The management of patients with acute myocardial infarction has undergone considerable change in the past several decades. These changes have included earlier mobilization, decreased length of hospitalization, improved diagnostic and monitoring procedures, and the introduction of numerous therapeutic agents aimed at improving the in-hospital as well as the long-term prognosis. The physician caring for the patient with acute myocardial infarction has available a wide variety of therapeutic agents. Several of these types of therapy have been the subject of controlled clinical trials, and the indications for some of them are controversial. Given the lack of a clear consensus as to the indications for these agents in patients with acute myocardial infarction, we have conducted a nationwide survey of members of the Section on Clinical Cardiology of the American College of Chest Physicians as to the current use of various pharmacologic interventions during hospitalization for acute myocardial infarction and after discharge from the hospital. In addition, we have examined the use of these medications by various characteristics of the physician, including age, specialty (internist vs cardiologist), practice affiliation (hospital-based, private, or group), and geographic region (New England, mid-Atlantic, South, and Midwest/West).

**Material and Methods**

This survey was conducted in the spring of 1983 under the auspices of the American College of Chest Physicians and administered through the Section on Clinical Cardiology. Questionnaires were mailed to three separate occasions to the 580 members of the section. Three hundred forty-nine physicians (60 percent) responded to the two mailings, with 266 (36 percent) responding to the initial mailing and 143 (25 percent) to the second mailing. This brief questionnaire asked physicians to record in what proportion of cases they used various types of therapy for managing patients with acute myocardial infarction in the hospital and after discharge.

For purposes of definition, routine administration of a type of therapy will refer to its use in 50 percent or more of the patients, while rarely used agents will be those administered to less than 10 percent of patients. Differences in the distribution of selected sociodemographic, physician-affiliation, and practice characteristics by medication usage were examined by using χ² and t-tests for discrete and continuous variables, respectively.

**Results**

The mean age of the physicians was 50 years, with the average age of the cardiologists being 47 years and that of the internists 57 years. The majority of physicians (66 percent) were cardiologists, and relatively similar proportions of the studied group were associated with private (36 percent), group (33 percent), or hospital-based (31 percent) practices. Regionally, 31 percent of the responding physicians practiced in New England and 27 percent in the mid-Atlantic region, while similar proportions (21 percent) practiced in the South and West. No significant age differences were noted between physicians practicing in these four regions.

The use of various medications during hospitalization for acute myocardial infarction is shown in Table 1. Differences in the use of these medications according to characteristics of the physician are summarized in Table 2.

Of the antiarrhythmic drugs, lidocaine was the most commonly used type of therapy, being routinely used by 73 percent of all physicians. Younger (less than 40 years) physicians (84 percent) and hospital-based physicians (82 percent) were significantly more likely to use lidocaine than older (60 years or more) physicians (74 percent) or those practicing in group (74 percent) or private settings (65 percent) (p<0.05). Quinidine and procainamide were administered on a routine basis by only 7 percent and 6 percent, respectively, of all physicians surveyed.

There were considerable variations in the use of nitrates during the acute phase of hospitalization.
Nitrovasodilators were administered topically (56 percent), sublingually (54 percent), and orally (41 percent) to patients routinely, while intravenously administered nitrates (7 percent) were rarely used on a regular basis. Internists (56 percent) were more likely to routinely use oral nitrates than were cardiologists (34 percent) (p<0.001). Relatively similar proportions of physicians based in New England (49 percent), the mid-Atlantic region (42 percent), and the South (44 percent) rou-

Table 2—Differences in Routine Use of Selected Medications during and after Hospitalization in Patients with Acute Myocardial Infarction by Physician Characteristics

<table>
<thead>
<tr>
<th>Medication*</th>
<th>Age</th>
<th>Specialty</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>In hospital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lidocaine</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Oral nitrates</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Intravenous nitrates</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Subcutaneous heparin</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Intravenous heparin</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Warfarin</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>After hospitalization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral nitrates</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Topical nitrates</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Beta-adrenergic blockers</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Calcium channel blockers</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Warfarin</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Dipyridamole</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

