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ABSTRACT

Begun in June, 1971 and completed in October 1973, the study had the following specific goals: to define the cardiologist's role; to determine cardiology training program objectives; to determine manpower needs for cardiologists; and to determine the educational needs of cardiologists. The major information was sought from all active cardiologists and all cardiology training programs in the United States and employed the use of questionnaires, log-diaries, content analysis, and interviews. The data furnishes an estimate of present and future manpower needs for cardiologists in the fields of patient care, teaching, and research within the United States. It also provides a description of the current practice of cardiology and identifies deficiencies in existing training programs in cardiology. Further, the study projects the future activities of the cardiologist, an aid in planning future training experiences for them. Contributors to the study include: W. H. Abelmann, S. Abrahamson, F. H. Adams, N. O. Fowler, P. L. Frommer, R. W. Gifford, Jr., R. A. Girard, W. P. Harvey, H. N. Hultgren, F. Y. K. Lau, H. D. McIntosh, R. C. Mendenhall, W. D. Nelligan, W. H. Pritchard, A. Soffer, and H. J. C. Swan. (MW)

Report of an

Evaluation Of Cardiology Training And Manpower Requirements

NOTICE

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EVALUATION OF CARDIOLOGY TRAINING AND MANPOWER REQUIREMENTS

Edited by
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and
Robert C. Mendenhall, M.S.

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PREFACE

Beginning in June 1967, the National Heart and Lung Institute supported a study conducted by the Sub-Board of Pediatric Cardiology of the American Board of Pediatrics entitled "Evaluation of Pediatric Cardiology: Training and Testing." This study involving all of the diplomates of the Board of Pediatric Cardiology had 3 major goals:

1. To define the professional roles and essential competence of the pediatric cardiologist

2. To develop and evaluate approaches for assessing the competence of the pediatric cardiologist, and

3. To determine the broad objectives of training programs in pediatric cardiology.

From the outset, the Board realized that professional competence in medical education relevant to testing techniques and evaluation would be necessary for the successful completion of the project. Accordingly, a sub-contract for appropriate portions of the work was let to the Division of Research in Medical Education, University of Southern California School of Medicine under the direction of Doctor Stephen Abrahamson. The study, the first of its kind of medical specialists, proved to be very successful as 93 percent of the diplomates participated in various aspects. Subsequently, several papers were published describing the findings of the study including an assessment of the manpower and training requirements in the field of pediatric cardiology[1,2,3].

It occurred to several of us involved in the study of pediatric cardiologists, that the techniques utilized in it could be applied to other specialty groups. As an officer of the American College of Cardiology, I realized how little we in the College knew about our colleagues in adult cardiology. We knew relatively little about their primary training in cardiology and how well this training was meeting their current professional needs. Such information seemed vital to continuing educational programs such as those offered by the various professional societies as well as the universities. Most of us could only guess what most cardiologists did with their professional time, and what they con-

[1]Foster, J. T., et.al., "Analysis of an Oral Examination Used in Specialty Board Certification," J. Med. Educ., 44:951, 1969.

[2]Adams, F. H., et.al., "The Review and Revision of Certification Procedures in Pediatric Cardiology," J. Med. Educ., 47:796, 1972.

[3]Adams, F. H., et.al., "Manpower and Training Requirements in Pediatric Cardiology," Pediat., 51:813, 1973.

sidered to be gaps in their knowledge and expertise. No one could provide us all of the names and addresses of the various training programs in cardiology in the United States. Furthermore, nothing was known regarding the content, quality and duration of training offered by each of the institutions, nor how many training positions were available. Finally, it was apparent to us that we needed much more information about the national and regional distribution of cardiologists if we were to be of assistance in "Building a National Health-Care System"*.

With the above as background, the American College of Cardiology in April 1971, sought and obtained a contract with the National Heart and Lung Institute to conduct a study with the following specific purposes.

1. To define the current professional roles of the cardiologist.

2. To determine the objectives of training programs in cardiology.

3. To determine the current and future manpower needs of cardiologists.

4. To determine the current and future educational needs of cardiologists.

In order to provide the study with a broad base of expertise and orientation, it was deemed advisable to establish an Advisory Committee under my chairmanship consisting of individuals representing the major professional groups interested in cardiology. Accordingly, the following organizations agreed to be represented by the individuals listed after each:

American College of Cardiology - H. J. C. Swan, M.D.
American Heart Association - Walter H. Pritchard, M.D.
American College of Chest Physicians - Alfred Soffer, M.D.
Association of University Cardiologists - W. Proctor Harvey, M.D.
Subspecialty Board in Cardiovascular Disease - Noble O. Fowler, M.D.

In view of the fact that the Division of Research in Medical Education (DRME), University of Southern California School of Medicine, had been so successful in assisting the pediatric cardiologists to obtain answers to their questions, it was decided by the Advisory Committee to invite them (DRME) to assist in this second study of adult cardiologists. Doctor Abrahamson and members of his staff at DRME were already well acquainted with many of the terms, concepts, and problems of cardiologists from the first study. Thus, they accepted the invitation to assist the American College of Cardiology in conducting certain phases of the study and a subcontract for appropriate portions of the work was let to them.

Eventually two individuals on the Advisory Committee were replaced by others from the same organization. Walter H. Abelmann, M.D. replaced W. Proctor Harvey, M.D.; and Ray W. Gifford, Jr., M.D. replaced Alfred Soffer, M.D.

*Committee for Economic Development, April 1973.

In the final phases of the study, the Advisory Committee received considerable help and guidance from two additional individuals: Herbert N. Hultgren, M.D., Chairman, Subspecialty Board in Cardiovascular Disease; and Henry D. McIntosh, M.D., President-Elect, American College of Cardiology.

Throughout the entire study, Mr. Robert C. Mendenhall, Associate Project Director, was the individual most responsible for the development of the survey instruments and for analysis of the data generated by them. Mr. William D. Nelligan, Executive Director of the Amer[illegible] College of Cardiology, organized, attended and contributed to all of the m[illegible]gs of the Advisory Committee. Doctor Peter L. Frommer, Project Officer, National Heart and Lung Institute, and members of his staff also contributed significantly to all phases of the study.

Forrest H. Adams, M.D.
Principal Investigator
American College of Cardiology

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1 to 127 add 12
136 to 272 add 13
289 to end add 14

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DATA SOURCES

Five data sources are used repeatedly in the tables and figures in this report. Rather than describe them each time they are used, they are noted as a "Source Number" on the particular table or figure. The sources and the assigned numbers are:

1. American Medical Association Physician Biographical File Statistics related to cardiologists;

2. Initial Cardiology Survey - sent to all cardiologists;

3. Cardiology Professional Diary - a sample of cardiologists;

4. Cardiovascular Training Programs Survey - sent to 534 training institutions of which 329 had cardiovascular training programs meeting study criteria;

5. Cardiologists' Training Survey - a sample of cardiologists.

Other references to data sources and reference sources appear on the table or figure with full notation.

SUMMARY AND RECOMMENDATIONS*

1. The American College of Cardiology sought and obtained a contract with the National Heart and Lung Institute, National Institutes of Health, for the following purposes:

   - o to define the current professional roles of the cardiologist;
   - o to determine the objectives of training programs in cardiology;
   - o to determine the current and future manpower needs for cardiologists;
   - o to determine the current and future educational needs for cardiologists;
   - o to review and to prepare the results of the study in a form appropriate for dissemination through usual professional channels and to make recommendations to the National Heart and Lung Institute for improving the availability of manpower in this field.

   The study began June 30, 1971, and was completed October 31, 1973.

2. The research methodology used in this investigation was very comprehensive and included four different data collection procedures.

   a. An initial classification questionnaire (Cardiology Survey):

      This provided the baseline data regarding practice characteristics against which information gathered later could be compared and from which final decisions about sampling design for other studies could be made.

   b. A log-diary of activities (Cardiology Professional Diary):

      This was used to obtain detailed information about cardiologist professional activities. Parenthetically, we believe that it was the most useful of the study instruments employed in the study of cardiologists.

   c. A training experiences questionnaire (Cardiologist's Training Survey):

      Cardiologists' training experiences and needs were described through use of a questionnaire.

*In making these recommendations, we do so fully cognizant of the fact that significant changes were underway at the time the study was being done, the effect of which has not (indeed, cannot) be estimated at this time.

d. Training programs questionnaire (Cardiovascular Training Programs Survey:

Training program directors were asked to describe program content, objectives, capabilities and staffing, through a questionnaire.

The methodology used in this study, if revised periodically, would yield a data base from which trends could be determined to assist in planning for the future.

3. There were 10,691 cardiologists in active practice in the United States and approximately 1,000 in training in December, 1971. This gives a ratio of 5.6 cardiologists per 100,000 population. Whether this is an optimal ratio to be maintained in the future cannot be stated. Their numbers seem to be distributed about equally between the Primary Cardiologist (one who estimates that he spends 50 percent or more of his professional time providing care for patients with cardiac problems) and the Secondary Cardiologist (less than 50 percent). Approximately 70 percent are based in offices not in institutions. About 50 percent of all cardiologists are certified in internal medicine and 10 percent certified in cardiovascular disease.

Per population density, cardiologists are irregularly distributed, tending to concentrate in the metropolitan centers of the Northeast, Middle Atlantic, and Pacific regions. These areas contain the large cities having the heaviest concentration of medical schools. The East South Central, West South Central, and West North Central regions contain significantly fewer numbers of cardiologists per 100,000 population.

On the basis of a cardiologist-to-population ratio of 6 per 100,000, it is projected that approximately 4,600 more cardiologists are needed in the next five years. The problem of maldistribution and some other factors altering the projected needs are not reflected in that projection.

4. Four general profiles of cardiologists were identified on the basis of types of activity: Primary Non-Institutional; Secondary Non-Institutional; Primary Institutional and Secondary Institutional. Clearly, certain activities overlapped from one category to another, but the general activities appeared to differ to a degree sufficient to justify separation. These four divisions of cardiologists described by the survey can perhaps be identified by more appropriate terms than Institutional or Non-Institutional, Primary or Secondary. That is, the group of Non-Institutional Primary Cardiologists may be looked upon as Clinical Cardiologists, while the Secondary Non-Institutional Cardiologist is usually the Internist-Cardiologist. The Institutional Primary Cardiologists devoting more than 50 percent of their time to problems of cardiovascular disease would likely include a substantive proportion of Cardiac Specialists, while the Institutional Secondary Cardiologists might include both the

Academic Cardiologist and those physicians collected under "other" who might have an infrequent occupation, for example, cardiac rehabilitation. A brief conceptual description based upon the data of this study of functions and activities of these four categories of cardiologists is described in the report.

5. There are 329 programs in the United States which offer at least one year of organized training in cardiology within an approved internal medicine training program. These programs have an average of four trainees per program. Approximately 711 trainees completed their training in 1972 and 791 trainees did so in 1973.

Training facilities in the United States have expanded over the past ten years and, based on training directors' estimates, will continue to do so. It is possible to accept 58 percent more trainees during the next five years. Clearly, to achieve this would require increased funding.

A shortage of staff members presently exists in many training programs. Twenty-nine percent of programs have an average of two staff positions budgeted but unfilled - a total of approximately 150-180 positions. If training programs expand over a five-year period (1973 to 1978) to increase the number of trainees by 58 percent, an average of 2.6 additional staff members will be required for each program. This is an increase of approximately 800 to 850 new staff members.

The present system for training of cardiologists in the United States should be continued, taking into account the recommendations of the Subspecialty Board of Cardiovascular Disease.

Federal support for training certain groups of cardiologists, particularly the Academic Cardiologist (Secondary Institutional), should be continued at a rate commensurate with population changes and related demands for trained cardiologists.

The cardiology training needs of internists and generalists (Secondary Non-Institutional) should be continually evaluated and their training within programs of internal medicine modified accordingly.

Programs need differentiation as to which of the four types of cardiologist is being trained, with the numbers trained adjusted to geographic area needs. This implies a level of program planning not currently practiced but one which, nevertheless, is required if the minimum ratios of cardiologists to population are to be realized.

Directors of cardiology training programs should receive continuing information as to the needs of their graduates, including a copy of this study report, a report from the American Board of Internal Medicine regarding areas of deficiency in cardiovascular training based on the

results of examination of their trainees, and an annual meeting with the other directors of similar programs.

6. The continuing educational needs of the cardiologists are currently varied and diverse. They appear to be influenced by (1) the type and content of his original training and (2) the role and age of the cardiologist. In the future, continuing educational needs will be influenced by (1) the role of certification in a national health care system, (2) regional considerations, (3) advances in medical knowledge, and (4) stable funding.

7. The standards for cardiovascular diagnosis and surgical centers developed by the American Heart Association and the Inter-Society Commission for Heart Disease Resources should be implemented.

8. This study provides, for the first time, data which furnish an estimate of present and future manpower needs for cardiologists in the fields of patient care, teaching, and research within the United States. The data collected provide a description of the current practice of cardiology and identify deficiencies in existing training programs in cardiology. Further, this study projects the future activities of the cardiologist, and thus will aid in planning training experiences for them. The data collected should be of value to individuals, hospitals, universities, governmental agencies, and voluntary health agencies which are concerned with providing administrative, financial, and educational support for training programs in cardiology, and which require cardiologists for patient care, teaching, and research activities.

CHAPTER 1

DEVELOPMENT OF THE STUDY

Forrest H. Adams, Stephen Abrahamson and Robert C. Mendenhall

BACKGROUND TO THE PROBLEM

Cardiovascular disease, particularly atherosclerosis, represents today the greatest and most important health problem in the United States as well as in many parts of the world. Cardiovascular disease accounts for over one-half the deaths in the United States[1]. Every American male at age 20 has one chance in five of having a heart attack (usually myocardial infarction) before the age of 60. It is estimated that over 14.6 million American adults have definite heart disease and an additional 13.0 million have suspected heart disease. This represents 24.9 percent of the adult American population[2].

Each year approximately 200,000 of the heart disease deaths occur in persons under the age of 65 with men affected 3.5 to 1 as compared with women[1]. Thus, unfortunately, this disease often appears during the most productive years. It has been stated that the cost of disability in patients surviving coronary disease is in excess of 4 billion dollars per year[3]. It is obvious that the total loss to the nation is incalculable. Based on our present knowledge, it is a realistic premise that cardiovascular disease will increase in this country rather than decrease.

Recently introduced methods in the diagnosis and treatment of cardiovascular diseases are effective only if skilled physicians and other personnel become available to deliver optimal health care. It is obvious that support for teaching and research activities must proceed in parallel. Urgently needed was an evaluation of manpower requirements in cardiology to make these benefits available to all.

The officers of the American College of Cardiology realized how limited our knowledge was regarding cardiologists: their training; their continuing educational needs; their roles and their competencies; their locations and types of practice. Furthermore, there existed no complete list of training programs available in cardiology in the United States and thus the content, quality, duration of training, and number of positions offered was unknown.

[1] Vital Statistics of the United States 1967. Vol. 2, Part A, 1969.

[2] Heart Disease in Adults, United States, 1960-62. PHS Publication No. 1000. Series 11, No. 6, September 1964.

[3] Felton, J.S. and Cole, R., Circulation 27:957-962, 1963.

For the above reasons, the American College of Cardiology sought and obtained a contract with the National Heart and Lung Institute, National Institutes of Health for the following purposes:

- To define the current professional roles of the cardiologist;
- To determine the objectives of training programs in cardiology;
- To determine the current and future manpower needs of cardiologists;
- To determine the current and future educational needs of cardiologists;
- To review and to prepare the results of the study in a form appropriate for dissemination through usual professional channels and to make recommendations to the National Heart and Lung Institute for improving the availability of manpower in this field.

The study began June 30, 1971 and was completed October 31, 1973.

ORGANIZATIONAL APPROACH TO THE PROBLEM

In its proposal to the National Heart and Lung Institute to conduct a comprehensive study of cardiology training and manpower requirements, the American College of Cardiology recognized that such a study would be most effective as a blueprint for change if it had a Principal Investigator and an Advisory Committee whose members were broadly representative of major societies and organizations concerned with cardiovascular disease. The Advisory Committee, thus, included members from each fo the following organizations:

American College of Cardiology

American Heart Association

American College of Chest Physicians

Association of University Cardiologists

Subspecialty Board in Cardiovascular Disease

Furthermore, it was part of the overall project plan from its inception to consult with the American Medical Association and the American Board of Internal Medicine as the study progressed for advice in certain areas and for information which might enhance the study.

The American College of Cardiology sought a research organization which had worked in the physician manpower and assessment area previously and chose the University of Southern California School of Medicine's Division of Research

in Medical Education (DRME) as its principal research resource because DRME had performed a similar study of pediatric cardiology. Indeed, the overall research plan proposed was developed jointly by the American College of Cardiology and DRME.

ORGANIZATIONAL RELATIONSHIPS

Conceptually and in actual fact, the American College of Cardiology through its Principal Investigator had responsibility for the project throughout the developmental, implementation and analysis phases. The Advisory Committee participated in survey instrument design, provided counsel regarding the number and types of cardiologists and/or institutions to be included in each study phase and recommended the level of analysis which each of the studies received. The Advisory Committee did so in recognition of the fact that after the data were collected, it was their responsibility to generate substantive evaluative statements and conclusions.

Following the agreements reached with the American College of Cardiology's Principal Investigator and the Advisory Committee, University of Southern California's DRME Cardiology Project Staff under a subcontract designed the studies, tested the instruments, conducted the studies, and provided the data deemed most appropriate to the ultimate study tasks. Thus, while the data were obtained by University of Southern California's DRME from study designs which they developed, the ultimate responsibility for the study's interpretive conclusions and recommendations were the American College of Cardiology's.

STUDY POPULATIONS

For the purposes of the study, cardiologists were defined as all physicians who were one or more of the following:

- Physicians listed by the American Medical Association as having either a primary or secondary specialty interest in cardiovascular disease;
- Fellows of the American College of Cardiology;
- Fellows of the Council of Clinical Cardiology of the American Heart Association;
- Diplomates of the Subspecialty Board in Cardiovascular Disease.

(Radiologists, surgeons, pediatric cardiologists, and pathologists were excluded even if they met one of the criteria noted above.)

It was recognized that such a listing of cardiologists would be quite redundant; however, one study objective was to identify all cardiologists and therefore the redundancy was acceptable. The resultant roster of 12,175 cardiologists in active practice, training, and retired included 10,691 in active practice of whom less than 3 percent came from sources other than the American Medical Association's listing.

Training Programs were defined as full-time cardiovascular training programs of at least one year's duration. This definition was developed during the study when it became apparent that there were no listings of cardiovascular disease training programs and there were no criteria for determining which of the training programs offered the variety and depth of training experiences which might reasonably prepare a physician for certification in cardiology.

The source listing for training programs was provided by the American Medical Association and consisted of all institutions in the United States with approved residencies in Internal Medicine. It was assumed that very few cardiovascular disease training programs would be found in institutions which did not have an approved training program in internal medicine. This study included 329 institutions involved in cardiovascular disease training.

STUDY FOCUS AND METHODS

The major information in this study was sought from all active cardiologists and all cardiology training programs in the United States. The cardiologists were ultimately divided into a number of subgroups for various types of analyses. Two major groups were empirically defined as Primary Cardiologists (those practicing cardiology more than 50 percent of their time) and Secondary Cardiologists (those practicing cardiology less than 50 percent of their time). The Advisory Committee also agreed to examine secondary data, (i.e., that which was not generated by the investigations), in those instances where such data could reasonably enhance their recommendations.

The methods employed in the investigation were proven behavioral science techniques: questionnaires; log-diaries; content analysis and interviews. The specific study designs which were used most successfully involved questionnaires and a log-diary. The latter, as conceptualized, is an instrument uniquely suited to this type of study.

STUDY DESIGNS

With a major study premise being that those who provide services to patients, perform research, provide teaching, and design and carry out the training programs are the best possible source of data regarding both current practices and immediate and future needs, a research plan was developed which drew almost exclusively on these individuals and institutions for data.

The cardiologists participated in three study phases:

1. An initial classification questionnaire to all;
2. A log-diary to a stratified random sample;
3. A training experiences and needs questionnaire to a stratified random sample.

All cardiology training programs participated either through completion of a detailed questionnaire or through an interview conducted by telephone.

Detailed study design considerations will be discussed in the next chapter. Our investigations generated much information regarding training programs which exceeded the needs of the Advisory Committee. A data base was created which could profitably be exploited more than this study required.

STUDY DESIGN PROCESS

At the very beginning, the Advisory Committee participated directly with the University of Southern California DRME Project Staff in the identification of the appropriate areas of investigation for each of the study phases. The Project Staff then developed an initial set of questions for obtaining the information. The questions were reviewed and altered by the Advisory Committee and the NHLI Project Officer and then the particular study instrument was given its final format. Upon completion of this review, the particular instrument with its sampling rationale was sent to the federal Office of Management Budget (OMB) for their internal review and assignment of a survey control number. OMB also had recommendations which were incorporated in the final design.

While the preceding may sound unduly complicated and complex, it had the positive effect of involving all interested parties in the details of the survey design process. The process consumed many months and required preparation of several drafts of each study instrument.

SUMMARY

This study provides, for the first time, data which furnish an estimate of present and future manpower needs for cardiologists in the fields of patient care, teaching, and research within the United States. The data collected provide a description of the current practice of cardiology and identify deficiencies in existing training programs in cardiology. Further, this study projects the future activities of the cardiologists, and thus, will aid in planning training and experience for them. The data collected should be of value to individuals, hospitals, universities, governmental agencies, and voluntary health agencies who are concerned with providing administrative, financial and educational support for training programs in cardiology, and who require cardiologists for patient care, teaching and research activities.

CHAPTER 2

STUDY RESEARCH DESIGN

Robert C. Mendenhall, Stephen Abrahamson, Roger Girard and
Francis Y. K. Lau

The research objectives (discussed in the preceding chapter) and a series of related research questions established the general characteristics of the overall research design. In the area of manpower or training requirements, the following information was considered essential - particularly those factors related to the cardiologist's actual practice:

- the type(s) of patients treated and their cardiovascular disorders;
- the methods employed in patient treatment and management;
- the degree to which the particular practice involved research and/or teaching and the topics of that research and/or teaching;
- the relative allocation of cardiologist time to the range of professionally-related activities (as the cardiologist defines them);
- whether the preparatory training and continuing educational opportunities are considered adequate by the cardiologists;
- whether the supportive facilities (personnel and equipment) are considered adequate by the cardiologists;
- the practice areas in which the cardiologist feels his training was (and is) deficient;
- the assessment of manpower adequacy and needs by cardiologists and training program directors.

In the training programs area, the study focus was on:

- characteristics and content of training programs;
- qualifications of training program staffs;
- resources to support training programs;
- the current and anticipated trainee graduate rates;
- continuing educational programs.

Two study designs were developed and used to obtain information in each of the areas enumerated.

Each study was conceptualized as an integral component of the total research design. Certain descriptors from one study were carried to another, either in identical form or in a form which could be converted to the previous form. This was done to permit comparisons between responses of the same participants to common questions asked in different study designs. This connection was strategically important methodologically (and just as important empirically) because it permitted refinements to estimates which would not otherwise have been possible. The application of this linked approach will be noted in the discussion of log-diary findings compared to classification questionnaire findings and in the analysis of the proportion of cardiologists certified in 1973 compared to 1971.

The relationship of specific study methods and designs to the study's objectives and research questions is shown in Figure 1. The column, "Advisory Committee" denotes both an information source and the source of final interpretation of study findings.

CLASSIFICATION CRITERIA AND ANALYTICAL VARIABLES

The studies of cardiologists and the institutions which train them suggested certain characteristics which were useful indices of differences and of commonalities in terms which were relevant to either cardiologist profiles or training program profiles. The appropriateness of selection of variables would appear to be intuitively obvious in some instances; for others, the rationale for selection is not so apparent. All variables included in the final analyses were chosen only after extensive analysis demonstrated that they did, indeed, provide the desired discrimination.

The Advisory Committee and USC DRME were aware of general differences in types of practices and of some of the factors which contributed to those differences. This awareness led to the initial dichotomy of "Primary Cardiologist" and "Secondary Cardiologist" and the differentiation as to type of practice which employment arrangements would describe. Ten variables which describe cardiologist practices and four which describe training programs were used as primary study classification and analysis variables. By "primary variable" we simply mean that the variable was used in one or more major analyses as one of the dimensions considered.

The primary variables used in cardiologist analyses are listed below.

- Proportion of Time to Cardiology
- Certification and Memberships

FIGURE 1

STUDY OBJECTIVES RELATED TO CONTRIBUTING DATA SOURCES AND STUDY DESIGNS

Study Objectives and Related Research Questions	Information Sources								
	Cardiologist Lists	Secondary Sources	Initial CD Survey	CD Log-Diary	CD Training Survey	Training Programs Survey	Training Programs Directors	Interviews	Advisory Committee
DEFINE CURRENT PROFESSIONAL ROLES	X	X	X	X	X	X	X	X	X
Professional activities			X	X	X	X			
Total time to professional activities			X	X					
Total cardiology professional time			X	X					
Number of patients seen				X					
Number of patients with cardiac diagnoses				X					
Number of patients without cardiac diagnoses				X					
Patient demography				X					
Typology of cardiac conditions				X				X	
Typology of non-cardiac conditions				X				X	
Patients seen as a consultant				X					
Patients where cardiologist is primary care physician				X					
Index of cardiologist skills			X	X	X				
Cardiologist's use of time			X	X					
Cardiologist's optimum time use								X	X
Cardiologist's preparation and certifications regarding services	X			X	X	X			
Proportion of cardiac population to be seen by cardiologists									X
Professional roles description								X	X
DETERMINE TRAINING PROGRAM OBJECTIVES		X				X	X	X	X
Identify training programs		X				X	X	X	
Distribution and number of programs		X				X		X	
Program characteristics		X				X		X	
Program plans and objectives						X		X	
Training program assessment					X	X	X	X	X
DETERMINE CURRENT AND FUTURE CARDIOLOGIST MANPOWER NEEDS	X	X	X		X	X	X	X	X
Distribution of cardiologists specialty, practice, age, certification status	X	X	X	X	X			X	
Number of cardiologists trained		X				X			
Number of cardiologists in training						X			
Future training plans					X	X	X		
Optimum cardiologist population ratios					X				X
DETERMINE CURRENT AND FUTURE CARDIOLOGIST EDUCATIONAL NEEDS		X			X	X	X	X	X
Cardiologist's assessments					X			X	
Training director's assessments						X	X		
Evaluation of assessments									X

X denotes information obtained through the source checked

- Practice Mode or Employment Arrangements
- Age: Chronological and Related to MD Certifications
- Medical Service Community Size
- Distance to Care
- Patient Sources (Own Patient versus Referral)
- Professional Time Commitments
- Patient Diagnoses as Primary or Secondary Cardiac Conditions
- Geographical Location of Cardiologist's Practice

The primary variables used in training program analyses were:

- Size of Training Programs (Number of Trainees)
- Usual Length of Training Programs
- Required Time in Programs by Program Length in Months
- Geographical Location

THE TOTAL STUDY DESIGN

This will be discussed by phases. For the most part, the phases actually occurred in the sequence discussed. Those related to cardiology studies will be presented first. Those pertaining to the study of cardiovascular training programs will follow. The rationale for selection of primary study variables has been presented in earlier sections and will not be repeated again.

PHASE ONE: DEFINITION OF THE STUDY POPULATION

The American Medical Association's Physician Biographical File listing of physicians who classified themselves as either "primary" or "secondary" in cardiology constituted the master file against which all other files were checked. Only the AMA file was available in a computerized tape format; all others were printed or typed lists of members. Exhaustive checking of the non-AMA sources identified approximately 300 additional board certified cardiologists (Internal Medicine or Cardiovascular Disease) whose names were not in the AMA file. Normally, the fact that the AMA file contained 97 percent of all names used would have justified using this file alone. However, with the requirement for the investigation being to identify all cardiologists and to

identify those who were certified, the research of other files was justified.

Number of Cardiologists

All data related to numbers of cardiologists were adjusted to the counts as of December, 1971. This was done to obtain the most accurate possible estimates of manpower at the end of a calendar year. There were 12,175 cardiologists potentially eligible to study. This number included physicians identified by the AMA as retired and in-training as well as those in an active practice status. Since both retirement and in-training are statuses subject to change, the entire eligible population was contacted in the initial survey study phase.

PHASE TWO: IDENTIFICATION OF CARDIOLOGISTS BY TYPE AND ACTIVITY STATUS - INITIAL CARDIOLOGY SURVEY

Study Objectives

The primary purpose of this study phase was to determine the strata within the specialty practice which should be studied in depth. To accomplish this it was necessary to obtain patient care, research/teaching statistics, and cardiological procedures and activity statistics which positively correlated with type of specialty and practice. The factors noted in each of these areas as related to specialty and practice were expected to define the types of cardiologists for subsequent studies.

The secondary purpose of the study was to determine the geographical distribution of cardiologists by specialty and other related factors such as age, types of certification and practice arrangements. These distribution statistics, along with the data provided by the AMA regarding cardiologist location, would be used to answer the question, "where are cardiologists practicing?"

Since the interest was in what cardiologists actually do, then differences within that group had to be known before selecting a smaller group for detailed study. Factors to be considered included (1) physician's type of practice, (2) his relative time commitments to the specialty, and (3) on an overall basis, how his time is committed among patient care, other professional, and non-professional activities. The Initial Cardiology Survey provided these facts and established a basis for stratification for analyses and subsequent studies. This study also described the potential service population, defined whether the individual physician was primarily a referral practitioner or not and indicated how long he has been in practice. Each of these indices is important in an assessment of cardiology as a medical specialty.

Study Questions

The study obtained information in the following areas:

- time in primary and secondary specialty
- year received medical degree
- an estimate of the population within the cardiologist's service area
- professional time in general activity categories
- patient sources and distances patients travel
- employment arrangements
- performance of selected cardiological activities

Survey Instrument

The Initial Cardiology Survey, designed as a classification questionnaire, was a one-page form which could be completed in approximately 15 minutes. It was pre-tested for clarity and utility with physicians whose practices covered the range of practice types expected within the surveyed population. Figure 2 is the survey form used in this study phase.

Study Strata

Sampling might have been employed with this study but was not because of an interest in obtaining the widest possible response (1) as evidence that all cardiologists had been given the opportunity to participate and (2) to increase the confidence in the estimates which would be made regarding actual geographical location of practicing cardiologists.

Field Study Procedures

Three contacts were made with the surveyed population through first-class return-postage-guaranteed mailings. Different covering letters and different colored forms were used in each mailing. This study phase extended from December 16, 1971 to April 6, 1972. The return rates by mailings were:

40 percent from the initial mailing;

28 percent from the second mailing;

9 percent from the third mailing.

FIGURE 2

CARDIOLOGY SURVEY

OMB Approval 68871116

This short survey form will provide a measure of how cardiology is practiced nationally and give the needed indicators for other phases of the Cardiology Manpower Study. Your answers are vitally important. Please answer all questions, including your best estimate of numbers or percent when asked. Thank you for your help.

NAME_____ STREET_____

CITY_____ STATE_____ ZIP CODE_____

YEAR YOU RECEIVED MD_____

YOUR MEDICAL SPECIALTIES

Primary Specialty_____
Years of Practice in Primary Specialty_____
% Time Now Spent in This Specialty_____

Secondary Specialty_____
Years of Practice in Secondary Specialty_____
% Time Now Spent in This Specialty_____

YOUR MEDICAL SERVICE COMMUNITY

About how many people live within a 25 mile radius of your office? (Please check ✓ the figure which is closest to the number.)

25,000 - ○	800,000 - ○
50,000 - ○	1,000,000 - ○
100,000 - ○	2,000,000 - ○
200,000 - ○	3,000,000 - ○
400,000 - ○	4,000,000 - ○
600,000 - ○	5,000,000 - ○

Please estimate the percentage of your cardiac patients who live within the distances indicated from your office.

Miles	Percent
Less than 5 miles	_____
From 5 to 10 miles	_____
From 11 to 15 miles	_____
From 16 to 25 miles	_____
Over 25 miles	_____
	Total 100%

REGARDING YOUR PROFESSIONAL TIME AND HOW IT IS COMMITTED. Please estimate the total percent by category and the portion of that total which goes to cardiology applications.

Activity Category	Percent of Total Professional Time Committed to____	Percent of Activity Time Applied to Cardiology* ____
Direct Patient Care - not involving research/teaching	_____	_____
Medical Research - involving patient care	_____	_____
Medical Research - not involving patient care	_____	_____
Medical Teaching - involving patient care	_____	_____
Medical Teaching - not involving patient care	_____	_____
Administrative (office, committees, staff member executive organization, etc.)	_____	*Each "Percent of Activity Time" may be up to 100%
Professional (journals, meetings, papers, etc.)	_____	
	Total 100%	

Hours per Week Devoted to Medical Activities [ ] If not currently professionally active, check here ○

YOUR PATIENT SOURCES. During the past three months, what proportion of your cardiac patients came from:

Source	Percent
Within your own practice	_____
Referred by other physicians	_____
Referred by your own patients	_____
Referred by themselves, family or friends	_____
Referred by an agency (insurance company, union, etc.)	_____
Other (Specify):_____	_____
	Total 100%

YOUR EMPLOYMENT ARRANGEMENTS. Several employment arrangements may be involved in your practice. Please estimate your involvement in each:

Employment Arrangement	Percent of Time
Self: "solo"	_____
Self: Partnership or other non-group arrangement	_____
Group	_____
Hospital: any type	_____
Medical School	_____
Other Employment (Specify): _____	_____
	Total 100%

CARDIOLOGY ACTIVITIES. Do you participate in or perform any of the following: (CHECK ✓ ALL THAT APPLY.)

- Office consultant for cardiac patients ○
- Office ECG Reader ○
- Hospital consultant for cardiac patients ○
- Hospital ECG Reader ○
- Hospital coronary care unit committee ○
- Cardiac diagnostic roentgenography ○
- Cardiac catheterization ○

THIS COMPLETES THE QUESTIONNAIRE. THANK YOU FOR YOUR COOPERATION.

Response Rates and Characteristics of Respondents

Table 1 summarizes the response statistics for this survey and indicates the numbers that were not usable and for what reasons. This table notes that

77 percent of all eligible cardiologists responded;

80 percent of the active cardiologists responded;

68 percent of the active population provided returns which were used in the study analyses.

The table, read from left to right, gives the type of cardiologist in broadly descriptive terms and the overall number for each type in the portion labeled "Cardiology Study Population." In the rows of figures which follow, the percentages relate to the total number for each stratum. Thus, 8053 questionnaires were received from the non-federal active physicians for a response rate of 80.2 percent; losses due to "non-use" factors reduced the number included in the analyses ("Use" column) to 6884 (68.6 percent) and the true non-respondents for this type of cardiologist amounted to 19.8 percent of the total. It is also evident from the "Active Subtotal" column that the response rate was 80 percent; non-use rate was 11 percent; use rate 68 percent and non-respondents amounted to 20 percent.

The lower half of this table accounts for those cardiologist strata of only peripheral interest to the study. The survey form was not designed for the practice situation or interest of these cardiologists except for the "In Training" stratum or the "Retired" who might have resumed active practice. The numbers associated with each "Cardiology Study Population Strata" were obtained exclusively from the secondary data sources used to define the eligible population. Those associated with the column, "Non Respondents," are also from the secondary sources. The "Respondent Classification" numbers describe the questionnaires received and, therefore, reflect an updated cardiologist practice classification. Some known shifts in classification occurred:

- 63 "in-training" cardiologists responded as active;
- 56 cardiologists were reported as deceased - 46 from the "retired" group;
- an unknown number of "active" cardiologists responded as "retired" - probably at least as many as those noted above for "in-training" shifts.

Errors in Estimates Attributable to Sampling

Since the entire population of cardiologists was surveyed, sampling error, per se, is not an issue. However, prior to considering the effects of non-response,

TABLE 1

CARDIOLOGIST STUDY POPULATION STRATA BY RESPONDENT CATEGORIES

Cardiology Study Population		Respondent Classification			Non Respondents
Type	Number	Received	Non-Use*	Use	
Non-Federal (active) % of type	10,040 (100.0)	8053 (80.2)	1169 (11.6)	6884 (68.6)	1987 (19.8)
Federal (active) % of type	651 (100.0)	472 (72.5)	53 (8.1)	419 (64.4)	179 (27.5)
Active Subtotal % of Subtotal	10,691 (100.0)	8525 (79.7)	1222 (11.4)	7303 (68.3)	2166 (20.3)
In Training % of type	1042 (100.0)	571 (54.8)	147 (14.1)	424 (40.7)	471 (45.2)
Retired/Deceased % of type	411 (100.0)	262 (63.7)	56 (13.6)	206 (50.1)	149 (36.3)
Osteopath** % of type	31 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	31 (100.0)
TOTAL % of Total	12,175 (100.0)	9358 (76.9)	1425 (11.7)	7933 (65.2)	2817 (23.1)

*Non-Use includes:

Deceased	56
Non-deliverable (active)	748
Non-usable (active)	474
Non-usable (training)	147

**Osteopathic physicians were not surveyed.

it should be noted that if the 7303 questionnaire respondents were assumed to constitute a random sample of the 10,691 active cardiologists, the sampling error (standard error for estimating population percentages from sampling percentages) would be less than one-half percent.

Respondents and the Effects of Non-Response

Achieving an 80 percent response rate from the active cardiologists effectively eliminates error attributable to sampling. The question remains: "Are there characteristics attributable to the 20 percent who did not respond which should be taken into account before concluding that the respondents truly represent the total population?" The data provided by the AMA on the entire physician file were examined in comparison to those cardiologists who responded to the survey. Table 2 presents one of the comparisons made for cardiologists by age groups. Differences in the two populations would be expected in either the younger age group (cardiologists still in training or just completing training) and the older age group. From inspection, there are no important differences in the age groups for the entire population and those achieved through respondents to the survey.

Geographical distribution is a factor of considerable importance to the study. To what extent do the respondents actually reflect the distributions for the total population? Table 3 presents the data to assess potential differences. The upper portion of the table gives frequency distributions for all active cardiologists first, as a total of all cardiologists by primary or secondary commitment; second, as percentages within each census division for the active practice cardiologists who responded and those who did not. Comparing the percentages for the two, the Middle Atlantic responded a little below the proportion they represent nationally and the two west divisions responded a little above their national proportions. The differences, however, are very small.

The lower half of the table presents Primary Cardiologists as a total and as respondents and Secondary Cardiologists in the same format. The differences between population and respondents for both Primary and Secondary Cardiologists are negligible.

We conclude from this table and Table 2 that the cardiologists who responded adequately represent the total population of cardiologists at the level of differentiation to be used in the study.

