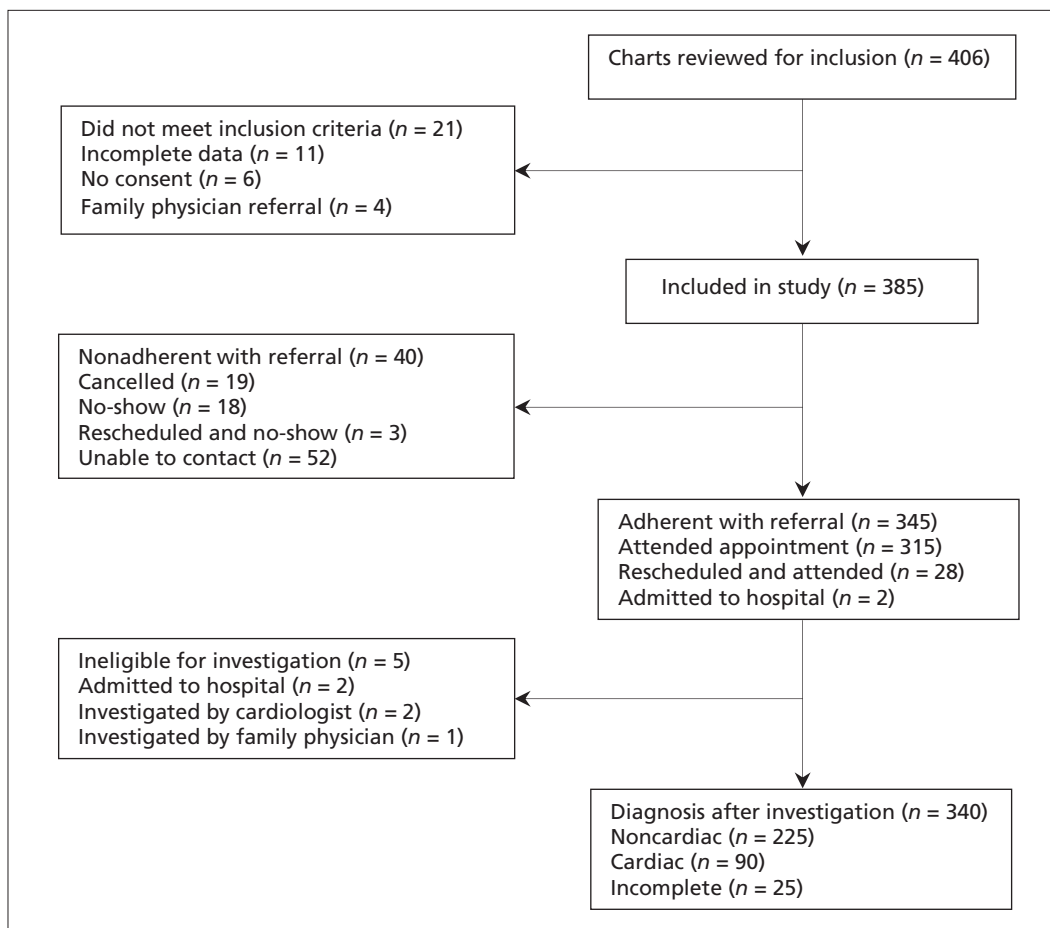


Fig. 1. Summary of participant flow.

Results

Of 406 charts that were reviewed, 21 were excluded from analysis based on a priori criteria (4 referred by a family physician, 6 refused consent and 11 had insufficient referral information available). As a result, 385 patients were included in this study, 345 of whom (89.6%, 95% CI 86.3%–92.4%) were adherent with their referral. This group included 315 patients who attended their original appointment, 28 who rescheduled and attended an appointment and 2 patients who were admitted to hospital at the time of their appointment. Forty patients were nonadherent with the referral, including 19 who called to cancel their appointment, 18 who were no-shows and 3 who rescheduled their appointment but did not attend. Figure 1 graphically depicts the study population. Demographic information for the study patients is provided in Table 1.

As mentioned, 2 patients were in hospital at the time of their CERA appointments. One patient was admitted to hospital with unstable angina after returning to the ED with chest pain. This patient had a normal thallium scan and the discharge diagnosis was “chest pain not yet diagnosed, likely musculoskeletal.” The other patient was admitted to hospital with pneumonia and subsequently diagnosed with metastatic breast cancer. She did not have any cardiac investigations during her admission.