*Only those medications showing significant (p<0.05) differences in usage by selected physician characteristics are shown.

significantly administered oral nitrates, while only 25 percent of physicians in the West routinely used oral nitrates (p<0.05). Intravenous nitrates were used on a regular basis more often by younger (less than 40 years) physicians (12 percent), as compared to older (60 years or more) physicians (2 percent), while cardiologists (9 percent) routinely used intravenous nitrates to a greater extent than internists (2 percent) (p<0.05). No other significant differences were noted in the various subgroups examined in the use of nitrate preparations.

Beta-adrenergic blockers were routinely used by 44 percent of the physicians. Only 5 percent stated that they rarely used β-adrenergic blockers during the in-hospital management of patients with acute myocardial infarction. The physician's age, specialty type, practice affiliation, or region had no significant affect on the usage of these drugs.

Digitalis and calcium-entry blockers were infrequently used. No statistically significant differences were observed in the in-hospital use of these medications by the various subgroups of physicians.

Significant variations were noted in the routine intravenous and oral use of anticoagulants. Subcutaneous or low-dose heparin was commonly used (31 percent) on a regular basis, while intravenous heparin (14 percent) and warfarin (Coumadin) (9 percent) were routinely used to a significantly lesser extent (p<0.05); however, differences were noted in the use of these agents by the physician's age (Table 3), specialty (Table 4), practice affiliation, and region of practice (Table 5) (p<0.05). Low-dose heparin was more often used on a routine basis by younger (less than 40 years) physicians (49 percent) as compared to older (60 years or more) physicians (36 percent), as did hospital-based physicians (38 percent) vs physicians practicing in a group setting (22 percent) (p<0.05). Physicians located in the South (42 percent) and in New England (40 percent) were more likely to use low-dose heparin routinely than were physicians in the West (29 percent) and the mid-Atlantic (15 percent) region (p<0.05). Full-dose
heparin, on the other hand, was used regularly to a greater extent by older (60 years or more) physicians (25 percent), as compared to younger (less than 40 years) physicians (4 percent) (p<0.01), and by those practicing in a group (21 percent) setting, as compared to those private (9 percent) or hospital-affiliated physicians (9 percent) (p<0.05). Southern physicians (25 percent) were also significantly more likely to use intravenous heparin on a routine basis than were physicians from the mid-Atlantic region (14 percent), New England (11 percent), and the West (3 percent) (p<0.01). Warfarin was routinely used more often by older (25 percent) as compared to younger (2 percent) physicians and by internists (15 percent) as compared to cardiologists (6 percent). In addition, physicians in the South, the mid-Atlantic region, New England, and the West routinely used warfarin (16 percent, 12 percent, 8 percent, and 0 percent, respectively) (p<0.05).

The use of platelet-active agents varied consider-
ably. Aspirin was routinely prescribed by 14 percent of physicians, while dipyridamole (Persantine) and sulfipyrazone (Anturan) were routinely used by 10 percent and 2 percent of physicians, respectively. No significant difference in the short-term use of these agents was noted in the four subgroups examined.

Administration of Drugs after Discharge

Quinidine and procainamide were infrequently administered as long-term antiarrhythmic agents (Table 6). There were no significant differences noted when subgroup analyses by age, physician type, practice affiliation, or region were separately examined.

Nitrates were frequently administered after discharge from the hospital. Prophylactic sublingual nitrates were routinely prescribed by 54 percent of all physicians, while oral and topical nitrates were routinely prescribed by 40 percent and 38 percent of physicians, respectively, for therapeutic purposes. No differences in the prescribing patterns for nitrates were noted by the physician's age or practice affiliation; however, differences were noted according to the physician's specialty and region (p<0.05). Internists used oral (52 vs 33 percent) and topical nitrates (45 vs 33 percent) more frequently than cardiologists on a regular long-term basis (Table 4). Physicians practicing in New England, the South, the mid-Atlantic region, and the West routinely used oral nitrates in 54, 44, 32 and 23 percent of all cases, respectively.