Confidence Associated with the Estimate of 10,691 Active Cardiologists

The totals for active cardiologists (10,691 with 5661 Primary and 5030 Secondary) are accurate within one or two percentage points for a count as of December, 1971. The factors contributing to this assessment are as follows.

TABLE 2

PARTICIPATING CARDIOLOGISTS BY AGE GROUPS
COMPARED TO AMA PHYSICIAN FILE AGE GROUPS

RESPONDING CARDIOLOGISTS	AGE GROUPINGS			TOTAL
	Under 40 Years	40-59 Years	60 and Over	
Usable Returns				
Active Cardiologists	2024	3908	1371	7303
Trainees	398	24	2	424
Non-Usable Returns				
Non-Deliverable	250	233	412	895
Non-Use	129	203	142	474
Retired			206	206
Deceased		10	46	56
Total Respondents	2801	4378	2179	9358
% of Total	(29.9)	(46.8)	(23.3)	(100.0)
AMA Physician File	3667	5684	2793	12144
% of Total	(30.2)	(46.8)	(23.0)	(100.0)
Active Respondents with Usable Data	2024	3908	1371	7303
% of Total	(27.7)	(53.5)	(18.8)	(100.0)

TABLE 3

DISTRIBUTION OF NATION'S CARDIOLOGISTS: SPECIALTY BY CENSUS DIVISION

ACTIVITY STATUS AND SPECIALTY		National Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
			New England	Middle Atlantic	South Atlantic	East South Central	West South Central	East North Central	West North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
All Cardiologists[1]													
Primary		6239	533	1709	1013	167	405	903	299	223	909	69	9
Secondary		5431	405	1565	932	159	324	820	300	146	720	40	20
Total		11,670	938	3274	1945	326	729	1723	599	369	1629	109	29
Less Trainees		979	105	276	172	8	46	185	42	32	106	6	1
All Active Cardiologists[1]	N	10,691	833	2998	1773	318	683	1538	557	337	1523	103	28
	%	100.0	7.8	28.0	16.6	3.0	6.4	14.4	5.2	3.2	14.2	1.0	0.3
Respondents[2]	N	7303	580	1945	1210	233	479	1046	397	254	1075	66	18
	%	100.0	7.9	26.6	16.6	3.0	6.6	14.3	5.4	3.5	14.7	0.9	0.2
Primary Active Cardiologists[1]	N	5661	462	1570	919	163	379	796	273	199	827	65	9
	%	100.0	8.2	27.7	16.2	2.9	6.7	14.1	4.8	3.5	14.6	1.1	0.1
Respondents[2]	N	3962	331	1050	632	126	274	553	201	158	589	43	5
	%	100.0	8.3	26.5	16.0	3.2	6.9	14.0	5.1	4.0	14.8	1.1	0.1
Secondary Active Cardiologists[1]	N	5030	371	1428	854	155	304	742	284	138	696	38	20
	%	100.0	7.4	28.4	17.0	3.1	6.0	14.8	5.6	2.7	13.8	0.8	0.4
Respondents[2]	N	3341	249	895	578	107	205	493	196	96	486	23	13
	%	100.0	7.5	26.8	17.3	3.2	6.1	14.8	5.8	2.9	14.5	0.7	0.4

[1]Includes respondent and non-respondent distributions as a composite.

[2]Useable returns from Initial Cardiology Survey.

- The AMA data were accurate within three or four percent with differences primarily in the classification of practice status for the young cardiologist or the old cardiologist.

- Analysis of cardiologist distributions based on the Initial Cardiology Survey data and the AMA data indicated 979 cardiologists in training. The survey to training program directors (discussed as Phase Five) identified 970 in training at this same time period.

- A total of 56 cardiologists were reported as deceased. This could be off by as much as 100 percent and still result in a difference of only 56.

- Those who actually are retired might be more numerous than reported. About 50 percent of those over 60 responded. Assuming that one-fourth of those who did not respond should be classified inactive, the over-estimate due to this factor would still be only about 100.

- The cumulative effect of the most extreme possible error to consider is about 150 too many in the active classification category. This amounts to an error of less than 2 percent.

Table 3 provided frequency distribution data for all cardiologists by Primary and Secondary Cardiologist in various combinations. It is a basic table used in the Advisory Committee discussion of manpower and provided the base for subsequent selection of cardiologists for specific studies.

It is extremely important to keep this table in context. The distributions are pertinent only for the time period when the data were obtained. Projections from this basic table must take the lapsed time interval between December, 1971 and the projected date into account. Changes in total numbers, in proportions of Primary and Secondary Cardiologists and in actual age composition will occur with the passage of time. The relative proportion of younger cardiologists entering their active practices and those leaving active practice will alter the age distributions. The concluding section in this chapter discusses projection factors and provides an estimate of the number of active cardiologists at year-end 1973.

PHASE THREE: LOG-DIARY STUDY OF PROFESSIONAL ACTIVITIES - CARDIOLOGY PROFESSIONAL DIARY

General conceptual design for this study was initiated in parallel to similar activities for the Initial Cardiology Survey. A log-diary of professional activities was an integral study phase in all project planning.

The log-diary was designed to obtain:

- precise measures of time committed to professional activities described in the cardiologist's own words;
- precise measures of time devoted to each patient transaction and to teaching and research as they occur;
- essential data to generate patient profiles which by (1) their reported frequency or (2) the methods employed in patient management associated with patient problems, might suggest potential training area;
- assessment of the extent to which the cardiologist is practicing as a specialist or generalist through analysis of his patient statistics regarding clinical problem, referral and time;
- comprehensive statistics (by type of cardiologist) on the incidence of cardiac and non-cardiac disorders within practices for those physicians classified as cardiologists;
- indices of types of teaching and research activity for types of cardiologists;
- information to validate data obtained through the Initial Cardiology Survey.

Survey Instrument

The instrument in use demonstrated the feasibility of having physicians with large patient-load practices keep (1) detailed records regarding each significant event which occurred during a professional day and (2) very detailed information of a diagnostic, treatment, and management nature. With the exception of the "Activity Overview" section - a general activity summary section for recording all types of professional activities - all significant data regarding the various patient transactions were recorded in symbol form by selecting from a set of classification categories. Similar specificity was obtained regarding the physician's teaching and research activities.

The 364 participating physicians recorded more than 20,000 patient transactions over a five-day period. It is believed that this detailed level of recording was due to the logical structure of the survey form, organized in five sections, with each section in the sequence which was most likely to apply to most participants. Furthermore, the sections were color coded and of increasing page width so that the physician could easily move from one section to another, depending on his recording need. The entire log-diary was limited to a size which fit conveniently in a man's suit pocket (or white lab coat) so that it could be carried easily. The recording categories were carefully reviewed by DRME's advisory committee and tested in a variety of field practice situations before the forms were actually considered satisfactory.

The participants were given (1) detailed instructions regarding completion of the log-diary and (2) a sample diary with "typical" entries for each of the sections. The sample diary not only illustrated what might be appropriate as an entry; it also established a "standard" for recording which was adhered to by most of the participating cardiologists.

The level of detail requested was established by the Advisory Committee who were not satisfied with merely knowing that a patient was "seen" during a specific time period for cardiac or non-cardiac reasons. Their desire was to be able to identify each patient by (1) age, (2) sex, (3) ethnicity, (4) distance traveled to care, (5) whether the patient was a new one or an old one, and (6) whether the physician considered the patient as his "own" or treated after referral. Similarly, specificity was desired for the diagnostic conditions where the interest was in creating a disease-specific profile which included both non-cardiac and cardiac disorders and further indicated which was primary - the cardiac or the non-cardiac. Fourteen non-cardiac and nineteen cardiac problems were provided to the cardiologist for his use in describing his patients and each was assigned a number to be used in the recording. The treatment and/or disposition was relatively gross, consisting of only eight numbered choices. The cardiologist was instructed to use as many of the non-cardiac, cardiac, and treatment/disposition choices as were appropriate to each patient.

The interest in detailed data regarding dianostic testing necessitated the use of a special form for this purpose. Some redundancy was created by this form since the physician would record "ordered tests" on the summary patient care form and then provide the details regarding those tests on the laboratory and diagnostic test form. Ideally, the two forms might better have been combined; however, the design constraint to make the overall form simple to carry wherever the physician went required a separate sheet. As with the patient diagnostic and disposition form, this laboratory recording form permitted recording seventeen different diagnostic tests and, through a letter symbol, the physician's role in each of the tests recorded. Selected patient descriptors were included on this form to assist in linking the two sets of patient related data.

Alphabetic symbols were employed in both the teaching and research forms to describe the salient characteristics of these activities. In addition, a brief descriptive phrase regarding the activity was obtained.

Figure 3 illustrates the five recording forms (without showing the full page allowed for recording). These are, in order from the top, forms for (1) Activity Overview, (2) Patient Care, (3) Laboratory, (4) Research, and (5) Teaching. When it is remembered that each number or letter designates what would otherwise have been a descriptive phrase, the richness of the data which this study instrument obtained becomes apparent. Of equal importance from a methodological and cost point of view is the fact that such "pre-coded" data are in a format which only has to be checked for legibility prior to preparing the data for computer processing.

FIGURE 3
LOG-DIARY RECORDING FORMAT

USE FOR ALL ACTIVITIES EXCEPT FOR DETAILS REGARDING CLINICAL, TEACHING AND RESEARCH

DATE 10/17/72

ACTIVITY OVER

TIME for ACTIVITY BEGIN	END	SUMMARY FOR DAY: Administrative, Professional, Personal, Travel, Patients, Laboratory, Teaching, Research, Vacation. (See examples opposite this page) WRITE A PHRASE DESCRIBING EACH ACTIVITY
9⁰⁰	10³⁰	Read ECGs in Heart Station

USE TO RECORD PATIENT CLINICAL PROBLEMS AND THEIR DISPOSITION *EXCEPT FOR TESTS*

DATE 10/17/72

PATIENT CARE

TIME for ACTIVITY BEGIN	END	PATIENT DISCHIPTORS From Records: AGE	SEX M/F	ETHNIC W/B/Other	Distance to Ores	New / Old	Ownership	PROBLEMS (Dx) and DISPOSITION *Use Numbered Categories from CODING KEY*: General Dx non-cardiac	P or S	Cardiac Dx	Rx and/or Action	If Seen On Rounds, ICU INDICATE: •Role	•Teach
10³⁰	12⁰⁰	43	M	W	20	0	R	1, 8	S	18	1, 2	S	S

USE TO RECORD CLINICAL TEST ORDERED, PERFORMED AND INTERPRETED

DATE 10/17/72

LABORA

TIME for ACTIVITY BEGIN	END	PATIENT DESCRIPTORS: AGE	SEX M/F	ETHNIC W/B/Other	Owned/Refer	RECORD ALL TESTS PERFORMED IN NUMBERED COLUMNS. Refer to *numbered list on opposite page*. FOR EACH TEST PERFORMED, indicate whether you A · ORDERED it; B · PERFORMED it; C · INTERPRETED it: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
12³⁰	1³⁰	31	F	B	R	A C						A C												

USE TO RECORD AND DESCRIBE YOUR RESEARCH

DATE 10/17/72

TIME for ACTIVITY Begin	End	RESEARCH PROBLEM *Brief descriptive statement* (Amplify on opposite page if more space is needed)	CHECK AND RECORD FOR ALL APPLICABLE CATEGORIES: Involving: Human / Animal / Other	Location: Lab / Bedside / ER/OR / Office	Utilizing: Drugs / Prosthetic Device / Equipment	Your Role: Teaching? YES or NO	Observe / Participate / Direct	Team? YES/NO If YES, NUMBER of Co-Investigators
1⁰⁰	6⁰⁰	Arrhythmia influence on Coronary flow	A	L	E	N	D	4-3

USE TO RECORD AND DESCRIBE YOUR TEACHING

DATE: 10/17/72

TIME for ACTIVITY Begin	End	TEACHING LEVEL and NUMBER TAUGHT: Med Student	House Staff	Post Graduate	Nursing	Paramedical	Community Health	SETTING Record all used: Case Room	Lecture Hall	Conference	Office	Bedside / ER/OR / Lab	METHODS: Audio-Visuals YES or NO	Examinations YES or NO	ROLE: CONDUCT or OBSERVE	TOPIC: Describe in a phrase
7⁰⁰	8³⁰	1	1	1								L	Y	N	C	Morning reading and check of ECGs from previous day

Figures 4, 5, 6, 7, 8, and 9, present the instructions to the participants and the actual recording forms and related recording categories for each of the Cardiology Professional Diary sections.

Strategy for Contacting Participants

The process to employ in contacting the participants was a major concern in the development of the sampling plan because the diary would demand about thirty minutes' time for each of five days. On the one hand, the concern was to obtain appropriate ratios of each type of cardiologist as respondents. On the other, if the return rate was low then the impact of non-respondents in determining the viability of the data increased. The objective was to achieve as high a return rate as time and resources would permit. Two options were available in contacting the participants:

- Have the Advisory Committee personally contact those who were selected and encourage their participation. This "peer-to-peer" contact would enhance the return rate.

- Make the initial contacts with participants by mail and follow-up contacts by telephone by members of the project staff. Rely upon the letterhead and explanatory letter to stimulate willingness to participate.

The latter option was followed. This required acceptance of a usable response rate of 50 percent for planning purposes. In actuality the usable rate was about 55 percent and the gross return rate about 63 percent. Willingness to work with a usable respondent group of 55 percent of those contacted is defendable only because (1) a great deal was known about the population from which the diary participants were drawn and hence comparisons could be made to ensure that those declining were not different from those agreeing to participate and (2) a record was kept of refusals to participate and the reasons given.

Log-Diary Cardiologist Types

The initial classification questionnaire was used to identify general practice characteristics including such elements as (1) perceived allocation of time to patient care, teaching, research, administration and other professional activities; (2) distribution of patients according to a) distance traveled to receive care and b) whether or not the patient was a referral; (3) an indication of types of procedures employed in the practice (selected to represent degrees of complexity in performance); (4) a time estimate of involvement in various practice arrangements.

From analyses of these variables it was concluded that for the log-diary study of what actually transpired within a practice, activities of four groupings

FIGURE 4

INSTRUCTIONS TO CARDIOLOGY PROFESSIONAL DIARY PARTICIPANTS

CARDIOLOGY PROFESSIONAL DIARY INSTRUCTIONS

IT IS EXTREMELY IMPORTANT TO OBTAIN A FULL RECORD OF YOUR PROFESSIONAL DAY . . . FROM THE TIME IT STARTS TO THE TIME IT ENDS. Each participating physician has a date to begin his recording. The dates have been selected to ensure a representative response for each day of the week. **PLEASE BE SURE TO START ON THE DAY AND DATE INDICATED ON YOUR DIARY AND CONTINUE UNINTERRUPTED FOR FIVE CONSECUTIVE DAYS.**

IF YOU ARE GOING TO BE ON VACATION OR AWAY FROM YOUR PRACTICE FOR TWO OR MORE OF THE DESIGNATED RECORDING DAYS, CALL US COLLECT FOR A NEW RECORDING TIME PERIOD.

RECORDING INSTRUCTIONS:

Record the date in the space provided in the upper left corner of each recording form. Start on a new page for each new day

Where possible, a list of categories to choose from has been developed. This *Coding Key* is on the page opposite the particular recording section. The categories allow you to select a number and record it rather than write a word or phrase. This will save you much time and make our analysis much easier.

DIARY RECORDING SHEETS. The number of recording sheets provided may be excessive for some individuals and for others there may not be enough. PLEASE USE THE DIARY FOR ONE DAY AND EVALUATE YOUR OWN RECORDING REQUIREMENTS. If you find that you need more sheets than provided, please call us collect immediately and we will send an additional booklet or sheets. *Please keep the diary booklet intact.*

Please record all professional and professionally-related activities. Also include events that consume significant amounts of time, e.g., travel or meals. A SAMPLE DIARY HAS BEEN PREPARED TO ILLUSTRATE THE TYPE OF ENTRY DESIRED IN EACH SECTION. PLEASE REFER TO THIS BEFORE YOU BEGIN YOUR RECORDING.

The sections of the diary are prepared according to the types of activity. Their sequence corresponds to the frequency of use by most physicians. For example, all will use the Activity Overview section but many will not use either the Teaching or Research sections.

- Start your day whenever you consider your professional day begins. *Enter Begin* Time and *End* Time for the activity and describe it according to the particular section's recording categories.
- Summary notation for *all* activities should be given in the first section, Activity Overview. Details for Patient Care, Laboratory and Diagnostic Testing, Research and Teaching are to be given in the designated sections. See the *sample diary* for examples.
- Make a new entry for each new activity.
- Types of activities for each section:

ACTIVITY OVERVIEW. Use this section to describe *all activities* in summary form. Such activities as administrative, professional, office operation, travel and patient charts are recorded only here.

PATIENT CARE. Use this section for clinical activities (except tests) wherever they are provided. If tests are performed *at this time*, so note and carry the activity to the Testing Section. The time end should be recorded at the end of the patient service.

LABORATORY AND DIAGNOSTIC TESTING. The categories are self-explanatory. Use this section if the patient service is only in this area or as a continuation of the more extensive patient care.

RESEARCH. The categories are self-explanatory. *If you do no research*, you may remove all but one of the Research recording pages from your diary. In that event, *write "no research"* on the remaining page.

TEACHING. Be sure to check all columns and enter the number of individuals taught. *If you do no teaching*, you may remove all but one of the Teaching recording pages from your diary. In that event, *write "no teaching"* on the remaining page.

This Diary Study is the most important of the studies which Advisory Committee on Cardiology Training and Manpower Requirements is doing. From this, we will be able to determine what cardiologists are actually called upon to do. Later study phases will obtain information regarding training and training needs.

YOUR COOPERATION AND PARTICIPATION IS VITALLY IMPORTANT. THE QUALITY OF THE STUDY AND ITS RECOMMENDATIONS DEPENDS UPON HOW YOU HELP US.

PLEASE RETURN YOUR COMPLETED DIARY IN THE SELF-ADDRESSED POSTAGE PAID ENVELOPE PROVIDED. MAIL IT TO US AS QUICKLY AS YOU CAN.

THANK YOU FOR YOUR HELP. CALL US COLLECT AT (213) 225-1511, Extension 349, IF YOU HAVE ANY PROBLEMS.

FIGURE 5

SAMPLE PAGE FROM CARDIOLOGY PROFESSIONAL DIARY

ACTIVITIES OVERVIEW

CODING KEY:

ADMINISTRATIVE, PROFESSIONAL, PERSONAL, TRAVEL and significant time interruptions are recorded only in this section. Some examples are:

Drive to office
Read *Circulation* and *Annals of Internal Medicine*
Dinner conference with CCU Committee
Afternoon vaction
Dictation
Consult with secretary
Consult with Dr. Jones
Prepare insurance forms
Review patient charts
Phone calls and correspondence
Drive to airport
Fly to New York
Visited friend in hospital

For PATIENT CARE, TESTING, RESEARCH and TEACHING, note only the total time in each of these areas in this section. For example:

Patients in office
Patients at hospital
Read ECGs in laboratory
Research with hamsters
Teaching students and nurses at hospital

USE FOR ALL ACTIVITIES EXCEPT FOR DETAILS REGARDING CLINICAL, TEACHING AND RESEARCH

DATE:

ACTIVITY OVERVIEW: Summary of Your Professional Day

TIME for ACTIVITY BEGIN	TIME for ACTIVITY END	SUMMARY FOR DAY: Administrative, Professional, Personal, Travel, Patients, Laboratory, Teaching, Research, Vacation. (See examples opposite this page) WRITE A PHRASE DESCRIBING EACH ACTIVITY

FIGURE 6

SAMPLE PAGE FROM CARDIOLOGY PROFESSIONAL DIARY

PATIENT CLINICAL PROBLEMS

CODING KEY:

1. **ACTIVITY TIME** New time sequence for each patient.
2. **PATIENT DESCRIPTORS** Data from patient's chart *Your staff may record.* ETHNIC = W (White), B (Black), O (Other) Distance to Dx/Rx = estimate of how far patient traveled for care, e.g., 5 miles, 25 miles. New/Old = to your practice Own = within your practice and walk-ins, *referral* = from other physicians or sources.
3. **PROBLEMS (Dx), TREATMENT (Rx) and/or DISPOSITION (Action)**
   Select appropriate *category or categories* for each and *record number. Record P* (Primary) *or S* for cardiac problems to denote their status relative to the general (non-cardiac) problems.
4. If seen on Rounds or ICU, record (1) your role and (2) whether teaching occurred *Role Supervise, Observe, Perform **Teach Students (medical), Attending, House, Nursing and/or Paramedical Staff(s).

GENERAL PROBLEMS (Dx)
Non-Cardiac

1. Respiratory
2. Renal
3. Neurological
4. Gastro-Intestinal
5. Musculoskeletal
6. Psychosomatic (non-cardiac)
7. Genito-Urinary
8. Dermatological
9. Obstetrics/Gyn.
10. Endocrine
11. EENT
12. None
13. Checkup
14. OTHER (specify) _____

CARDIAC PROBLEMS (Dx)

1. Heart failure, acute, severe
2. Heart failure, chronic, severe
3. Acute myocardial infarction
4. Pulmonary embolism
5. Pericardial disease
6. Coronary atherosclerosis without infarcation
7. Hypertension
8. Rheumatic
9. Cardiomyopathy
10. Arrhythmia
11. Infectious
12. Peripheral vascular disease
13. Cerebral vascular disease
14. Psychosomatic (cardiac)
15. Post cardiac surgery
16. Pacemaker evaluation
17. Congenital
18. None
19. OTHER (specify) _____

TREATMENT (Rx) AND/OR DISPOSITION (Action)

1. Prescribed drugs
2. Ordered routine lab tests
3. Ordered ECG
4. Ordered more elaborate non-invasive studies, e.g., phono, apex
5. Ordered catheterization tests
6. Evaluation for cardio-vascular surgery
7. Evaluation for other surgery
8. OTHER (specify) _____

USE TO RECORD PATIENT CLINICAL PROBLEMS AND THEIR DISPOSITION *EXCEPT FOR TESTS*

DATE		PATIENT DISCRIPTORS From Records						PROBLEMS (Dx) and DISPOSITION *Use Numbered Categories* from CODING KEY				If Seen On Rounds, ICU INDICATE	
PATIENT CARE: Office, Hospital, ECF, ER, Clinic or Home	TIME for ACTIVITY BEGIN / END	AGE	SEX M/F	ETHNIC W B Other	Distance to Dx Rx	New / Old	Own/Refer	General Dx non-cardiac	P or S	Cardiac Dx	Rx and/or Action	*Role S O P	**Teach S A H N P

FIGURE 7

SAMPLE PAGE FROM CARDIOLOGY PROFESSIONAL DIARY

CLINICAL TESTS

CODING KEY:

1. ACTIVITY TIME – New time sequence for each patient.
2. PATIENT DESCRIPTORS – An abbreviated set is all that is needed since the patient will appear in the PATIENT CARE section in most instances. Data obtained from patient's chart. Nurse or assistant may record.
3. LABORATORY AND TESTING – Make an entry for each test performed. If a test or procedure was used and is not on the list, DESCRIBE IN COLUMN 17 and then record.
4. YOUR INVOLVEMENT – For each test performed, indicate whether you (A) *ordered* it; (B) *performed* it and/or (C) *interpreted* it. You will probably use more than one letter with each test.

LABORATORY AND DIAGNOSTIC TESTING PROCEDURES

1. Electrocardiogram
2. Vectorcardiogram
3. Phonocardiogram
4. Echo, apex or other non-invasive techniques
5. Exercise testing
6. Cardiac fluoroscopy
7. Chest X-ray
8. Right and/or left heart catheterization
9. Right and/or left heart catheterization with angiogram
10. Flotation catheterization
11. Selective coronary arteriogram
12. Pulmonary angiogram
13. Non-coronary arteriogram
14. His bundle recording
15. Pacemaker insertion
16. Pacemaker evaluation
17. OTHER: Specify and record _____

_____

USE TO RECORD CLINICAL TEST ORDERED, PERFORMED AND INTERPRETED

DATE:

PATIENT DESCRIPTORS

RECORD ALL TESTS PERFORMED IN NUMBERED COLUMNS
Refer to *numbered list* on *opposite page*

FOR EACH TEST PERFORMED, indicate whether you
A - ORDERED it; B - PERFORMED it; C - INTERPRETED it

LABORATORY & DIAGNOSTIC TESTING

TIME for ACTIVITY BEGIN	END	AGE	SEX M/F	ETHNIC W B Other	Own/Refer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

FIGURE 8

SAMPLE PAGE FROM CARDIOLOGY PROFESSIONAL DIARY

RESEARCH

USE TO RECORD AND DESCRIBE YOUR RESEARCH

DATE:		RESEARCH PROBLEM	CHECK AND RECORD FOR ALL APPLICABLE CATEGORIES								
			Involving	Location	Utilizing			Your Role		Team	
TIME for ACTIVITY		*Brief descriptive statement*									
Begin	End	(Amplify on opposite page if more space is needed)	Human / Animal / Other	Lab / Bedside / ER/OR / Office	Drugs	Prosthetic Device	Equipment	Teaching? YES or NO	Observe	Participate	Direct	Team? YES/NO If YES, NUMBER of Co-Investigators

RESEARCH

FIGURE 9

SAMPLE PAGE FROM CARDIOLOGY PROFESSIONAL DIARY

TEACHING

USE TO RECORD AND DESCRIBE YOUR TEACHING

DATE:		TEACHING LEVEL and NUMBER TAUGHT						SETTING Record all used				METHODS		ROLE	TOPIC
TIME for ACTIVITY		Med Student	House Staff	Post Graduate	Nursing	Paramedical	Community (non-medical)	Class Room	Lecture Hall	Conference	Office	Bedside	ER/OR Lab	Audio-Visuals YES or NO	Examinations YES or NO	CONDUCT or OBSERVE	*Describe* in a phrase
Begin	End																
TEACHING																	

differed sufficiently to justify identification and independent analysis. While USC DRME and the ACC Advisory Committee were fully cognizant of the fact that the specializations within cardiological practice extend well beyond the four groupings selected, it was agreed that these groups would supply sufficient information to meet the major objectives for this study stage. The four types of cardiologists identified for this log-diary study were:

1. Primary Cardiologists in a non-institutional practice setting (approximately 37 percent of the study population);

2. Secondary Cardiologists in a non-institutional practice setting (approximately 41 percent of the study population);

3. Primary Cardiologists in an institutional practice setting (approximately 16 percent of the study population);

4. Secondary Cardiologists in an institutional practice setting (approximately 6 percent of the study population).

The non-institutional practice includes those practice arrangements which traditionally are described as "solo," "group," and "partnership." It is recognized that the concept of "corporation" is omitted in this classification and that the difference between "partnership" and "group" is a relatively obscure one - particularly when the numbers of individuals involved in the arrangement are small. However, initial data did not show significant differences in activity profiles among these groups and they were combined on that basis.

The institutional practice includes hospital and "hospital-like" arrangements and employment by medical schools. It does not include individuals whose employment is with federal agencies (e.g., NIH, VA); nor does it include comparable employment arrangements on the state, county or municipal level.

Sampling Population

The population for the diary sample consisted of the non-federal respondents to the first mailing of the Initial Cardiology Survey. The decision to limit the sampling population to this group was reached after extensive comparisons between response groups revealed no important differences attributable to whether they responded to the first, second, or third mailing. A controllable difference would be the numbers of Primary or Secondary Cardiologists responding since this was one of the stratification criteria used in describing the four groups to study. A non-controllable difference would be associated with proportion of time to activities, proportion of patients in a referral status - any factor which was not part of the stratification plan. Analyses were run to provide comparative statistics on the two respondent groups used in reaching the conclusion that there were no important differences attributable to

when they responded. Analyses were made to compare the Cardiology Professional Diary sampling strata with the total responding population to the Initial Cardiology Survey. The differences between the two groups are negligible as they relate to geographical location, patient distance to care, practice arrangements, size of medical service community and proportion of time given to summarized professional activities. The groups used for the Cardiology Professional Diary study has a little more time in cardiological activities, received more referral patients and had more members who are board certified, Certified in Cardiology and/or members of the ACC. With the exception of board certified cardiologists where 10 percent more have this status, the differences cited are all less than 5 percent. As a profile, the differences might suggest a slightly better "qualified" group of cardiologists than those who were not included but even the areas where the difference is greatest had no apparent effect on the activities which cardiologists perform.

The reasons for using the first respondents as the sampling population, once it was determined that no important bias would result from the action, were (1) the motivation of participants and (2) the fact that the first study was not completed at the time the log-diary study had to begin. Motivation was important because the log-diary was a complex time-consuming instrument. Knowing the complexity of the instrument, it was only logical to work with a respondent group who had willingly participated previously - as long as doing so would not bias the results. Cardiologists who responded to the Initial Cardiology Survey only after a second or third mailing were questionable potential respondents to this longer survey instrument.

Sampling Plan

The basis of the sampling plan was the desirability, expressed by all groups involved in the study through Advisory Committee action, of obtaining separate statistical estimates within reasonable error margins for each of the four cardiologist types described previously.

The log-diary population consisted of 3,266 active cardiologists who responded to the Cardiology Survey during the first response period. The four cardiologist types were treated as separate populations (major strata) as follows:

1. Primary Cardiologist, Non-Institutional Employment (N=1295)

2. Primary Cardiologist, Institutional Employment (N= 530)

3. Secondary Cardiologist, Non-Institutional Employment (N=1192)

4. Secondary Cardiologist, Institutional Employment (N= 107)

Other (not included) (N= 142)

"Other" includes a wide array of non-patient care and non-research or teaching roles such as working with pharmaceutical houses, insurance firms, law firms, and the like. Exclusion of "Other" reduced the log-diary population to 3,124.

Each of these major strata was sampled according to the following rationale. The confidence interval for an obtained sample percentage of 50 percent was set at $\pm$ 5 percent (68 percent confidence level). Since confidence intervals are a maximum for sample percentages of 50 percent, actual confidence intervals were anticipated to be somewhat narrower. The basic relationship involved in determining the required sample size for each stratum is expressed in the equation below.

$$CI = P \pm Z \sqrt{\frac{p(1-p)}{n}\left[1 - \frac{n}{N}\right]}$$

CI = Confidence Interval

P = value of the sampled proportion

n = sample size

N = size of the stratum or population

Z = the normal deviation associated with the desired probability level (Z=1 for a probability of 68 percent, Z=1.96 for a probability of 95 percent)

Given the above constraints on the Confidence Interval, sample sizes for the strata can be determined by this formula:

$$n = \frac{100N}{N + 100} \quad \frac{1}{R} \qquad \text{(R is rate of return)}$$

Sample sizes are shown for the four log-diary strata in Table 4.

The actual sample was based on the conservative possibility of a return rate as low as 50 percent. This was set because of the known difficulty participants would have in maintaining the log-diary, the time involved in keeping it, and the introduction of the survey instrument by mail rather than personal contact.

TABLE 4

SAMPLE SIZES REQUIRED FOR STANDARD ERROR OF FIVE PERCENT[a]

Specialty/Practice Type	N	Assuming Usable Returns At:			Actual Sample[b]
		100%	75%	50%	
Primary Non-Institutional	1295	93	124	186	192
Primary Institutional	530	84	112	168	171
Secondary Non-Institutional	1192	92	123	184	187
Secondary Institutional	107	52	69	104	106

[a]For sample percentages of 50 percent

[b]Sample augmented to ensure representation from all states

In addition to the stratification variables, some concern was raised about the representativeness of the samples with respect to geographic and population variables. Therefore, each stratum was divided into 40 cells created by combining 10 geographic regions and four community sizes, and then sampled proportionately according to the size of the cells within the stratum.

Differences in the data obtained from the 40 cells were not anticipated, and in addition, sampling error for these cells was uncontrolled. For these reasons, no statistical estimates were planned with respect to geographic region or community size. The proportional sampling, however, could result in a reduction of sampling error for the major strata.

Each of the 40 cells was sampled by the sampling fraction used for the major strata (.144, .318, .154 and 1.000 respectively). However, certain adjacent small cells were collapsed based on community size so that there were 30, 30, 29 and 25 cells used. The strata were collapsed to four types of cardiologists, four community sizes and ten census divisions for analyses.

Participation Rates

The actual rate of return, based on usable diaries, was 55.5 percent (based on total returns the rate was 63 percent), as shown in Table 5. Primary Cardiologists responded at a 58.6 percent rate, compared with 51.5 percent for Secondary Cardiologists. A somewhat higher willingness to respond on the part of the Primary Cardiologist is also indicated in Table 5 by the higher percentage of this group in the sampling population (the respondents to the first mailing) than in the total respondent group.

The distribution of usable returns among the four strata was, of course, purposely created according to the sampling plan. By applying the weights shown in column (f) of Table 5, the strata are reweighted in accordance with the distribution in the total respondent group.

Table 6 compares the total respondent population, sampling population, sample and sample returns on the basis of census division, the only deviation being an under representation of the Middle Atlantic region in the diary returns relative to the sample and sampling populations. Table 7 compares the sample and the sample returns in a cross-tabulation of strata by census division.

Sampling Errors Expected for Diary Data

As previously discussed, samples were drawn from each of the four strata so that the standard error for estimating percentages within each stratum would be a maximum of 5 percent under the most conservative assumptions. Actual errors could be anticipated to be somewhat lower.

TABLE 5

CARDIOLOGISTS' PROFESSIONAL DIARY PARTICIPATION RATES:
BY SPECIALTY/PRACTICE TYPE

Specialty/Practice Type	Cardiologists Nationally[a]		Sampling Population[b]		Diary Sample[c]	Usable Returns[d]		Return Rate[e]	Adjustment Weight for Sample[f]
	N	%	N	%	N	N	%	%	
Primary:									
Non-Institutional	2411	(37.5)	1295	(41.4)	192	111	(30.5)	57.8%	1.25
Institutional	1056	(16.4)	530	(17.0)	171	102	(28.0)	59.6%	0.58
Secondary:									
Non-Institutional	2612	(40.6)	1192	(38.2)	187	97	(26.6)	51.9%	1.53
Institutional	357	(5.5)	107	(3.4)	106	54	(14.8)	50.9%	0.37
TOTAL	6436	(100.0)	3124	(100.0)	656	364	(100.0)	55.5%	

[a]Active non-federal cardiologists with known specialty and practice characteristics

[b]Respondents from (a) to first mailing of Initial Cardiology Survey

[c]Sample from (b) described on pages

[d]Actual returns from (c)

[e](d) divided by (c)

[f]Weight applied to (d) to achieve percentage distribution comparable to (a)

TABLE 6

CARDIOLOGY STUDY POPULATIONS:
PERCENTAGE AND DISTRIBUTION BY CENSUS DIVISION WITHIN REGION

CARDIOLOGY STUDY POPULATIONS		Northeast		South			North Central		West		Caribbean	National Totals
		New England	Middle Atlantic	South Atlantic	East South Central	West South Central	East North Central	West North Central	Mountain	Pacific		
All Active Cardiologists*	N	833	2998	1773	318	683	1538	557	337	1523	103	10,691*
	(%)	(7.8)	(28.1)	(16.6)	(3.0)	(6.4)	(14.4)	(5.2)	(3.2)	(14.3)	(1.0)	(100.0)
Cardiology Survey Respondents*	N	550	1829	1139	229	463	980	371	247	1013	64	6885*
	(%)	(8.0)	(26.6)	(16.5)	(3.3)	(6.7)	(14.3)	(5.4)	(3.6)	(14.7)	(0.9)	(100.0)
Diary Population Stratum	N	271	849	500	92	181	454	177	100	472	28	3124
	(%)	(8.7)	(27.2)	(16.0)	(3.0)	(5.8)	(14.5)	(5.6)	(3.2)	(15.1)	(0.9)	(100.0)
Diary Sample	N	57	172	107	20	39	100	41	26	88	6	656
	(%)	(8.7)	(26.2)	(16.3)	(3.1)	(5.9)	(15.2)	(6.3)	(4.0)	(13.4)	(0.9)	(100.0)
Diary Participants	N	26	79	66	8	18	62	30	21	52	2	364
	(%)	(7.1)	(21.7)	(18.1)	(2.2)	(5.0)	(17.0)	(8.2)	(5.8)	(14.3)	(0.6)	(100.0)

*Includes 419 federal cardiologists.

TABLE 7

PERCENTAGE AND DISTRIBUTION OF CARDIOLOGY PROFESSIONAL DIARY PARTICIPANTS: ALLOCATIONS WITHIN SPECIALTY AND PRACTICE BY CENSUS DIVISION WITHIN REGION

SPECIALTY AND PRACTICE		Northeast		South			North Central		West		Caribbean	National Totals
		New England	Middle Atlantic	South Atlantic	East South Central	West South Central	East North Central	West North Central	Mountain	Pacific		
Primary Cardiologist												
Non-Institutional	N	7	23	18	4	4	20	4	9	20	2	111
	(%)	(6.3)	(20.7)	(16.3)	(3.6)	(3.6)	(18.0)	(3.6)	(8.1)	(18.0)	(1.8)	(100.0)
Institutional	N	6	26	18	2	5	13	11	6	15	0	102
	(%)	(5.9)	(25.5)	(17.7)	(2.0)	(4.9)	(12.6)	(10.8)	(5.9)	(14.7)	(0.0)	(100.0)
Sub Total	N	13	49	36	6	9	33	15	15	35	2	213
	(%)	(6.1)	(23.0)	(16.9)	(2.8)	(4.2)	(15.5)	(7.0)	(7.0)	(16.4)	(0.9)	(100.0)
Secondary Cardiologist												
Non-Institutional	N	8	22	19	1	4	15	11	3	14	0	97
	(%)	(8.3)	(22.7)	(19.6)	(1.0)	(4.1)	(15.5)	(11.3)	(3.1)	(14.4)	(0.0)	(100.0)
Institutional	N	5	8	11	1	5	14	4	3	3	0	54
	(%)	(9.3)	(14.8)	(20.4)	(1.9)	(9.3)	(25.9)	(7.4)	(5.6)	(5.6)	(0.0)	(100.0)
Sub Total	N	13	30	30	2	9	29	15	6	17	0	151
	(%)	(8.6)	(19.9)	(19.9)	(1.3)	(6.0)	(19.2)	(9.9)	(4.0)	(11.2)	(0.0)	(100.0)
All Cardiologists												
	N	26	79	66	8	18	62	30	21	52	2	364
	(%)	(7.1)	(21.7)	(18.1)	(2.2)	(5.0)	(17.0)	(8.2)	(5.8)	(14.3)	(0.6)	(100.0)

When an obtained sample percentage is 50 percent, the standard error is a maximum, with percentages deviating in either direction from 50 percent having smaller associated error. In addition, response rates were higher than conservative estimates - 55.1 percent usable diaries were achieved rather than 50 percent. Taking these factors into account, estimates for the standard errors of percentages obtained in the log-diary study can be made. A detailed analysis of expected standard errors for each stratum and for stratum composites was made. This analysis may be summarizes as follows:

For individual strata, the errors are

- between 4 and 5 percent for sampled percentages in mid-range (30 to 70 percent);
- between 3 and 4 percent for sampled percentages in the ranges of 15 to 30 and 70 to 85 percent;
- between 2 and 3 percent for sampled percentages from 5 to 15 and 85 to 95 percent;
- about one percent for extreme percentages.

