CLINICAL STUDIES

MYOCARDIAL ISCHEMIA

Cardiologist Versus Internist Management of Patients With Unstable Angina: Treatment Patterns and Outcomes

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Objectives. This study sought to assess the impact of generalist versus specialist direction on the pattern of care and outcome in patients admitted to the hospital for unstable angina.

Background. Physicians trained as internists or as cardiologists may have different approaches to treating patients with unstable angina.

Methods. We reviewed a prospectively collected cohort of patients discharged with a diagnosis-related group (DRG) diagnosis of unstable angina from William Beaumont Hospital, a large community-based hospital in southeast Michigan. Of 890 consecutive patients, 225 were treated by internists and 665 by cardiologists. We compared these two groups with respect to patterns of use of established pharmacotherapies for unstable angina, diagnostic testing and clinical outcome.

Results. Patients treated by internists less often had a previous cardiac history (53% vs. 80%, p ≤ 0.0001). Internists were less

likely to use aspirin (68% vs. 78%, p = 0.032), heparin (67% vs. 84%, p ≤ 0.001) or beta-adrenergic blocking agents (18% vs. 30%, p ≤ 0.004) in their initial management. Exercise tests were performed more frequently by internist-treated patients (37% vs. 22%, p ≤ 0.001), but catheterization (27% vs. 61%, p ≤ 0.0001) and angioplasty (7% vs. 40%, p ≤ 0.0001) were utilized less frequently. The incidence of myocardial infarction was similar (11% vs. 9%) in the two groups, but the mortality rate tended to be higher (4.0% vs. 1.8%, p = 0.06) in the internist group.

Conclusions. Patients with unstable angina treated by internists were less likely to receive effective medical therapy or revascularization procedures and experienced a trend to poorer outcome. This study does not support a positive gatekeeper role for generalists in the treatment of unstable angina.

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Unstable angina pectoris remains an ill-defined clinical entity, constituting that part of the clinical spectrum of coronary artery disease between chronic stable angina and acute myocardial infarction. In 1990, >525,000 patients were admitted to hospitals in the United States with the diagnosis of unstable angina (1). In most hospitals, this diagnosis is the most common diagnosis-related group (DRG) entity among acute care cardiology discharge diagnoses. As such, unstable angina accounts for a substantial portion of health care expenditures in the United States.

In the late 1970s and 1980s, a series of clinical studies established the therapeutic benefits of beta-adrenergic (2,3) and calcium channel blocking agents (4), aspirin (5–8), heparin (9–11) and mechanical therapy in treating unstable angina (12,13). Some of these studies are established benchmark examples of the randomized clinical trial, which currently is widely espoused by specialists and generalists alike as the reference standard for clinical research methods for establishing the utility of any individual therapeutic measure (14–16).

Concurrently and independently, medical economists and educators alike have developed a concept wherein primary care physicians or generalists would be the backbone of a novel dynamic health care delivery system in the United States that would permit increasing access into the system and decreasing expenditures largely based on a "gatekeeper" role for the generalist (17–20). In essence, this model assumes that the vast majority of initial care for all (including acutely ill) patients would be delivered by a generalist who would also function to triage patients to further interventions, including but not limited to admission to the hospital, subspecialty consultations and diagnostic and therapeutic procedures.

However, validation of the utility of the gatekeeper concept requires a positive effect on clinical outcome and health care expenditures. To date, neither prospective nor retrospective reports exist evaluating the utility of the gatekeeper concept in the management of patients with coronary artery disease. Moreover, despite the high profile that prospective clinical trials of interventions in coronary artery disease have achieved to date, the compliance with suggested clinical regimens for the treatment of patients of unstable angina by generalists or specialists is unknown. Accordingly, the present study sought to assess the impact of generalist- versus specialist-directed care in patients admitted to the hospital with a diagnosis of unstable angina on resource utilization and outcome at a large community hospital in southeast Michigan. Compliance with

the use of certain established pharmaceutical therapies and common diagnostic and therapeutic workup algorithms for patients with unstable angina was also specifically evaluated.