Beta-adrenergic blockers were commonly used by all physicians and subgroups examined. Overall, 65 percent of physicians regularly prescribed β-adrenergic blocking agents after discharge from the hospital, while only 2 percent rarely used these agents in the long-term therapeutic management of patients with

<table>
<thead>
<tr>
<th>Medication</th>
<th>Routinely Administered, percent*</th>
<th>Rarely Administered, percent†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antiarrhythmics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quinidine</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Procainamide</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>Nitrates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sublingual</td>
<td>54</td>
<td>10</td>
</tr>
<tr>
<td>Oral</td>
<td>40</td>
<td>11</td>
</tr>
<tr>
<td>Topical</td>
<td>38</td>
<td>9</td>
</tr>
<tr>
<td>Beta-adrenergic blockers</td>
<td>65</td>
<td>2</td>
</tr>
<tr>
<td>Digitalis</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>Calcium entry blockers</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>Warfarin</td>
<td>5</td>
<td>71</td>
</tr>
<tr>
<td>Platelet-active agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspirin</td>
<td>24</td>
<td>31</td>
</tr>
<tr>
<td>Dipyridamole</td>
<td>15</td>
<td>40</td>
</tr>
<tr>
<td>Sulfinpyrazone</td>
<td>3</td>
<td>79</td>
</tr>
</tbody>
</table>

*More than 50 percent of time.
†Less than 10 percent of time.
acute myocardial infarction. Significant regional differences in the use of β-adrenergic blocking agents were observed ($p<0.05$). In terms of routine long-term administration, 79 percent, 66 percent, 64 percent, and 51 percent, respectively, of the physicians in New England, the South, the West, and the mid-Atlantic states used these agents. Long-term therapy with digitalis was infrequently used (5 percent on a regular basis), regardless of the physician’s age, practice type, affiliation, or region. Long-term calcium channel blockers were routinely prescribed by 16 percent of physicians, with 9 percent using these medications less than 10 percent of the time. While no differences in the use of these agents were noted by age, practice setting, or region, internists (22 percent) used these drugs on a routine basis more frequently than cardiologists (12 percent) ($p<0.05$).

In terms of long-term anticoagulation, a minority of physicians (5 percent) used warfarin on a routine basis. Significant differences in the post-discharge use of warfarin were noted with regard to the physician’s age (Table 3), specialty (Table 4), and region (Table 5). Whereas 15 percent of the physicians 60 years or older routinely prescribed long-term anticoagulation, this percentage decreased to 3 percent, 1 percent, and 0 respectively, in those physicians aged 50 to 59 years, 40 to 49 years, and 40 years of age or less ($p<0.01$). Internists were also more likely (9 vs 2 percent) to use long-term warfarin on a routine basis than cardiologists ($p<0.05$). Physicians located in the mid-Atlantic states (8 percent) were significantly more likely to use warfarin on a routine basis after discharge from the hospital than were physicians located in the South (7 percent), New England (3 percent), and the West (0) ($p<0.05$).

Prescribing differences were noted in the long-term use of platelet-active agents. Aspirin was used on a routine basis (24 percent) significantly more often than dipyridamole (15 percent) or sulfinpyrazone (3 percent) ($p<0.05$). In separate subgroup examination of these antiplatelet agents, there were no significant differences in the use of these agents by the physician’s age, specialty, or practice affiliation. The only significant variation was in regional use of long-term dipyridamole. Whereas 21 percent of the physicians in the South regularly used dipyridamole in the long-term management of patients with acute myocardial infarction, 20 percent, 16 percent, and 9 percent of the physicians located in the mid-Atlantic region, the West, and New England, respectively, used dipyridamole on a routine basis ($p<0.05$).