In the case of sample percentages for "All Cardiologists" (a weighted composite across strata), the erros are expected to be only about half as large as those for individual strata, even assuming no gains from stratification. To the extent that sample percentages vary from stratum to stratum, as opposed to variation within the strata, error in the composite data may be even lower.

Bias in Response Attributable to Time

Bias could emanate from factors associated with the time-period given to a particular physician for his five-day recording. Those factors might be unique to his practice situation or attributable to an unusual set of environmental events. The study did extend over five months (from June through October) and there was a major flood along the entire Eastern seaboard at the beginning of the study. It is not necessary to speculate regarding whether or not such events influenced the study since a question was included with the diary addressed to the typicality issue. The question asked, "Is this time period typical of your practice? If NO, how does it differ?" The analysis of responses to this question did not establish a clear pattern of atypicality even though about 24 percent checked that their time period was not typical. To summarize the analysis for all cardiologists:

- 16 percent checked the time was slower than usual
  4 percent checked the time was faster than usual
  4 percent gave no reason or statement

- reasons given for atypicality - applicable about equally to the slow and fast practices were

- vacation or summer	6.9 percent
- office patient load	5.5 percent
- hospital patient load	4.1 percent
- no teaching rounds	3.0 percent
- laboratory work	2.2 percent
- research	0.8 percent
- environmental factors	0.8 percent
- medical school teaching	0.5 percent

The diaries from those indicating atypical factors were individually compared with other diaries of the same type. This comparison did not establish either particularly heavy-load or light-load practices. DRME concludes from these limited data that while variations were reported, they were not systematic (i.e., in the same direction) with the possible exception of the summer effect on institutional practices. Perhaps the fact that the study extended from the end of one school year into the beginning of the next allowed the Institutional Cardiologists a choice of participation times which most accurately reflected their normal practice situation.

Effects of Non-Response on Study Conclusions

DRME has reviewed the respondent data in terms of all known and potential sources of bias as these might affect the four types of cardiologist respondents. The effect of differential response on a geographic basis has been examined as well. The conclusion reached is that the data do not have significant biasing elements associated with them at the primary sampling level - the level of the four types of cardiologists. However, there are some differences between the respondents and non-respondents based on comparable data from the AMA supplied data and the Initial Cardiology Survey. The actual detailed analysis is found in Appendix A. The conclusions reached from this analysis are as follows.

1. Cardiologists more heavily involved in cardiology are more likely to respond to the log-diary. This willingness to participate is expected on the part of Primary Cardiologists as compared to Secondary Cardiologists. In addition, the fact that the study was conducted under the auspices of the American College of Cardiology produced a larger return rate among members of that group.

2. The older cardiologists did not respond in as high a percentage as their younger counterparts.

3. Cardiologists in solo practice and in hosptial-based practices responded at a lower rate than those in either partnerships or group practice. This might be attributable to differences in the availability of support staffs to assist with patient-descriptive data for the log-diary.

4. The lower response-rate for the Urban Middle Atlantic cardiologist is not readily explainable. Although the age distribution in this area is higher than in other areas, a comparison based on age showed a tendency toward non-response for solo and hospital-based cardiologists noted earlier might be a factor since these are more heavily concentrated in the Urban Middle Atlantic areas.

PHASE FOUR: CARDIOLOGISTS' TRAINING, TRAINING NEEDS AND PRACTICES STUDY - CARDIOLOGISTS' TRAINING SURVEY

In this study, the project obtained data on the training cardiologists received before entering practice, their assessment of needs for training, and their assessment of the adequacy of cardiological manpower in their practice areas. This study and another, involving the institutions which train cardiologists (Phase Five), provide direct assessments regarding the training matters of concern to the Advisory Committee.

Both studies asked the same questions regarding topics in training and similar questions in the area of actual training completed. The design symmetry was incorporated to allow direct comparisons between the trainers' required training and the trainees' assessment of its adequacy in a practice setting.

Study Objectives

1. To determine the amount of post-doctoral training (expressed in years) for residencies and fellowships.

2. To verify initial estimates of the proportion of cardiologists who are Board-Certified in either Internal Medicine or Cardiology.

3. To determine topical areas in which the cardiologist was trained, his assessment of relevancy of training to his practice, and his judgment regarding the training's importance to others in practices similar to his.

4. To determine his needs for continuing education: in what areas, with what frequency, and by what means.

5. To obtain his assessment of manpower adequacy for both Primary and Secondary Cardiologists in his particular geographic area.

Study Instrument

The eleven- page questionnaire design permitted either recording of factual data (e.g., "where received residency training and number or years in training") or checking of a response choice most closely approaching the statement which would have been made had the question been open-ended. This procedure simplified the respondent's tasks and provided the project staff with uniform response data. The first three sections focused on characteristics of the cardiologist's current practice and his training for practice. The fourth section asked about continuing education - frequencey of participation and recommendations for programs. The fifth section asked for an assessment of manpower adequacy. The final section invited narrative recommendations in either manpower or training areas.

Field testing occurred in the Los Angeles area. Cardiologists whose ages and practices were representative of those to whom the instrument would be sent participated in this test. The final instrument reflected their recommendations as well as some provided by the Advisory Committee and NHLI.

The development of the questionnaire extended over about one calendar year, during which time it was an agenda item for each of the Advisory Committee's meetings. Initially the plan had been to obtain information regarding functions and responsibilities of support staffs and similar organizational questions; these were omitted by the Committee who deemed it more important to obtain a comparatively detailed assessment of the parameters of individual's training and assessment of what ought to be offered for each type of training. The actual survey instrument follows and is referenced as Figure 10.

Study Strata

Analysis of the Initial Cardiology Survey data suggested that some differences in the training area might be associated with their age and with age-related measures. The Committee was particularly interested in the training received by cardiologists whose ages were less than 40, although they had an interest in the training experiences of older cardiologists as well. It was believed that the younger cardiologists' assessments of training programs would be much more appropriate than those of the older cardiologists' because substantive changes in formal cardiovascular training have occurred during the past ten years. Because of the special importance of young cardiologists in assessing training program adequacy, the sampling plan was designed to obtain more participants from this age group.

Form Approved
OMB No 685-73029
App Exp 12/31/73

FIGURE 10

AMERICAN COLLEGE OF CARDIOLOGY
9650 ROCKVILLE PIKE BETHESDA, MARYLAND 20014 PHONE: 301 530-1600

ADVISORY COMMITTEE ON CARDIOLOGY TRAINING
AND MANPOWER REQUIREMENTS

CARDIOLOGIST'S TRAINING SURVEY

SAMPLE LABEL

00000-XX-0-0000

John A. Doe, M.D.
Anytown, U.S.A.

Your participation is vitally important. If you have any questions please call our Associate Project Director, R. C. Mendenhall, at (213) 225-1511, extension 349, collect.

Please return your completed form to our Cardiology Manpower Study Project, University of Southern California School of Medicine, Division of Research in Medical Education in the self-addressed stamped envelope which accompanied the survey. If you misplaced it, the address is 2025 Zonal Avenue, Los Angeles, California 90033.

FIGURE 10A

I. CHARACTERISTICS OF YOUR PRACTICE

Cardiologists's practices vary widely both in the amount of time actually devoted to cardiovascular matters and the activities which they perform or supervise. The list below is representative of the range of activities within practices.

PLEASE CHECK WHETHER OR NOT YOU PERFORM OR ENGAGE IN THE ACTIVITIES LISTED. FOR THOSE CHECKED *YES*, ALSO CHECK THE BOX WHICH MOST CLOSELY DESCRIBES HOW OFTEN YOU DO THE ACTIVITY.

Professional Activity	For each CHECK		If YES, how often? CHECK ONE			
	Yes	No	Daily	Weekly	Monthly	Occasionally
	√	√	√	√	√	√
CLINICAL:						
Treat patients with cardiac disease classified as						
Coronary	☐	☐	☐	☐	☐	☐
Hypertensive	☐	☐	☐	☐	☐	☐
Rheumatic	☐	☐	☐	☐	☐	☐
Congenital	☐	☐	☐	☐	☐	☐
Cardiomyopathy	☐	☐	☐	☐	☐	☐
Peripheral Vascular Disease	☐	☐	☐	☐	☐	☐
See pediatric patients with cardiac disease	☐	☐	☐	☐	☐	☐
Perform as a consultant on cardiac problems	☐	☐	☐	☐	☐	☐
Manage an intensive care and/or coronary care facility	☐	☐	☐	☐	☐	☐
Serve as a cardiologist on a CCU committee	☐	☐	☐	☐	☐	☐
Perform exercise stress testing	☐	☐	☐	☐	☐	☐
Perform or interpret ECGs	☐	☐	☐	☐	☐	☐
Perform or interpret VCGs	☐	☐	☐	☐	☐	☐
Perform or interpret angiograms (cardiac, coronary or peripheral)	☐	☐	☐	☐	☐	☐
Perform or interpret echocardiograms	☐	☐	☐	☐	☐	☐
Perform or interpret cardiac fluoroscopies	☐	☐	☐	☐	☐	☐
Conduct diagnostic cardiac catheterizations	☐	☐	☐	☐	☐	☐
Direct a hemodynamics laboratory	☐	☐	☐	☐	☐	☐

continued

FIGURE 10B

I. CHARACTERISTICS OF YOUR PRACTICE (Continued)

Professional Activity	For each CHECK: Yes	For each CHECK: No	If YES, how often? CHECK ONE: Daily	Weekly	Monthly	Occasionally
	√	√	√	√	√	√
RESEARCH:						
Conduct clinical research	☐	☐	☐	☐	☐	☐
Conduct basic laboratory research	☐	☐	☐	☐	☐	☐
TEACHING:						
Teach nursing staff on clinical rounds or classroom	☐	☐	☐	☐	☐	☐
Teach medical students, interns, residents and/or fellows in clinical and laboratory settings	☐	☐	☐	☐	☐	☐
Teach medical students, interns, residents and/or fellows in formal classroom settings	☐	☐	☐	☐	☐	☐
Teach others to perform cardiac diagnostic x-ray procedures	☐	☐	☐	☐	☐	☐
Teach others to perform cardiac catheterizations	☐	☐	☐	☐	☐	☐
Teach other diagnostic techniques: ECG, VCG, etc.	☐	☐	☐	☐	☐	☐
Participate in professional seminars, workshops and symposia as a consultant cardiologist	☐	☐	☐	☐	☐	☐

II. YOUR TYPE OF PRACTICE

A year ago, we asked you questions about the amount of time which you devote to different activities and the employment arrangements for your practice. *We need a current summary* of (a) your involvement in cardiology and (b) your practice arrangement. PLEASE CHECK THE STATEMENTS BELOW WHICH BEST DESCRIBE YOUR PRACTICE.

	Check Best Descriptors
	√
1. My practice is:	
Primarily in cardiology (over 50 percent time)	☐
Secondarily in cardiology (under 50 percent time)	☐
2. My practice arrangements are predominantly:	
Non-Institutional (Solo, Group, Partnership)	☐
Institutional (Medical School, Hospital)	☐

FIGURE 10C

III. YOUR TRAINING IN CARDIOVASCULAR DISEASES, ITS ADEQUACY AND YOUR RECOMMENDATIONS FOR THE TRAINING OF OTHER CARDIOLOGISTS

	CHECK ONE Yes	No
1. How many years of post-doctoral clinical training did you have before entering your own continuous practice? _____ (years)	✓	✓
2. Are you board certified in internal medicine?	☐	☐
3. Are you board certified in a specialty other than internal medicine? If yes, certified in _____ (describe)	☐	☐
4. Are you subspecialty board certified in cardiovascular disease?	☐	☐

5. Please indicate the types, dates and locations for your post-doctoral training:

Type of Training	Year(s)	Institution	Institution City
Internship			
Residency			
Internal Medicine			
Other (name):			
Fellow in Cardiology*			

*At least one year of full-time training

FIGURE 10D

6. ***Your formal cardiovascular disease training and recommendations:***
We need to know what training *you received* during residency and/or fellowship in cardiovascular disease and in *your judgment* its adequacy for your practice. Both aspects — *what* you received and its *value to you in your practice* — are extremely important.

As well as assessing your own training, please do so for someone now in training for cardiovascular diseases who might enter a *practice similar to yours* today. *Please rate* the training areas for *your type of practice in importance: low; medium; or high.*

CARDIOVASCULAR TRAINING PROGRAM EXPERIENCES AND TRAINING TOPICS	CHECK	CHECK ONE			CHECK ONE		
		This Training was:			Importance for Training Others:		
	My Training Included:	Too Limited	About Right	Too Much	Low	Med.	High
A. *Experience in Clinical Care, Research and Teaching*	√	√	√	√	√	√	√
Cardiac patient care:							
Pediatric							
Medical							
Surgical							
Coronary Care Unit							
Pacemaker insertion							
Pacemaker follow-up							
Cardiovascular research:							
Basic							
Clinical							
Teaching:							
Clinical							
Didactic							
B. *Laboratory Diagnostic Techniques*							
Electrocardiography							
Phonocardiography							
Echocardiography							
Exercise tolerance testing							
Vectorcardiography							

continued

FIGURE 10E

CARDIOVASCULAR TRAINING PROGRAM EXPERIENCES AND TRAINING TOPICS	CHECK	CHECK ONE			CHECK ONE		
	My Training Included:	This Training was:			Importance for Training Others:		
		Too Limited	About Right	Too Much	Low	Med.	High
B. *Laboratory Diagnostic Techniques (continued)*	√	√	√	√	√	√	√
Angiography:							
Cardiac							
Coronary							
Peripheral							
Cardiac catheterization							
Swan-Ganz right heart catheterization							
C. *Laboratory and Classroom Instruction*							
CV anatomy							
CV physiology							
CV biochemistry							
CV pathology							
CV epidemiology							
CV pharmacology							
CV radiology							
Pulmonary physiology							
Hypertensive renal disease							
Peripheral vascular disease							
Cerebral vascular disease							
Biostatistics							
Bioengineering							

IV. CONTINUING EDUCATION, ITS ADEQUACY AND RECOMMENDATIONS

1. *Your Needs for Continuing Education Programs:*

As a practicing physician with a significant involvement in cardiovascular patient care, you are in a better position to assess your own needs for further formal training than anyone else. Your assessment is vitally important to us.

For your own training, please check the areas or topics of interest, the length of course desired and how often it should be offered to you.

TYPE OF TRAINING	I would like continuing education available in:	OWN TRAINING						
		COURSE LENGTH				HOW OFFERED		
		Less than 1 Week	1 to 2 Weeks	2 to 4 Weeks	1 Month or More	Several times per year	Yearly	2 Year Intervals or more
A. *CLASSROOM INSTRUCTION OR SEMINARS*	√	√	√	√	√	√	√	√
General medical cardiology								
CV surgery								
Pediatric cardiology								
CV anatomy								
CV physiology								
CV biochemistry								
CV pathology								
CV epidemiology								
CV pharmacology								
CV radiology								
Pulmonary physiology								
Hypertensive renal disease								
Peripheral vascular disease								
Cerebral vascular disease								
Biostatistics								
Bioengineering								
Electrocardiography								
Phonocardiography								

continued

FIGURE 10G

(continued)

TYPE OF TRAINING	I would like continuing education available in:	OWN TRAINING							
		COURSE LENGTH				HOW OFFERED			
		Less than 1 Week	1 to 2 Weeks	2 to 4 Weeks	1 Month or More	Several times Per Year	Yearly	2 Year Intervals or more	
	√	√	√	√	√	√	√	√	
Echocardiography									
Exercise tolerance testing									
Vectorcardiography									
Angiography									
Cardiac catheterization									
B. *ACTUAL PERSONAL SUPERVISED EXPERIENCE*									
Cardiac patient care:									
Pediatric									
Medical									
Surgical									
Coronary Care Unit									
Pacemaker insertion and follow up									
C. *LABORATORY DIAGNOSTIC TECHNIQUES*									
Electrocardiography									
Phonocardiography									
Echocardiography									
Exercise tolerance testing									
Vectorcardiography									
Angiography:									
Cardiac									
Coronary									
Peripheral									
Cardiac catheterization									
Swan-Ganz right heart catheterization									

FIGURE 10H

2. *Participation in Continuing Education Programs*

In formulating recommendations regarding educational programs, it will be important to know how often you and other cardiologists actually participate in different types of programs.

A. How often do you participate in continuing education courses in cardiovascular diseases?

(Check One)

- ☐ More than once a year
- ☐ Once a year
- ☐ Every 1 to 2 years
- ☐ Every 2 to 3 years
- ☐ Every 3 to 5 years
- ☐ Every 5 to 10 years
- ☐ Do not participate

B. Do you consider the opportunities offered:

(Check one)

- ☐ adequate
- ☐ inadequate
- ☐ no opinion

C. How often do you attend national meetings devoted exclusively to cardiology (i.e., broad scope scientific meetings — not "postgraduate" courses)?

(Check One)

- ☐ More than once a year
- ☐ Once a year
- ☐ Every 1 to 2 years
- ☐ Every 2 to 3 years
- ☐ Every 3 to 5 years
- ☐ Every 5 to 10 years
- ☐ Do not participate

D. How often do you attend national or regional meetings having *substantial* cardiology sessions (i.e., broad scope scientific meetings — not "postgraduate" courses)?

(Check One)

- ☐ More than once a year
- ☐ Once a year
- ☐ Every 1 to 2 years
- ☐ Every 2 to 3 years
- ☐ Every 3 to 5 years
- ☐ Every 5 to 10 years
- ☐ Do not participate

FIGURE 10F

V. ASSESSMENT OF CARDIOLOGY MANPOWER

In your geographical area only, please indicate whether or not more cardiologists with either a primary or secondary commitment to cardiology are needed.

In my geographical area:	CHECK ONE		
	Too Few	About Right	Too Many
A. The number of physicians whose practice involves a primary commitment to cardiovascular disease is:	☐	☐	☐
B. The number of physicians whose practice involves a secondary commitment to cardiovascular disease is:	☐	☐	☐

VI. RECOMMENDATIONS: The Advisory Committee and National Heart and Lung Institute will be grateful for any recommendations which you have regarding either (1) cardiology manpower; (2) training of cardiology residents/fellows; or (3) the continuing education for cardiologists in practice.

1. Cardiology manpower: _____

2. **Training of cardiology residents/fellows:**

3. **Continuing education for cardiologists in practice:**

The four types of cardiologists studied in the log-diary study were used in this study. These, divided into two age groups (under 40 and 40 years or more), resulted in eight for individual study and analyses.

SAMPLING PLAN

Cardiologists under age 40 were sampled with the maximum standard error set at 3 percent. Those over age 40 were sampled with the maximum standard error at 5 percent. The more stringent sampling procedure for the under-40 age group was used because the responses of the younger group were considered more important in training program assessments and recommendations.

Table 8 presents the sampling plan. The sampling plan was developed under the assumption that only two age groups would be studied; (1) under 40 years old and (2) from 40 to 60 years old. Federal reviewers (OMB) insisted on including the cardiologists older than 60. Rather than revise the plan with a consequent reduced number required in the middle age group, the samples for the age group 40 through 59 were augmented by samples taken from the age group 60 and over. These samples were drawn in the same proportions as the samples from the 40 through 59 age groups, which permitted analysis of data either as in the original sampling plan, or analysis based on a combination of both age groups. For these reasons, the combined sample is larger than would have been required if only the combined group (all cardiologists 40 years and over) were of interest.

All cardiologist who were in-training in December 1971 received this survey although they were not included in the active cardiologist analyses. The rationale for their inclusion was the belief that (1) while their training might still be in process, useful insights would accrue from their responses to those questions which were training program specific; (2) some shifts from "in-training" to "active" might be identified.

Participation Rates

The study extended over 86 calendar days. Two mailings with accompanying survey instruments and one final letter encouraging participation consituted the contact methods for this study. The total response rate was 73 percent.

Figure 11 displays the percent of toal survey forms received by data collection days, distinguishing among those obtained from one mailing, those from a second, and those that responded after a third mailing. (The percentages sum to 100 percent and are read, 30 percent received during first 10 days, etc.) The interest in Figure 11 is primarily methodological although it does indicate minimum lapsed times to achieve response rates greater than 70 percent and the yield in returns which sequential requests produce.

TABLE 8

SAMPLE SIZES REQUIRED FOR CARDIOLOGISTS' TRAINING SURVEY[1]

Specialty/Practice Type and Age Groups	N	Assuming Usable Returns at:			Actual Sample
		100%	75%	50%	
UNDER 40 YEARS					
Primary:					
Non-Institutional	565	186	248	372	373
Institutional	733	201	268	402	403
Secondary:					
Non-Institutional	483	177	236	354	354
Institutional	180	109	145	180	180
40 AND OVER					
Primary:					
Non-Institutional	1881	92	123	184	250*
Institutional	614	84	112	168	190*
Secondary:					
Non-Institutional	2174	93	124	186	269*
Institutional	304	71	95	142	176*
Subtotal	6934	1013	1351	1988	2195
FELLOWS	424				424
TOTAL	7358				2619

[1]Strata 1-4 sampled for 3 percent standard error;
Strata 5-8 sampled for 5 percent standard error

*Samples augmented to achieve representation for over 60 years of age groups

FIGURE 11

CARDIOLOGIST'S TRAINING SURVEY PERCENT OF TOTAL RETURNS
BY SELECTED TIME PERIODS

Survey Respondents

Table 9 presents the distribution for respondents by age and type of cardiologist. It includes percentages received, not usable and actually used in analyses. It is apparent from this table that the Primary Cardiologists responded better than the Secondary Cardiologists. Based on usable returns, and not including cardiology Fellows, the overall rate of return for the training survey was 68.7 percent. As in the diary study, Primary Cardiologists responded at a higher rate (73.2 percent) than Secondardy Cardiologists (63.2 percent). Non-institutional Cardiologists under 40 years of age responded at a somewhat higher rate (72.2 percent) than either Institutional Cardiologists under 40 (66.6 percent), or than Non- institutional Cardiologists 40 years and over (67.6 percent). The analysis of non-respondents which follows provides more complete data on tendencies toward non-response.

The essential sampling objectives were met and in most instances exceeded for each of the eight groups sampled. Weighting, applied to each stratum, adjusts the respondents to reflect the proportion of the total cardiologist population which they represent.

While weighting will put the respondent group in its proper perspective related to other groups, a question emerges concerning the selectivity in respondents which different response rates may indicate. A detailed analysis of respondents compared to non-respondents using Initial Cardiology Survey and AMA biographical data was conducted to determine the potential effects of the non-respondent group. This is reported in detail in Appendix A. Conclusions from that analysis are similar to those reported for the log-diary study.

- Those cardiologists more heavily involved in cardiology (primary) responded better than those with a minor cardiology commitment (secondary). This tendency was greater than a similar tendency noted in the log-diary study, due to the fact that the log-diary population (first wave questionnaire respondents) already contained selectively more cardiology specialists than the study population for the training survey (all questionnaire respondents).

- Younger cardiologists engaged in solo and hospital-based practices responded at a lower rate than those in other practice arrangements.

- No important geographical or population differences were found.

- No important differences related to professional activities were found.

Since stratification for this study was based on (1) primary or secondary cardiologist in (2) non-institutional or institutional practice settings and (3) by age groups, the variability noted is accounted for through the sampling plan except

TABLE 9

CARDIOLOGISTS' TRAINING SURVEY PARTICIPATION RATES:
SPECIALTY/PRACTICE TYPE AND AGE GROUPS
BY PROPORTIONS WITHIN SAMPLING CATEGORIES

Specialty/Practice Type and Age Groups	Population[a]		Sample[b]		Usable Returns[c]		Return Rate[d]	Adjustment Weight for Sample[e]
	N	%	N	%	N	%	%	
UNDER 40 YEARS								
Primary:								
Non-Institutional	565	(8.0)	373	(17.0)	282	(18.7)	75.6%	.428
Institutional	733	(10.6)	403	(18.4)	288	(19.1)	71.5%	.555
Secondary:								
Non-Institutional	483	(7.0)	354	(16.1)	243	(16.1)	68.6%	.435
Institutional	180	(2.6)	180	(8.2)	100	(6.6)	55.6%	.392
40 AND OVER								
Primary:								
Non-Institutional	1881	(27.1)	250	(11.3)	178	(11.8)	71.2%	2.298
Institutional	614	(8.9)	190	(8.6)	142	(9.4)	74.7%	.946
Secondary:								
Non-Institutional	2174	(31.4)	269	(12.2)	173	(11.4)	64.3%	2.739
Institutional	304	(4.4)	176	(8.0)	103	(6.8)	58.5%	.645
Subtotal	6934	(100.0)	2195	(100.0)	1509	(100.0)	68.7%	
FELLOWS	424		424		234		55.2%	
TOTAL	7358		2619		1743		66.6%	

[a]All private and federal cardiologists responding to initial questionnaire, less those unclassifiable with respect to strata

[b]Sample as described in Table

[c]Does not include 235 non-usable returns

[d](c) divided by (b)

[e]Weight applied to (c) to achieve percentage distribution comparable to (a)

for the young cardiologist in solo and hospital-based practice. However, deviation from the sample mean in both instances is less than 2 percent.

The relationship of the respondent group to the sample and, in turn, to the total cardiology population is shown in Table 10. Comparing the sample with the participants, the differences are inconsequential. The differences between the sample and the line noted as "Training Population Stratum" are expected since Middle Atlantic has proportionately more <u>older</u> cardiologists and South Atlantic has proportionately more <u>younger</u> cardiologists than other geographic divisions.

Sampling Errors Expected for Cardiologists' Training Survey Data

The sampling plan discussion made the observation that conservative assumptions regarding obtained percentages could be expected to result in standard errors substantially lower than (1) the 5 percent used for cardiologists 60 years old and over; (2) the 3 percent used for cardiologists under age 40. Comparatively lower error rates were achieved in this study than in the log-diary study because of higher response rates in all age groups. The detailed error rates that could be expected for sampled percentages obtained from this survey are presented in Chaper 8. These are summarized in Table 11.

PHASE FIVE: CARDIOLOGY TRAINING PROGRAMS STUDY

This study, addressed to institutions providing full-time cardiovascular training of at least one year duration, consumed more Advisory Committee and DRME Project Staff time in its conception than any of the other study phases. The time was required because (1) there was no existing list of institutions offering the type of training of interest; (2) there were no formally accepted standards for such trining programs; and (3) a compromise related to "desired level of detail" and "likely level of response" was required through each of the iterations of the study design - a problem never fully resolved to all party's satisfaction.

The resultant survey instrument was very complex, one which would readily be answered only by those who attached the same level of importance to it as was given by the investigators. None of the sections called for data which could be easily obtained from a single source; most of them required compilation by the responding individuals.

The objectives may be summarized as follows.

1. Determine the number of cardiovascular training programs, their location, and the affiliations which they have with other institutions.

TABLE 10

CARDIOLOGY TRAINING SURVEY POPULATIONS: PERCENTAGE AND DISTRIBUTION BY CENSUS DIVISION WITHIN REGION

Cardiology Study Populations		Northeast		South			North Central		West		Caribbean	Military	National Totals
		New England	Middle Atlantic	South Atlantic	East South Central	West South Central	East North Central	West North Central	Mountain	Pacific			
All Active Cardiologists	N	833	2998	1773	318	683	1538	557	337	1523	103	28	10,691
	(%)	(7.8)	(28.0)	(16.6)	(3.0)	(6.4)	(14.4)	(5.2)	(3.1)	(14.2)	(1.0)	(0.3)	(100.0)
Cardiology Survey Respondents	N	580	1945	1210	233	479	1046	397	245	1075	66	18	7,303
	(%)	(7.9)	(26.6)	(16.6)	(3.0)	(6.6)	(14.3)	(5.4)	(3.5)	(14.7)	(0.9)	(0.2)	(100.0)
Training Population Stratum	N	551	1832	1162	226	462	988	368	247	1020	61	17	6,934
	(%)	(7.9)	(26.4)	(16.8)	(3.3)	(6.7)	(14.2)	(5.3)	(3.6)	(14.7)	(0.9)	(0.2)	(100.0)
Training Sample	N	181	523	420	72	146	299	118	75	327	20	14	2,195
	(%)	(8.2)	(23.8)	(19.1)	(3.3)	(6.7)	(13.6)	(5.5)	(3.4)	(14.9)	(0.9)	(0.6)	(100.0)
Training Participants	N	128	352	287	49	100	211	78	53	228	14	9	1,509
	(%)	(8.5)	(23.3)	(19.0)	(3.3)	(6.6)	(14.0)	(5.2)	(3.5)	(15.1)	(0.9)	(0.6)	(100.0)

TABLE 11

CARDIOLOGY PROFESSIONAL DIARY
EXPECTED ERRORS WITH OBTAINED PERCENTAGES

Age Group Less than 40 Years,
Not Including Secondary Institutional[1]

Obtained Sample Percentages	Expected Error
30-70%	2.0-2.5%
15-29%, 71-85%	1.5-2.0%
5-14%, 86-95%	1.0-1.5%
5%, 95%	1.0%

Age Group 40 Years and Over,
Plus Secondary Institutional Under 40 Years[1]

Obtained Sample Percentages	Expected Error
30-70%	3.0-4.0%
15-29%, 71-85%	2.5-3.5%
5-14%, 86-95%	1.5-2.5%
5%, 95%	1.0%

[1] Because Secondary Non-institutional Cardiologists responded at a much lower rate than other groups within the younger age classification, errors associated with this group are on the same order of magnitude as in the 40-years-and-over age classification.

For percentages obtained for the weighted composite across strata (all cardiologists) expected errors range from about 1.0 percent in the midrange to less than 0.5 percent at the extremes.

2. Determine the general characteristics of their facilities and services with particular reference to those directly applicable to cardiovascular disease training.

3. Determine the composition of the training program staffs.

4. Letermine the qualifications of the training program staff and their relative time commitments to components of the training program.

5. Determine criteria for admission to programs as well as opportunities available for training.

6. Determine the training program director's objectives for the training program: what does he believe his graduates are prepared to do?

7. Determine who is trained by the cardiovascular training program staff with specific indication of required hours in designated topical and experience areas.

8. Determine sources of fiscal support for the training program.

9. Determine perception of adequacy of staff, potential for program expansion, and the number of additional trainees which could be added (1) without staff increase and (2) with staff increase.

10. Determine the type of continuing educational programs sponsored by the institution.

11. Obtain recommendations for cardiovascular training program improvement.

Survey Instrument

The Cardiovascular Training Programs Survey incorporated questions which Advisory Committee members felt were necessary and those of primary interest to the National Heart and Lung Institute. Questions related to types of training experience were obtained from a questionnaire which the Subspecialty Board in Cardiovascular Disease had previously developed for their use in assessing the training experiences of their candidates. The resultant data can be used by the Board as "baseline measures" of training which they consider appropriate, if not required. The questions regarding continuing education reflect the special interest of the American College of Cardiology. Other questions were uniformly interesting to the Advisory Committee, NHLI and the USC Project Staff.

The survey instrument was pretested in the Los Angeles area in institutions the characteristics of which were similar to the anticipated range of institutions to be contacted.

Upon completion of the field test, the conclusion was that the questions were clear and that they could be answered, but that answering them would require very positive interest in the study on the part of those to whom it was addressed. The Cardiovascular Training Program Survey form is identified as Figure 12.

Study Population

The population was defined from a listing provided by the AMA of all institutions with approved residencies in Internal Medicine. From this list of 534 hospitals and other agencies, it was expected that the institutions providing the "cardiovascular training of at least one year's duration" could be identified. While it was possible that this list might not encompass the study universe, the likelihood of important omissions was considered remote. The 534 listed institutions include 528 hospitals and yielded 329 which had training programs which met the study criteria.

Field Study Methods

There were two study objectives which influenced the methods for data acquisition: the first, to obtain an accurate count of all cardiovascular training programs and their current number of trainees; the second, to obtain complete responses from as many institutions as possible.

The survey form was mailed to all 534 potentially eligible institutions. Non-responding institutions were contacted by telephone and their Chief of Medicine and/or Chief of Cardiology was asked whether or not he had a program. If he had one, he was asked how many trainees were currently participants in that program.

Characteristic of the Responding and Non-Responding Institutions

Response and non-response analyses are extremely difficult to make in this instance because so few facts are known about those institutions which did not respond. The number of training institutions, number of internal medicine residency positions and the number of trainees at the institutions consititute all that is known about each of the 329 programs. Any conclusions which are made pertaining to the toal population of 329 other than those just noted must necessarily assume that either the non-respondents are identical to the respondents or that they differ by only minor factors. The available data which apply to all training institutions suggest only minor differences between respondents and non-respondents.

FIGURE 12

Form Approved
OMB No. 68-572187

AMERICAN COLLEGE OF CARDIOLOGY

9650 ROCKVILLE PIKE BETHESDA, MARYLAND 20014 PHONE: 301 530-1600

ADVISORY COMMITTEE ON CARDIOLOGY TRAINING
AND MANPOWER REQUIREMENTS

CARDIOVASCULAR TRAINING PROGRAMS SURVEY

SAMPLE LABEL

000-0000-000

DIRECTOR
Department of Internal Medicine
Hospital
Anytown, U.S.A.

Please return your completed forms to our Cardiology Manpower Study Project, University of Southern California School of Medicine, Division of Research in Medical Education in the self-addressed stamped envelope which accompanied the survey. If you misplaced it, the address is 2025 Zonal Avenue, Los Angeles, California 90033.

FIGURE 12A

CARDIOVASCULAR TRAINING PROGRAMS SURVEY

The purpose of this survey is to obtain information which describes current training in cardiovascular diseases in the United States. *While the primary focus is upon those training programs which provide trainees with full-time training of at least one year's duration, we are also interested in the cardiovascular disease training which is offered to medicine residents and interns.* Training programs in pediatric cardiology and cardiovascular surgery are the subject of separate study. This survey is concerned only with those cardiovascular training programs which are within departments of internal medicine.

Many cardiovascular training programs draw upon the facilities and resources of several hospitals and institutions. If yours is one of these, please combine the statistics for the institutions involved, reporting the combined figure for the training program as a whole. Please also name these hospitals and institutions in the space provided below. On the other hand, a few institutions may have more than one training program in cardiovascular disease which are such distinct entities that they should be treated separately. Duplicate forms are readily available for this purpose.

It is very important to have accurate information. Rather than guess or merely estimate where actual figures are requested, please leave a question blank.

There is no need to gather new data if data have been collected for other purposes within the past year. For example, hospital accreditation procedures ask for much of the utilization data which we are requesting and your cardiovascular division probably collects the specific statistics related to services and their uses and laboratory tests for their internal use. The Committee will welcome any suggestions related to cardiovascular training which you care to offer in the concluding section of the survey.

This survey is divided into seven sections. The first contains questions related to the services and facilities available in your hospital(s). The remainder contains questions related to cardiovascular disease training. *You may wish to involve the hospital administrator in answering the first, and your cardiovascular program director in answering the remaining sections.*

Your participation is vitally important. If you have any questions or need additional forms, please call our Associate Director, R. C. Mendenhall, at (213) 225-1511, extension 349, collect.

YOUR INSTITUTION _____ _____
(name) (address)

Does your institution offer full-time cardiovascular training programs of at least one year duration? (CHECK ONE) Yes ☐ No ☐

If you checked no, PLEASE RETURN THE FORM NOW IN THE ENVELOPE PROVIDED. Thank you.

If yes, how many years training do the majority receive; (CHECK ONE) One ☐ Two ☐ Three ☐

Are other institutions and hospitals affiliated with your training program? (CHECK ONE) Yes ☐ No ☐

If yes, please list the affiliated institutions and hospitals:

	NAME	ADDRESS
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

FIGURE 12B

I. TRAINING PROGRAM HOSPITAL(S)

Information is sought in this section related to available inpatient and outpatient facilities and their utilization rates. If more than one hospital is involved in your cardiovascular training program, please give the total combined figures. If a particular statistic is not available, leave the item blank and proceed to the next one.

1. Inpatient Beds and Their Use Rates*

Type	Number	Percent Occupancy
Total Beds		
Beds for:		
General Medicine		
Cardiac Medicine		
CCU and/or ICU		
General Surgery		
Cardiac Surgery		
Emergency		

2. Outpatient Services*

Type	Estimated Number	Actual Number
General Medicine Visits		
Cardiac Visits		
Number of cardiac clinic patients currently registered:		
Total for clinic		
YOUR ESTIMATE FOR CARDIAC VISITS CLASSIFIABLE AS:		
Hypertensive		
Rheumatic		
Congenital		
Cardiomyopathy		
Coronary		
Peripheral Vascular Disease		
Other		

3. Inpatient Admissions and Services*

Type	Estimated Number	Actual Number
General Medicine		
Cardiac Medicine:		
Total Inpatient		
YOUR ESTIMATE FOR CARDIAC ADMISSIONS CLASSIFIABLE AS:		
Hypertensive		
Rheumatic		
Congenital		
Cardiomyopathy		
Coronary		
Peripheral Vascular Disease		
Other		
CCU and/or ICU		
General Surgery		
Cardiovascular Surgical:		
Total Inpatient		
ESTIMATED CARDIOVASCULAR SURGICAL CLASSIFIABLE AS:		
Congenital		
Valvular		
Peripheral Vascular		
Coronary		
Emergency		

4. Laboratory Services*

Type	Number
Cardiac Catheterizations	
Angiograms:	
Cardiac	
Coronary	
Peripheral	
ECGs	
VCGs	
Echocardiograms	
Cardiac Fluoroscopies	
Exercise Tests	

*Numbers and rates desired are for most recent 12 month time period for which you have data available.
The period chosen to report on is from _____ to _____.

FIGURE 12C

II. CARDIOVASCULAR TRAINING PROGRAM STAFF

Several divisions within your hospital(s) may contribute to the cardiovascular training program. We need to know the number of physicians who are significantly involved in the training program, their backgrounds and how their time is allocated. The following questions will give us the needed information.

1. Please give the total number of professional staff who contribute directly to your cardiovascular disease training program by:

   a. Primarily in cardiovascular division and

      Part-time _____

      Full-time _____

   b. Primarily in other divisions and

      Part-time _____

      Full-time _____

2. *For your full time staff only*, we need to know their specialties, assignments and how their time is allocated across program related activities. Space is provided to record time given to interns, non-cardiovascular residencies and to cardiovascular disease residencies or fellowships. DO NOT RECORD THE PHYSICIAN'S NAME.