Methods

Entry into the study cohort required a discharge DRG diagnosis (either primary or secondary) of unstable angina. Eight hundred ninety patients with unstable angina admitted to the William Beaumont Hospital from July 1, 1992 to November 30, 1992 were prospectively entered into a data base for the purpose of chart analysis in a consecutive fashion. Two groups were then established on the basis of the attending physician of record. Internal medicine physicians were responsible for the care of 225 patients; the other 665 patients had a cardiologist as their physician of record. The hospital chart was first reviewed to determine baseline epidemiologic descriptors, including age; gender; admission cholesterol level; history of diabetes; and history of previous myocardial infarction, coronary angioplasty or coronary artery bypass surgery. Pharmacologic agents previously established by randomized controlled trials to be of utility in unstable angina (including aspirin, intravenous heparin infusion, nitroglycerin preparations, calcium channel blockers and beta-blockers) were searched for on the clinical record to determine their utilization. The type of presenting clinical pattern of angina was also analyzed. Three separate categories were determined on the basis of a clinical classification system (21,22) available for use at the time and included 1) acceleration of preexisting typical stable angina, 2) exertional angina of new onset, or 3) new onset typical or atypical rest angina. It was recognized at the beginning of the study that the third category might include a subset of patients who subsequently would be determined to have nonischemic chest pain.

Both clinical outcomes and financial charges generated during the hospital period were determined. Death or new myocardial infarction occurring during the index hospital period comprised the primary clinical end point. Total charges during the hospital period were determined by analysis of data from the hospital computerized billing system and included such components as charges for room and board, pharmacy, radiology and catheterization laboratory. Actual cost data were not available, but in view of the comparative nature of the study, it was judged that the difference in resource utilization between the two groups would be accurately reflected by charges. Finally, the duration of the hospital period in days was determined for each patient.

To further assess practice patterns, the frequency of use of noninvasive testing, heart catheterization, angioplasty or coronary artery bypass surgery was assessed. To determine whether any objective prognosticator of clinical risk beyond clinical history was utilized by the treating physician, frequency of use of either treadmill testing or catheterization was determined.

Statistics. The statistical significance of differences between continuous variables of the two groups was assessed with

Table 1. Baseline Characteristics of Patient Groups

	Treatment by Internist (n = 225)	Treatment by Cardiologist (n = 665)	p Value
Age (yr)	66.3 ± 14.1	64.3 ± 12.6	0.046
Female gender	56.0%	44.4%	0.0025
Cholesterol (mg/dl)	198 ± 88	195 ± 77	0.6223
Diabetes	20.4%	28.3%	0.3287
Previous myocardial infarction	31.6%	46.2%	0.0006
Previous coronary angioplasty	7.6%	30.1%	0.0001
Previous bypass surgery	11.1%	25.1%	0.0001
Any cardiac history	53.3%	80.6%	0.0001

Data presented are mean value ± SD or percent of patients.

the Student unpaired t test using a two-tailed $p \leq 0.05$ level. Categoric variables were evaluated using the total chi-square parameter (23), and $p \leq 0.05$ was regarded as significant.

Results

Baseline characteristics. Table 1 summarizes the baseline characteristics of the two groups. It can be seen that patients managed by cardiologists were slightly younger, more likely to be male and had a substantially higher prevalence of established coronary disease (80.6% vs. 53.3%, $p \leq 0.0001$), as reflected by the rates of previous myocardial infarction, coronary angioplasty or bypass surgery. There was no difference between the two groups with respect to baseline cholesterol levels or incidence of diabetes.

Table 2 describes the differences in clinical presentation of the two groups. In view of the higher proportion of patients with a previous cardiac history in the cardiologist group, it is not surprising that a substantially higher proportion of these patients (55.4% vs. 24.9%, $p \leq 0.0001$) presented with acceleration of previous angina. Patients in the internist group were more likely to present with exertional angina of new onset (23.6% vs. 19.6%, $p \leq 0.001$) or rest pain, typical or atypical (51.6% vs. 25.0%, $p \leq 0.001$).