Table 2 shows the relationship between the interval from referral to CERA appointment and referral type. Of the 375 patients in this analysis, 47 were scheduled to be seen within 1 week of referral to CERA and all were adherent with the referral. Thirty-three of the 36 patients (91.7%) seen within 1–2 weeks of their ED visit were adherent, 128 of the 145 (88.3%) seen within 2–6 weeks were adherent and 128 of the 147 (87.1%) who were booked to be seen more than 6 weeks after referral were adherent.

Chi-square testing found a significant relationship between adherence with a CERA appointment and the hospital from which the patient was referred ($p = 0.004$). None of the other previously outlined comparisons were significant.

Of the 385 patients, 340 (88.3%) were eligible to undergo further investigation, 315 (92.6%) of whom underwent risk stratification (Table 3). The 42 patients who did not attend an appointment (nonadherent or currently admitted to hospital) could not be further investigated. Additionally, 3 patients who attended their CERA appointment were not investigated because they were already being investigated by a cardiologist ($n = 2$) or their family physician ($n = 1$). Table 4 shows the final diagnoses for patients attending their initial CERA appointment. There was no association between the final diagnosis and the urgency of

referral (Table 5). Of the 41 patients with a final diagnosis of coronary artery disease (CAD), 12 (29.3%) had pre-existing CAD and 29 (70.7%) were newly diagnosed. Nine of the patients with newly diagnosed CAD (31.0%) had been referred urgently and 20 patients (69.0%) were referred nonurgently.

Two-hundred five patients were prescribed a medication,

Table 1. Demographic factors by attendance group ($n = 385$)

Variable	No. (%) of patients	
	Adherent with referral, $n = 345$	Not adherent with referral, $n = 40$
Age, yr		
18–30	6 (1.7)	0 (0.0)
31–45	78 (22.6)	12 (30.0)
46–60	164 (47.5)	18 (45.0)
61–75	68 (19.7)	8 (20.0)
75+	29 (8.4)	2 (5.0)
Sex		
Male	181 (52.5)	23 (57.5)
Female	164 (47.5)	17 (42.5)
Referring hospital		
FMC	141 (40.9)	9 (22.5)
PLC	89 (25.8)	20 (50.0)
RGH	115 (33.3)	11 (27.5)
Residence		
Northwest	100 (29.0)	6 (15.0)
Northeast	56 (16.2)	10 (25.0)
Southwest	99 (28.7)	8 (20.0)
Southeast	67 (19.4)	13 (32.5)
Rural	23 (6.7)	3 (7.5)
Patient contacted		
Yes	345 (100.0)	39 (97.5)
No	0 (0.0)	1 (2.5)
Referral type		
Urgent	32 (9.3)	1 (2.5)
Semiurgent	6 (1.7)	0 (0.0)
Nonurgent	307 (89.0)	39 (97.5)
Reason for referral		
Chest pain	302 (87.5)	33 (82.5)
CAD	4 (1.2)	0 (0.0)
Risk assessment	1 (0.3)	1 (2.5)
ACS	1 (0.3)	0 (0.0)
Syncope	12 (3.8)	3 (7.5)
Palpitations	8 (2.3)	0 (0.0)
Arrhythmia	6 (1.7)	2 (5.0)
Short of breath	5 (1.4)	0 (0.0)
Abnormal ECG	5 (1.4)	0 (0.0)
Hypertension	1 (0.3)	0 (0.0)
No reason stated	0 (0.0)	1 (2.5)

ACS = acute coronary syndrome; CAD = coronary artery disease; ECG = electrocardiogram; FMC = Foothills Medical Centre; PLC = Peter Loughheed Centre; RGH = Rockyview General Hospital.

4 underwent angioplasty and 1 had ablation therapy. Two patients underwent cardiac surgery, 1 patient underwent coronary artery bypass grafting and 1 had a congenital structural abnormality repaired.

Of the 40 nonadherent patients, 5 were seen in the ED in the period between referral and their scheduled appointment. All were seen at the same hospital that they had initially attended. One of these patients presented to the ED with chest pain, and the others had noncardiac reasons for seeking medical care. The patient who presented with chest pain was diagnosed with panic attacks and dis-

charged home. One of the patients seen for a noncardiac presentation was admitted to hospital and was discharged before their CERA appointment. No deaths were identified in hospital charts or at the medical examiner's office for the interval between referral to CERA and the scheduled appointment time.