RESPONSIBILITY AND BACKGROUND																PERCENT OF TIME TO PROGRAM AND RELATED ACTIVITIES									
			Board Certification (Check all that apply)						Training Program										Other Professional		
									Research			Clinical									
Title or Position	Age	Specialty by Primary Secondary and Major Area of Interest	Internal Medicine	Cardiovascular	Thoracic Surgery	Radiology	Pediatric Cardiology	Other	Interns	Non-Cardiovascular Residents	Cardiovascular Residents/Fellows	Interns	Non-Cardiovascular Residents	Cardiovascular Residents/Fellows	Administration	Own Consulting	Own Research	Other
Example:																		
Lab Director	51	Card/Int Med Ex. STRESS TEST	✓	✓					2	5	10	9	10	15	8	20	20	7
1																		
2																		
3																		
4																		
5																		
6.																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		

FIGURE 12D

III. CARDIOVASCULAR TRAINING PROGRAM

A cardiovascular program trainee is anyone spending at least one year, full-time, in cardiovascular training, whether the individual is designated as a resident, fellow or trainee. Individuals receiving less than full-time cardiovascular training are considered medical program trainees.

1. *For your cardiovascular program trainees only.*

   What are the minimum required years of post-M.D. training for entry into your program? CHECK ONE BOX ONLY.

None	One	Two	Three	Over Three
☐	☐	☐	☐	☐

2. What is the *minimum period of time* an individual is accepted for your specialized cardiovascular training program?

   Minimum Time _____
   (in months)

   What is the usual period of time elected by your cardiovascular residents/fellows?

   Usual Period of Time _____
   (in months)

3. Number of cardiovascular trainees in your program:

   a. For the current year (1972-73)
      - How many positions did you have _____
      - How many applicants _____
      - How many positions filled _____
      - How many will complete the program this year _____

   b. For the last year (1971-72)
      - How many positions did you have _____
      - How many were filled _____
      - How many completed the program that year _____

   c. For the year before (1970-71)
      - How many positions did you have _____
      - How many were filled _____
      - How many completed the program that year _____

4. What are the career plans of trainees completing your program in the specified years. Please indicate number whose primary activity is expected to be in the following area:

	1971-72	1972-73
Clinical practice		
Academic medicine, i.e. clinical research, basic research and teaching		
Other		
Unknown		

5. *On the average*, how many conferences and rounds related to cardiovascular training are scheduled in your institution(s) per week?

   Number: _____
   Of these, what percent are
   - Grand Rounds _____
   - Ward Rounds _____
   - CCU and/or ICU _____
   - Cardiac Medicine _____
   - Other (specify) _____ _____

6. Do you provide your trainees any of the following instructional aids? Please *check* their availability.

	Yes	No
Self Teaching Rooms		
Video Taping		
Audio Taping		
Cardiovascular Division Library *in Hospital*		
Heart Sound Tapes		

7. Are there active cardiovascular research programs in your institution? *Check one.*

   Yes ☐ No ☐

   If you checked yes, would you describe the programs as primarily
   - Clinical ☐
   - Non-Clinical ☐
   - Both ☐

8. Does your program have any of the facilities listed below which are available for research? *Check all that apply.*

Type	Available
Animal laboratory	☐
Radiological laboratory	☐
Biochemical laboratory	☐
Hemodiagnostic laboratory	☐

FIGURE 12E

9. *Training Program Subject Areas and Experiences.* Most institutions offering specialty training in cardiovascular disease will also offer a component of that training to their other medical residents. *In both instances*, minimum or required amounts of time in specified areas are usually stipulated. *It is important for us to know these minimums for cardiovascular trainees.*

This question is divided into instructional areas and experiences which are applicable to most programs. Not all will offer each type of training. *For those applicable to your program, please check in the designated column if the experience is offered.* FOR THE CARDIOVASCULAR PROGRAM TRAINEES, ALSO RECORD THE REQUIRED HOURS *in the last column.* THE HOURS REQUESTED ARE FOR THE TOTAL TRAINING TIME PERIOD. That is, if cardiovascular training covers two years, the hours desired cover that two year span.

	Interns	Non-CD Medical Residence	Cardiovascular Trainee	
	✓	✓	✓	Hours
A. Experience in Clinical Care, Research and Teaching				
Cardiac patient care:	//////	//////		//////
Pediatric				
Medical				
Surgical				
Cardiovascular research:	//////	//////		//////
Basic				
Clinical				
Teaching:	//////	//////		//////
Clinical				
Didactic				
B. Laboratory Diagnostic Techniques	//////	//////		//////
Electrocardiography				
Phonocardiography				
Echocardiography				
Exercise tolerance testing				
Vectorcardiography				
Angiography:	//////	//////		//////
Cardiac				
Coronary				
Peripheral				
Cardiac catheterization				
Pacemaker insertion				
Pacemaker follow-up				
Swan-Ganz right heart catheterization				
C. Laboratory and Classroom Instruction for Trainees	//////	//////		//////
CV anatomy				
CV physiology				
CV biochemistry				
CV pathology				
CV epidemiology				
CV pharmacology				
CV radiology				
Pulmonary physiology				
Hypertensive renal disease				
Peripheral vascular disease				
Cerebral vascular disease				
Biostatistics				
Bioengineering				

80

10. Program directors and their institutions have different objectives for their cardiovascular training programs. *Please check all of the following:*

Upon completion of our program, the majority of our trainees are able to:

	Yes	No
Manage an intensive care and/or coronary care facility	☐	☐
Conduct diagnostic cardiac catheterizations	☐	☐
Direct a hemodynamics lab	☐	☐
Serve as cardiologist consultant on a CCU committee	☐	☐
Perform as a cardiologist consultant in all clinical areas	☐	☐
Conduct clinical research	☐	☐
Conduct basic laboratory research	☐	☐
Teach graduate students and residents in clinical and laboratory settings	☐	☐
Teach medical students, residents and fellows in both clinical and formal classroom settings	☐	☐
Participate in professional seminars, workshops and symposia as consultant cardiologists	☐	☐
Are eligible for subspecialty board certification in cardiovascular diseases	☐	☐
Perform and teach others to perform cardiac diagnostic x-ray procedures	☐	☐
Perform and teach others to perform non-invasive laboratory techniques such as . . . (list)		
_____	☐	☐
_____	☐	☐
_____	☐	☐
_____	☐	☐

FIGURE 12G

IV. TRAINING PROGRAM SUPPORT

Please note the number of grants from the agencies indicated and the total dollar support they provide to the cardiovascular training program.

Type of Support	Number	Dollars (total amount for each category)
1. Training grants and fellowships		
Federal Government Agency		
NHLI	_____	_____
Other NIH	_____	_____
Other	_____	_____
Non-Federal Government Agency	_____	_____
Non-Government Agency	_____	_____
AHA	_____	_____
Local Heart Association	_____	_____
Foundation	_____	_____
Other	_____	_____
2. Research grants contributing to the cardiovascular training program. (Record dollars for only the training portion.)		
Federal Government Agency		
NHLI	_____	_____
Other NIH	_____	_____
Other	_____	_____
Non-Federal Government Agency	_____	_____
Non-Government Agency		
AHA	_____	_____
Local Heart Association	_____	_____
Foundation	_____	_____
Other	_____	_____
3. Own institution funds, including fees from patients, etc. (Do not include any government support.)	_____	_____

V. POTENTIAL FOR EXPANSION OF YOUR PROGRAM

1. Given present staff and resources, could you take additional trainees in your current cardiovascular program? If yes, please record how many could be added to the program years enumerated below.

Program Year	Number we could add
1	_____
2	_____
3	_____

2. Do you have staff positions which are budgeted currently unfilled in the cardiovascular division?

Yes ☐ No ☐

If yes, how many? _____

3. Given your present training load, how many additional staff positions would you consider currently desirable in the cardiovascular division to provide for optimal teaching and research.

_____

4. Please estimate the percentage increase from your present level in your cardiovascular training load (number of pre- and post-doctoral students and trainees) which you might expect in five years time.

_____%

Given this increase in training load, what number of additional staff positions would you consider desirable for the cardiovascular division in five years time in order to provide for optimal teaching and research?

_____

FIGURE 12H

VI. CONTINUING EDUCATION COURSES AT YOUR INSTITUTION

1. Does your institution offer continuing education courses to physicians in the cardiovascular field? [Included should be circumscribed courses of one full day as a minimum, or extended courses of at least one hour per week.] (CHECK ONE)

Yes_____ No_____

If you answered yes, what percent per year are given for physicians

a. In the local area _____ b. At the national level _____

2. For the courses which you offer, we need to know the number offered and the number of participants by three types for the past three years. The types are noted below. *If these data are not readily available in all instances, simply complete those portions which you can.*

Courses by Type	1970		1971		1972	
	Number of courses	Number of Partic-ipants	Number of courses	Number of Partic-ipants	Number of courses	Number of Partic-ipants
Less than two weeks - full-time						
More than two weeks - full-time						
Extended - at least one hour per week for 3 months or more						

3. Please indicate the numbers of courses in their general subject areas for the total three years.

	Number
General Medical Cardiology	_____
CV Physiology	_____
CV Surgery	_____
CV Pharmacology	_____
CV Radiology	_____
CV Pathology	_____
Other (list):	
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

VII. RECOMMENDATIONS REGARDING PROGRAM IMPROVEMENTS

We would appreciate receiving your comments about how cardiovascular training programs could or should be improved in order to provide optimal training experiences. These might concern curriculum, facilities, staff or any other aspect of a training program.

Regarding formal initial cardiovascular training:

FIGURE 12J

Regarding continuing education for physicians:

Internal Medicine Residencies

Table 12 compares the non-respondents to the respondents on a program size measure constructed from grouping internal medicine residencies by (1) lower quartile, (2) two mid-quartiles and (3) upper quartile. From this table it appears that there are no important differences in response patterns attributable to size of internal medicine training programs. These groupings are referred to in Chapters 5 and 8 as Type I, Type II and Type III programs. The differences in size of internal medicine residency programs between the questionnaire respondents and non-respondents are minimal.

Number of Cardiology Trainees

The 190 responding programs have 760 trainees for an average of 4.0 per institution. The 139 non-responding program institutions have 518 trainees for an average of 3.7 per institution. The average number of trainees for all program institutions is 3.9. An estimate of trainees based on the 190 questionnaire respondents and their mean number of trainees would suggest 1,316 trainees for all programs rather than 1,278 as obtained through the questionnaire survey and telephone survey. The estimating error would be about 3 percent, indicating the programs among the non-respondents were slightly smaller. Figure 13 presents a distribution for trainees by programs responding to the survey and those declining to participate.

Training Program Configurations

The 329 programs are describable in terms of the training arrangements which they have with other training institutions. These configurations range from institutions which are totally self-contained (provide all of the training and have no affiliations) to institutions which provide some portion of the training and hence are "satellites" of a parent institution. Three categories of "primary" and one of "secondary" were identified in this study. They are:

1. Primary Training Program. A training program with at least one cardiovascular trainee position which is independent of any other program:

   a. lists no affiliations or dependent programs; or

   b. lists affiliations of a staff exchange character with other primary programs and/or medical schools; or

   c. lists at least one dependent (secondary) program and may or may not show an affiliation with other primary programs.

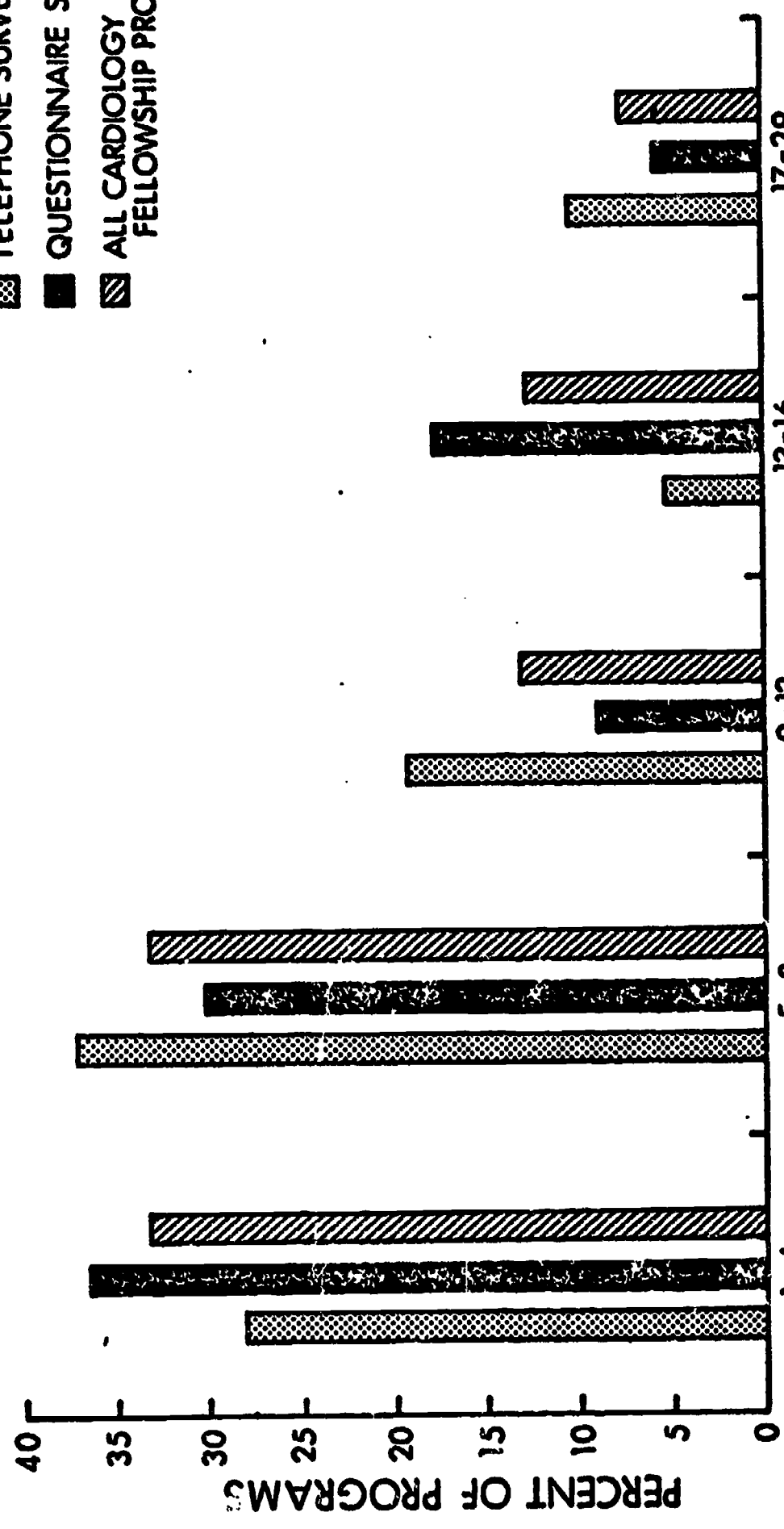
TABLE 12

CARDIOVASCULAR TRAINING PROGRAMS:
DISTRIBUTION OF INTERNAL MEDICINE RESIDENCIES
BY RESPONDENT CATEGORIES

Cardiovascular Training Programs	Questionnaire Respondents		Telephone Respondents		All	
	N	%	N	%	N	%
Type I: Internal Medicine Residencies = 1 to 15	50	26.3	38	27.3	88	26.8
Type II: Internal Medicine Residencies = 16 to 41	91	47.9	64	46.0	155	47.1
Type III: Internal Medicine Residencies = 42 and over	49	25.8	37	26.7	86	26.1
ALL INSTITUTIONS	190	100.0	139	100.0	329	100.0

FIGURE 13

CARDIOVASCULAR TRAINEES AT PARTICIPATING AND NON-PARTICIPATING TRAINING PROGRAM INSTITUTIONS



2. Secondary Training Program. A cardiovascular training program which provides a portion of the trainee's total training, receives its trainees from a primary program, and provides this training as directed by a primary program.

The distribution of these three primary types of training programs and one secondary type by institutions responding to the survey form and those responding only to telephone queries is given in Table 13. A geographically oriented display of the location of the 329 training institutions is presented in Chapter Five (Figure 1).

Errors Associated with Cardiovascular Training Programs Survey Data

The preceding section presented available information which applies to both the institutions responding to the questionnaire survey and those responding only by telephone. It indicated minor differences in the two groups, none being large enough to indicate that biases would result from working with the respondent data only.

Although there was no sampling for the Cardiovascular Training Programs Survey (all 534 eligible institutions were contacted and positive responses obtained), the fact that 57.8 percent of the institutions actually respond with survey questionnaire data makes it necessary to attempt to estimate the error associated with these data.

There is insufficient information available on the non-respondents to perform an analysis comparable to that performed for the Diary and Training surveys. However, standard errors for percentages derived from the Institutional Survey data can be estimated under the assumption that the respondents represent a random sample drawn from the institution population.

The data from the Institutional Survey were analyzed according to the following groupings:

1. all responding institutions

2. all responding institutions divided into two groups based on length of training program

3. all responding institutions divided into three groups based on size of program

4. all responding institutions divided into three units for program in size, and further divided by the two groupings for length of program

Since the subdivision of responding institutions results in small numbers of responding institutions in the category, errors would be expected to be larger

TABLE 13

CARDIOVASCULAR TRAINING INSTITUTIONS:
AFFILIATE STATUS BY RESPONDENT CLASSIFICATIONS

Type of Affiliation	Questionnaire Respondents		Telephone Respondents		All	
	N	%	N	%	N	%
Primary with no affiliation	47	24.7	25	18.0	72	21.9
Primary with primary affiliation	119	62.6	71	51.1	190	57.8
Primary with secondary affiliation	18	9.5	10	7.2	28	8.5
Secondary only	6	3.2	33	23.7	39	11.8
TOTAL	190	100.0	139	100.0	329	100.0

for the sub-groups. These errors are shown in Table 14, and are made under the assumption that the respondents in each group represent a random sample of that group.

If the programs are divided by both size (three categories) and program length (two categories), then only the estimates for the large programs and moderate size programs which are over 24 months in duration have error estimates comparable to those noted for the 24 month programs. Divisions at this fine a level should not be interpreted statistically; rather the interpretations should be limited to the trend differences as compared to those for either of the two types of programs or for all programs.

REFINED ESTIMATES IN CARDIOLOGISTS' ACTIVITY TIMES, PRACTICE CHARACTERISTICS AND PROPORTIONS BOARD CERTIFIED

Time in Professional Activities and Practice Characteristics

The Initial Cardiology Survey and the Cardiology Professional Diary study obtained comparable data in professional activities and in such practice characteristics as referral and non-referral and distances patients travel for care. Comparing the two information sources, there is a consistent tendency for the cardiologist to give higher estimates of activities than recorded in the log-diary when the activity is one of prominent importance in his type of practice. For activities which are considered of only minor importance, the estimate tends to be lower than that which is provided as recorded activity. For example, research-oriented cardiologists estimate this activity time at 26 percent compared to a diary-recorded percentage of 18, while others in non-institutional settings have percentage differences of about 1 percent. Those in predominantly patient-care practice arrangements over-estimate that activity time while their institutional counterparts under-estimate this time. The effect of these differences is discussed in Chapter 4, "Roles and Profiles of the Cardiologist". Supportive tables for the discussion are found in Chapter 8.

The differences may not be critical if the interest is only in broadly descriptive information. However, if the intent is to use these data in developing profiles of professional activity which are used to create estimates of "effective cardiologist time" or to determine the proportion of cardiologists' practices which is primary care and non-primary care, then the log-diary data should be used. Failure to do so would result in distorted professional activity profiles.

Cardiologists at Year End 1971 and Year End 1973

Evidence from each of the study phases suggests that the age distribution for cardiologists at the end of 1971 is different from that at the end of 1973. It

TABLE 14

CARDIOVASCULAR TRAINING PROGRAM ESTIMATED RESPONDENT ERRORS

Study Stratum	Number	Error Estimate Attributable to Respondents Compared to Population
All Training Institutions	190	2.3 percent
Training Programs Less than 24 Months	51	4.5 percent
Training Programs 24 Months or More	139	2.7 percent
Type I Internal Medicine Training Programs	50	4.6 percent
Type II Internal Medicine Training Programs	91	3.3 percent
Type III Internal Medicine Training Programs	49	4.7 percent

differs in important respects from actuarial data[1] projected for the end of 1976 and from anticipated new cardiologists from the known training programs. The trend is for more young cardiologists to enter the active practice of cardiology than for others to leave it. The implications of this shift are discussed in Chapter 7. The relevant, detailed statistical tables are found in Chapter 8.

The changes which should be noted at this time pertain to percentages of cardiologists who are (1) board-certified in Internal Medicine and/or (2) sub-specialty-board-certified in cardiology.

Cardiologists Certified in Internal Medicine

The Initial Cardiology Survey indicated that approximately 53 percent of all active cardiologists are board certified. Extrapolating from the numbers of physicians certified by the American Board of Internal Medicine (ABIM) during the two years and assuming that cardiologists account for about 15 percent of this total, the probable number certified at year end 1973 is 60 percent.

Cardiologists Certified in Cardiovascular Disease

The Initial Cardiology Survey indicates that 9.6 percent are certified by the Sub-Specialty Board in Cardiovascular Disease. Taking into account the ABIM's statistics for certification during this time period and the entries into and exits from active practice, the rate is probably no greater than 10 percent.

It must be remembered that both percentages apply to the total cardiology population -- 47 percent of which have less than 50 percent of their time in cardiology.

Number of Cardiologists at December 31, 1973

Actuarial statistics applied to the cardiologist population for forecasting changes were obtained from a study of physicians from 1967 through 2002.[2] Estimates of cardiologists completing their training and presumably entering active practices as cardiologists were obtained from training program directors. These and related factors influencing the cardiologists population are utilized in the manpower estimates discussed in Chapter 7. The detailed tables and their potential uses are discussed in Chapter 8. The loss and gain factors, applied to the 10,691 cardiologists in active practice at year end 1971 result in an estimated 11,768 in active practice at year end 1973.

[1] Blumberg, M.S., Trends and Projections of Physicians in the United States 1967-2002. The Carnegie Foundation for the Advancement of Teaching, Berkeley, California, 1971.

[2] Ibid.

SUMMARY AND RECOMMENDATIONS

This chapter has summarized the overall study design, specific study designs and the relationships between one study phase and another. The utility of each study phase's survey approach was discussed as well as the confidence which one may place in the statistics generated by a particular study phase. Estimates were made regarding changes in the cardiology manpower pool during the two-year study, including the proportions certified either in Internal Medicine or in Cardiovascular Disease.

CHAPTER 3

CURRENT STATUS OF MANPOWER IN CARDIOLOGY

Walter H. Pritchard and Walter H. Abelmann

INTRODUCTION

As already stated cardiovascular diseases currently represent a major health problem in the United States and account for over 50 percent of the deaths. It is obvious that new methods of diagnosis and treatment will be effective only if skilled physicians and other personnel are available to deliver optimal health care to patients with such illnesses. Thus, there is a need to identify the number of cardiologists, the characteristics of their mode of practice, their qualifications, their regional distribution and other items of importance in understanding the present status of the manpower pool.

It must be realized, however, that the cardiologists surveyed in this study probably only care for a limited segment of the total number of patients seeking care for cardiovascular problems. Primary care physicians composed of general internists and practitioners probably care for at least as large a number of patients with heart disease as does the cardiologist group represented in this study. Cardiologists, however, are more concerned with patients having complex problems requiring more sophisticated diagnostic and therapeutic procedures as well as giving care to the type of patients seen by primary care physicians.

TOTAL PHYSICIAN MANPOWER IN THE UNITED STATES

In order to view in perspective the present studies of the specialty of cardiology, information was collected concerning the total physician manpower pool now available for health care in the United States. This was obtained for certain broad categories, although it is recognized that more detailed studies have been and are being conducted by other specialty groups.

The population of the United States at the time of this study was approximately 206,000,000 people. As shown in Table I the total number of active physicians was estimated to be 311,000 giving a ratio of physicians per 100,000 population of 150.9. If this latter figure is broadly reduced further, we find ratios of physicians per 100,000 population to be as follows: general practice - 28.1, surgical specialties - 41.8, and medical specialties - 81.0.

For our purposes, we have divided the country into nine census divisions excluding Puerto Rico and the Canal Zone. The latter division will be ignored because of likely differences in medical and patient population practices. This Caribbean group represents only 1.3 percent of the total population.

From Table 1 we find that the greatest population densities in order of magnitude are in the following areas: East North Central, Middle Atlantic, South Atlantic, and Pacific. Thereafter, a distinct break in population density occurs and we find fewer people in the West South Central, West North Central, East South Central, New England, and Mountain areas.

Table 2 summarizes some of the important findings relative to physician ratios by broad specialty areas and by census division. The table is of considerable interest and may be interpreted as showing the following:

1. There are differing total physician ratios to population in census tracts of both high population and low population density.

2. There are certain similarities in total physician ratios in some areas of widely differing population densities, i.e., East North Central, West North Central, West South Central, areas in which the ratios fall within a general medium range.

3. High ratios of physician to 100,000 population occur in widely different geographic population density areas, i.e., in densely populated areas of the Middle Atlantic and Pacific zones the physician ratio is similar to that in New England which has next to the smallest number of people in its area.

4. The East South Central area falls much below the national average in total physicians/100,000 but approximates the national average ratio in the number of general practitioners per population being low by virtue primarily of its lack of medical and surgical specialists.

5. With the exception of the Pacific and Mountain areas where the ratios are greatest, there is a fairly uniform ratio of general practitioners in all areas irrespective of size.

6. In general, there are about twice as many medical as surgical specialists per 100,000 population in over half the regions. Exceptions are noted in the West South Central, West North Central, and East South Central areas. The discrepancy here may be assumed to be caused by the lack of medical specialists rather than an excess of surgical specialists since the total number of physicians per 100,000 is also less than the average in these areas.

Many causes may be ascribed to this relative maldistribution, but foremost are those of socio-economic differences and educational, both general and medical, opportunities in the areas of greater physician grouping. More will be stated later about this.

TABLE 1

PHYSICIAN'S (MD) DISTRIBUTION AND RATIOS TO POPULATION[1]:
CENSUS DIVISION BY SELECTED SPECIALTY GROUPINGS

PHYSICIAN (MD) SPECIALTY GROUPINGS[1]	RATIOS per 100,000 POPULATION																							
	National Total Population 205,923,959 100%		New England Population 11,841,663 5.8%		Middle Atlantic Population 37,199,040 18.1%		South Atlantic Population 30,671,337 14.9%		East-South Central Population 12,803,470 6.2%		West-South Central Population 19,320,560 9.4%		East-North Central Population 40,252,476 19.5%		West-North Central Population 16,319,187 7.9%		Mountain Population 8,281,562 4.0%		Pacific Population 26,522,631 12.9%		Puerto Rico, V.I., Canal Zone Population 2,712,033 1.3%		APO and FPO
	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Count Not Available
ALL PHYSICIANS (includes retired)	330,824	160.7	23,436	197.9	74,435	200.1	48,585	158.4	14,036	109.6	24,574	127.2	53,465	132.9	21,574	132.2	12,747	153.9	51,942	195.8	6,008	221.5	
All Active Physicians Federal	29,501		1,485		3,194		7,269		1,207		2,910		2,504		1,484		1,466		4,552		3,430		Count Not Available
Non-Federal	281,344		20,391		67,250		37,560		12,155		20,463		48,162		18,891		10,368		43,675		2,469		
Total	310,845	150.9	21,876	184.7	70,444	189.4	44,829	146.2	13,362	104.4	23,373	121.0	50,666	125.9	20,315	124.5	11,834	142.9	48,227	181.3	5,919	218.2	
All Active Surgery		41.8		49.2		50.3		42.1		32.7		36.8		34.8		34.8		40.7		49.0		55.2	
All Active General Practice		28.1		25.7		28.2		24.9		24.7		27.4		26.8		28.9		30.7		35.9		42.2	
All Active Medical Specialties		81.0		109.8		110.8		80.9		47.8		57.6		64.3		61.6		71.5		97.0		120.8	
Within Medical Specialties	166,855	81.0	13,011	109.9	42,218	110.8	24,542	80.9	6,017	47.0	11,125	57.6	25,963	64.5	10,059	61.6	5,923	71.5	25,718	97.0	3,278	120.8	
Primary Cardiology[2]	5,661	3.0		4.5		4.6		3.3		1.3		2.1		2.2		1.8		2.7		3.4		2.5	
Internal Medicine		20.3		29.2		28.5		20.5		11.9		13.2		16.2		16.5		16.2		23.5		24.9	
Other Specialties		57.7		76.2		77.7		56.2		33.8		42.3		46.1		43.3		52.8		70.1		93.4	
Internal Medicine and Cardiology		23.3		33.7		33.1		23.8		13.2		15.3		18.4		18.3		18.9		26.9		27.4	
Primary Cardiology[2]		3.0		4.5		4.6		3.3		1.3		2.1		2.2		1.8		2.7		3.4		2.5	
Secondary Cardiology[2]		2.6		3.4		4.2		3.0		1.2		1.7		2.0		1.8		1.8		2.7		1.5	
Other Internal Medicine[3]		17.7		25.8		24.3		17.5		10.7		11.5		14.2		14.7		14.4		20.8		23.4	

[1]Specialty groupings and data pertaining to all except cardiologists obtained from American Medical Association, Distribution of Physicians in the United States 1970.

[2]Data obtained from Initial Cardiology Survey.

[3]"Other Internal Medicine" total is a little smaller than might be the case since 93 percent of our respondents were in this area rather than 100 percent.

[4]U.S. Bureau of the Census. U.S. Census of Population: 1970. Number of Inhabitants. Final Report PC (1) - A1 United States Summary

TABLE 2

Distribution Ratios of Physicians to Population:
Census Division By Selected Specialty Groupings

Census Division	Population (M)	Ratios Per 100,000 Population			
		Total	General Practice	Medical Specialists	Surgery
Middle Atlantic	37.2	189.4	28.2	110.8	50.3
New England	11.8	184.7	25.7	109.9	49.2
Pacific	26.5	181.3	35.9	97.0	49.0
South Atlantic	30.7	146.2	24.0	80.0	42.1
Mountain	8.3	142.9	30.7	71.5	40.7
East North Central	40.3	125.9	26.6	64.5	34.8
West North Central	16.3	124.5	28.9	61.6	34.0
West South Central	19.3	121.0	27.4	57.6	36.0
East South Central	12.8	104.4	24.7	47.0	32.7

Source: 1, 2

CARDIOLOGY MANPOWER IN THE UNITED STATES

As shown in Table 3 our data indicate there are 10,691 cardiologists in active practice in the United States. This gives a ratio of cardiologists to population of 5.1/100,000. There are an additional 979 cardiologists in training making a total number active or in training of 11,670. Trainees thus constitute 8.4 percent of the total manpower pool of cardiologists.

Cardiologists were classified further into Primary and Secondary types. A Primary Cardiologist gave at least 50 percent of his time to the practice of cardiology. If his estimated percent of effort in cardiology was less than 50 percent, he was classified as a Secondary Cardiologist and his primary classification was in another medical specialty. By this arbitrary classification, there were 5,661 individuals identified as Primary Cardiologists (53 percent of total), and 5,030 or 47 percent fall into the Secondary type. The ratio of 5.1/100,000 changes little if trainees are included because of the small number of trainees involved.

MODE OF PRACTICE OF CARDIOLOGISTS

The great majority (72 percent) of all cardiologists locate their base of practice outside institutions and are classified as Non-Institutional Cardiologists as shown in Table 4. Fifty-four percent of them or 39 percent of all cardiologists are in solo practice and 21 percent of Non-Institutional Cardiologists are over 60 years of age.

Institutional Cardiologists comprise a smaller group (22 percent) of younger men with only 5.4 percent of them over 60 years of age. Approximately 50 percent of them are under the age of 40. This group represents those cardiologists more recently trained and generally responsible for the more sophisticated technical and research aspects of cardiac problems referred to institutions.

BOARD CERTIFICATION OF CARDIOLOGISTS

Certification by specialty boards indicates formal acceptance of practice competence within standards set by the examining bodies. The process of board certification is a strong force in developing clinical expertise in the given specialty. Although 56 percent of all Non-Institutional Cardiologists are certified by the American Board of Internal Medicine, only 9 percent of them are also certified by the Subspecialty Board in Cardiovascular Disease (tables 5 and 6). Proportionally fewer Institutional Cardiologists, 49 percent, are certified by the American Board of Internal Medicine but 14 percent are also certified by the Subspecialty Board in Cardiovascular Disease. These findings on certification were somewhat unexpected but there are no data from which to make a value judgment that board certification indicates better individual clinical performance, the main goal of all boards.

TABLE 3

DISTRIBUTION OF NATION'S CARDIOLOGISTS: CENSUS DIVISION BY ACTIVITY STATUS AND SPECIALTY

ACTIVITY STATUS AND SPECIALTY	National Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Active Cardiologists												
Primary - Resp. *	3962	331	1050	632	126	274	553	201	158	589	43	5
Primary - N. Resp.**	1699	131	520	287	37	105	243	72	41	238	22	3
	5661	462	1570	919	163	379	796	273	199	827	65	8
Secondary - Resp.*	3341	249	895	578	107	205	493	196	96	486	23	13
Secondary - N. Resp.**	1689	122	533	276	48	99	249	88	42	210	15	7
	5030	371	1428	854	155	304	742	284	138	696	38	20
Total	10691	833	2998	1773	318	683	1538	557	337	1523	103	28
Cardiologists In Training												
Primary - Resp. *	298	44	55	61	1	13	50	17	17	39	1	0
Primary - N. Resp. **	280	27	84	33	3	13	57	9	7	43	3	1
	578	71	139	94	4	26	107	26	24	82	4	1
Secondary - Resp. *	126	9	43	21	0	7	25	5	4	12	0	0
Secondary - N. Resp.**	275	25	94	57	4	13	53	11	4	12	2	0
	401	34	137	78	4	20	78	16	8	24	2	0
Total	979	105	276	172	8	46	185	42	32	106	6	1
All Cardiologists												
Primary	6239	533	1709	1013	167	405	903	299	223	909	69	9
Secondary	5431	405	1565	932	159	324	820	300	146	220	40	20
Total	11,670	938	3274	1945	326	729	1723	599	369	1629	109	29

* Survey respondents
** Survey non-respondents

Source: 2

TABLE 4

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE:
BY AGE GROUPINGS

PRACTICE MODE	Under 40 Years		40 through 59 Years		60 Years and Over		All Cardiologists	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
Non-Institutional								
Solo	349	5.0	1581	22.6	810	11.6	2740	39.2
Partnership	328	4.7	629	9.0	114	1.6	1071	15.3
Group	304	4.4	591	8.5	102	1.5	997	14.3
Combination (Other)*	65	0.9	133	2.0	35	0.5	239	3.4
Sub Total	1046	15.0	2940	42.1	1061	15.2	5047	72.2
Institutional								
Hospital	413	5.9	293	4.2	54	0.8	760	10.9
Medical School	257	3.7	310	4.4	25	0.4	592	8.5
Combination (Other)*	92	1.3	87	1.2	8	0.1	187	2.7
Sub Total	762	10.9	690	9.9	87	1.3	1539	22.1
Other*								
Majority Other	173	2.5	150	2.1	45	0.6	368	5.3
Combined Other	2	0.0	18	0.3	7	0.1	27	0.4
Sub Total	175	2.5	168	2.4	52	0.7	395	5.7
TOTAL	1983	28.4	3798	54.4	1200	17.2	6981	100.0

*In tables, in sections which follow, these "Other" types are combined as "Other" because, for all practical purposes, they include either (1) individuals whose practice involves medical school/hospital plus some non-institutional or (2) are federal cardiologists who simply checked "Other" for their employment. Source: 2

TABLE 5

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE:
BY SPECIALTY BOARD CERTIFICATION IN INTERNAL MEDICINE

PRACTICE MODE	Specialty Board Certified		Non-Certified		Total Cardiologists	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
Non-Institutional						
Solo	1341	19.0	1426	20.1	2767	39.1
Partnership	701	9.9	385	5.4	1086	15.3
Group	675	9.5	333	4.7	1008	14.2
Combination (Other)*	136	1.9	106	1.5	242	3.4
Sub Total	2853	40.3	2250	31.7	5103	72.0
Institutional						
Hospital	343	4.9	435	6.1	778	11.0
Medical School	329	4.7	273	3.9	602	8.5
Combination (Other)*	102	1.4	87	1.2	189	2.7
Sub Total	774	11.0	795	11.2	1569	22.2
Other*						
Majority Other	186	2.6	193	2.8	379	5.4
Combination Other	13	0.2	14	0.2	27	0.4
Sub Total	199	2.8	207	3.0	406	5.8
TOTAL	3826	54.1	3252	45.9	7078	100.0

*See Footnote, Table 4

TABLE 6

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE:
BY SUBSPECIALTY BOARD CERTIFICATION IN CARDIOVASCULAR DISEASE

PRACTICE MODE	Subspecialty Board Certified		Non-Certified		Total Cardiologists	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
Non-Institutional						
Solo	187	2.6	2580	36.5	2767	39.1
Partnership	105	1.5	981	13.8	1086	15.3
Group	114	1.6	894	12.6	1008	14.2
Combination (Other)*	31	0.4	211	3.0	242	3.4
Sub Total	437	6.1	4666	65.9	5103	72.0
Institutional						
Hospital	67	1.0	711	10.0	778	11.0
Medical School	115	1.6	487	6.9	602	8.5
Combination (Other)*	29	0.4	160	2.3	189	2.7
Sub Total	211	3.0	1358	19.2	1569	22.2
Other*						
Majority Other	36	0.5	343	4.9	379	5.4
Combination Other	1	0.0	26	0.4	27	0.4
Sub Total	37	0.5	369	5.3	406	5.8
TOTAL	685	9.6	6393	90.4	7078	100.0

*See Footnote, Table 4

DISTRIBUTION OF CARDIOLOGISTS IN THE UNITED STATES

The ratios of cardiologists to population by census division are shown in Table 7. Maldistribution of cardiologists is apparent. The national ratio of active cardiologists is 5.1. It is noted from this table and also from Table 8 reconstructed from Table 7 that the greatest number of cardiologists/100,000 is in the North East section of the country with the Middle Atlantic region being 8.0 and the New England region 7.0/100,000 population. South Atlantic and Pacific regions follow with 5.8 and 5.7/100,000. Lowest is East South Central with 2.5 cardiologists per 100,000. All other regions are somewhat above this ratio but are below the 5.1 national average. With the exception of the West North Central area where the ratio of Primary to Secondary Cardiologists is unity, Primary Cardiologists are slightly more numerous across the population than are the Secondary type. The ratio of cardiologists in training to population density roughly corresponds with the practicing cardiologists' ratio within a given census division.