Practice patterns. Pronounced differences were evident in the clinical practice pattern during the study period (Fig. 1). Cardiologists were more likely to use aspirin as an initial therapy for patients with unstable angina (78.2% vs. 68.4%, $p \leq 0.032$) as well as heparin (84.2% vs. 67.1%, $p \leq 0.001$). Beta-blockers were used in a minority of patients in either cohort but significantly more often by cardiologists (29.8% vs.

Table 2. Clinical Presentation Patterns as a Function of Cohort

Angina	Treatment by Internist	Treatment by Cardiologist	p Value
Accelerated, typical	24.9%	55.4%	0.0001
New onset, exertional	23.6%	19.6%	0.001
Rest or atypical	51.6%	25.0%	0.001

Data presented are percent of patients.

Figure 1. Pharmacotherapies used for treatment of unstable angina.
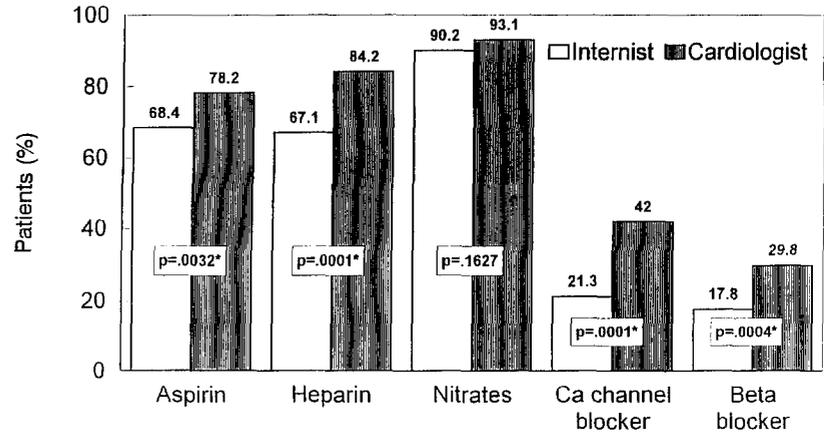
17.8%, p ≤ 0.004). Similarly, calcium channel blockers were used more often by cardiologists than internists (42% vs. 21.3%, p ≤ 0.01). The only therapy applied equally to each patient cohort was nitrates (90.2% vs. 93.1%, p = 0.16).

Figure 2 depicts the pattern of use of ancillary noninvasive and invasive procedures for patients with unstable angina. Treadmill testing was performed before hospital discharge in 37% of internist-treated patients but in only 22% of cardiologist-treated patients (p ≤ 0.001). Conversely, the cardiology group was much more likely to undergo heart catheterization during the initial hospital period for unstable angina (61.4% vs. 26.7%, p ≤ 0.0001). Altogether, either stress testing or heart catheterization before hospital discharge, to confirm the diagnosis and risk-stratify the patient, was performed in only 56% of internist-treated patients, a bare majority. Conversely, 77% of the cardiology group underwent either modality before hospital discharge (p ≤ 0.0001). Differences in use of revascularization were also present. Patients of cardiologists (39.6%) underwent coronary angioplasty more often during the same hospital period than those of internists (6.7%, p ≤ 0.0001). The difference for utilization of bypass surgery was much less (5.7% vs. 4.4%, cardiologists vs. internists, p ≤ 0.46). Any

coronary revascularization procedure was performed in only 10.5% of internist-treated patients compared with 44% of cardiologist-treated patients (p ≤ 0.001).

Outcome. Clinical outcome appeared nonsignificantly enhanced among cardiologist-treated patients relative to internist-treated patients (death in 1.8% vs. 4%, p = 0.06; new myocardial infarction in 10.7% vs. 9.3%, p = 0.55; either death or myocardial infarction in 12.9% vs. 9.9%, p = 0.21).