Discussion

Our study indicates that 89.6% of patients referred to CERA from Calgary EDs are adherent with referrals. This

Table 2. Interval between referral and CERA appointment by referral type (n = 375*)

Referral type	No. (%) of patients			
	< 1 wk	1 – < 2 wk	2 – < 6 wk	≥ 6 wk
Urgent, n = 33	6 (18.2)	7 (21.2)	14 (42.4)	6 (18.2)
Semiurgent, n = 6	1 (16.7)	0 (0.0)	3 (50.0)	2 (33.3)
Nonurgent, n = 336	40 (11.9)	29 (8.6)	128 (38.1)	139 (41.4)

CERA = cardiac evaluation and risk assessment.

*Only 375 participants are included in this table because 1 patient did not have a referral date in the CERA chart and 9 referral letters were entered into the CERA system after the initial appointment.

Table 3. Investigations for patients completing follow-up at CERA (n = 340)

Type of investigation	No. (%) of patients*
Risk stratifying	
Exercise treadmill test (ETT) only	121 (35.6)
Nuclear imaging (NI) only	28 (8.2)
Echocardiography (ECG) only	11 (3.2)
Angiography (AG) only	0 (0.0)
ETT + NI	30 (8.8)
ETT + NI + ECG	22 (6.5)
ETT + ECG	36 (10.6)
ETT + NI + ECG + AG	3 (0.9)
NI + AG	2 (0.6)
NI + ECG	56 (16.5)
NI + ECG + AG	6 (1.8)
Non-risk stratifying	
Holter monitor	62 (18.2)
Ambulatory blood pressure	4 (1.2)
Other investigations†	39 (11.5)

CERA = cardiac evaluation and risk assessment.

*The total percentage exceeds 100 because some patients underwent more than 1 investigation.

†Other investigations included: pulmonary function testing (n = 20); abdominal ultrasound (n = 13); ventilation/perfusion scan (n = 2); electroencephalogram (n = 1); electrophysiology study (n = 1); King of Hearts monitor (n = 1); carotid ultrasound (n = 1); cardiopulmonary study (n = 1); cardiac magnetic resonance imaging (n = 2); barium swallow (n = 1). The total number of investigations performed (n = 43) is greater than number of patients undergoing additional investigations because some patients underwent more than 1 investigation.

Table 4. Final CERA diagnosis for patients eligible for investigation (n = 340)

Diagnostic category	No. (%) of patients
Incomplete follow-up	25 (7.4)
Acute coronary syndrome	0 (0.0)
Noncardiac disease	225 (66.2)
Low-risk CAD*	172 (50.6)
Musculoskeletal	10 (2.9)
Gastrointestinal	24 (7.1)
COPD/asthma	2 (0.6)
Anxiety	6 (1.8)
Obstructive sleep apnea	2 (0.6)
Noncardiac chest pain	7 (2.0)
Anemia	2 (0.6)
Cardiovascular-related disease	90 (26.4)
Coronary artery disease	41 (12.1)
Hypertension	23 (6.8)
Cardiomyopathy/CHF	6 (1.8)
Intermediate risk CAD*	5 (1.5)
Arrhythmia	5 (1.5)
Structural heart disease	4 (1.2)
Metabolic syndrome	4 (1.2)
Peripheral vascular disease	1 (0.3)
Syncope NYD	1 (0.3)

CAD = coronary artery disease; CERA = cardiac evaluation and risk assessment; CHF = congestive heart failure; COPD = congestive obstructive pulmonary disease; NYD = not yet diagnosed.