Table 8 also shows that within wide differences in geography, population densities, total physicians, and medical specialists/100,000, the ratio of cardiologists to medical specialists is within a rather narrow range of from 5.3 to 7.3 percent with a median value of 5.8 percent.

DISTRIBUTION OF CARDIOLOGISTS IN METROPOLITAN AREAS

In cities of over one million population (Table 9) it can be seen that the largest number of cardiologists/100,000 are located in cities of the east and west coastal areas. This is also shown graphically in Figure 1. Certain metropolitan areas, however, have ratios much below the national average of 5.1, i.e., Milwaukee (3.3), Kansas City (4.0), Louisville (3.3), and Detroit (3.9). Most others scatter somewhat above the national average. These discrepancies may again be due to varying socio-economic and educational factors causing regional maldistribution.

In most of these larger cities, which have increased ratios over the national level of 5.1, there is a medical school with its affiliated hospitals. In most of the cities with the larger numbers of cardiologists per 100,000 there are two or more schools per city. In New York, Boston, and Philadelphia, cities with the greatest numbers of cardiologists per 100,000, there are three or more medical schools.

It is quite probable that among other factors, medical schools and their affiliated hospitals offer educational attractions and practice opportunities that lead to a greater concentration of cardiologists and probably other specialists in their communities. It is also evident, however, that the presence of a medical school and its metropolitan hospitals does not assure a community of a large number of cardiologists.

TABLE 7

CARDIOLOGIST'S RATIOS TO POPULATION[1]:
CENSUS DIVISION BY SPECIALTY AND ACTIVITY STATUS

CARDIOLOGIST'S ACTIVITY STATUS	205,923,959 National Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England 11,841,663	Middle Atlantic 37,199,040	South Atlantic 30,671,337	East-South Central 12,803,470	West-South Central 19,320,560	East-North Central 40,252,476	West-North Central 16,319,187	Mountain 8,281,562	Pacific 20,522,631	Puerto Rico, V.I., Canal Zone 2,712,033	APO and FPO
Active Cardiologists												
Primary	2.7	3.9	4.2	3.0	1.3	2.0	2.0	1.7	2.4	3.1	2.4	Not Available
Secondary	2.4	3.1	3.8	2.8	1.2	1.6	1.8	1.7	1.7	2.6	1.4	
Total	5.1	7.0	8.0	5.8	2.5	3.6	3.8	3.4	4.1	5.7	3.8	
Cardiologists In Training												
Primary	.3	.6	.4	.3	•0.0	.1	.3	.2	.3	.3	1.5	
Secondary	.2	.3	.4	.3	0.0	.1	.2	0.0	0.0	0.0	0.0	
Total	.5	.9	.8	.6	0.0	.2	.5	.2	.3	.3	1.5	
All Cardiologists												
Primary	3.0	4.5	4.6	3.3	1.3	2.1	2.2	1.8	2.7	3.4	2.5	
Secondary	2.6	3.4	4.2	3.0	1.2	1.7	2.0	1.8	1.8	2.7	1.5	
Total	5.6	7.9	8.8	6.3	2.5	3.8	4.3	3.6	4.5	6.1	4.0	

• -> .1

[1] U.S. Bureau of the Census. U.S. Census of Population: 1970. Number of Inhabitants. Final Report PC (1) - A1 United States Summary

Source: 2

TABLE 8

Distribution Ratios of Medical Specialists and Cardiologists
To Population According to Census Division

Census Division	Population (M)	Ratios Per 100,000 Population			
		Total	Medical Specialists	Cardiologists	Cardiology - Medical Specialists
Middle Atlantic	37.2	189.4	110.8	8.0	7.3%
New England	11.8	184.7	109.0	7.0	6.4%
Pacific	26.5	181.3	97.0	5.7	5.8%
South Atlantic	30.7	146.2	80.0	5.8	7.6%
Mountain	8.3	142.9	71.5	4.1	5.7%
East North Central	40.3	125.9	64.5	3.8	5.9%
West North Central	16.3	124.5	61.6	3.4	5.6%
West South Central	19.3	121.0	57.6	3.6	6.3%
East South Central	12.8	104.4	47.0	2.5	5.3%

Source: 1, 2

TABLE 9

CARDIOLOGISTS' RATIOS TO POPULATION:
BY RANK-ORDERED METROPOLITAN AREAS OVER 1,000,000 POPULATION

Metropolitan Area[1]	Population[2]	Primary CD Ratio per 100 M	Secondary CD Ratio per 100 M	All CDs Ratio per 100 M
New York	16,062,700	5.6	5.5	11.0
Los Angeles	8,568,000	4.0	3.7	7.7
Chicago	7,797,400	2.8	2.5	5.3
Philadelphia	5,177,000	5.1	3.3	8.4
Baltimore-Washington, D.C.	4,803,900	5.8	3.8	9.5
Detroit	4,693,000	2.4	1.4	3.9
San Francisco	4,529,200	4.3	3.5	7.9
Boston	3,549,000	6.6	3.5	10.1
St. Louis	2,490,300	2.6	2.8	5.5
Cleveland	2,367,500	3.8	3.2	7.0
Dallas-Fort Worth	2,303,000	1.9	2.5	4.5
Pittsburgh	2,242,300	3.3	2.7	6.0
Minneapolis-St. Paul	2,226,300	3.3	2.6	5.9
Houston	2,153,700	3.6	2.1	5.7
Miami	2,128,300	9.0	8.0	17.0
Seattle-Everett-Tacoma	1,998,200	3.6	1.5	5.1
Milwaukee	1,957,000	1.7	1.5	3.3
Atlanta	1,893,600	2.6	3.7	6.3
Cincinnati	1,849,900	2.8	2.5	5.3
Kansas City	1,546,800	2.0	1.9	4.0
Buffalo	1,490,800	3.1	2.4	5.4
Memphis	1,405,600	1.9	1.4	3.2
Providence	1,327,000	3.4	2.9	6.3
San Diego	1,300,000	4.2	2.5	6.7
Indianapolis	1,295,400	3.2	2.2	5.3
Columbus	1,246,000	2.7	2.3	5.1
Portland	1,200,400	2.8	2.3	5.2
Tampa-St. Petersburg	1,171,600	3.7	4.2	7.9
New Orleans	1,117,100	3.5	2.0	5.5
San Antonio	1,116,100	3.3	2.3	5.6
Denver	1,115,100	5.0	2.4	7.4
Louisville	1,085,900	2.0	1.3	3.3
Dayton	1,073,900	2.4	1.5	3.9
New Haven	1,067,200	3.7	3.8	7.4
Greensboro-Winston, Salem	1,066,400	1.5	2.5	4.0
Phoenix	1,058,200	2.6	2.1	4.6
Norfolk-Newport News	1,051,500	1.2	1.4	2.7

[1]Metropolitan area as defined by three digit zip code combinations.

[2]Population estimates related to zip code areas based on 1969 population estimates, "Rand McNally Zip Code Atlas, 1970."

Source: 1, 2

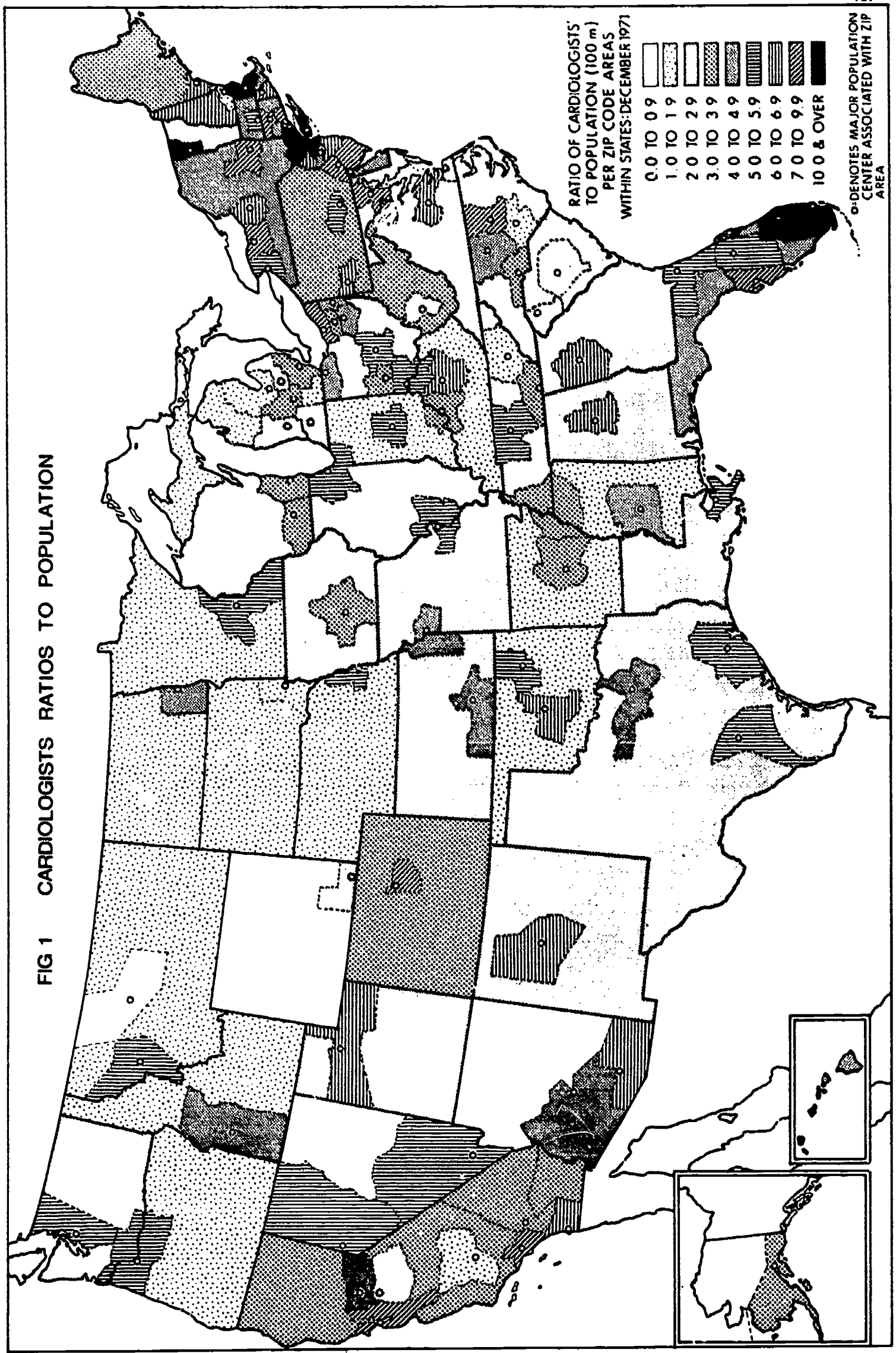


FIG 1 CARDIOLOGISTS RATIOS TO POPULATION

REFERRAL OF PATIENTS TO CARDIOLOGISTS

Approximately 60 percent of all patients seen by cardiologists come from their own practice with 40 percent referred by other physicians or agencies (Table 10). The referral pattern was essentially the same for both Board Certified and non-certified cardiologists in Internal Medicine.

On the other hand cardiologists with Subspecialty Board Certification in Cardiovascular Disease stated that 53 percent of their patients were referred by other physicians or agencies (Table 11). There seemed to be no marked differences in referral pattern according to census divisions.

DISTANCE TRAVELLED BY PATIENT TO CARDIOLOGISTS

As shown in Table 12, approximately 60 percent of the cardiologists' patients travelled five miles or greater to be seen. For some areas of the country, the percentage of patients who travelled greater than 25 miles varied considerably.

CARDIOLOGISTS' AGE AND YEARS SINCE DEGREE

The average age of all cardiologists is 47.8 years (Table 13). Primary Cardiologists on an average are three years younger than Secondary Cardiologists (46.7 vs. 49.9) and Federal Cardiologists are seven years younger than Non-Federal Cardiologists (41.0 vs. 48.2). As would be expected from the above, Federal Cardiologists have graduated from medical school more recently (by seven years) than Non-Federal, and Primary Cardiologists more recently (by three years) than Secondary as shown in Table 14.

Data on the age distribution of cardiologists show 26 percent are between 25 and 39 years of age; 55 percent are between 40 and 59 years of age; and 21 percent are 60 and over. Some regional differences exist. These are discussed in Chapter 8.

SUMMARY AND RECOMMENDATIONS

There are 10,691 cardiologists in active practice in the United States and approximately 1,000 in training. This gives a ratio of 5.6 cardiologists per 100,000 population. Whether this is an optimal ratio to be maintained in the future cannot be stated. Their numbers seem to be distributed about equally between the Primary Cardiologist and the Secondary Cardiologist. Approximately 70 percent are office based outside institutions and about 50 percent of all cardiologists are certified in Internal Medicine and 10 percent certified in Cardiovascular Disease.

TABLE 10

PERCENTAGE OF CARDIAC PATIENTS REFERRED TO PHYSICIAN
BY TYPE OF REFERRAL SOURCE:
CENSUS DIVISION BY BOARD CERTIFICATION

BOARD CERTIFICATION	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Board Certified Distribution (N)	3769	315	944	647	122	241	556	210	144	556	23	11
Type of Referral:												
own practice	59.7	61.4	63.3	58.7	54.1	55.7	56.3	57.5	66.5	60.0	59.7	17.7
from other physicians	33.3	32.0	30.4	33.7	36.7	34.8	38.2	37.7	26.8	32.0	29.2	38.6
other (agencies)	7.1	6.6	6.4	7.6	9.1	9.5	5.7	4.8	6.7	8.0	11.1	43.6
Non-Board Certified Distribution (N)	3160	231	899	504	102	218	434	167	97	461	40	7
Type of Referral:												
own practice	61.8	63.6	66.3	60.2	60.0	57.7	62.2	61.9	59.7	56.6	63.8	29.3
from other physicians	29.4	29.9	23.9	30.1	32.0	32.1	30.1	35.5	33.5	34.3	24.2	25.7
other (agencies)	8.7	6.1	9.9	9.7	8.0	10.2	7.6	2.6	6.8	9.1	12.1	45.0

Source: 2

TABLE 11

PERCENTAGE OF CARDIAC PATIENTS REFERRED TO PHYSICIAN
BY TYPE OF REFERRAL SOURCE:
CENSUS DIVISION BY CARDIOLOGY SUBSPECIALTY BOARD IN CARDIOVASCULAR DISEASE CERTIFICATION

CARDIOLOGY SUBSPECIALTY BOARD IN CARDIOVASCULAR DISEASE CERTIFICATION	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Cardiology Certified Distribution (N)	670	52	164	118	26	60	96	45	30	72	5	2
Type of Referral:												
own practice	46.5	49.7	48.6	45.9	35.7	44.5	46.5	42.8	48.4	46.3	73.4	5.0
from other physicians	45.8	42.3	43.1	45.6	50.8	49.1	47.7	53.3	45.1	45.1	4.4	95.0
other (agencies)	7.7	7.9	8.3	8.5	13.6	6.4	5.8	3.9	6.5	8.6	22.2	0.0
Non-Cardiology Certified Distribution (N)	6259	494	1679	1033	198	399	894	332	211	945	58	16
Type of Referral:												
own practice	62.2	63.6	66.3	60.9	59.6	58.5	60.1	61.7	66.0	59.4	61.3	24.4
from other physicians	30.0	30.9	25.6	30.6	32.4	31.1	33.3	34.4	27.3	32.1	27.9	25.9
other (agencies)	7.9	6.2	8.1	8.5	8.0	10.4	6.6	3.8	6.8	8.5	10.8	49.7

Source: 2

TABLE 12

PERCENTAGE OF CARDIAC PATIENTS BY MILEAGE DISTANCE FROM PHYSICIAN: CENSUS DIVISION BY PHYSICIAN AGE GROUPINGS

PHYSICIAN AGE GROUPINGS	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I. Canal Zone	APO and FPO
Less Than 40 Years Distribution (N)	1801	161	382	362	57	127	252	92	61	283	14	10
Mileage:												
less than 5	38.8	43.9	49.6	37.2	28.4	31.6	35.1	26.2	40.8	35.8	30.8	37.7
5 to 25	48.5	46.9	45.4	48.7	46.3	48.4	50.7	45.2	46.6	52.9	61.1	44.7
over 25	12.7	9.2	5.0	14.1	25.3	20.0	14.1	28.6	12.6	11.3	8.1	17.6
40 Through 59 Years Distribution (N)	3586	254	926	574	136	242	532	191	132	554	41	4
Mileage:												
less than 5	41.8	47.4	49.4	40.9	25.7	32.6	38.4	30.1	40.3	42.4	47.0	50.0
5 to 25	48.5	45.7	45.3	48.6	54.9	49.1	52.9	46.3	46.9	50.1	47.1	32.5
over 25	9.8	6.9	5.3	10.6	19.4	18.2	8.7	23.6	12.7	7.5	5.9	17.5
60 Years And Over Distribution (N)	1135	99	435	140	22	60	157	62	28	128	4	0.0
Mileage												
less than 5	43.7	42.8	52.6	40.1	36.1	35.3	34.0	29.1	46.1	42.5	30.0	0.0
5 to 25	49.3	50.1	43.5	52.4	51.9	52.6	59.8	51.1	42.7	50.5	61.2	0.0
over 25	6.9	7.1	3.9	7.5	12.0	12.1	6.1	19.8	11.3	6.9	8.8	0.0

Source: 2

TABLE 13

AVERAGE PHYSICIAN AGE BY PHYSICIAN CLASSIFICATION:
BY SPECIALTY

PHYSICIAN CLASSIFICATION	SPECIALTY				ALL CARDIOLOGISTS	
	Primary Cardiologist		Secondary Cardiologist			
	years	N	years	N	years	N
Non-Federal	46.7	3629	49.9	3158	48.2	6787
Federal	39.5	289	44.3	125	41.0	414
Average Age	46.2		49.7		47.8	
Total Number (N)		3918		3283		7201

Source: 2

TABLE 14

AVERAGE YEARS SINCE DOCTOR OF MEDICINE DEGREE:
BY SPECIALTY

PHYSICIAN CLASSIFICATION	SPECIALTY				ALL CARDIOLOGISTS	
	Primary Cardiologist		Secondary Cardiologist			
	years	N	years	N	years	N
Non-Federal	21	3670	24	3212	22	6882
Federal	14	292	19	127	15	419
Average Years	20		24		22	
Total Number (N)		3962		3339		7301

Source: 2

Per population density, cardiologist are irregularly distributed tending to concentrate in the metropolitan centers of the North East, Middle Atlantic and Pacific regions. These areas contain the large cities having the heaviest concentration of medical schools. The East South Central, West South Central and West North Central regions contain significantly fewer numbers of cardiologists per 100,000 population.

The numbers of general practitioners/100,000 do not vary greatly in most parts of the country, although there are approximately twice as many medical specialists as surgeons/100,000 population in a majority of the census division regions.

Factors related to manpower maldistributions are many and complex. Our recommendations regarding more desirable manpower to population ratios and techniques to realize them are discussed at the conclusion of Chapter Seven.

CHAPTER 4

ROLES AND PROFILES OF THE CARDIOLOGISTS

H.J.C. Swan and Ray W. Gifford, Jr.

BACKGROUND

The study conducted by the Sub-Board of Pediatric Cardiology[1,2] has already been referred to in the Preface and the results of it are a reasonable starting point for the material covered in this chapter.

The Sub-Board of Pediatric Cardiology reviewed among other matters, the professional activities of all pediatric cardiologists who were board certified as of June 1967. The response rate was 93 percent. The professional activities of the pediatric cardiologist were categorized as (1) professional - including maintenance of learning skills, (2) clinical application of professional skills, (3) research, (4) teaching and (5) administrative.

Only 8 percent of the pediatric cardiologists were in full time private practice. Ninety-two percent were either in academic positions or in full time non-academic hospital practice. Nevertheless, clinical (patient care) activities dominated the activities of these physicians averaging 62 percent of the time. This ranged from 44 percent of the time for the academic (senior) group, to 81 percent of time for those in private practice.

ADULT CARDIOLOGISTS

Historically, adult cardiology has been regarded as a component of internal medicine. The emergence of cardiology as a subspecialty occurred by reasons of the increase in special knowledge and newer diagnostic and therapeutic techniques in the field. Also, a large number of persons in the population with significant disease suffer from disorders of the cardiovascular system.

The subspecialty of pediatric cardiology developed in part because of rapid advances in the field of congenital heart disease associated with the introduction of cardiac catheterization and cardiovascular surgery in the early 1950's. In contrast, specific and innovative changes in the management of adult cardiovascular diseases occurred gradually and by reason of the more complex nature of such problems, demanded a more varied pattern of profes-

[1]Adams, F.H., et.al.: "The Review and Revision of Certification Procedures in Pediatric Cardiology." J. Med. Educ. 47:796, 1972.

[2]Adams, F.H., et.al.: "Manpower and Training Requirements In Pediatric Cardiology." Pediat. 51:813, 1973.

sional activities. Hence, we are making the assumption that the adult cardiologist cannot be described by a single profile.

ROLES AND PROFILES OF CARDIOLOGISTS

The professional activities of adult cardiologists were identified by two techniques: an initial classification questionnaire to all who listed cardiovascular disease as a professional activity with the American Medical Association; and log-diary analysis of the activities of a stratified random sample of these physicians. Since the number of federally employed physicians was small (2.3 percent - Table 1) in comparison to those of the non-federally employed, the data that will follow are those of the non-federally employed group. The responses of 6,436 non-federally employed cardiologists indicated that 1,413 or 22 percent were engaged in Institutional Practice, while 5,023 or 78 percent were engaged in Non-Institutional (private, solo, group, office) Practice.

The initial classification questionnaire allowed a separation of cardiologists into those who spent greater than 50 percent of professional time in cardiology -- designated Primary Cardiologists -- and those who spent less than 50 percent of time in cardiology -- designated Secondary Cardiologists. Hence, physicians in Institutional or Non-Institutional Practice could be then subdivided into the additional categ ries -- Primary or Secondary.

Table 2 shows the percentage of professional activity time and proportion of time to cardiology by specialty. As a group, all cardiologists indicated that 81 percent of professional activity time was devoted to patient care including teaching and research with patients. Primary Cardiologists indicated that 65 percent of their time was devoted to clinical care of patients with cardiovascular disease including time spent in teaching and research involving patients. The Primary Cardiolcgist carried out substantively more research and teaching than did the Secondary Cardiologist. A substantive portion (17 percent) of the total time of the Primary Cardiologist was devoted to teaching. Administrative and professional (journals, meetings, etc.) activities amounted to approximately 12 percent for all cardiologists and did not differ between Primary and Secondary Cardiologists (Table 3).

The general types of cardiologic activity for all cardiologists is defined in Table 4. The great majority of cardiologists acted as consultants in the office or hospital for cardiac patients and read electrocardiograms. Primary Cardiologists conducted most of the catheterization procedures.

In attempting to define the distribution and percentage of cardiologists according to the Institutional and Non-Institutional practice modes, a significant difference was identified according to age groupings (Table 5). Twenty-eight percent of the cardiologists were under the age of 40 years and 53 percent of these were in Non-Institutional practice equally divided among solo, partnerships, and group modality. Fifty-four percent of the physicians were between

TABLE 1

AVERAGE PERCENT OF TIME IN DIRECT PATIENT CARE:
SPECIALTY AND PRACTICE BY
FEDERAL AND NON-FEDERAL CARDIOLOGISTS

Specialty and Practice	Average Percent of Time in Activity					
	Federal		Non-Federal		Combined Total	
	N	%	N	%	N	%
Non-Institutional						
Primary	13	75.7	2411	76.7	2424	76.7
Secondary	5	78.0	2612	82.7	2617	82.7
Subtotal	18	76.3	5023	79.8	5041	79.8
Institutional						
Primary	107	31.0	1056	32.4	1163	32.3
Secondary	31	53.0	357	36.6	388	37.9
Subtotal	138	35.9	1413	33.5	1551	33.7
TOTAL	156	40.6	6436	69.6	6592	68.9

Source: 2

TABLE 2

PERCENTAGE OF PROFESSIONAL ACTIVITY TIME
AND PROPORTION OF TIME TO CARDIOLOGY
BY SPECIALTY AND SELECTED ACTIVITY CLASSIFICATION

SELECTED ACTIVITY CLASSIFICATION	SPECIALTY					
	Primary Cardiologist (N=3910)		Secondary Cardiologist (N=3256)		ALL CARDIOLOGISTS (N=7166)	
	% of total	% to CD	% of total	% to CD	% of total	% to CD
CLINICAL CARE . Direct Patient Care . Research with Patients . Teaching with Patients	79.5	65.0	83.7	32.9	81.4	50.6
RESEARCH . With Patients . Without Patients	10.5	9.7	3.7	1.9	7.5	6.2
TEACHING . With Patients . Without Patients	16.5	13.7	8.6	3.9	12.9	9.3

Source: 2

TABLE 3

PERCENTAGE OF PROFESSIONAL ACTIVITY TIME AND PROPORTION OF TIME TO CARDIOLOGY BY SPECIALTY

TYPE OF ACTIVITY	SPECIALTY					
	Primary Cardiologist (N=3910)		Secondary Cardiologist (N=3256)		ALL CARDIOLOGISTS (N=7166)	
	% of total	% to CD	% of total	% to CD	% of total	% to CD
Direct Patient Care	60.8	48.8	75.3	28.9	67.3	39.9
Research with Patient Care	6.2	5.7	1.8	1.0	4.2	3.6
Teaching with Patient Care	12.6	10.5	6.6	3.0	9.9	7.1
Sub Total - Clinical	79.5	65.0	83.7	32.9	81.4	50.6
Research without Patient Care	4.4	4.0	1.9	0.9	3.3	2.6
Teaching without Patient Care	3.9	3.2	2.0	0.9	3.0	2.2
Sub Total - Non-Clinical Research and Teaching	8.3	7.2	3.9	1.8	6.3	4.8
Administrative	6.8	0.0	7.5	0.0	7.1	0.0
Professional	5.4	0.0	4.3	0.0	5.1	0.0
TOTAL	100.0	72.2	99.9	34.7	99.9	55.4

Source: 2

TABLE 4

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES: BY SPECIALTY

TYPE OF ACTIVITY	SPECIALTY		ALL CARDIOLOGISTS (N=7045)
	Primary Cardiologist (N=3876)	Secondary Cardiologist (N=3169)	
Office Consultant for Cardiac Patients	84.1	87.7	85.7
Office ECG Reader	71.5	81.7	76.1
Hospital Consultant for Cardiac Patients	92.9	80.6	87.4
Hospital ECG Reader	77.0	60.9	69.8
Hospital CCU Committee	64.8	53.2	59.6
Cardiac Diagnostic Roentgenography	37.3	14.8	27.2
Cardiac Catheterization	40.9	7.9	26.0

Source: 2

TABLE 5

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE:
BY AGE GROUPINGS

PRACTICE MODE	Under 40 Years		40 through 59 Years		60 Years and Over		All Cardiologists	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
Non-Institutional								
Solo	349	5.0	1581	22.6	810	11.6	2740	39.2
Partnership	328	4.7	629	9.0	114	1.6	1071	15.3
Group	304	4.4	591	8.5	102	1.5	997	14.3
Combination (Other)*	65	0.9	139	2.0	35	0.5	239	3.4
Sub Total	1046	15.0	2940	42.1	1061	15.2	5047	72.2
Institutional								
Hospital	413	5.9	293	4.2	54	0.8	760	10.9
Medical School	257	3.7	310	4.4	25	0.4	592	8.5
Combination (Other)*	92	1.3	87	1.2	8	0.1	187	2.7
Sub Total	762	10.9	690	9.9	87	1.3	1539	22.1
Other*								
Majority Other	173	2.5	150	2.1	45	0.6	368	5.3
Combined Other	2	0.0	18	0.3	7	0.1	27	0.4
Sub Total	175	2.5	168	2.4	52	0.7	395	5.7
TOTAL	1983	28.4	3798	54.4	1200	17.2	6981	100.0

*In tables, in sections which follow, these "Other" types are combined as "Other" because, for all practical purposes, they include either (1) individuals whose practice involves medical school/hospital plus some non-institutional or (2) are federal cardiologists who simply checked "Other" for their employment. Source: 2

the ages 40 and 59, and in contrast to the younger group, 77 percent of the cardiologists in this age group were Non-Institutional and more than half of these were in solo practice. This trend was even greater in physicians 60 years and older, representing 17 percent of the entire group. Nearly 90 percent of the older cardiologists were in the Non-Institutional mode and 76 percent of these were in solo practice. Thirty-eight percent of those physicians below the age of 40 were Institutionally employed with a dominance in hospital as opposed to medical school positions. Eighteen percent of physicians 40 through 59 years were Institutionally employed equally divided between hospital and medical school distribution, while only 7 percent of those 60 years or over were Institutionally employed.

The distribution of cardiologists by practice mode and specialty board (internal medicine) certification is demonstrated in Table 6. While a majority (55 percent) of Non-Institutional Cardiologists were certified, certified or non-certified physicians were equally represented in Institutions.

Table 7 demonstrates the distribution of cardiologists by subspecialty board certification in cardiovascular disease. Less than 9 percent of Non-Institutional Cardiologists and 13 percent of Institutional Cardiologists were subspecialty certified. The latter category included 19 percent of medical cardiologists, and 9 percent of hospital cardiologists.

When we examine the functional activities of all cardiologist by age groupings (Table 8), virtually all undertook similar duties as regards office consultation for cardiac patients, reading of office electrocardiograms and providing hospital consultation for cardiac patients. Cardiologists less than 40 years spent less time reading office electrocardiograms. Physicians under the age of 60 years participated more frequently as electrocardiographic readers in the hospital and on the coronary care unit committees than did older physicians. In the application of new and special skills, including cardiac diagnostic roentgenography and cardiac catheterization there was significantly greater listing of activity in these categories in physicians under the age of 40. In contrast, cardiologists 60 years and over participated to minimal degree in these activities. Whereas 50 percent of physicians of less than 40 conducted cardiac catheterizations, only 2.6 percent of physicians over the age of 60 provide these services. When these activities were examined within the categories of Primary or Secondary Cardiologist (Table 4) there was a reduction in the participation of the Secondary Cardiologists in the more highly skilled activities: hospital ECG readers; CCU Committee; diagnostic roentgenography; and cardiac catheterization. The distribution of activities by age of cardiologist is open to amny interpretations and may change in the future as an adequate number of physicians are trained in a required skill, or new skills are developed.

Table 9 demonstrates in detail the distribution of professional activity time and the proportion of time concerned with cardiology. Among Non-Institu-

TABLE 6

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE: BY SPECIALTY BOARD CERTIFICATION IN INTERNAL MEDICINE

PRACTICE MODE	Specialty Board Certified		Non-Certified		Total Cardiologists	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
Non-Institutional						
Solo	1341	19.0	1426	20.1	2767	39.1
Partnership	701	9.9	385	5.4	1086	15.3
Group	675	9.5	333	4.7	1008	14.2
Combination (Other)*	136	1.9	106	1.5	242	3.4
Sub Total	2853	40.3	2250	31.7	5103	72.0
Institutional						
Hospital	343	4.9	435	6.1	778	11.0
Medical School	329	4.7	273	3.9	602	8.5
Combination (Other)*	102	1.4	87	1.2	189	2.7
Sub Total	774	11.0	795	11.2	1569	22.2
Other*						
Majority Other	186	2.6	193	2.8	379	5.4
Combination Other	13	0.2	14	0.2	27	0.4
Sub Total	199	2.8	207	3.0	406	5.8
TOTAL	3826	54.1	3252	45.9	7078	100.0

*See Footnote, Table 5

TABLE 7

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE:
BY SUBSPECIALTY BOARD CERTIFICATION IN CARDIOVASCULAR DISEASE

PRACTICE MODE	Subspecialty Board Certified		Non-Certified		Total Cardiologists	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
Non-Institutional						
Solo	187	2.6	2580	36.5	2767	39.1
Partnership	105	1.5	981	13.8	1086	15.3
Group	114	1.6	894	12.6	1008	14.2
Combination (Other)*	31	0.4	211	3.0	242	3.4
Sub Total	437	6.1	4666	65.9	5103	72.0
Institutional						
Hospital	67	1.0	711	10.0	778	11.0
Medical School	115	1.6	487	6.9	602	8.5
Combination (Other)*	29	0.4	160	2.3	189	2.7
Sub Total	211	3.0	1358	19.2	1569	22.2
Other*						
Majority Other	36	0.5	343	4.9	379	5.4
Combination Other	1	0.0	26	0.4	27	0.4
Sub Total	37	0.5	369	5.3	406	5.8
TOTAL	685	9.6	6393	90.4	7078	100.0

TABLE 8

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES: BY PHYSICIAN AGE GROUPINGS

TYPE OF ACTIVITY	PHYSICIAN AGE GROUPINGS			ALL CARDIOLOGISTS (N=6954)
	Less than 40 Years (N=1964)	40 to 59 Years (N=3782)	60 Years or Over (N=1208)	
Office Consultant for Cardiac Patients	76.0	90.1	88.1	85.7
Office ECG Reader	66.1	80.3	79.3	76.1
Hospital Consultant for Cardiac Patients	91.0	89.8	74.3	87.5
Hospital ECG Reader	76.5	71.1	55.5	69.9
Hospital CCU Committee	61.4	64.2	42.6	59.6
Cardiac Diagnostic Roentgenography	42.1	23.7	13.8	27.2
Cardiac Catheterization	51.4	20.5	2.6	26.1

Source: 2

TABLE 9

CARDIOLOGISTS BY PRACTICE MODE:
PERCENTAGE OF PROFESSIONAL ACTIVITY TIME AND PROPORTION OF TIME TO CARDIOLOGY

PRACTICE MODE	Distribution (N) Total N=6987	Time Allocation	TYPE OF ACTIVITY: Direct Patient Care %	Research with Patient Care %	Teaching with Patient Care %	Sub Total Clinical %	Research without Patient Care %	Teaching without Patient Care %	Sub Total Non-Clinical Res. & Teach %	Administrative %	Professional %
NON-INSTITUTIONAL:											
Solo	N=2724	% of total	81.3	1.3	5.6	88.2	0.5	1.6	2.1	4.7	4.9
		% to CD	45.8	1.0	3.6	50.3	0.3	1.1	1.4	0.0	0.0
Partnership	N=1079	% of total	80.0	1.3	6.7	88.0	0.4	1.9	2.3	4.9	4.7
		% to CD	46.0	1.1	4.7	51.9	0.3	1.4	1.7	0.0	0.0
Group	N=997	% of total	79.2	1.7	6.7	87.6	0.7	1.7	2.4	5.0	4.9
		% to CD	45.6	1.3	4.5	51.5	0.6	1.2	1.8	0.0	0.0
Sub Total	N=4800	% of total	80.6	1.4	6.1	88.0	0.5	1.7	2.2	4.8	4.9
		% to CD	45.8	1.1	4.0	50.9	0.4	1.2	1.6	0.0	0.0
INSTITUTIONAL:											
Hospital	N=771	% of total	45.4	10.2	18.3	73.8	5.6	4.9	10.5	10.0	5.6
		% to CD	32.1	9.0	14.1	55.2	4.6	3.8	8.4	0.0	0.0
Medical School	N=597	% of total	19.5	14.8	22.3	56.7	16.2	8.9	25.1	12.6	5.7
		% to CD	15.8	13.2	17.3	46.2	12.8	6.1	18.9	0.0	0.0
Sub Total	N=1368	% of total	34.1	12.2	20.0	66.3	10.2	6.6	16.9	11.1	5.6
		% to CD	25.0	10.8	15.5	51.3	8.2	4.8	13.0	0.0	0.0
Other	N=819	% of total	45.6	7.3	15.4	68.3	7.1	4.8	11.9	13.9	5.8
		% to CD	29.6	6.3	12.1	47.9	5.9	7.4	13.3	0.0	0.0

Source: 2

tional physicians, 81 percent of time was estimated to be spent in direct patient care of which 57 percent was related to cardiovascular disease. The nature of the Non-Institutional practice (solo, partnership or group) made no difference to either the allocation of time or its distribution to cardiovascular disease. In contrast, 34 percent of the activity of Institutionally employed physicians was devoted to patient care, but close to 73 percent of the time allocated to patient care was devoted to cardiovascular disease. When other activities associated with patient care (research, teaching) were included, 74 percent of the time of hospital physicians was devoted to some patient related activity, while 57 percent of the time allocation of medical school physicians was so defined. However, the medical school based Institutional physicians showed greater activity in non-clinical research and teaching and approximately the same expenditure of time in administrative and professional fields as their hospital employed colleagues.

Identifying clinical related activities, there were striking differences (Table 10) between the Institutional and Non-Institutional groups. The Non-Institutional physicians provided office consultation and electrocardiographic reading in the great majority of instances. In the partnership and group category, they also demonstrated significant frequency of services in cardiac catheterization and cardiac diagnostic roentgenology. The solo practitioners contributed extensively as hospital ECG readers, hospital consultants, and members of the hospital CCU Committee. In contrast to Non-Institutional physicians, only 55 percent of Institutionally based physicians provided office consultation, and 37 percent provided office ECG interpretation. Institutional physicians reported similar clinical activities irrespective of whether they were based in a hospital or medical school. Fifty-six percent of the physicians Institutionally employed provided cardiac catheterization services.