With respect to resource utilization, in-hospital charges were nonsignificantly greater for cardiologist-treated patients ($17,313.00 ± $15,352.00 vs. $15,333.00 ± $13,727.00, p = 0.08). It should be noted that these in-house charge figures reflect the use of cardiac catheterization or angioplasty in ~66% of cardiologist-treated patients versus only 28% of internist-treated patients (p ≤ 0.001), with a mean difference in cost of <$2,000.00 in hospital charges. Nevertheless, length of hospital stay was similar between cardiologist- and internist-treated patients (5.3 ± 5.1 days vs. 5.56 ± 4.7 days, p = 0.53). This nonsignificant trend in favor of the cardiologist cohort indicates that its resource utilization may have been more efficient inasmuch as heart catheterization, angioplasty and bypass surgery were likely to be performed together with initial

Figure 2. Diagnostic and therapeutic procedures used before hospital discharge. CABG = bypass surgery; cath = catheterization; ETT = exercise treadmill test; PTCA = coronary angioplasty.
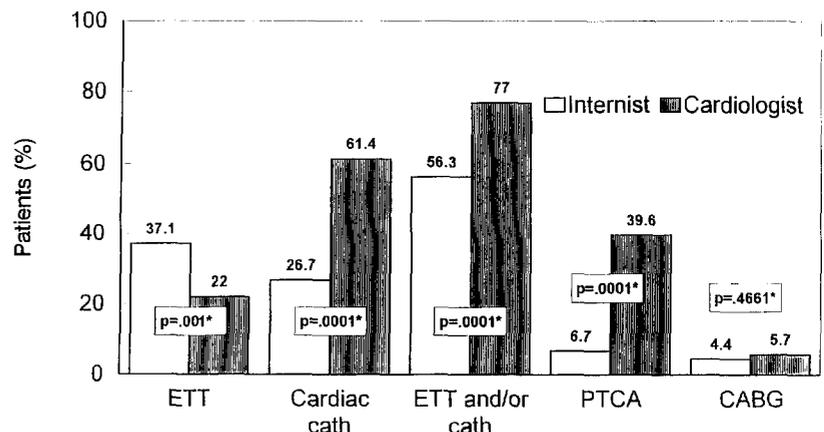
therapeutic stabilization, in the same or less mean length of stay as the internist cohort.

Discussion

The movement for health care reform in the United States has achieved very high visibility and has been described by the current administration as the number one item on its agenda for legislative passage (20). Hospital admissions for unstable angina increased to 525,000 in 1990, according to the National Center for Health Care Statistics (1) and resulted in 2.9 million hospital days. Inasmuch as acute cardiovascular disease is the leading cause of death in the United States, and unstable angina is the leading cause of hospital admission for cardiovascular disease, this entity is receiving intensive attention as a major target of health care reform.

The proposed essential elements of health care reform are several: 1) It is believed that assigning direction of inpatient care to generalists may preserve or enhance clinical outcome while reducing aggregate health care expenditure (17,18). 2) It is believed that the quality of care may be enhanced by uniform conformity to practice standards, which the generalist is assumed to be more likely to follow (24). 3) A reduction in costly procedures may further reduce the aggregate overall cost of care. It is believed that under such a *gatekeeper* model, use of these procedures would decrease. The intensity of support for this paradigm of health care administration is such that massive reduction of support for specialist training and augmentation of generalist training programs have already been proposed by governmental and educational authorities (25).

William Beaumont Hospital is a large community hospital in Southeast Michigan whose catchment area encompasses >2.2 million patients. It has a large general medical staff, the overwhelming majority of whom are internists, with a small proportion family practitioners. Although care on the teaching service (which encompassed less than a third of all patients with unstable angina) is based on an approved house officer training program in internal medicine, all care is directly supervised by the attending physician of record, who is defined at the time of the patient's admission through the emergency department. The attending physician either personally formulates or supervises all medical orders. Unstable angina is the most common DRG diagnosis at William Beaumont Hospital, and as a result, we have established a data base to facilitate outcomes analysis for patients with this entity receiving standard or investigational therapeutic approaches (22,26,27).

