

Differences in diagnostic evaluation and clinical outcomes in the care of patients with chest pain based on admitting service: The benefits of a dedicated chest pain unit

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Background: Chest pain is one of the most common complaints of patients presenting at emergency departments. However, the most appropriate diagnostic evaluation for patients with chest pain but without acute coronary syndrome remains controversial, and differs greatly among institutions and physicians. At our institution, patients with chest pain can be admitted to an internist-run hospitalist service, a private attending service, or a cardiologist-run Chest Pain Unit. The goal of the present study was to compare the management and outcomes of patients admitted with chest pain based on admitting service.

Methods: The charts of 750 patients (250 consecutive patients per service) with a discharge diagnosis of chest pain were studied retrospectively.

Results: Patients admitted to the Chest Pain Unit were younger and had a lower prevalence of known coronary artery disease, hypertension, or diabetes, but a similar prevalence of other risk factors compared with the other groups. Sixty percent of the patients in the Chest Pain Unit underwent stress myocardial perfusion imaging as their primary diagnostic modality (vs 22% and 12% of patients in the hospitalist and private services, respectively; $P < .001$). In contrast, 35% of the patients admitted to the hospitalist service underwent rest echocardiography (vs 8% and 17% of patients in the Chest Pain Unit and private services, respectively; $P < .001$). Finally, 47% of the patients in the private service underwent coronary angiography as their primary diagnostic modality (vs 6% and 10% of patients in the Chest Pain Unit and hospitalist services, respectively; $P < .001$). The length of stay was shortest for patients in the Chest Pain Unit (1.4 ± 1.2 days vs 3.9 ± 3.4 days and 3.5 ± 3.6 days in the hospitalist and private services, respectively; $P < .001$), even when corrected for patient age and number of risk factors. Readmission within 6 months was lowest for patients in the Chest Pain Unit (4.4% vs 17.6% and 15.2% in the hospitalist and private services, respectively; $P < .001$).

Conclusions: The results of this study demonstrate that a highly protocolized chest pain unit, using myocardial perfusion imaging as primary diagnostic modality, results in a decreased length of stay and readmission rate. (J Nucl Cardiol 2008;15:186-92.)

Key Words: Chest pain unit • coronary artery disease • myocardial perfusion imaging • chest pain

Chest pain (CP) is a very common presenting complaint, resulting in as many as 8 million emergency

department visits across the United States each year.¹ Approximately 60% (5 million) of these patients are admitted to hospitals, of whom half do not have acute coronary syndrome (ACS) as the cause of their chest pain. Our results showed that approximately 37% of patients presenting with CP but without ACS have coronary artery disease (CAD). Because of this relatively high prevalence of CAD in this population, we adopted a strategy of provocative stress testing before hospital discharge.² It was shown previously that patients who do not undergo diagnostic testing after their index visit for CP have increased rates of return visits for CP and

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adverse events such as myocardial infarction and death, compared with those who undergo diagnostic testing.²

While there are clear guidelines for the evaluation and treatment of patients who present with acute myocardial infarction or unstable angina,³⁻⁸ the evaluation and treatment of patients presenting at an emergency department with CP but without ACS are controversial and differ greatly among medical centers and individual physicians.⁹⁻¹⁸ Many medical centers have established chest pain units (CPUs) to handle the high volume of patients who are admitted to the hospital with chest pain, in an attempt to standardize their approach and expedite and improve the care of these patients. Many CPUs rule out patients for ACS and send them home. Some CPUs perform exercise stress testing after ACS has been ruled out.^{12,18} However, as demonstrated in our previous study, approximately 40% of patients presenting with CP fail to achieve sufficient exercise effort to reach heart-rate or treadmill-time goals, and thus require pharmacologic testing with imaging.² In addition, stress testing combined with myocardial perfusion imaging (MPI) is much more sensitive for the detection of CAD, especially in patients with single-vessel or two-vessel CAD.¹⁹

It was the goal of this study to determine the differences in diagnostic testing strategies used by various hospital services, and to observe whether a dedicated CPU, primarily using stress MPI for the evaluation of these patients, alters the length of stay (LOS) and readmission rates for CP or ACS. An additional goal was to evaluate whether provocative stress testing with MPI is an appropriate strategy for patients with chest pain who have been ruled out regarding ACS but who are at low to intermediate risk for CAD.

METHODS

We performed a retrospective chart review of 750 patients (250 consecutive patients in three different services), starting at July 1, 2004, who had an ICD-9 discharge diagnosis of CP (DRG 143). Thus, patients with acute myocardial infarction or unstable angina were not included in the analysis. All patients had normal or nondiagnostic electrocardiograms (ECGs) at 0 and 6 hours after presentation to the Emergency Department, and all had normal serum troponin-I levels at 0 and 6 hours of presentation. All patients were admitted and underwent at least 24 hours of telemetry monitoring. Patients were admitted to one of three services: a hospitalist unit served by eight experienced internists, a private medicine attending service, or a cardiologist-run Chest Pain Unit. Every patient in each service was covered by medicine house staff 24 hours per day.

The decision about admitting particular patients to particular services depended on a number of factors, including whether a patient had a private outpatient physician, whether that physician had privileges to admit patients to the hospital, and whether he or she wanted the patient admitted to his or her

service. Patients who did not have a private physician were admitted to either the hospitalist service or the CPU. This was decided by emergency-medicine attending physicians. Admission to the CPU was predicated on CP as the major complaint of the patient, and on the patient manifesting few other uncontrolled comorbidities.

The CPU at Beth Israel Medical Center is a highly protocolized virtual unit (ie, there are no fixed hospital beds), with twice-daily rounds by an attending cardiologist. Patients who are felt to be at >5% pretest probability of having a coronary event according to the Framingham risk score²⁰ are scheduled for stress testing with MPI, unless they have had previous diagnostic evaluation in the past year or there is a compelling alternative explanation for the patients' symptoms as assessed by the attending cardiologist with a special interest in the area of chest pain. The goal of the CPU is not only to determine whether a patient's CP is cardiac in origin, but to determine the alternative causes of the CP once CAD has been eliminated as the cause. Myocardial perfusion imaging is used liberally in the CPU to detect or rule out significant CAD. The CP pathway at our hospital encourages use of MPI for all such patients, regardless of admitting service.

The use of echocardiography, stress MPI, and coronary angiography in each patient was stratified by each of the three services. In addition to clinical history and risk factors, the length of stay of patients in each service, and the readmission rates for chest pain, shortness of breath, or ACS for a predetermined follow-up period of 6-months, were evaluated.

Statistical Analysis

Data were analyzed using the Statistical Analysis System software. A bivariate analysis was conducted to assess factors associated with readmissions. Categorical variables were analyzed using the chi-square statistic. Continuous variables whose distribution met normality assumptions were analyzed using the *t* test. When normality assumptions were not met, the nonparametric median test was used. Length of stay was compared between units, using the median test. Correlation coefficients were analyzed between pairs of variables using the Spearman correlation coefficient. A logistic regression analysis was conducted to assess predictors of LOS >3 and >4 days. Length of stay was also analyzed as a continuous variable in a multivariate regression analysis. Multivariate logistic regression was also used to assess independent predictors of the dichotomous variable readmission. *P* < .05 was considered statistically significant.

RESULTS

The clinical characteristics of the three groups of patients were similar but not identical (Table 1). Patients in the CPU were younger (52 ± 12 years, SD) compared with patients in the hospitalist (58 ± 15 years, SD) or private (62 ± 15 years, SD) services (*P* < .001). Patients in the CPU also had a lower prevalence of hypertension, diabetes mellitus, and known CAD (previous history of

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