Analysis of Log-Diary Data

To determine the accuracy of the initial classification questionnaire Table 11 compares the estimated data with the recorded log-diary data from the same physicians. In the physicians in Non-Institutional practice there was an underestimation by 100 percent of the amount of time devoted to administrative activities and professional advancement. This was equally true for both the Primary and Secondary Cardiologists. As a consequence the estimation of time devoted to direct patient care exceeded the recorded time by approximately 6 percent. The Non-Institutionally based physician was reasonably precise in his estimates concerning teaching with and without patients. However, he overestimated the time devoted to research which was for practical purposes negligible. The Institutionally based physician grossly overestimated the time devoted to research with patients: 15 percent for Primary and 9 percent for Secondary as against 2 percent recorded for both. The Institutionally based cardiologists also overestimated the time devoted to teaching with patients: 24 percent estimated versus 13 percent recorded for the Primary Cardiologist and 18 percent versus 9 percent for the Secondary

TABLE 10

PERCENTAGE OF CARDIOLOGISTS BY PRACTICE MODE:
BY SELECTED TYPES OF CARDIOLOGY ACTIVITIES

PRACTICE MODE	Distribution (N)	TYPES OF ACTIVITIES: Office Consultant	Office ECG Reader	Hospital Consultant	Hospital ECG Reader	Hospital CCU Committee	Cardiac Diagnostic X-ray	Cardiac Catheterization
NON-INSTITUTICNAL:								
Solo	2723	95.5	87.2	89.7	65.1	58.4	19.7	12.8
Partnership	1081	97.1	91.6	91.8	73.5	68.8	26.3	28.6
Group	1002	97.2	91.0	92.3	77.1	71.1	27.8	29.7
Sub Total	4806	96.2	89.0	90.7	69.5	63.4	22.8	19.9
INSTITUTIONAL:								
Hospital	752	51.6	38.6	89.1	75.0	56.0	40.8	56.0
Medical School	547	61.1	35.8	87.2	64.2	41.1	34.6	55.9
Sub Total	1299	55.6	37.4	88.3	70.5	49.7	38.2	56.0
OTHER	771	71.5	60.8	85.0	72.0	54.1	37.4	41.5
TOTAL	6876	85.8	76.1	87.6	70.0	59.8	27.4	29.1

Source: 2

TABLE 11

CARDIOLOGISTS' ACTIVITY TIME AS REPORTED ON CLASSIFICATION QUESTIONNAIRE AND RECORDED IN LOG-DIARY:* ACTIVITIES BY SPECIALTY AND TYPE OF PRACTICE

Type of Activity	Non-Institutional				Institutional			
	Primary N=111		Secondary N=102		Primary N=97		Secondary N=54	
	Classification Questionnaire	Log-Diary	Classification Questionnaire	Log-Diary	Classification Questionnaire	Log-Diary	Classification Questionnaire	Log-Diary
	%	%	%	%	%	%	%	%
Direct Patient Care	76.6	70.9	82.5	75.7	27.7	36.9	34.6	40.3
Teaching with Patients	8.3	6.6	5.5	4.0	23.6	13.2	18.1	8.5
Teaching without Patients	2.1	2.4	1.3	1.2	7.3	6.8	8.3	9.5
Research with Patients	2.4	0.2	0.8	0.2	14.8	2.0	8.6	1.8
Research without Patients	0.4	1.4	0.1	0.8	11.0	16.0	4.5	5.5
Professional	5.3	10.1	4.0	9.3	5.9	13.7	5.1	12.5
General Administration	4.9	8.4	5.8	8.8	9.7	11.4	20.8	21.9
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Comparative differences are conservative since log-diary travel time was not included in percentage calculations.

Cardiologist. The Primary Institutional Cardiologist underestimated the time devoted to research without patients while the Secondary Institutional Cardiologist closely estimated this activity. All groups underestimated the time devoted to administrative and professional activities by nearly 100 percent.

The log-diary analysis (Table 12) revealed that the average working day for all cardiologists including travel was 10 hours. There was no significant difference as to whether the individual was in Non-Institutional or Institutional practice or had Primary or Secondary time commitment in cardiology. The reporting of a high proportion of time (23 percent) of the Secondary Institutional physicians in administrative activities possibly reflects the inclusion of department chairmen, deans, and section heads in this categorization. Non-Institutional physicians devoted a considerable time to teaching with patients and professional advancement (15 percent for the Primary and 13 percent for the Secondary Cardiologist). Although these times were less than those of Institutional Cardiologists, it nevertheless represented a sizeable proportion of the Non-Institutional practitioners' investment in so-called academic affairs. Of note again is the remarkably small proportion of time devoted to research with patients by Institutional Cardiologists. The greater proportion of time devoted to professional activities by the Institutional Cardiologists probably reflects preparation for lectures, writing papers, review of journal material, etc. A sustantive proportion of the time of Primary Institutional Cardiologists is devoted to research without patients and probably indicates basic science activities.

Table 13 relates to the activity of cardiologists on weekends. In the Non-Institutional subcategories, approximately 3 hours per day were expended in direct patient care. Only in the Primary Institutional practice category was substantially less time spent in direct patient care (1 1/2 hours per day). Teaching with patients is also a feature of all subcategories and probably reflected the inclusion of house officers on rounds. A noteworthy fact is the designation of between one half and three quarters of an hour per day to professional advancement by all categories of cardiologists, with the greatest time commitment indicated by the Non-Institutional Secondary Cardiologists. This reflects a significant dedication of such physicians to continued learning and professional advancement. Primary Institutional Cardiologists also conducted significant research without patients on weekend time.

Table 14 presents log-diary data regarding the distribution of patient encounters by office and hospital for Non-Institutional and Institutional Primary and Secondary Cardiologists. Using the "weighted" data it shows that the Non-Institutional Cardiologists were responsible for in excess of 95 percent of patient office encounters and 85 percent of patient hospital encounters. This demonstrates clearly the dominance of Non-Institutional based cardiologists as providers of clinical care in the survey. The Primary Institutional Cardiologist rendered significantly more care within the hospital than did the Secondary Institutional group.

TABLE 12

PERCENTAGE AND DISTRIBUTION OF CARDIOLOGISTS' DAILY WEEKDAY TIME*
IN PROFESSIONAL ACTIVITIES BY SPECIALTY AND PRACTICE

TYPE OF ACTIVITY	NON-INSTITUTIONAL PRACTICE				INSTITUTIONAL PRACTICE			
	Primary		Secondary		Primary		Secondary	
	DAILY TIME				DAILY TIME			
	Minutes	%	Minutes	%	Minutes	%	Minutes	%
Direct Patient Care	409	72	449	77	217	37	222	38
Research with Patients	2	0	1	0	14	2	10	2
Research without Patients	6	1	5	1	90	15	32	6
Teaching with Patients	35	6	22	4	83	14	52	9
Teaching without Patients	15	3	6	1	38	6	60	10
Administration	48	9	52	9	69	12	132	23
Professional	52	9	51	9	81	14	71	12
Sub Total Time Per Day								
-Minutes	567	100%	586	101%	592	100%	579	100%
-Hours	9.5		9.8		9.9		9.7	
Travel**	49		47		51		63	
Total Time Per Day								
-Minutes	616		633		643		642	
-Hours	10.3		10.6		10.7		10.7	

*Five day work week.

**Travel: includes long distance due to limited amount of time (1 to 9 minutes per day).

Source: 3

TABLE 12

PERCENTAGE AND DISTRIBUTION OF CARDIOLOGISTS' DAILY WEEKDAY TIME*
IN PROFESSIONAL ACTIVITIES BY SPECIALTY AND PRACTICE

TYPE OF ACTIVITY	NON-INSTITUTIONAL PRACTICE				INSTITUTIONAL PRACTICE			
	Primary		Secondary		Primary		Secondary	
	DAILY TIME				DAILY TIME			
	Minutes	%	Minutes	%	Minutes	%	Minutes	%
Direct Patient Care	409	72	449	77	217	37	222	38
Research with Patients	2	0	1	0	14	2	10	2
Research without Patients	6	1	5	1	90	15	32	6
Teaching with Patients	35	6	22	4	83	14	52	9
Teaching without Patients	15	3	6	1	38	6	60	10
Administration	48	9	52	9	69	12	132	23
Professional	52	9	51	9	81	14	71	12
Sub Total Time Per Day								
-Minutes	567	100%	586	101%	592	100%	579	100%
-Hours	9.5		9.8		9.9		9.7	
Travel**	49		47		51		63	
Total Time Per Day								
-Minutes	616		633		643		642	
-Hours	10.3		10.6		10.7		10.7	

*Five day work week.

**Travel: includes long distance due to limited amount of time (1 to 9 minutes per day).

Source: 3

TABLE 13

PERCENTAGE AND DISTRIBUTION OF CARDIOLOGISTS' DAILY WEEKEND TIME* IN PROFESSIONAL ACTIVITIES BY SPECIALTY AND PRACTICE

TYPE OF ACTIVITY	NON-INSTITUTIONAL PRACTICE				INSTITUTIONAL PRACTICE			
	Primary		Secondary		Primary		Secondary	
	DAILY TIME				DAILY TIME			
	Minutes	%	Minutes	%	Minutes	%	Minutes	%
Direct Patient Care	179	64	200	68	96	39	144	60
Research with Patients	1	0	2	0	1	0	6	3
Research without Patients	8	3	0	0	50	20	11	5
Teaching with Patients	25	9	19	7	20	8	11	5
Teaching without Patients	4	1	3	1	20	8	5	2
Administration	23	8	25	9	21	9	28	12
Professional	39	14	44	15	37	15	34	14
Sub Total Time Per Day								
-Minutes	279	99%	293	100%	245	99%	239	101%
-Hours	4.7		4.9		4.1		4.0	
Travel**	30		25		35		23	
Total Time Per Day								
-Minutes	309		318		280		262	
-Hours	5.2		5.3		4.7		4.4	

*Weekends: Saturday and Sunday.

**Travel: includes long distance due to limited amount of time (1 to 9 minutes per day).

Source: 3

TABLE 14

CARDIOLOGIST'S CONTACTS WITH PATIENTS:
WEIGHTED AND UNWEIGHTED PATIENT ENCOUNTERS
BY TYPE OF SETTING
BY SPECIALTY AND PRACTICE

Type of Setting	Non-Institutional				Institutional				All Cardiologists	
	Primary		Secondary		Primary		Secondary			
	N	%	N	%	N	%	N	%	N	%
Office										
Unweighted	3748	36.3	5334	51.7	655	6.3	590	5.7	10327	100.0
Weighted	4610	34.5	8155	61.1	380	2.8	218	1.6	13363	100.0
Hospital										
Unweighted	3370	38.0	2674	30.1	1743	19.6	1092	12.3	8879	100.0
Weighted	4145	42.9	4091	42.4	1011	10.5	404	4.2	9651	100.0
Combined										
Unweighted	7118	37.0	8008	41.7	2398	12.5	1682	8.8	19206	100.0
Weighted	8755	38.1	12251	53.2	1391	6.0	622	2.7	23014	100.0

Source: 3

Table 15 indicates by category the site and referral pattern and cardiac and non-cardiac encounters. In the relative percentage of referrals and Primary Cardiac encounters, the Primary Institutional Cardiologist differed from his Non-Institutional colleagues, in that he accounted for 12.9 percent of referrals and only 3 percent of patients originated from his own practice. Non-Institutional Primary Cardiologists representing, 37.5 percent of all cardiologists, reported 34.3 percent of patients from his own practice and 45.4 percent of the referral patients. Corresponding values for the Secondary Non-Institutional Cardiologist (40.6 percent of all cardiologists) were 60.6 and 37.3 percent.

Table 16 examines the age categories of patients seen by practicing cardiologists. The number and percentage of encounters are related to the national population distribution as of 1970, in the right column. In this survey, a disproportionately small number of patients between the ages of 0 and 35 are seen by cardiologists. Between the ages of 35 and 44, patients were seen by these physicians in proportion to their prevalence in the 1970 population. Above 45 years there is a rapid increase in the numbers of patients seen by cardiologists. Thus, patient encounters above the age of 65 amounted to 33 percent of all office encounters in an office setting, and 42 percent of those in a hospital setting as compared to the prevalence in the population of this age category of approximately 10 percent.

Table 17 from the diary report confirms certain substantive differences between practice activities. Of considerable significance is the overall allocation of time of the Non-Institutional practitioner (74 percent) devoted to patient care, while approximately 39 percent of the activity of Institutional practitioners was so allocated. Only in the category of laboratory and diagnostic testing - reflecting cardiac catheterization and coronary arteriography - do Primary Institutional practitioners provide a greater level of participation in patient care than Non-Institutional practitioners. Little or no research was conducted by the Non-Institutional practitioner, but a substantive amount of teaching with patients which amounted to about 50 percent of the time devoted to this activity by the Institutional practitioner was so reported. With the exception of the Secondary Institutional practioner (presumably department heads, deans etc.) who devoted 22 percent of his time to administration, all categories had a similar distribution of administrative time (about 10 percent).

The distribution of cardiac problems in office and hospital settings is shown in Table 18. The category "none" includes patients with another primary medical diagnosis or in some cases those patients referred for anethesia check, evaluation of innocent murmurs and for cardiac catheterization and found to be normal (some of these will be listed under "none"). The cardiac problems most frequently encountered in the office were coronary atherosclerosis without acute myocardial infarction, hypertension with chronic heart failure, acute myocardial infarction, arrhythmias and a wide variety of other cardiac and vascular abnormalities. Except for the anticipated higher prevalence of acute myocardial infarction and severe heart failure, a similar pattern was seen in

TABLE 15

CARDIOLOGISTS' PATIENT DISTRIBUTION:
PRACTICE CHARACTERISTICS PERCENT DISTRIBUTION BY SPECIALTY AND PRACTICE

Practice and Patient Characteristics	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
Percent of Cardiologists	37.6	40.7	16.2	5.5	100.0
Percent of Patient Encounters					
Office	34.5	61.1	2.8	1.6	100.0
Hospital	42.9	42.4	10.5	4.2	100.0
Combined	38.1	53.2	6.0	2.7	100.0
Percent of Patients					
Office	35.5	60.1	2.7	1.7	100.0
Hospital	41.7	39.9	13.2	5.2	100.0
Combined	37.3	54.1	5.8	2.7	100.0
Percent of Patients within Own Practice					
Office	32.1	64.5	1.9	1.6	100.0
Hospital	38.9	52.4	5.5	3.2	100.0
Combined	34.3	60.6	3.0	2.1	100.0
Percent of Patients-Referral					
Office	42.2	48.6	7.2	2.0	100.0
Hospital	47.1	31.2	16.1	5.6	100.0
Combined	45.4	37.3	12.9	4.3	100.0
Percent of Primary Cardiac Encounters					
Office	[illegible]5	49.4	4.7	1.4	100.0
Hospital	4[illegible].8	32.5	13.8	3.9	100.0
Combined	47.0	41.5	9.0	2.6	100.0
Percent of Primary Non-Cardiac Encounters					
Office	26.2	70.6	1.3	1.9	100.0
Hospital	36.6	52.2	6.4	4.7	100.0
Combined	30.1	63.8	3.2	2.9	100.0

Source: 3

TABLE 16

CARDIOLOGISTS' PATIENTS: AGE GROUPS
BY TYPE OF SETTING COMPARED TO NATIONAL AGE
GROUPED NORMS

AGE GROUPS (in years)	OFFICE %	HOSPITAL %	COMBINED %	NATIONAL NORMS[1] (1970) %	N
4 and Under	0.6	0.6	0.6	8.4	17,119,245
5 through 14	1.8	1.3	1.6	20.1	40,892,234
15 through 24	8.2	4.8	7.2	17.4	35,302,039
25 through 34	7.7	4.9	6.9	12.2	24,845,947
35 through 44	10.8	9.9	10.5	11.4	23,132,821
45 through 54	17.8	15.6	17.2	11.4	23,158,493
55 through 64	20.0	20.7	20.2	9.2	18,660,224
65 through 74	20.8	24.1	21.8	6.1	12,439,678
75 through 84	10.4	14.5	11.6	3.8	7,662,196
85 and Over	1.9	3.6	2.4	*	
TOTAL	100.0	100.0	100.0	100.0	203,212,877

[1]National Norms: U.S. Bureau of the Census
Census of Population 1970
General Social and Economic Characteristics
Final Report PC(1)-C1 United States Summary

*Census categories group all who are 75 and over.

Source: 3

TABLE 17

CATEGORIES OF CARDIOLOGISTS' AVERAGE DAILY ACTIVITY TIME:
TYPE OF ACTIVITY BY SPECIALTY AND PRACTICE

Type of Activity	Non-Institutional				Institutional				All Cardiologists*	
	Primary		Secondary		Primary		Secondary			
	% of Time	Hours	% of Time	Hours	% of Time	Hours	% of Time	Hours	% of Time	Hours
DIRECT PATIENT CARE										
Unspecified	1.8		5.0		1.6		4.2		3.1	
Hospital	23.7		21.0		15.3		15.0		20.9	
Office	30.3		36.7		3.2		6.7		27.2	
Non-scheduled, Emergency	1.8		2.1		0.8		1.6		1.8	
Lab and Diagnostic Tests	5.4		3.8		9.0		4.7		5.3	
Extended Care Facilities	0.4		1.0		0.0		1.8		0.6	
Patient Records, Charts	7.5		6.1		7.0		6.3		6.7	
Subtotal	70.9	5.9	75.7	6.6	36.9	3.1	40.3	3.4	65.6	5.6
TEACHING										
With Patients	6.6		4.0		13.2		8.5		6.7	
Without Patients	2.4		1.2		6.8		9.5		3.0	
Subtotal	9.0	0.8	5.2	0.5	20.0	1.7	18.0	1.5	9.7	0.8
RESEARCH										
With Patients	0.2		0.2		2.0		1.8		0.6	
Without Patients	1.4		0.8		16.0		5.5		3.9	
Subtotal	1.6	0.1	1.0	0.1	18.0	1.5	7.3	0.6	4.5	0.4
PROFESSIONAL	10.1	0.8	9.3	0.8	13.7	1.2	12.5	1.1	10.4	0.9
GENERAL ADMINISTRATION	8.4	0.7	8.8	0.8	11.4	1.0	21.9	1.9	9.8	0.8
TOTAL	100.0	8.3	100.0	8.8	100.0	8.5	100.0	8.5	100.0	8.5

*Percentages based on weighted frequencies, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Souce: 3

TABLE 18

CARDIOLOGISTS' PATIENTS WITH PRIMARY CARDIAC DIAGNOSES:
RANK ORDERED PERCENTAGE OF OCCURRENCE
BY TYPE OF SETTING

Primary Cardiac Diagnosis	Type of Setting		
	Office %	Hospital %	Combined %
Percent of Total	70.2	29.8	100.0
Coronary Atherosclerosis without Infarction	29.3	19.9	26.1
Hypertension	26.5	9.1	20.7
Acute Myocardial Infarction	4.9	18.1	9.4
Heart Failure: Chronic, Severe	7.0	10.2	8.1
None	7.1	3.8	5.8
Rheumatic	5.0	5.2	5.1
Arrhythmia	3.9	4.5	4.1
Cerebral Vascular Disease	3.0	4.1	3.4
Peripheral Vascular Disease	3.0	3.3	3.1
Heart Failure: Acute, Severe	1.3	6.2	2.9
Other	1.9	2.2	2.0
Pulmonary Embolism	0.8	3.1	1.6
Psychosomatic (Cardiac)	1.7	1.3	1.6
Post Cardiac Surgery	1.2	2.5	1.6
Congenital	1.3	1.8	1.5
Cardiomyopathy	1.2	1.9	1.4
Pacemaker Evaluation	0.6	1.3	0.9
Pericardial Disease	0.3	1.2	0.6
Infectious	0.0	0.3	0.1
Total	100.0	100.0	100.0

Source: 3

the hospital. Extremely few encounters were reported relative to activities such as pacemaker evaluation (0.6 - 1.3 percent). A small but significant prevalence (1.5 percent) of congenital heart disease was reported by these physicians. This is summarized in Figure 1. It was to be expected that the proportion of acute myocardial infarction and acute severe cardiac failure seen in the hospital exceeded that seen in the office by a factor of four. On the contrary, the prevalence of hypertension identified as a problem in office setting was twice that of its prevalence in the hospital. Figure 2 presents the percent of non-cardiac diagnoses for all cardiologists. The distribution is as might be anticipated.

The choice of cardiac diagnostic and therapeutic modalities according to patient diagnosis is indicated in Table 19. There was a significantly greater use of non-invasive procedures, cardiac catheterization and evaluation for cardiac surgery in the hospital than in the office. A high percentage of patients with congenital heart disease, rheumatic heart disease, cardiomyopathy and infection (presumably bacterial-endocarditis) were considered for cardiac catheterization. A relatively small percentage of patients with coronary atherosclerosis were so referred. Evaluation for cardiac surgery was recommended in patients with congenital heart disease, "infections" and rheumatic disease in a high proportion of instances. Evaluation of cardiovascular surgery in an office or hospital setting was undertaken for a very small proportion of patients with coronary atherosclerosis.

Table 20 shows those diagnostic tests and procedures recommended by different categories of physicians. Vectorcardiography, phoncardiography, and non-invasion techniques as well as right or left heart catheterization with or without angiography were utilized dominantly by Institutional Primary Cardiologists.

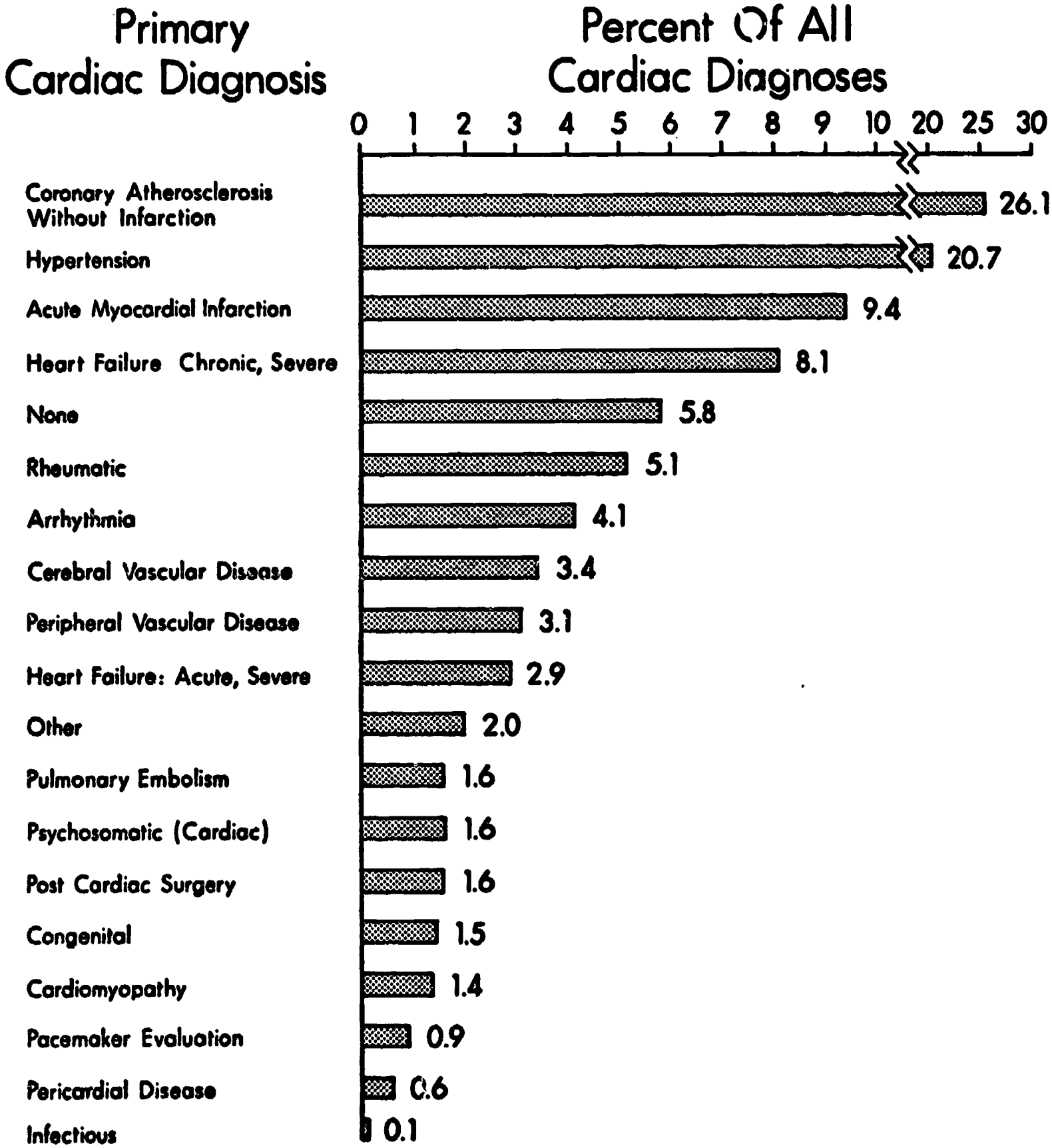
Figure 3 indicates the allocation of time by the cardiologist to the patient in the office and hospital. The physician averaged between 6 and 15 minutes to visit both the office and hospitalized patient. A second peak of time distribution between 26 and 30 minutes for both the office and hospital patient may in indicate the average duration of first visits. Only in a very small proportion of instances did the duration of physician-patient contact exceed 60 minutes, in either the hospital or office setting.

SUMMARY AND RECOMMENDATIONS

As expected, this study has shown that many older cardiologists who obtained training prior to the extensive use of cardiac catheterization and cardiovascular surgery are using their valuable professional skills in clinical diagnosis, electrocardiography, the management of arrhythmias and the drug therapy of heart disease. On the other hand, younger physicians who are recent graduates of contemporary training programs, are utilizing strikingly different techniques and hence contribute through a different form of practice.

FIGURE 1

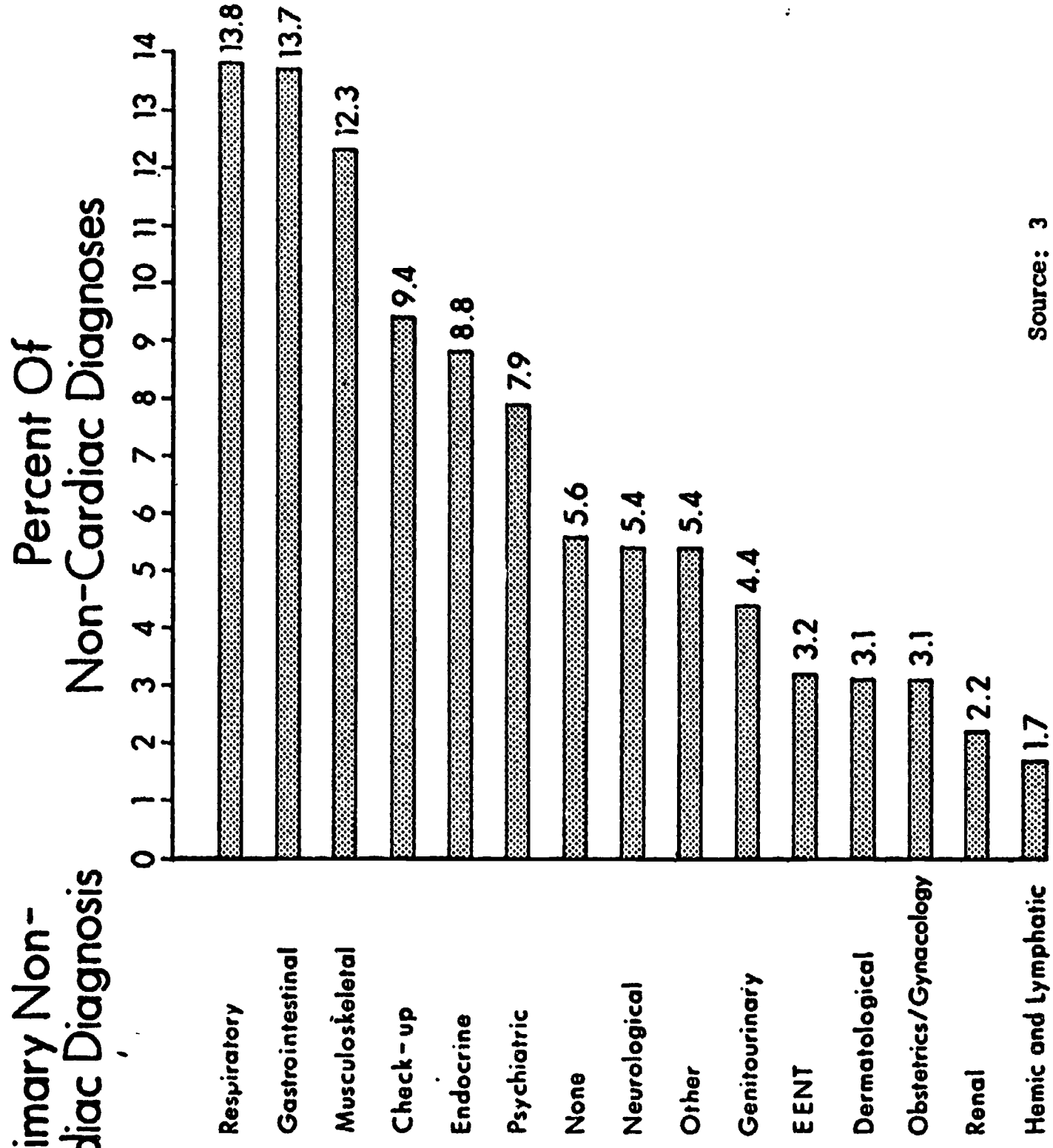
CARDIOLOGIST'S PATIENTS WITH PRIMARY CARDIAC DIAGNOSIS



Source: 3

FIGURE 2

CARDIOLOGISTS' PATIENTS WITH PRIMARY NON-CARDIAC DIAGNOSIS



Source: 3

TABLE 19

ALL CARDIOLOGISTS:
PERCENTAGE OF CHOICE OF SELECTED DISPOSITIONS (Rx)
APPLIED TO PATIENTS WITH PRIMARY CARDIAC DIAGNOSES

Disposition or Treatment			Primary Cardiac Diagnosis (Percent Receiving Treatment for each Diagnosis Condition)															
Type	Type of Setting**	Average Use for Treatment	Heart Failure: Acute, Severe	Heart Failure: Chronic, Severe	Acute Myocardial Infarction	Pulmonary Embolism	Pericardial Disease	Coronary Atherosclerosis, without Infarction	Hypertension	Rheumatic	Cardiomyopathy	Arrhythmia	Infectious	Peripheral Vascular Disease	Cerebral Vascular Disease	Psychosomatic (Cardiac)	Post Cardiac Surgery	Pacemaker Evaluation	Congenital
Prescribed Drugs	O	76.0	64.8	83.7	75.7	66.9	67.9	76.7	83.6	71.4	47.9	83.6	*	71.2	82.8	71.0	52.4	41.7	32.6
	H	66.4	83.7	83.1	72.0	62.6	36.7	59.1	72.3	57.4	66.8	61.6	52.1	60.5	68.6	59.9	68.3	34.0	26.2
Ordered Routine Lab Tests	O	32.6	27.9	35.7	37.0	27.3	24.6	31.2	32.7	38.1	36.0	31.8	-	25.5	40.8	36.1	32.2	27.3	30.4
	H	39.7	52.4	51.0	47.8	48.2	36.2	30.7	34.3	42.0	32.0	27.0	38.7	41.8	35.7	30.7	38.8	15.4	32.0
Ordered ECG	O	25.7	32.4	26.1	44.7	27.2	19.2	28.4	19.2	29.9	48.4	47.9	-	11.0	12.6	42.9	21.2	56.5	40.3
	H	27.7	35.2	33.4	37.7	29.6	16.1	25.2	19.6	24.5	30.0	33.2	6.7	11.3	16.2	44.3	17.1	27.5	22.8
Ordered Other Non-Invasive Studies	O	2.8	5.4	2.1	1.5	6.5	-	3.1	1.0	5.4	13.8	2.9	-	1.0	1.7	4.0	4.8	3.7	9.7
	H	6.1	5.2	6.7	2.7	8.5	14.3	6.2	4.5	10.7	19.7	6.3	-	6.0	2.6	12.5	1.8	7.8	19.2
Ordered Catheterization Test	O	1.3	1.8	0.5	1.7	3.9	-	2.2	0.2	3.0	2.9	-	-	1.9	-	0.6	5.8	-	9.1
	H	4.9	2.3	3.1	1.5	7.4	8.8	6.9	0.5	13.8	17.2	1.9	13.4	6.2	2.5	4.5	4.6	6.2	26.9
Evaluation for Cardiovascular Surgery	O	0.8	1.8	0.3	0.6	-	-	1.4	-	2.6	-	0.3	-	2.4	-	-	2.4	-	3.9
	H	3.3	1.5	3.5	1.1	0.4	-	3.5	1.5	14.9	2.5	3.9	13.4	5.9	0.5	-	3.2	6.8	15.1
Evaluation for Other Surgery	O	0.5	-	0.9	-	-	-	0.6	0.4	1.3	-	-	-	2.4	-	-	-	-	-
	H	1.1	0.3	1.0	-	2.6	-	1.8	1.2	0.8	1.1	1.0	-	2.0	-	1.7	-	1.1	6.1
Office Patients N_w=4376: Percent with Specific Diagnosis		-	1.3	7.0	4.9	0.8	0.3	29.3	26.5	5.0	1.2	3.9	*	3.0	3.0	1.7	1.2	0.6	1.3
Hospital Patients N_w=2636: Percent with Specific Diagnosis		-	6.2	10.2	18.1	3.1	1.2	19.9	9.1	5.2	1.9	4.5	0.3	3.3	4.1	1.3	2.5	1.3	1.8

* Insufficient Data
** "Type of Setting": O=office; H=hospital.
N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

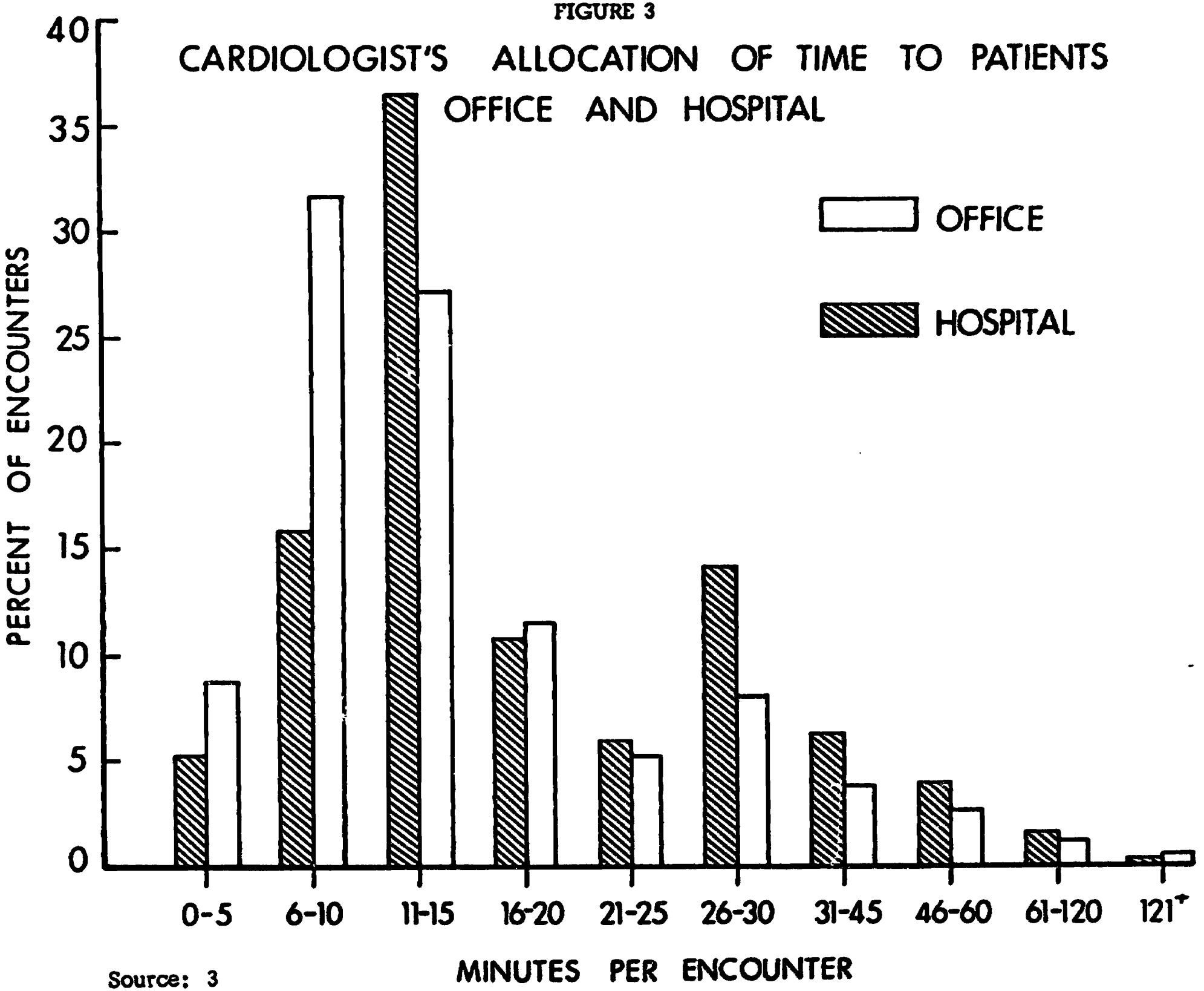
TABLE 20

CARDIOLOGISTS' UTILIZATION OF CARDIAC
DIAGNOSTIC TESTS AND PROCEDURES
PERCENT OF USE BY SPECIALTY AND PRACTICE

Type of Test	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
Electrocardiogram	78.4	75.5	77.2	77.4	77.1
Vectorcardiogram	1.1	0.9	8.8	0.2	2.0
Phonocardiogram	2.2	0.4	5.5	0.5	1.8
Non-Invasive Techniques	1.8	0.2	5.9	0.4	1.6
Exercise Testing	3.8	4.0	5.2	1.6	3.9
Cardiac Fluoroscopy	3.0	2.4	5.4	0.4	2.8
Chest X-ray	18.9	28.3	15.5	17.6	2[illegible].2
R or L Heart Catheterization	0.5	0.7	3.3	0.3	0.9
R or L Heart Catheterization with Angiogram	1.4	0.4	9.3	2.0	1.9
Flotation Catheterization	-	-	0.5	0.1	-
Selective Coronary Arteriogram	1.2	0.4	6.2	0.5	1.4
Pulmonary Angiogram	0.1	-	1.1	0.5	0.1
Non-Coronary Arteriogram	0.3	-	0.7	0.8	0.2
HIS Bundle Recording	0.1	-	1.2	-	0.1
Pacemaker Insertion	0.6	-	1.3	0.2	0.4
Pacemaker Evaluation	0.7	0.1	1.5	0.4	0.5
Other	2.8	3.6	2.3	10.1	3.7
Routine Lab Tests	12.2	20.1	3.2	7.4	14.1

Source: 3

FIGURE 3



Source: 3

Four general types of profiles of cardiologists were identified on the basis of types of activity. Clearly, specific activities extended from one category to another, but the general activities appeared to differ to a degree sufficient to justify separation. These four divisions of cardiologists described by the survey can perhaps be identified by more appropriate terms than Institutional or Non-Institutional, Primary or Secondary. Thus, the group of Non-Institutional Primary Cardiologists may be looked upon as Clinical Cardiologists, while the Secondary Non-Institutional Cardiologist is usually the Internist-Cardiologist. The Institutional Primary Cardiologists devoting more than 50 percent of their time to problems of cardiovascular disease would likely include a substantive number of Cardiac Specialists while the Institutional Secondary Cardiologists might include both the Academic Cardiologist and those physicians conveniently collected under "other" who might have an infrequent occupation, for example, cardiac rehabilitation. A brief conceptual description based upon the data of this study of functions and activities of these four categories of cardiologists follows.