*Based on risk stratification.

is substantially better than adherence rates reported in the international literature.²⁻⁸ Field and colleagues⁹ found that only 38% of ED patients who were assessed for chest pain and referred to a medical clinic for follow-up attended their appointment. In another study, only 47% of ED patients who were assessed for possible acute coronary syndrome (ACS) and were offered follow-up in a hospital-based chest pain clinic attended the clinic.¹⁰ The high rate of adherence in our location may in part be a result of the manner in which appointments are booked with CERA. After CERA receives the referral from the ED, the clinic's staff makes 2 attempts to contact the patient to set up an appointment. Patients who book appointments receive an automated reminder call 2 days before their appointment. Previous studies have found that this type of system improves adherence.¹¹⁻¹⁴

The only variable in our study that was identified as having a significant effect on adherence with referrals was the referring hospital, with adherence being less likely if the patient was referred from the PLC. This centre is located in a more culturally diverse and lower socioeconomic status section of the city. Previous studies have shown that these factors can influence adherence with appointments.¹⁵ Poorer adherence in lower socioeconomic status groups may be related to communication problems, financial or transportation issues, or a lack of understanding of the health care system and the need for follow-up. We were not able to determine ethnicity, primary language or socioeconomic status of patients enrolled in the study; therefore, we cannot conclude with certainty that these reasons had an influence on the lower adherence from the PLC. Adherence has been shown to improve when patients perceive their health status to be worse and when medical personnel convey that their condition is more urgent.^{2,3} Placing greater emphasis on the importance of follow-up may improve adherence in patients who are referred from locations such as the PLC.

No patients assessed at CERA were diagnosed with a missed ACS. This contrasts with previous studies that

found 2%–12% of patients with chest pain are discharged from the ED while suffering an ACS.^{9,16-21} In our study, 70% of patients completing follow-up were diagnosed with a noncardiovascular cause for their chest pain or a low likelihood of cardiac disease. These findings are not surprising, since it is generally only low-risk patients who are discharged from the ED without undergoing cardiac consultation.

CERA was designed to be a resource for further evaluation of patients felt to be at low risk for serious disease. This is a subjective determination, as there are no predetermined criteria that define suitability for referral to CERA. The relatively small proportion of patients referred to CERA who are ultimately diagnosed with CAD or other serious illness suggests that CERA is being used in a manner consistent with its mandate to evaluate low-risk patients

We believe that CERA plays an important role in our region's health care system. CERA is able to evaluate and manage a large number of patients who would otherwise require referral to outpatient cardiology or other specialty clinics, prolonging the wait time for sicker patients who require assessment by a cardiologist. Additionally, CERA may reduce the number of patients making return visits to the ED, since CERA provides timely follow-up for patients.

Limitations

This study has some important limitations that should be considered. First, as this was a retrospective chart review and we did not contact study participants, we were unable to definitively identify factors that affected adherence. The results of our study may not be generalizable to other patient populations or clinical settings. Variables not included in this study may have influenced adherence. Additionally, we did not identify which, if any, nonadherent patients sought medical attention from their family physician rather than attending CERA, or were referred to a cardiologist for outpatient evaluation from the ED. We also do not know if some patients chose not to attend because their symptoms had resolved. Not all out-of-hospital deaths are reported to the medical examiner's office. It is therefore possible that there were deaths among the nonadherent group that we were unable to identify. In our study, patients who cancelled their appointments in advance were considered to be nonadherent because we could not be sure that they had obtained appropriate follow-up for the symptoms that had originally led them to be referred to CERA. Determining how to categorize this group of patients is difficult, as the reasons for cancellation are unclear and the results are influenced by the approach chosen. With a prospective study design, the reasons for cancellation could be better clarified

Table 5. Final CERA diagnosis by referral type (n = 340)

Referral type	No. (%) of patients		
	Cardiovascular-related disease	Noncardiac disease	Incomplete follow-up
Urgent, n = 32	13 (40.6)	16 (50.0)	3 (9.4)
Semiurgent, n = 6	0 (0.0)	5 (83.3)	1 (16.7)
Nonurgent, n = 302	81 (26.8)	200 (66.2)	21 (7.0)

CERA = cardiac evaluation and risk assessment.

to ensure that patients did receive some appropriate form of follow-up.

This study was designed to determine adherence at CERA, not to identify missed ACS discharged from the ED. Although there were no patients with missed ACS in our study, these results should be interpreted with caution.

We only reviewed charts for those patients who were referred to CERA. Not all patients with potentially cardiac symptoms are referred to CERA for follow-up. Also, there were no routine investigations performed on patients presenting to CERA, nor was the timing of the visits standardized. As a result, it is possible that patients could have had an ACS in the ED, but not have had it identified in their CERA visit. Identifying all patients with missed ACS discharged from the ED would require a more rigorous study design.