The data assembled by the present study do not give positive support for the role of internists as gatekeepers in the treatment of patients with unstable angina. Despite a lower prevalence of confirmed coronary artery disease, patients whose care was directed by internists experienced a trend toward increased hospital mortality. Moreover, compared with cardiologists, internists were less likely to use proven effective medical therapies, such as aspirin and heparin, strategies to assess clinical risks before hospital discharge or corrective mechanical measures, such as angioplasty or bypass surgery, in

patients admitted with unstable angina. Despite this finding, the length of stay and hospital charges were similar between groups whose care was directed by either cardiologists or internists.

Outcomes research has been championed as the only definitive measure to assess efficacy of a specified diagnostic or therapeutic approach (28). Established risk factors for short- and long-term outcome after myocardial infarction or unstable angina have included age, diabetes, presence of previous infarction or previous cardiovascular therapies (29). Patients treated by cardiologists had an incidence of diabetes that was over 33% greater, previous myocardial infarction over 50% greater and previous coronary angioplasty or bypass surgery at least 250% greater than those treated by internists. All in all, 80.6% of cardiologist-treated patients but only 53.3% of internist-treated patients had a previous cardiac history. Even so, the incidence of death during the hospital period was more than two times greater (4% vs. 1.8%) for internist-treated patients. The relative infrequency of this event, consistent with previous recent data-base studies for unstable angina, precluded this difference from achieving greater statistical strength (5-9). In line with previous studies, myocardial infarction occurred in 10.7% of internist-treated patients and 9.3% of cardiologist-treated patients, a nonsignificant difference. When the end point of either death or nonfatal myocardial infarction during the hospital period was analyzed, 12.9% of internist-treated patients and 9.9% of cardiologist-treated patients achieved this combined end point, again a nonsignificant difference.

There appeared to be a suboptimal clinical care pattern in patients in the internist cohort with respect to utilization of proven diagnostic and therapeutic modalities. Aspirin administered on hospital admission has been found highly effective in ameliorating acute coronary artery disease outcome (5-8). Meta-analysis of these studies (30) has shown that aspirin reduces the risk of myocardial infarction by 48% and death by 51% in patients admitted with acute unstable angina. Similar results have been achieved in patients with acute myocardial infarction and with stroke (29,31). Despite the established benefit of aspirin in cardiovascular care at our hospital in the study period in the second half of 1992, aspirin was utilized in only 68.4% of internist-treated patients versus 78.2% of cardiologist-treated patients.

Similarly, several studies (7,9,10,32) have established compellingly that when given by intravenous infusion during the course of unstable angina, heparin reduces the risk of subsequent myocardial infarction and refractory angina during the same hospital period. Despite these data, heparin infusion was used in only 67% of internist-treated patients versus 84% of cardiologist-treated patients. Although the data for routine use of beta-blockers for unstable angina are less compelling with respect to showing only a trend toward reduction in nonfatal infarction and death in single studies (2,9), meta-analysis showed a 13% reduction in risk of progression to acute myocardial infarction (31). In acute myocardial infarction, unequivocal benefit of beta-blockade with respect to symptom

control and survival (33–36) had been demonstrated. Nevertheless, beta-blockers were utilized in only 29.8% of cardiologist-treated patients, and even more surprising, they were used in only 17.8% of internist-treated patients. Across the board, a substantially lower proportion of internist-treated patients received proven therapeutic agents for treatment in the United States. These differences have influenced the survival difference between the two groups.