Internist-Cardiologist. This physician usually functions as a solo practitioner or may be associated with a small group. In larger group practices (greater than 20 members) this physician may see the majority of patients with signigicant problems of cardiovascular medicine within a department of internal medicine. However, he is usually private-office based and may be in the older age bracket. He sees a wide variety of both selected and non-selected cardiovascular problems either as a primary care physician or as a referral physician in his community. He will usually perform and interpret his own electrocardiograms and may serve in an electrocardiographic laboratory as an interpreter of records. He will be knowledgeable of and have access to other laboratory procedures in cardiovascular disease but will rely on others to perfrom them. He will provide general internal medical and cardiac care for most of his own patients in the hospital and may rely on other cardiac specialists for support in more complex diagnostic procedures such as cardiac catheterization, and in the management of serious and critical cardiovascular disease or arrhythmias. He is not involved in research but he may be involved in teaching medical students, house officers, and nurses. He is Board eligible in Internal Medicine and may be Board certified.

Clinical Cardiologist. This physician performs many of the functions of the Internist-Cardiologist but applies more of his time to special problems of cardiovascular disease. He is primarily office based but may have substantive hospital responsibilities. He is usually in solo or small group practice but may be an important physician in a salaried institutional setting. In the latter circumstance he will maintain a similar practice pattern seeing a substantive number of referred cardiac outpatients. He will spend more time than the Internist-Cardiologist in consultation on cardicvascular problems in one or more community hospitals. He will participate in the hospital ECG Department as an interpreter of records and frequently as the chief of the heart station.

He will participate in a coronary care unit and may function as chairman of the coronary care unit committee for his community hospital. He will do little or no research but may report interesting clinical phenomena to meetings of the hospital staff. He will have more hospital teaching responsibilities for nurses, house officers, and medical students than the internist. He may have an association on a part-time basis with a teaching hospital and may hold clinical faculty rank. He may be compensated on a part-time or fee-for-service basis by a community hospital or other institution. This type of physician will usually be Board Certified in Internal Medicine and will have had some specialty training in general cardiology with particular emphasis on electrocardiographic interpretation and intensive coronary care. Many of the younger Clinical Cardiologists will have acquired skills in cardiac catheterization and coronary angiography during their training and may serve on catheterization teams in teaching hospitals. These special skills are not necessary, however, for the clinical cardiologist although he should know indications for these procedures and how to interpret the data. It is probably that in the future more and more clinical cardiologists will utilize newer non-invasive diagnostic techniques.

The above two groups of cardiologists, both predominantly based in solo or small group Non-Institutional practice, care for 80 percent of cardiology patients seen by physicians who identify themselves as having special interests or skills in cardiovascular disease. However, this patient population accounts for an unknown but probably small portion of all patients suffering from diseases of the heart and blood vessels. It is assumed that the primary care of such patients is accomplished by internists or family practitioners.

Cardiac Specialist. The Cardiac Specialist is generally younger and a product of more formal training programs developed in the middle to late 1950's and subsequently. He will usually be Certified in Internal Medicine and in the Subspecialty of Cardiovascular Disease. At the present time he frequently is concerned with activities in cardiology usually requiring special skills or expertise. In addition, he will frequently see patients with cardiovascular disease in consultation, may provide primary care to a small group of patients with cardiovascular disease or other internal medicine problems. This physician will be trained and competent in cardiac catheterization and frequently in coronary arteriography. He will be capable and familiar with modern non-invasive techniques. He will have a greater knowledge and competency in more specialized cardiovascular areas, that is the management of hypertension, valvular heart disease, cardiac arrhythmias, acute myocardial infarction, selection of patients for cardiovascular surgery and frequently will have some knowledge of congenital heart disease. He also will be an interpreter of electrocardiograms, phonocardiograms, echocardiograms, etc. He may be chief of the heart stations, director of the cardiac catheterization laboratory or director of a coronary care unit. Although he provides clinical consultation, much of his practice and his value to community

practice is based upon the special skills with which training in the more recent past has provided him. The Cardiac Specialist will be competent in the conduct of clinical investigation although it is unusual for him to have highly developed skills or motivation. He will be engaged in investigation related directly to the disease state of patients who come under his care. He will contribute to the medical literature in this respect with clinical descriptions of unusual cardiovascular disease. He will report the results of special procedures and tests in interesting or unusual clinical circumstances. It is only rarely that he will conduct basic laboratory investigations. He will be actively involved in the teaching of medical students, house officers, and nurses. He will be capable of writing modern guidelines for optimal care of cardiac patients in his community hospital and in the promulgation of such information to the community at large. He will usually be Institutionally based but may combine this with an office practice within or outside of the institution. He will usually be salaried by the institution but a wide variety of financial arrangements for compensation will exist. His patients are usually physician-referred, often from internists, Internist-Cardiologists or Clinical Cardiologists. This physician is younger than those in Non-Institutional practice by virtue of the recent expansion of technology in the field of cardiology.

Academic Cardiologist. The Academic Cardiologist is not definable within a single profile but is an individual who may devote his time to several important categories of activity. He will not spend the majority of his time in direct patient care. It is usual, however, for his responsibilities to be divided between teaching in a clinical setting, research in a clinical or basic setting, administration and clinical care in that order of relative effort. The background of the Academic Cardiologist usually involves certification in internal medicine and frequently in cardiovascular diseases. His training has involved cardiac catheterization as well as electrocardiography and clinical cardiology. He has usually devoted 1-2 years to cardiovascular research, frequently in the basic science areas. The age of such individuals is similar to the Clinical Cardiologist - older than the cardiac specialist and younger than the Internist-Cardiologist. He is institutionally based and usually institutionally compensated. He will frequently be director of professional programs and perhaps of a patient service area such as a heart station.

The above four categories describe in a general way the present activities of adult cardiologists and hence serve to define a distribution of physician skills. Clearly they do not represent a rigid categorization either of specific professional skills or personal professional arrangements. Consideration of the data may allow prediction of training needs and geographic distribution.

Recommendations regarding the content and type of training for the various categories of cardiologists are found in Chapters Five and Six. Those pertaining to the numbers required in each category are found in Chapter Seven.

CHAPTER 5

TRAINING PROGRAMS IN CARDIOLOGY

Noble O. Fowler, Herbert N. Hultgren, and Henry D. McIntosh

INTRODUCTION

A major objective of this study was to identify and describe in some detail the number, distribution, content, quality, duration, faculty, facilities and certain other aspects of training programs in cardiology in the United States today. Such information, as well as number of trainees positions available, filled and potential for expansion was unknown prior to the study, but it seemed essential in considering the manpower needs in cardiology.

Training Programs were defined as full-time cardiovascular training programs of at least one year's duration. This definition was developed during the study when it became apparent that there were no listings of cardiovascular disease training programs. The source listing for training programs was provided by the American Medical Association and consisted of approximately 500 institutions in the United States with approved residencies in Internal Medicine. This study included 329 institutions involved in cardiovascular disease training.

NUMBER AND DISTRIBUTION OF TRAINING PROGRAMS

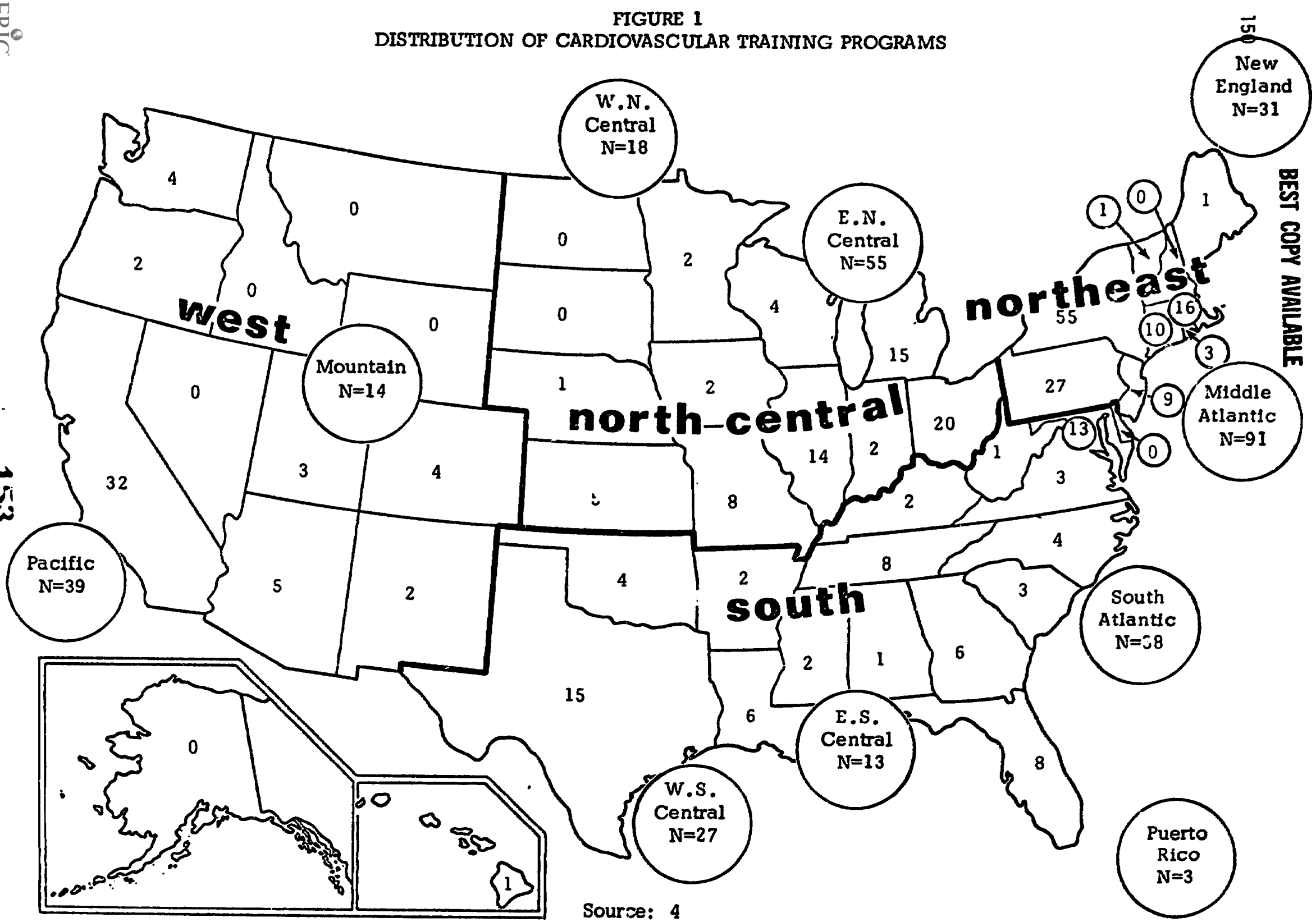
There were 534 institutions and organizations either responsible for or conducting internal medicine training programs at the beginning of 1973. Of these, 329 offered at least one year of training in cardiology, with the majority (73 percent) providing training of two years duration.

The data in this report are based on the returns of a questionnaire from directors of 190 of the 329 programs who responded to the questionnaire. All estimations have been projected for the 329 programs with the assumption that the non-responding programs were similar to the programs responding to the questionnaire. The validity of this assumption is discussed in the section on methods (Chapter 2). The number of training programs in non-approved hospitals is probably small and was excluded from this report.

Figure 1 shows the geographical distribution of the 329 training programs in cardiology by state, census division and region. As might be expected, the training programs were most numerous in the areas of high population density.

Table 1 shows the total number of trainees in the 329 programs for the years 1970-1973. In addition, Table 1 shows the average number of trainees per program by year with an estimate of the number of trainees completing the training each year. It is obvious that the number for each variable has increased

FIGURE 1
DISTRIBUTION OF CARDIOVASCULAR TRAINING PROGRAMS



Source: 4

TABLE 1

Numbers of Trainees Enrolled and Completing Training 1970-1973

Year	Number of Trainees Enrolled	Average Number of Trainees/Program	Number of Trainees Completing Training
1970-71	970	3.09	617
1971-72	1188	3.79	711
1972-73	1278	4.09	791

Source: 4

over the past three years and that we can anticipate having about 800 individuals complete their training each year. The actual number may be somewhat larger due to trainees completing programs in non-approved hospitals and trainees who take their final year of training in positions outside of a cardiology program such as a final year of medical residency or an instructorship.

It is of interest to note that cardiologists tend to practice in areas close to where they were trained. This is shown in Figures 2 and 3. They may have selected their training program based on an area where they plan to practice. Either selection before initiating training or during training seems to have the effect of locating the majority of cardiologists.

Candidates who are seeking certification in the subspecialty of cardiovascular disease have increased over the past four years as evidenced by the numbers taking the oral and written examination. Data obtained from the Subspecialty Board on Cardiovascular Disease indicate consistent increases from 1969 through 1972 as follows:

Oral Examinations in 1969 for 84 candidates with 64 certified
Oral Examinations in 1970 for 126 candidates with 92 certified
Oral Examinations in 1971 for 135 candidates with 119 certified

Written Examinations in 1972 for 543 candidates with 431 passing the examination.

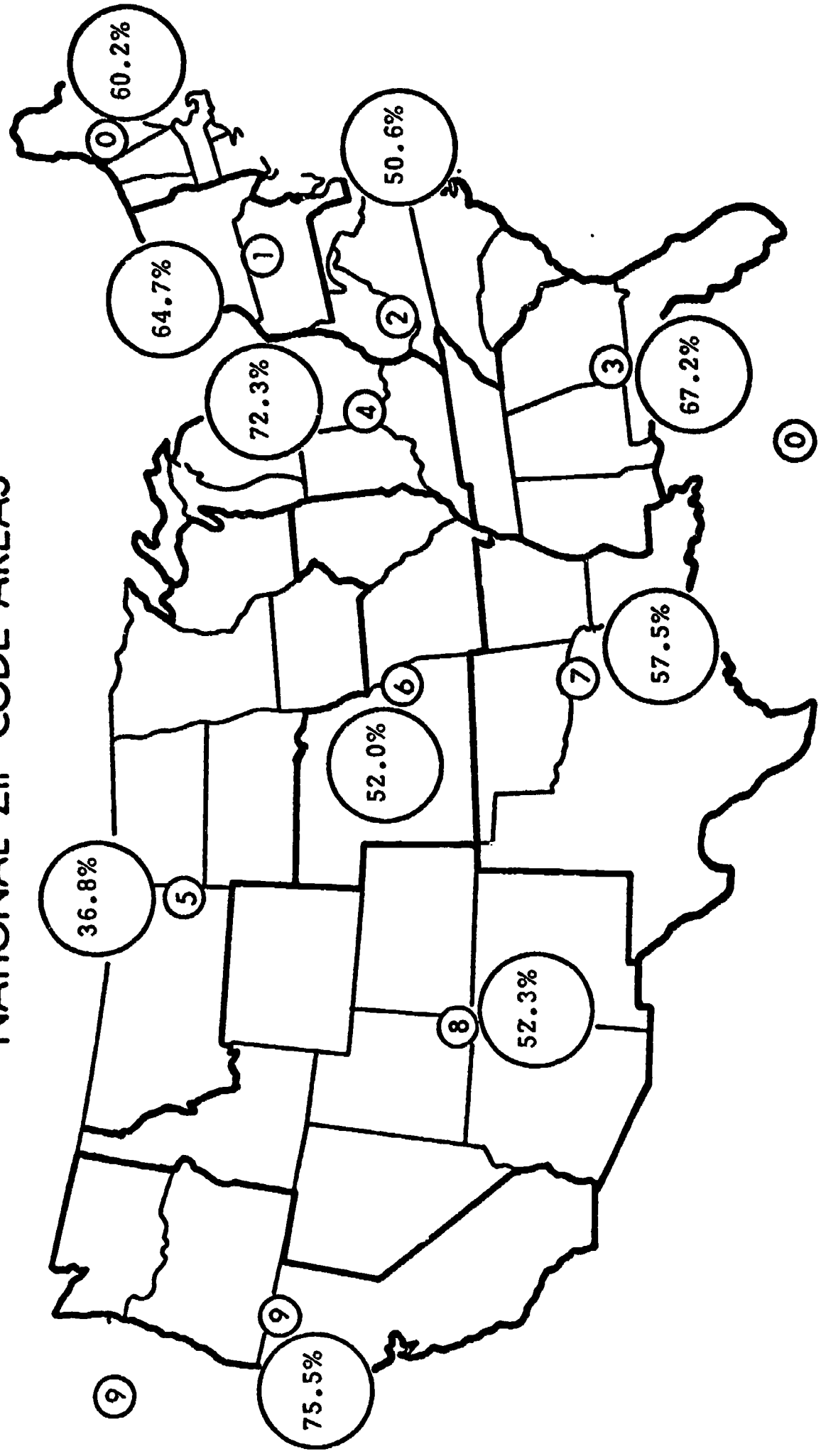
CONTENT AND DURATION OF TRAINING

Considerable variability was found in the content of the various cardiology training programs surveyed. Some of the variability was due to whether the program offered was of one or two years duration. At the present time, it is not known to what extent the different programs can and are able to meet the high standards of training experience recommended by the Subspecialty Board in Cardiovascular Disease. The detailed recommendations of this Board appear in Chapter 8, page 293. Major elements of their recommendation include: acquisition of clinical skills used in diagnosis, mastery of laboratory techniques, instruction and experience in management of various types of heart disease, and opportunity for research. They stress the importance of a certain core experience provided in sufficient depth and with sufficient emphasis on scholarship, self-instruction and development of critical judgement, so that the trainee-product of the program will not become dated after he has entered his chosen profession.

As shown in Table 2, most of the trainees entering cardiology training programs have had two years of post-M.D. training prior to entering the program. Forty-nine percent of the programs required two years, and 46 percent required three years. Thus, less than half of the entering trainees (46 percent) have fulfilled

FIGURE 2

NATIONAL ZIP CODE AREAS

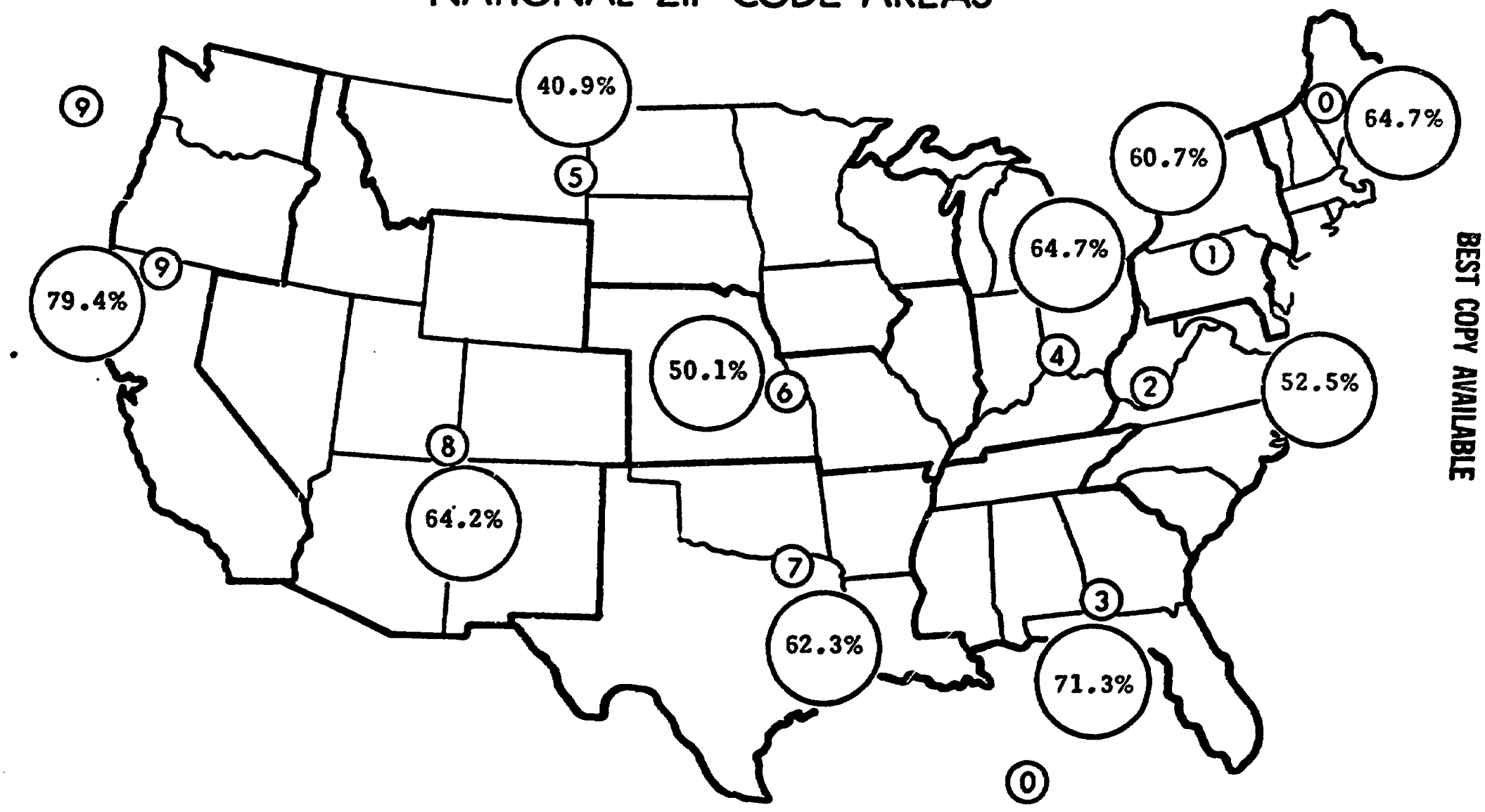


PROPORTION OF CARDIOLOGISTS WITH FELLOWSHIP TRAINING PRACTICING IN AREA WHERE TRAINED
(defined by national zip code area boundaries)

Source: 4

FIGURE 3

NATIONAL ZIP CODE AREAS



PROPORTION OF CARDIOLOGISTS PRACTICING
IN AREA WHERE LAST TRAINED
(defined by national zip code area boundaries)

Source: 4

TABLE 2

MINIMUM REQUIRED YEARS OF POST-MD TRAINING: PERCENTAGE DISTRIBUTION BY NUMBER OF YEARS AND THREE TYPES OF TRAINING INSTITUTIONS[1]

Number of Years	All Programs	Type I Programs	Type II Programs	Type III Programs
	N=190	N=50	N=91	N=49
	%	%	%	%
No Answer	1.1	2.0	0.0	2.0
One	1.6	2.0	2.2	0.0
Two	48.9	56.0	48.2	42.9
Three	45.8	36.0	36.2	55.1
Over Three	2.6	4.0	3.3	0.0

[1]Training institutions categorized based on number of internal medicine residencies: Type I = 1 to 15; Type II = 16 to 41; Type III = 42 and over.

Source: 4

the requirements for Board Certification in Internal Medicine before beginning their cardiovascular disease training.

The time spent by trainees in cardiology training programs varies, in part, depending upon the career objectives of the trainee. A minimum of two years of training in cardiology is required for Subspecialty Board Certification in Cardiovascular Disease. Approximately 73 percent of the training programs provide two-years assuming they will train their candidates to the level of Subspecialty Board requirements. The average number of hours offered or required by broad categories in the two-year programs are shown in Table 3.

According to estimates made by cardiology training program directors, the majority of their trainees received sufficient training to perform adequately in most areas. There are differences in skills acquired according to whether the training is for one year or for two years. Table 4 indicates the percentage of program directors who indicated their trainees had the skills upon program completion.

It is clear that striking differences existed between some programs in regard to content. Some of these differences are shown in Figures 4, 5, and 6 which display the frequency distribution curves for: cardiac catheterization, electrocardiography, and echocardiography. Such data are valuable in determine how many training programs are providing proper experiences in the different categories considered to be important.

FACULTY IN CARDIOLOGY

In 1973 the average training program had 4.6 full-time professional staff members and 3.7 part-time staff members, primarily in the division of cardiology, contributing directly to the program (Table 5). In addition, there were 1.9 full-time and 1.8 part-time staff members, primarily in other divisions, who also contributed to the program. Thus, the faculty manpower devoted to training programs was considerable with 2,734 cardiologists (full-time and part-time), primarily in the cardiology division, who devoted part of their time to the training of 1,278 trainees.

The full-time staff devoted from 60 to 67 percent of their professional time to the cardiology training program. The findings were as follows:

Program Directors	67 percent
Associate Directors	65 percent
Cardiology Staff	59 percent
Non-Cardiology Staff	61 percent

TABLE 3

AVERAGE NUMBER OF HOURS IN SPECIFIC TRAINING AREAS
IN TWO-YEAR PROGRAMS

Training Area	Hours
Cardiac Patient Care	
Pediatric	209
Medical	1140
Surgical	279
Cardiovascular Research	
Clinical	384
Basic	350
Teaching	
Clinical	298
Didactic	112
Laboratory Diagnostic Techniques	
Angiography	423
Cardiac Catheterization	481
Echocardiography	114
Electrocardiography	331
Exercise Testing	130
Pacemaker Insertion	81
Phonocardiography	130
Vectorcardiography	77
Laboratory and Classroom Instruction in Basic Sciences and Clinical Diseasc	494
TOTAL HOURS	5033

Source: 4

TABLE 4

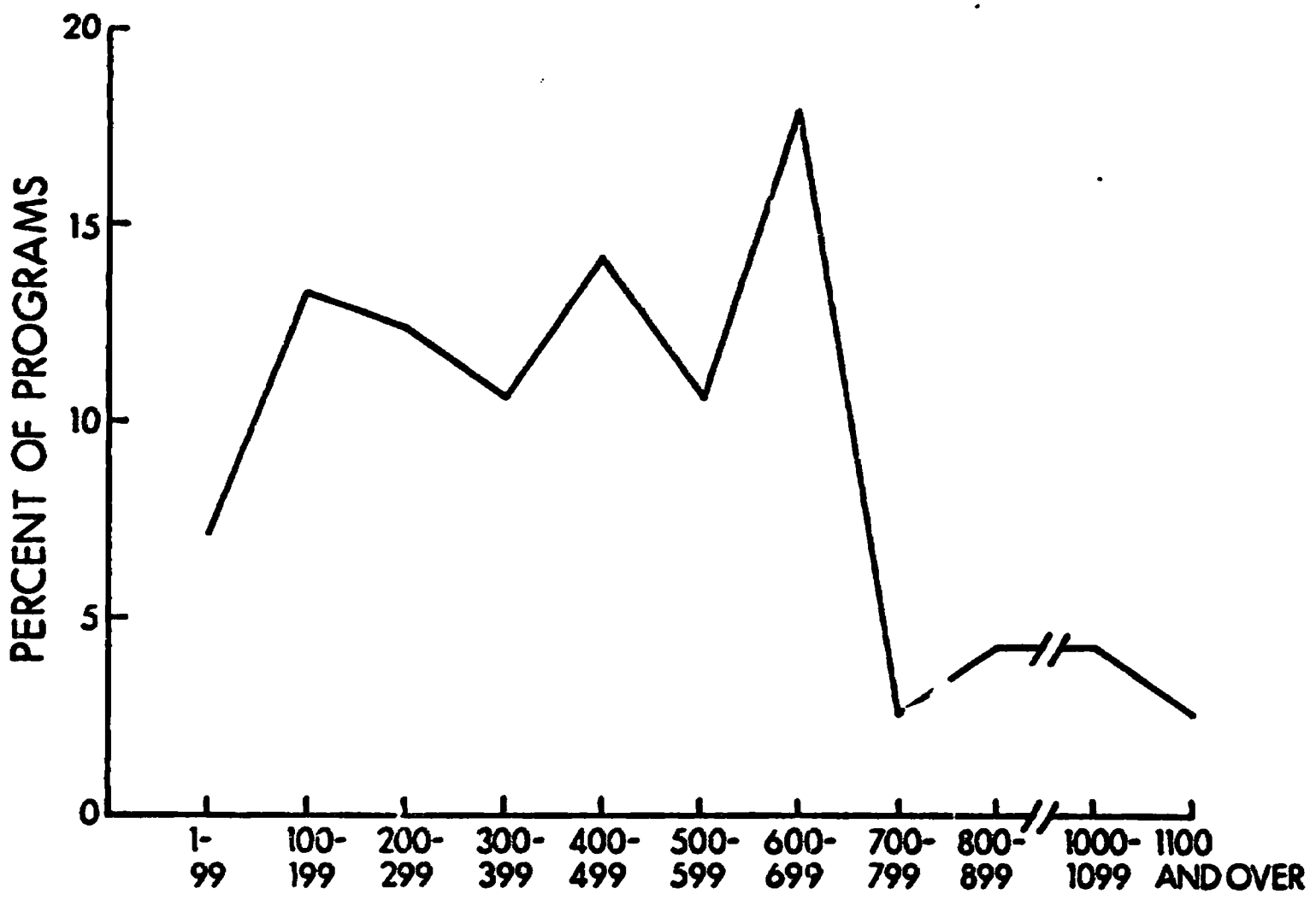
PERCENTAGE OF DIRECTORS INDICATING SKILL COMPETENCE
OF TRAINEES UPON COMPLETION OF TRAINING

Skill Area	One-Year Programs N=51	Two-Year Programs N=139	All Programs N=190
Manage an intensive care or coronary care facility	98	97	97
Teach students, house staff or fellows	94	98	97
Perform as a consultant cardiologist	87	98	95
Perform and teach others non-invasive lab techniques	83	90	88
Conduct diagnostic cardiac catheterization	60	96	86
Eligible for cardiology subspecialty boards	51	99	86
Conduct clinical research	66	82	78
Perform and teach cardiac diagnostic x-ray procedures	49	84	74
Conduct basic laboratory research	6	16	13

Source: 4

FIGURE 4

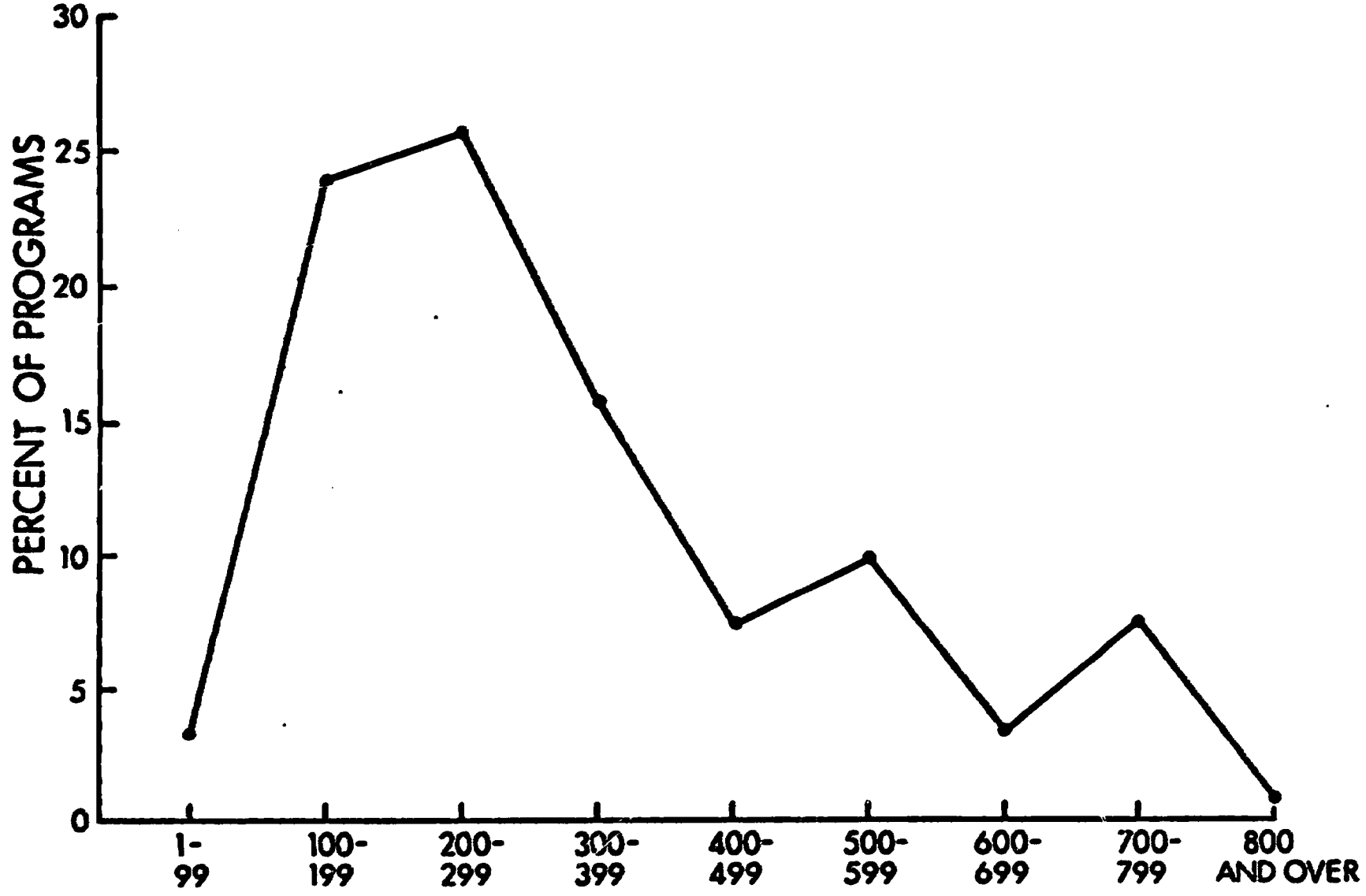
ALL TRAINING PROGRAMS DISTRIBUTION OF REQUIRED HOURS IN CARDIAC CATHETERIZATION
(76 Percent Responding)



Source: 4

FIGURE 5

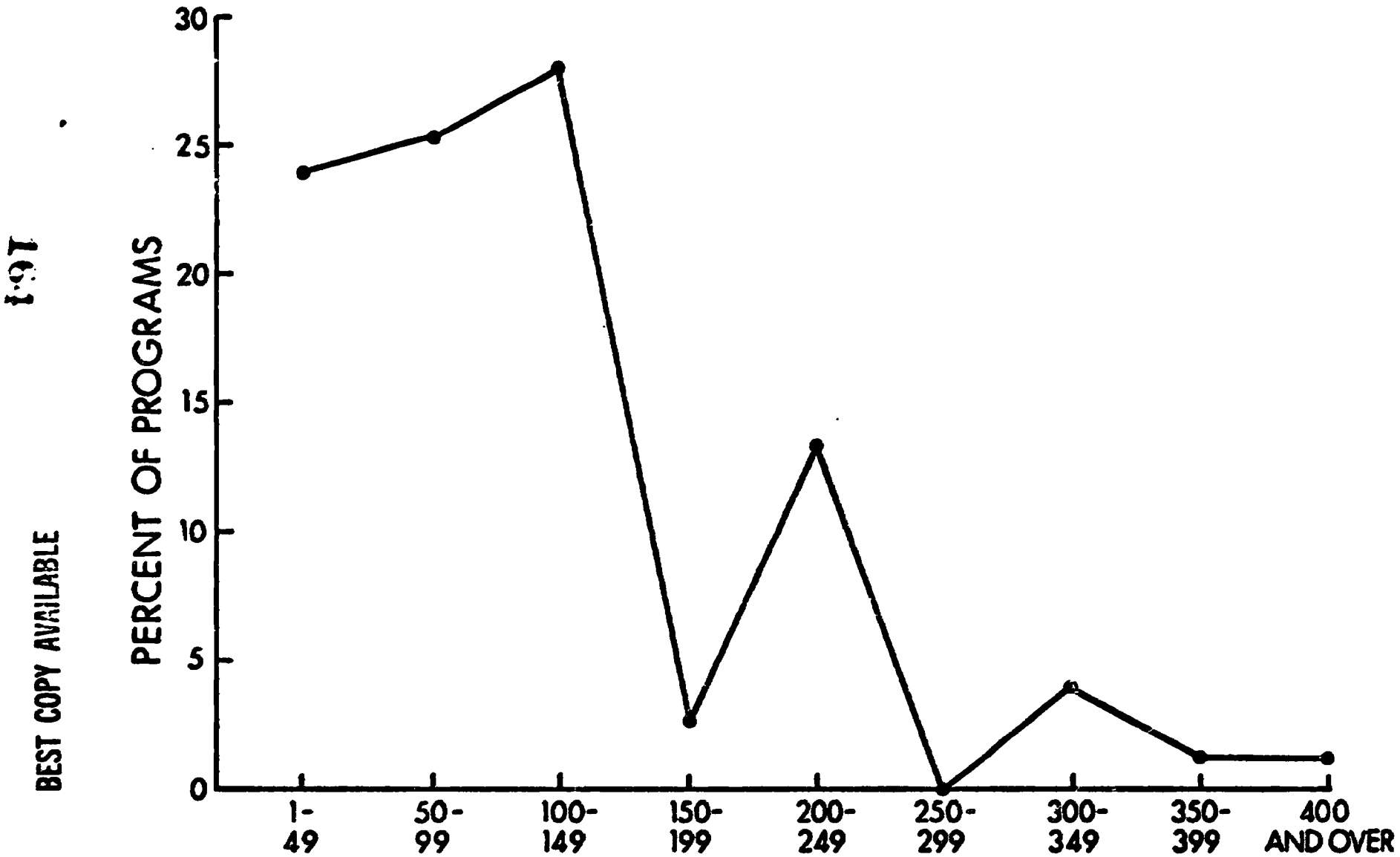
ALL TRAINING PROGRAMS DISTRIBUTION OF REQUIRED HOURS IN ELECTROCARDIOGRAPHY
(96 Percent Responding)



Source: 4

FIGURE 6

ALL TRAINING PROGRAMS DISTRIBUTION OF REQUIRED HOURS IN ECHOCARDIOGRAPHY
(49 Percent Responding)



Source: 4

TABLE 5

NUMBER OF PROFESSIONAL STAFF IN CARDIOVASCULAR DISEASE TRAINING PROGRAMS

Staff by Division	Mean/Program	Total Programs (N=329)
Primarily in Cardiovascular Division		
Part-Time	3.71	1220.8
Full-Time	4.69	1513.4
sub-total		2734.0
Primarily in Other Divisions		
Part-Time	1.82	598.8
Full-Time	1.91	628.4
sub-total		1227.2
TOTAL		3961.2

Source: 4

The numbers of faculty per program are means. Thus, some programs may have as many as 21 faculty, while others may have no full-time faculty. In fact, about 5 percent of the training programs had no full-time faculty!

A shortage of faculty appears to exist in some training programs. Twenty-nine percent of the 329 programs had an average of 1.87 staff positions budgeted but unfilled - a total of about 150-180 positions. It is evident, however, that the majority had adequate faculty, since program directors indicated that with their existing facilities and staff they could accommodate an additional 665 trainees if funds for trainees were available.