Conclusion

The great majority of patients referred to CERA from Calgary EDs are adherent with the referral. Future studies may identify factors impairing adherence that are amenable to intervention. Implementation of a referral model similar to the one used by CERA may improve adherence with attendance at other outpatient clinics.

Acknowledgement: We would like to thank Ms. Linda Fauth for being a valuable resource and for facilitating access to CERA. We would also like to thank Ms. Luz Palacios-Derflinger for her assistance with the statistical analyses used for this study.

Competing interests: None declared.

References

- Heart and Stroke Foundation of Canada [home page]. Available: www.heartandstroke.ca (accessed 2008 Oct 2).
- Straus JH, Orr ST, Charney E. Referrals from an emergency room to primary care practices at an urban hospital. *Am J Public Health* 1983;73:57-61.
- Vukmir RB, Kremen R, DeHart DA, et al. Compliance with emergency department patient referral. *Am J Emerg Med* 1992;10:413-7.
- Magnusson AR, Hedges JR, Vanko M, et al. Follow-up compliance after emergency department evaluation. *Ann Emerg Med* 1993;22:560-7.
- Vukmir RB, Kremen R, Ellis GL, et al. Compliance with emergency department referral: the effect of computerized discharge instructions. *Ann Emerg Med* 1993;22:819-23.
- Ritchie PD, Jenkins M, Cameron PA. A telephone call reminder to improve outpatient attendance in patients referred from the emergency department: a randomized controlled trial. *Aust N Z J Med* 2000;30:585-92.
- Murray MJ, LeBlanc CH. Clinic follow-up from the emergency department: Do patients show up? *Ann Emerg Med* 1996;27:56-8.
- Hamilton W, Round A, Sharp D. Effect on hospital attendance rates of giving patients a copy of their referral letter: randomised controlled trial. *BMJ* 1999;318:1392-5.
- Field DL, Hedges JR, Arnold KJ, et al. Limitations of chest pain follow-up from an urban teaching hospital emergency department. *J Emerg Med* 1988;6:363-8.
- Rouan GW, Hedges JR, Toltzis R, et al. A chest pain clinic to improve the follow-up of patients released from an urban university teaching hospital emergency department. *Ann Emerg Med* 1987;16:1145-50.
- Bigby J, Giblin J, Pappius EM, et al. Appointment reminders to reduce no-show rates: a stratified analysis of their cost-effectiveness. *JAMA* 1983;250:1742-5.
- Macharia WM, Leon G, Rowe BH, et al. An overview of interventions to improve compliance with appointment keeping for medical services. *JAMA* 1992;267:1813-7.
- Shepard DS, Moseley TA. Mailed versus telephone reminders to reduce broken appointments in a hospital outpatient department. *Med Care* 1976;14:268-73.
- Gates SJ, Colborn DK. Lowering appointment failures. *Med Care* 1976;14:263-7.
- Oppenheim GL, Bergman JJ, English EC. Failed appointments: a review. *J Fam Pract* 1979;8:789-96.
- Schor S, Behar S, Modan B, et al. Disposition of presumed coronary patients from an emergency room. *JAMA* 1976;236:941-3.
- Emerson PA, Russell NJ, Wyatt J, et al. An audit of doctor's management of patients with chest pain in the accident and emergency department. *Q J Med* 1989;70:213-20.
- Lee TH, Rouan GW, Weisberg MC, et al. Clinical characteristics and natural history of patients with acute myocardial infarction sent home from the emergency room. *Am J Cardiol* 1987;60:219-24.
- Pope JH, Aufderheide TP, Ruthazer R, et al. Missed diagnosis of acute cardiac ischemia in the emergency department. *N Engl J Med* 2000;342:1163-70.
- McCarthy BD, Beshansky JR, D'Agostino RB, et al. Missed diagnoses of acute myocardial infarction in the emergency department: results from a multicenter study. *Ann Emerg Med* 1993;22:579-82.
- Christenson J, Innes G, McKnight D, et al. Safety and efficiency of emergency department assessment of chest discomfort. *CMAJ* 2004;170:1803-7.

Correspondence to: Dr. Jeremy Wojtowicz, Department of Emergency Medicine, Hamilton Health Sciences, 237 Barton St. E., Hamilton ON L8L 2X2; jmwojtow@ucalgary.ca