Although clinical stabilization of unstable angina by the time of hospital discharge is associated with a lower risk of mortality from myocardial infarction over the subsequent 3 to 6 months, a substantial number of patients remain at high risk for subsequent death or myocardial infarction. These patients may be identified by predischarge stress testing or coronary arteriography or both. The use of noninvasive tests of exercise duration ≤6 min; exercise-induced ST segment deviation; exercise limited by angina; exertional hypotension; or scintigraphic redistribution in two or more zones, with or without increased lung uptake, will identify patients with a first-year cardiac mortality rate ≥4% and subsequent risk of myocardial infarction of 20% to 30% (37,38). By coronary arteriography, the findings of impaired ventricular function in the presence of multivessel disease or critical coronary artery stenosis ≥90% severity, or both, have been associated with ominous short-term prognosis (39,40). Unless recent noninvasive or invasive testing has preceded the hospital period, most authorities recommend the performance of routine noninvasive testing before hospital discharge, when a so-called conservative strategy is used, or routine heart catheterization for patients with unstable angina, when a so-called routine invasive strategy is used (41). Nevertheless, in our study only 37% of internist-treated patients performed treadmill stress testing or other forms of physiologic stress testing, and 26.7% underwent heart catheterization, resulting in only 56.3% of the internist cohort with an objective test to confirm the diagnosis for risk stratification. Conversely, an aggregate 77% of patients had such testing by hospital discharge in the cardiologist cohort. It is recognized that in both cardiologist- and internist-treated groups, some patients may have had either form of testing after hospital discharge in an effort to keep the inpatient stay at a minimum; however, this is unlikely in view of the >5-day length of the hospital period. Although failure to obtain exact risk prognostication at the time of discharge obviously does not affect in-hospital outcome, it may well result in higher subsequent morbidity and mortality.

Limitations of the study. By its necessarily observational nature, this study was retrospective. However, with respect to outcomes analysis, a retrospective design in which individual clinicians are not aware of monitoring of outcome appears to be inherently advantageous over a prospective design with respect to ascertainment of actual clinical utilization patterns. The two groups were clearly not matched in terms of baseline characteristics. Nevertheless, we believe that the two groups are representative of what may be found at other community hospitals in the United States. The internist-treated group not unexpectedly had a lower prevalence of previous established

cardiovascular disease. However, patients treated by internists presented more frequently with pain at rest. The failure to distinguish between typical rest angina of new onset, which would carry with it higher than usual mortality and morbidity risk, and atypical chest pain at rest, which would suggest a noncardiac diagnosis, is a significant limitation of the study. If the internist-treated patients truly had rest angina of new onset, this may explain the higher probability for adverse short-term outcome observed in this group. However, this is unlikely in view of the surprisingly lower frequency with which proven therapeutic modalities and diagnostic testing were used in this subgroup. The data suggest that either a potentially higher risk of the subset was not detected by the treating clinician or, more likely, that atypical noncardiac symptoms were suspected.

Implication for clinical policy making. Our study suggests that at our hospital, at least, direction by internists of care for patients with unstable angina did not enhance quality of care or clinical outcome or reduce health care expenditures. Several corrective measures may be used to enhance the outcome and clinical care paradigm of the generalist group.

Definitive clinical practice guidelines for the management and diagnosis of unstable angina should be used and were recently drafted by a panel of experts compiled by the Agency of Health Care Policy and Research under the directive of Congress (41). If these guidelines are accepted by appropriate representatives of the generalist and specialist communities involved in the delivery of cardiovascular care for unstable angina, it should then be expected that relatively rigid adherence to these protocols might well enhance quality of care if not also the outcome. At each institution considering use of such a gatekeeper role for their generalists, it is suggested that an outcomes analysis similar to that done at our hospital be employed. Moreover, once a gatekeeper strategy is in use, consideration may be given to annual or biannual reassessment of its clinical efficacy and effect on outcome. Finally, physicians, health care planners and administrators need to recognize the possibility that the driving force for health care reform (i.e., that the high standard of care provided by specialists may be provided at a relatively lower level of expenditure by generalists) is at best a well intended but axiomatic concept not yet supported by the available clinical data.

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