A summary of the significant in-hospital and long-term usage of selected types of therapy according to examined physician characteristics is shown in Table 6. In addition, differences in prescribing patterns according to the physician’s age, specialty, and geographic region are shown in Tables 3 to 5, respectively.

### Discussion

Numerous types of therapy have been employed in the in-hospital and post-discharge management of patients with acute myocardial infarction. These pharmacologic approaches have included the use of antiarrhythmic drugs, nitrates, digitalis, anticoagulants, platelet-active agents, calcium channel agents, β-adrenergic blockers, and lipid-lowering agents.

Clinical trials and observational studies conducted to date have either questioned the efficacy or noted potentially deleterious effects of some agents (antiarrhythmic drugs, lipid-lowering agents, and digitalis). Inconclusive results have been reported with regard to anticoagulants, platelet-active agents, and intravenous nitrates. The most compelling evidence to date has been collected from randomized trials examining the use of β-adrenergic blocking agents in reducing mortality after myocardial infarction.

Given the sometimes conflicting results of these randomized trials and a prior survey demonstrating extensive differences in anticoagulation practices among physicians in coronary care units in several countries, we herein report the results of physician prescribing practices of selected types of therapy during hospitalization and after discharge of patients with acute myocardial infarction during the survey year, 1983.

During the acute phase of hospitalization, lidocaine, nitrate preparations (topical, sublingual, and oral), and β-adrenergic blockers were regularly used by a majority of the responding physicians. Conversely, quinidine, procainamide, intravenous nitrates, digitalis, and sulfinpyrazone were the least frequently used medications. These findings are consistent with those of a recently published survey carried out by the American Heart Association that observed routine use of nitrates, β-adrenergic blockers, and prophylactic antiarrhythmic agents and infrequent use of digitalis in the hospitalization of patients with uncomplicated acute myocardial infarctions. While relatively similar trends were noted in the overall use of the majority of drugs examined, some subgroup differences were observed. The most marked variations in the use of these medications were by the physician’s age and region of practice, particularly with regard to the use of anticoagulants. The impact of the physician’s age on the use of anticoagulants in acute myocardial infarction was particularly striking, as shown in Table 3. The higher use of full-dose heparin followed by long-term anticoagulation by physicians over the age of 50 years reflects the patterns of practice that prevailed during their postgraduate training. Controversy still exists as to the efficacy of anticoagulants in reducing the mor-
bidity and mortality in patients with acute myocardial infarction. 11,16-18

In examining the long-term management of patients with myocardial infarction, β-adrenergic blockers and nitrates were usually used, while only one-fourth of the physicians surveyed regularly recommended the long-term use of aspirin. Consistent with in-hospital management, selected antiarrhythmic agents, digitalis, warfarin, and sulfipyrazone were rarely used as long-term therapy in the care of patients after myocardial infarction. These long-term prescribing patterns are similar to the nationwide survey of physicians previously noted, which found the regular long-term use of nitrates and β-adrenergic blocking agents and uncommon use of anticoagulants and sulfipyrazone. 19 In contrast to the findings noted in the in-hospital treatment of patients with acute myocardial infarction, significant specialty and regional differences were noted in the long-term use of several medications, particularly oral nitrates and warfarin. The significant differences in the use of warfarin according to the physician's age probably reflects the prevailing philosophy of medical education at the time the physicians were trained. In the late 1940s and early 1950s, acute myocardial infarction and acute coronary thrombosis were believed to be synonymous, and anticoagulant therapy was encouraged. During the 1960s and 1970s, the importance of coronary thrombosis in the development of acute myocardial infarction was questioned, and the use of anticoagulants was de-emphasized.

While it is difficult to extrapolate these results to the broader universe of all practicing physicians, it is of interest to note the relatively common use of agents whose effectiveness has been documented (eg, β-adrenergic blockers), while agents whose efficacy has been questioned (eg, sulfipyrazone 19) or still is controversial after several decades (eg, anticoagulants) are rarely used or are only used by selected subsets of physicians.

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