The staff of most training programs were highly qualified. As an average, 69 percent of the full-time staff were Board Certified in Internal Medicine, and 25 percent were certified in the Subspecialty Board in Cardiovascular Disease.

Training program directors estimated that an average of 2.63 additional staff positions will be required from 1973 to 1978 if they are to increase their trainee capacity by 58 percent over that period. This represents a total estimated five year increase in staff of between 800 and 850. These figures do not include additional staff needed for new programs that might start during this time period, and it assumes that existing programs will continue.

FACILITIES AND MATERIALS

Important elements in a cardiology training program are the numbers of cardiac patients seen: in the hospital, in the outpatient clinic, and in the various cardiovascular laboratories. Table 6 shows the mean values for some aspects of the above, obtained from the questionnaire to the training program directors. These statistics are means for all hospitals and for all training programs. While variation was large, the statistics are broadly descriptive of overall resources.

Table 7 shows the mean percentage of outpatient and inpatient visits per year by general diagnosis. As would be expected, coronary, hypertensive, and rheumatic heart disease were the most common problems seen.

Ninety-four percent of the program directors indicated that they had facilities for research. In 40 percent, the research was clinical; in 5 percent it was basic; and in 55 percent it was combined.

On an average, each training program performed 583 cardiovascular surgical procedures per year. The percentages by major category were as follows: coronary 36 percent, valvular 25 percent, peripheral vascular 23 percent, congenital 13 percent, and others 3 percent.

TABLE 6

Hospital Facilities and Laboratory Services for the Average Cardiovascular Training Program

Facilities and Services	Mean Number
Inpatient Beds	
General Medicine	204
Cardiac Medicine *	22
CCU or ICU	19
Cardiac Surgery	13
Inpatient Admissions per Year	
General Medicine	4,936
Cardiac Medicine	1,561
CCU or ICU	838
Cardiac Surgery	583
Outpatient Services	
General Medicine Visits per Year	23,106
Cardiac Medicine Visits per Year	2,712
Laboratory Procedures per Year	
Angiograms	555
Cardiac Catheterizations	368
Echocardiograms	162
Electrocardiograms	21,264
Exercise Tests	315
Vectorcardiograms	291

* These beds are not necessarily segregated beds on a separate cardiology service, but include segregated beds as well as beds on a general medical service which are occupied by patients with primary cardiac problems being evaluated by the cardiology service. These figures may underestimate the number of beds, since some program directors only included segregated beds in their report. No data are available regarding the number of training programs that have segregated beds or separate designated cardiology service beds.

Source: 4

TABLE 7

PERCENTAGE DISTRIBUTION OF PATIENTS SEEN
BY CARDIAC DIAGNOSIS IN TRAINING PROGRAMS

Cardiac Diagnosis	Percent of Cardiology Outpatient Visits per Year	Percent of Cardiology Inpatient Visits per Year
Hypertension	20	16
Rheumatic	18	14
Congenital	7	4
Cardiomyopathy	7	6
Coronary	39	47
Peripheral vascular	4	6
Other	5	7

Source: 4

TRAINING MANPOWER

It is evident that training programs in the United States have been expanding over the past several years (Figure 7). Continued expansion would no doubt have occurred if the funding policies in effect prior to 1973 were continued. Present program directors estimate that their cardiology programs could accommodate 58 percent more trainees over a five-year period if appropriate funds for this expansion were available.

Thus, it can be estimated that if appropriate funds were available, by 1978 a total of 1,250 to 1,300 cardiologists could complete their training that year. This estimate does not include trainees from new training programs that might be started after 1973, and it assumes that existing training programs would continue.

Two-thirds of the present programs (1972-73) could accommodate an average of 1.7 additional trainees in the first year with their existing staffs and facilities if trainee stipends were available. Thus, an estimated 200 additional physicians could be added immediately to existing training programs. Increases beyond this level would require additional funding for program staffs, trainee stipends and training facilities.

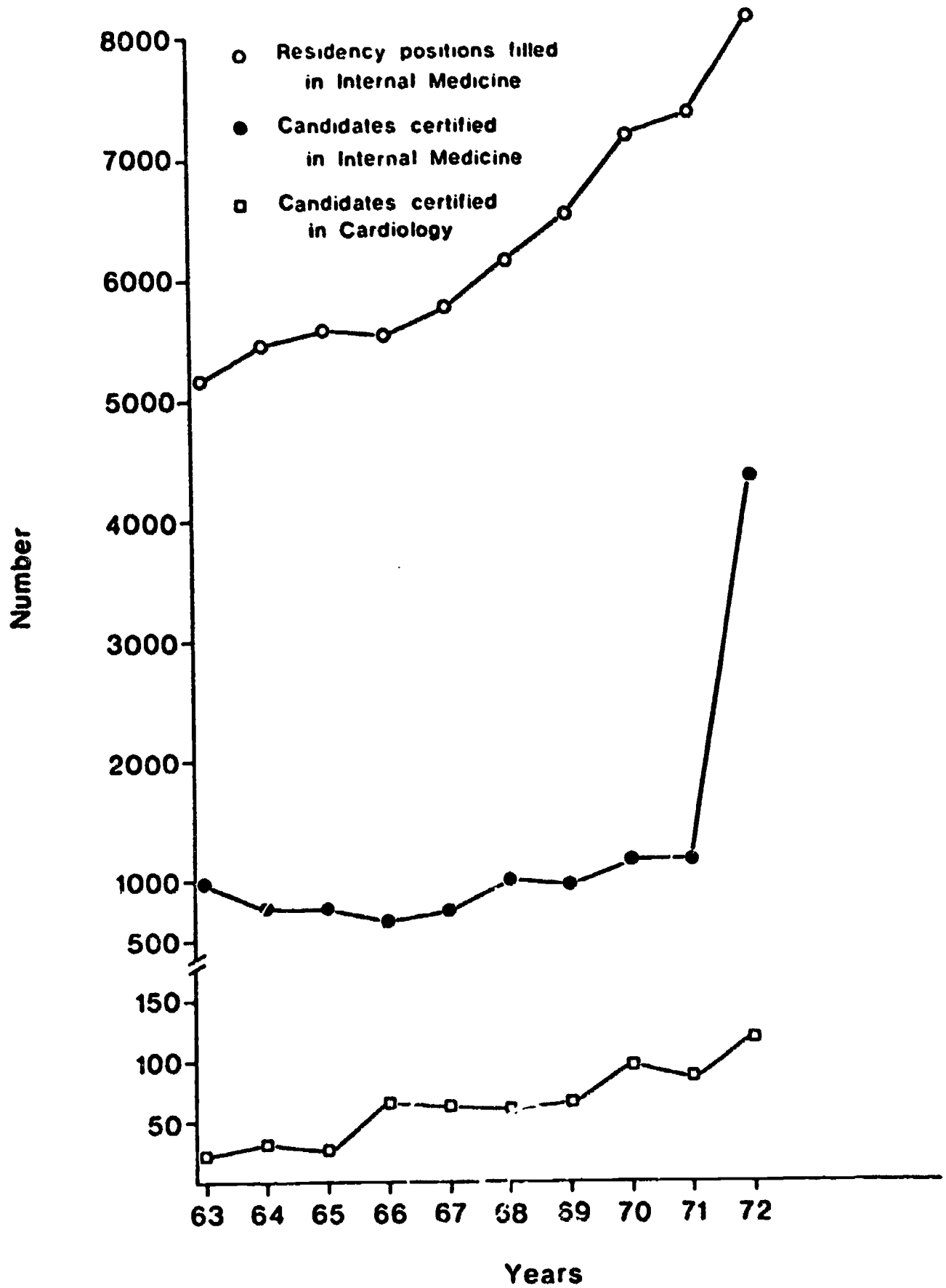
FUNDING FOR TRAINING IN CARDIOLOGY

It was difficult to get a valid picture of how most cardiology training programs were supported. Fifty-seven percent of the program directors indicated they received support from their own institution; 27 percent received support from the National Heart and Lung Institute; and 24 percent received support from their local heart association. As might be expected, research support was reported from many sources.

ADEQUACY OF TRAINING PROGRAMS FOR CURRENT PRACTICE NEEDS

This question can be answered by examining what cardiologists do in practice and what present training programs provide. This comparison has certain limitations, however. While a cardiologist in practice may perform few angiograms or cardiac catheterizations, he must understand the indications for and risks of these procedures and be able to evaluate the data from these studies. Thus, the fact that cardiologists in practice perform few such specialized studies should not indicate that less time should be devoted to such techniques in the training program. For this reason, a second type of evaluation is also presented in this report - how do cardiologists in practice evaluate their own training in terms of deficiencies and redundancies? The answers to these questions are presented in the next chapter on "Continuing Education, Educational Needs and Standards."

FIGURE 7



TEN YEAR TREND IN NUMBER OF
INTERNAL MEDICINE RESIDENCIES, INTERNAL MEDICINE
CERTIFICATES, AND CARDIOLOGY CERTIFICATION*

*Reference source: American Board Internal Medicine

Are these needs being met by current training programs realizing that the cardiologists responded in terms of the training they received five to ten years ago? Only a very general speculation can be permitted on this point. It is clear that cardiologists believe that electrocardiography was an adequate part of their training experience five to ten years ago. It is unlikely that there is less electrocardiography in present training programs, and the general experience is that more electrocardiography is currently being offered considering the rapid increase in electrocardiograms performed in all cardiology programs over the past five to ten years. It is also evident that five to ten years ago very few non-invasive studies (phonocardiograms, echocardiograms, exercise tests) were done. In present programs the fact that more time is spent on these non-invasive techniques than on electrocardiography suggests that this deficiency has been corrected in present training programs.

SUMMARY AND RECOMMENDATIONS

There are 329 programs in the United States which offer at least one year of organized training in cardiology in an approved internal medicine training program. These programs have an average of four trainees per program. Approximately 711 trainees completed their training in 1972 and 791 trainees did so in 1973. Most of the trainees will be Certified in Internal Medicine and approximately 15 to 20 percent will become certified in Cardiovascular Disease. Approximately two-thirds of the trainees plan to enter private practice, while one-third plan careers in academic medicine.

Training facilities in the United States have expanded over the past ten years, and, based on training directors' estimates, will continue to do so. It is possible to take on 58 percent more trainees during the next five years. Clearly, to achieve this would require increased funding. These training programs could accommodate 200 more trainees at the present time without additional faculty or space.

The average cardiology training program has 4.6 full time and 3.7 part-time professional staff in the cardiology division contributing to the training program. In addition, there are 1.9 full-time and 1.8 part-time staff from other divisions who contribute to the program. The full time professional staff is highly qualified. A shortage of staff members presently exists in many training programs. Twenty-nine percent of programs have an average of two staff positions budgeted but unfilled - a total of approximately 150-180 positions. If training programs expand over a five-year period from 1973-1978 to increase the number of trainees by 58 percent, an average of 2.63 additional staff members will be required for the average program. This is an increase of approximately 800-850 new staff members.

Trainees entering training programs have had either two years of prior training in internal medicine (49 percent) or three years of training (46 percent).

Most training programs offer experience in all areas required for certification in the Subspecialty Board in Cardiovascular Disease, and the practice of modern cardiology in the office or institutional setting. Some programs do not provide a complete experience in all areas, however.

Our recommendations are:

1. The present system for training of cardiologists in the United States should be continued, taking into account the recommendations of the Subspecialty Board of Cardiovascular Disease.

2. Federal support for training certain groups of cardiologists particularly the Academic Cardiologist (Primary Institutional), should be continued at a rate commensurate with population changes and related demands for trained cardiologists. These training programs for the Academic Cardiologist should be smaller in number but better in quality and more comprehensive in nature than the programs available for the Internist Cardiologist (Secondary Non-Institutional) or the Clinical Cardiologist (Primary Non-Institutional).

3. The cardiology training needs of internists and generalists (Secondary Non-Institutional) should be continually evaluated and their training modified accordingly. Evidence regarding the number of patients seen by these physicians and the diversity of their problems indicate a clear need for comprehensive cardiovascular training for these specialists.

4. Programs need clear differentiation as to which of the four types of cardiologist is being trained, with the numbers trained adjusted to geographic-area needs. This implies a level of program planning not currently practiced but one which, nevertheless, is required if the minimum ratios of cardiologists to population discussed in Chapter 7 are to be realized.

5. Directors of cardiology training programs should receive continuing information as to the needs of their graduates including:

   a. a copy of this study report;

   b. a report from the American Board of Internal Medicine regarding areas of deficiency in cardiovascular training based on the results of examination of their trainees;

   c. an annual meeting with the other directors of similar programs.

In making these recommendations, we do so fully cognizant of the fact that significant changes were underway at the time the study was being done, the effect of which has not (indeed, cannot) be estimated at this time. In essence, we assumed a "steady state" of federal support to many facets of the training programs which may or may not be forthcoming in the future. It is one thing to imply that hospitals can pick up certain costs; it is quite another to demonstrate that this might happen.

Currently, medical schools and training hospitals supporting cardiology training programs rely heavily on government funding. We have not examined alternative approaches to federal support as part of this study, although the need for such investigation is fully acknowledged. Furthermore, there is a need for federal funding to provide support for basic science research and teaching in keeping with the significant advances in this area. This component will not ordinarily be available from the clinical faculty of the hospital but must be provided by medical school academic cardiologists.

Cardiovascular training programs receive considerable clinical, teaching and research support from such disciplines as surgery, radiology, physiology, pharmacology, biomedical engineering. Although these fields have not been surveyed by this study except as contributing manpower to the training staffs, their contributions are larger and important. These disciplines owe their tremendous advances and expansion in recent years in part to federal support. The types of training programs recommended presuppose their continued involvement, if not increased participation. Manpower needs in these related fields, though not included in this study, are crucially important to cardiology.

CHAPTER 6

CONTINUING EDUCATION, EDUCATIONAL NEEDS AND STANDARDS

Forrest H. Adams

The continuing education of the physician (cardiologist) will undoubtedly assume increasing importance in the future. It has recently been stated[1] "medical education should be designed as a true continuum extending from secondary school through college, medical school, hospital training, and postgraduate education." A number of factors undoubtedly influence the continuing education needs. We will attempt to highlight some of them in this chapter.

In this study most of the information relative to continuing educational needs was obtained from the Cardiologist's Training Survey instrument. It will be recalled that this survey instrument was sent to a random stratified sample of 2,619 cardiologists. Approximately 80 percent answered the survey of which 1,509 were deemed useable for analysis according to the following breakdown:

Institutional

Primary under 40 years	288
Primary over 40 years	142
Secondary under 40 years	100
Secondary over 40 years	103

Non-Institutional

Primary under 40 years	282
Primary over 40 years	178
Secondary under 40 years	243
Secondary over 40 years	173
TOTAL	1,509

The second source of continuing education needs was obtained from comments made by the Cardiology Training Program Directors. In this instance, it will be recalled that 329 institutions stated that they had a training program in cardiology. Only 190 institutions answered the questionnaire in writing and of this group only about 50 percent included comments concerning continuing educational needs.

[1]Anlyan, W.G., The Future of Medical Education. Duke University Press, Durham, N.C., 1973, page IX and page 131.

COMMENTS OF CARDIOLOGISTS REGARDING EDUCATIONAL NEEDS

Tables 1 and 2 show the responses of the cardiologists, as a whole and by the above indicated stratified randomly selected subgroups, to the statement: "I would like continuing education available in--". It is of interest to note that:

1. Most cardiologists desire classroom instruction in a wide range of topics including: general cardiology (81 percent); physiology (63 percent); pharmacology (61 percent); renal disease (56 percent); electrocardiology (65 percent); echocardiography (51 percent); and exercise testing (52 percent).

2. Smaller but significant numbers of all cardiologists desire instruction in such areas as: cardiodiovascular surgery (32 percent); pediatric cardiology (30 percent); anatomy (30 percent); epidemiology (29 percent); biostatistics (21 percent); cardiac catheterization (28 percent), etc.

3. Expressed needs by the cardiologist varied considerably between the various subgroups in a number of areas: general cardiology (62-93 percent); cardiovascular surgery (20-56 percent); pediatric cardiology (21-50 percent); physiology (54-71 percent); pharmacology (55-72 percent); renal disease (40-68 percent); vascular disease (27-59 percent), etc.

When asked concerning the desired length of specific courses, most cardiologists preferred courses not longer than 1-2 weeks duration.

Table 2 is a continuation of Table 1 in answer to the statement: "I would like continuing education available in--". This portion of the questionnaire asked specifically regarding personal experience rather than classroom instruction for the listed topics. It is of interest that the percentage of cardiolcgists indicating a desire for personal instruction was considerably lower in every category than those desiring classroom instruction.

It is recognized that the physician (cardiologist) can continue his education and update his knowledge by a number of methods and tehcniques: journals; books; audio-visual tapes; hospital conferences; regional meetings and national meetings. Table 3 shows the responses of the cardiologists as a whole and by subgroups to three related questions relative to attendence at cardiovascular courses or national cardiovascular meetings. It is apparent from this table:

1. Most cardiologists (79 percent) attend at least one cardiovascular course each year.

2. Most cardiologists (68 percent) attend at least one national cardiovascular meeting each year.

TABLE 1

PERCENTAGE OF CARDIOLOGISTS DESIRING CONTINUING EDUCATION IN

Classroom Instruction	All	Institutional				Non-Institutional			
		Primary		Secondary		Primary		Secondary	
		Under 40	Over 40	Under 40	Over 40	Under 40	Over 40	Under 40	Over 40
General Cardiology	81	68	62	85	75	76	80	93	91
C-V Surgery	32	56	27	43	24	53	28	42	20
Peds Cardiology	30	50	28	39	26	47	28	31	21
Anatomy	30	29	20	32	30	32	29	36	32
Physiology	63	71	60	70	54	68	63	63	61
Biochemistry	40	44	44	44	42	42	43	32	36
Pathology	39	44	39	56	37	42	36	37	38
Epidemiology	29	34	30	47	29	35	25	31	25
Pharmacology	61	71	63	68	58	72	55	70	59
Radiology	48	58	43	56	40	60	45	55	44
Renal Disease	56	40	42	61	50	49	55	62	68
Vascular Disease	45	28	27	42	43	37	42	49	59
Biostatistics	21	35	33	34	28	16	18	14	15
Bioengineering	23	36	31	32	24	19	23	16	19
Electrocardiography	65	60	49	73	51	62	64	75	72
Phonocardiography	41	44	32	50	36	44	43	45	39
Echocardiography	51	71	54	54	37	69	49	51	44
Exercise Tolerance Testing	52	53	40	52	33	60	52	66	54
Vectorcardiography	41	47	35	55	36	45	41	43	38
Angiography	36	47	28	47	33	51	33	33	34
Cardiac Catheteri-zation	28	44	21	35	21	42	26	29	23

Source: 5

TABLE 2

PERCENTAGE OF CARDIOLOGISTS DESIRING CONTINUING EDUCATION IN

Personal Experience and Laboratory Techniques	All	Institutional				Non-Institutional			
		Primary		Secondary		Primary		Secondary	
		Under 40	Over 40	Under 40	Over 40	Under 40	Over 40	Under 40	Over 40
<u>Personal Experience</u>									
Patient Care:									
Pediatric	13	18	11	19	15	19	12	12	12
Medical	39	25	24	45	32	34	36	50	49
Surgical	14	16	9	18	10	20	12	17	13
Coronary Care	37	24	28	41	30	31	30	49	49
Pacemaker Insertion	35	22	23	35	34	30	35	51	41
<u>Laboratory Techniques</u>									
Electrocardiography	47	34	24	46	40	40	46	59	60
Phonocardiography	31	30	19	32	28	33	33	36	31
Echocardiography	41	55	38	43	32	56	39	43	36
Exercise Testing	40	36	23	32	28	41	40	49	45
Vectorcardiography	30	28	23	34	30	34	30	37	31
Angiography	25	31	18	26	23	31	24	24	23
Catheterization	23	33	18	28	20	33	23	24	20

Source: 5

TABLE 3

PERCENTAGE OF CARDIOLOGISTS PARTICIPATING IN CARDIOVASCULAR COURSES OR NATIONAL CARDIOVASCULAR MEETINGS

Participation In Continuing Education Programs	All	Institutional				Non-Institutional			
		Primary		Secondary		Primary		Secondary	
		Under 40	Over 40	Under 40	Over 40	Under 40	Over 40	Under 40	Over 40
Participation in C-V Courses									
Once/Year	56	39	68	43	52	65	65	47	45
Once/Year	23	25	10	29	20	20	19	30	27
Never	5	7	6	12	8	4	2	3	5
Participation in C-V Meetings									
Once/Year	30	50	64	27	23	31	35	15	13
Once/Year	38	43	24	33	27	50	42	39	34
Never	5	1	1	17	11	2	1	7	11
Opportunities Offered									
Adequate	74	74	75	73	71	76	77	73	72
Inadequate	16	15	8	16	14	17	15	20	19

Source: 5

3. The percentage of cardiolosits who attend no cardiovascular course or meetings ranges from 1-17 percent, depending upon the subgroup. The average would appear to be less than 10 percent.

4. Approximately 75 percent of the cardiologists believe the opportunities offered are adequate.

An important factor affecting the continuing educational needs of the cardiologist could be his original training experiences. Tables 4 and 5 contain the responses to the statement "Training in this Topic Too Limited--". It is apparent that:

1. Many cardiologists believe they received inadequate training experience in : pediatric cardiology (47 percent); phonocardiography (41 percent); echocardiography (74 percent); vectorcardiography (55 percent); coronary angiography (50 percent); biochemistry (46 percent); physiology (43 percent); biostatistics (59 percent) and bioengineering (65 percent).

2. Differences between the subgroups varied considerably in a number of areas: phonocardiography (29-59 percent); echocardiography (60-96 percent); coronary angiography (29-76 percent) and bioengineering (53-86 percent).

By examining the responses of cardiologists who indicate (1) their training was "too limited" and (2) such training is of either "medium" or "high" importance for the training of physicians going into cardiological practices similar to theirs, a measure of training inadequacy or insufficiency is obtained. From this perspective, training was seen as insufficient by over one-third of the respondents in the following areas:

Area	Percent
CPC Pediatric	34
Pacemaker follow-up	35
Echocardiography	55
Vectorcardiography	34
Coronary angiography	42
Peripheral angiography	39
Swan-Ganz right heart catheterization	44
CV biochemistry	38
Pulmonary physiology	40
Biostatistics	39
Bioengineering	41

TABLE 4

PERCENTAGE OF CARDIOLOGISTS INDICATING TRAINING TOO LIMITED

Type of Training	All	Institutional				Non-Institutional			
		Primary		Secondary		Primary		Secondary	
		Under 40	Over 40	Under 40	Over 40	Under 40	Over 40	Under 40	Over 40
Experience in Clinical Care, Research and Teaching									
Cardiac Patient Care:									
Pediatric	47	47	32	55	44	48	43	47	57
Medical	10	3	4	1	10	2	11	6	17
Surgical	35	33	34	33	36	25	35	29	46
Coronary Care Unit	30	20	44	17	33	22	27	27	50
Pacemaker Insertion	32	11	41	24	50	17	42	32	70
Cardiovascular Research:									
Basic	31	29	29	40	30	26	27	27	42
Clinical	26	28	23	28	20	21	25	29	31
Laboratory Diagnostic Techniques									
Electrocardiography	11	11	9	7	15	8	9	8	16
Phonocardiography	41	31	29	33	35	30	46	36	59
Echocardiography	74	61	70	60	71	72	75	78	96
Exercise Tolerance Testing	32	32	33	35	35	34	23	32	37
Vectorcardiography	55	48	50	58	55	50	52	55	70
Angiography:									
Cardiac	30	9	34	25	39	14	32	27	61
Coronary	50	29	60	44	49	39	68	54	76
Peripheral	55	50	50	56	53	53	44	53	69
Cardiac Catheterization	26	7	22	25	42	13	32	26	48

Source: 5

TABLE 5

PERCENTAGE OF CARDIOLOGISTS INDICATING TRAINING TOO LIMITED

Laboratory and Classroom Instruction	All	Institutional				Non-Institutional			
		Primary		Secondary		Primary		Sedondary	
		Under 40	Over 40	Under 40	Over 40	Under 40	Over 40	Under 40	Over 40
C-V Anatomy	31	37	38	42	35	36	29	28	26
C-V Physiology	25	22	26	27	33	27	18	24	29
C-V Biochemistry	46	50	54	44	59	45	47	35	44
C-V Pathology	28	40	21	43	27	34	27	25	24
C-V Epidemiology	39	54	50	57	33	41	38	31	32
C-V Pharmacology	30	35	28	35	35	25	28	22	33
C-V Radiology	28	26	22	33	31	30	26	31	32
Pulmonary Physiology	43	47	39	50	34	40	42	38	49
Hypertensive Renal Disease	25	39	29	30	18	29	21	18	22
Peripheral Vascular Disease	34	60	29	35	32	40	32	32	28
Cerebral Vascular Disease	32	56	39	28	41	46	29	24	22
Biostatistics	59	60	59	63	64	58	60	44	63
Bioengineering	65	53	56	67	77	55	65	55	86

Source: 5

The majority are in newly differentiated areas. Echocardiography training was found inadequate by over one-half of those responding.

Another important factor effecting the continuing educational needs of the cardiologist could be the role of certification and recertification in our future national health care system[2]. It has recently been recommended that "the feasibility of recertification, relicensure, and the use of a scheme of incentives as a mechanism for motivating physicians to maintain a high level of professional competence should be exploited"[3]. At the present time, less than 66 percent of all cardiologists have their boards in internal medicine, and less than 15 percent are certified in cardiovascular disease. If the requirements for practicing cardiology were made more stringent, it is likely that a large number of individuals would need to have future training and course work in order to demonstrate competence in the field. The Physician Reassessment Test Program currently being jointly developed by the American College of Cardiology and the American Heart Association could be of assistance in identifying for the cardiologist his areas of strength and weakness, thus pinpointing for him which courses might be most valuable to him.

COMMENTS OF CARDIOLOGY TRAINING PROGRAM DIRECTORS REGARDING EDUCATIONAL NEEDS

As one of the groups most involved in the continuing education of the cardiologist, the comments of the training program directors seem quite relevant. Many directors recognize the need for varying levels of training and course work in order to fit the varying roles and levels of competence required to practice cardiology. Thus not all cardiologists need to be trained in a similar fashion. A number of training program directors strongly recommend physician assessment tests and recertification; some even recommended that these be required now by all cardiologists.

Many of the directors of larger training programs believed one of the major problems was stable and adequate funding of their programs. A number stated they needed additional faculty.

For many of the smaller training programs, a frequent point raised by the directors centered around the need for pooling of the teaching resources. By this, they meant patient material, types of procedures available, and audio-visual facilities particularly in the basic sciences. In regard to this latter

[2] Building a National Health-Care System. Committe for Economic Development, 477 Madison Ave., New York, N.Y., 1973.

[3] Ibid.

point, the need for a core curriculum was frequently expressed. Several program directors suggested the need for a separate television channel for physicians, particularly for showing national scientific meetings.

SUMMARY AND CONCLUSIONS

The continuing educational needs of the cardiologists are currently varied and diverse. They appear to be influenced by:

1. The type and content of his original training
2. The role and age of the cardiologist

In the future, continuing educational needs will be influenced by:

1. The role of certification and recertification in a national health care system
2. Regional considerations
3. Advances in medical knowledge
4. Stable funding

CHAPTER 7

FUTURE MANPOWER NEEDS IN CARDIOLOGY

Walter H. Pritchard and Walter H. Abelmann

INTRODUCTION

Evidence obtained from our study suggests that a laissez-faire or unplanned medical system results in wide variations, inequalities and inadequacies in the distribution of physician specialists including cardiologists. The inadequacies of past planning for health manpower raise serious questions about traditional approaches to manpower studies and predictions for the future. On the other hand, Badgley and co-workers[1] recently critically reviewed six methods of assessment and projection of needs for health manpower. They are: (1) Health Personnel/Population Ratio; (2) Demographic Projection; (3) Need for Health Services; (4) Supply and Demand; (5) Functional Analysis; and (6) Target-Setting Approach.

The method used by us to assess manpower needs in cardiology is that of analyzing the number of active cardiologists available for patient care per 100,000 population (Health Personnel/Population Ratio). This has provided a figure from which correlations of different kinds have been made. Such physician ratios per 100,000 population can also be used to estimate future needs. The major limitation of this approach is that it is based on a ratio for which scientific and technical advances, changing demands and expectations are not taken into account.

MANPOWER NEEDS BASED ON CHANGES IN CARDIOLOGIST/POPULATION RATIO

The overall ratio of cardiologists to population in the United States is 5.1/100,000 (Table 7, Chapter Three). In one census division, the ratio is as high as 8.0/100,000. If one assumes that the population will increase at the rate of 1 percent per year, projections of the manpower needs in cardiology can be made for following years using various ratios of cardiologists/100,000 population. Table 1 shows such projections by census division through 1976 using ratios of 5,6, and 7 cardiologists per 100,000 population in all census divisions. Losses to the population of cardiologists from deaths and from retirements are estimated by using factors discussed in detail in Chapter Eight. An assumption is made that the cardiologist over 65 will have a decreasing activity rate as a cardiologist with the passage of time, even though he may classify himself as active. For planning purposes it is estimated that the older cardiologist will

[1] Badgley, R.F., Bloom, S., Mechanic, D., Pearson, J.C., and Wolfe, S.. "International Studies of Health Manpower: A Sociological Perspective", Medical Care. 9:235-252, 1971.

TABLE 1

Projection of Cardiology Manpower Needs: 1972 Through 1976

Census Division	Population (M)	Ratios Per 100,000 Population			
		Present Ratio	Projected Ratios		
			5	6	7
Middle Atlantic	37.2	8.0	---	---	---
New England	11.8	7.0	---	---	---
South Atlantic	30.7	5.8	---	62	368
Pacific	26.5	5.7	---	79	344
Mountain	8.3	4.1	74	157	240
East North Central	40.3	3.8	483	886	1288
West South Central	19.3	3.6	271	464	657
West North Central	16.3	3.4	262	425	588
East South Central	12.8	2.5	321	449	577
Total number needed in 1972			1411	2522	4062
Additional Cardiologists Needed by 1976 due to:					
Population growth @ 1%/year			530	637	743
Death and retirement			1063	1063	1063
Inactivity for over 65 age group			346	346	346
			1939	2046	2152
Total Additional Manpower Needs Through 1976			3550	4568	6214
Active cardiologists through 1976			12632	13850	15496

be 50 percent active.

Thus, if we had brought all regions of the country up to a ratio of six cardiologists per 100,000 population (in 1972), we would have required 2,522 more cardiologists than we had. When we project ahead through the year 1976 taking into account population growth, death and retirement, and inactivity of cardiologists over 65 years of age, 2,046 additional cardiologists would be required making a total of 4,568 needed.

If numbers of cardiologists and not their practice location are the only concern then 4,568 cardiologists would be produced in a little over five years' time with either an annual graduate output of 800 or with an incremental increase per year of about 10 percent. The estimate of 4,568 required was made under the theoretical assumption that these individuals would be distributed where they were needed. Clearly, two additional factors affect the time when this proposed ratio might actually be achieved:

1. The classes of 1971-72 and 1972-73 have graduated and are in practice at this time. It is not known where they are practicing but in all likelihood they are disproportionately clustered in areas which have cardiologist to population ratios well above 6.0 per 100,000.

2. With the 1971-72 and 1972-73 graduates already "in place", achieving the suggested national norm of at least 6.0 per 100,000 in all census divisions will require at least one year and possibly more than the five indicated in the analysis.

From the Cardiovascular Training Program Questionnaire of 329 institutions providing one or more years of training in cardiology, it was determined that they had 1,278 trainees. It was also estimated that approximately 800 will complete their training each year. However, to meet the additional manpower requirements of 4,568 cardiologists by 1976 estimated above, it would require an increase of 100 to 900 for the number completing training each year. Since the training program directors indicated that they could accommodate 58 percent more trainees if adequate funding and staffing were available, we probably have adequate facilities for training cardiologists at the present time.

MANPOWER NEEDS AND TRAINING PROGRAMS FOR DIFFERENT TYPES OF CARDIOLOGISTS

In estimating the total numbers needed by using the ratios of cardiologists per 100,000 population, no consideration was given to the medical needs of cardiology or to the types of cardiologists to be trained. From the profile studies of the cardiologists' r[illegible], four types of cardiologists were identified:

Internist Cardiologist	-	Non-Institutional, Secondary
Clinical Cardiologist	-	Non-Institutional, Primary
Cardiac Specialist	-	Institutional, Primary
Academic Cardiologist	-	Institutional, Secondary

If we now look at training needs and projections in terms of these categories, the problem can be brought into sharper focus.

Internist-Cardiologist (Non-Institutional, Secondary).

The Internist-Cardiologist will provide general medical and cardiac care for most of his patients, but will rely on Cardiac Specialists for support in the more complex cardiac problems. He will be familiar with diagnostic ECG, acute infarction and will function as a primary physician but at a higher level than the generalist. There are presently approximately 500 training programs in internal medicine. The Internist-Cardiologist could receive his training in a program of internal medicine if it were to include sufficient clinical cardiology embracing the problems of hypertension coronary care, ECG X-ray interpretation, etc. A three year program in internal medicine should include at least six months in cardiovascular disease. Thus, his particular tasks would be to be aware of, and concerned with, the relatively routine management of common cardiac conditions and to become a competent electrocardiographer with skill levels in these areas in excess of the average internist. He should have considerable exposure to the use of drugs in the management of heart disease particularly diuretics and anti-arrhythmic agents. He would acquire these specific skills by an extended activity in the heart station and in a coronary care unit. If his program in internal medicine cannot offer at least six months in cardiology, he should have a year of cardiology training elsewhere to insure competence in this area.

The number of Internist-Cardiologists should be large. Approximately 4,500 physicians are currently identified in this particular role and more might be needed. Improved programs in Internal Medicine could reduce the number of special cardiology training programs required. Since these programs are now financed by hospitals, they should not require government support.

Clinical Cardiologist (Non-Institutional, Primary).

This cardiologist is usually non-institutionally based but may be in an institutional setting and, in that event, will see a substantial number of referred cardiac patients from his institution. He will spend more time in consultation, may participate in the interpretation of electrocardiographic records in a more formalized institutional department, and

may be a chief of a heart station in a smaller center. He has a knowledge of the value of vectorcardiography, echocardiography, phonocardiography, cardiac catheterization and coronary arteriography. He does not necessarily practice these skills in a "hands-on" role. He will be more in demand for clinical consultations and may function also as a director of a coronary care unit in a community hospital.

He will provide expert clinical care for cardiac problems and will work closely with the more highly skilled Cardiac Specialist and Academic Cardiologist. He will also be called upon to help manage the post-operative problems of surgery, and arrhythmias, and although he may not be primarily concerned with pacemaker and catheterization techniques, he must be aware of their application and their general use in patient care.

We believe he should have greater in depth training in cardiology than the Internist-Cardiologist. He requires two years of training in cardiology. This should be spent largely in electrocardiography, coronary care and some of the more specialized clinical aspects of cardiology such as evaluation for cardiac surgery, etc. The individual should also spend 3-4 months in the cardiac catheterization laboratory and in the indirect measurements laboratory. In this way, he will have intimate exposure to the indications for and the problems encountered in the procedures and the interpretation of data derived from the procedures. Ideally, he would also be involved in a clinical research project and would be knowledgeable in assessing and contributing to clinical trials of drugs or surgical procedures. A two year program in cardiology seems optimal. A minimum of one year in unusual circumstances might be sufficient.

The number of Clinical Cardiologists needed might be approximately six to seven thousand. Hospital funding for these training programs should continue and need not be financed by the federal government.

Cardiac Specialist (Institutional, Primary).

He is identified as being generally younger, a product of a formal training program and is institutionally based. He may be a director of, or an important physician in, a catheterization laboratory, but will also have greater knowledge and competency in management of certain specific areas of clinical cardiology than the Clinical Cardiologist. He will devote more of his time to research and teaching than the Clinical Cardiologist. If regionalization of cardiac care occurs, he will occupy a position of great importance in the diagnosis and management of the more complex problems in a tertiary care center. He will be the consultant for major problems in this center as well as the specialist in the catheterization laboratory and the non-invasive techniques laboratory. While certain of these individuals will spend their careers in an institution, some will provide these services from a private office. Ultimately they may cease providing such service and attend more to the aspects of clinical cardiology as they become older.

Attention should be given in training such that emphasis on clinical skills for this person, as well as technical skills, are developed in the future. Training programs should assure the specialty of cardiology that the Cardiac Specialist is not over-produced and that his present scope of activity is broadened to include a more extensive clinical base than exists in some institutions today.

Standards for cardiac diagnostic and surgical centers have recently been developed in a report submitted by a committee of the American Heart Association which recommends that those centers dealing with adult patients with heart disease should perform a minimum of 250 cardiac catheterizations and 150 operations employing extracorporeal circulation per year. Centers dealing with both pediatric and adult patients should perform a minimum of 350 catheterizations and 200 operations employing open heart surgery per year. If such recommendations are eventually accepted by agencies planning for future health care or by insurance companies presently funding these procedures, it will mean the elimination of many smaller centers in community hospitals now performing too few to qualify. It will restrict these efforts to groups of physicians highly skilled in the procedures and to large centers. This is a desirable goal for the future. It would be hoped that these centers would institute training programs which would be smaller in number but better in quality and more comprehensive in nature than the programs available for training for the Internist-Cardiologist or the Clinical Cardiologist.

The current number of physicians attempting Subspecialty Certification would indicate that current training programs are probably adequate to provide the manpower pool for this group of cardiologists, bearing in mind the potentially useful duration of their careers could be as long as twenty years. Clearly there is a limit to the number of coronary arteriographers and echocardiographers that are needed. One to two thousand of this type of physician appears to be reasonable in the total number of practicing cardiologists.

Academic Cardiologist (Institutional, Secondary).

His role is not definable within a single profile and he will not spend the majority of his time in direct patient care. He will have some of the training and clinical expertise of those in other categories described above, such as at least one year in clinical cardiology, but he will also be involved more in basic research, clinical investigation, teaching or administration. The Academic Cardiologist needs exposure to many, but not all, of the above disciplines and, in addition, training in basic science, the scientific method and basic and clinical research. His training should extend beyond a one-year cardiology fellowship to include two or three years of which one or more should be devoted entirely to research.

The numbers of such individuals would be determined by the requirements of scientists, instructors, leaders and teachers. Three to five individuals per medical school with dispersion of some of these across community lines would be the order of need. However, there would be several individuals straddling an Academic or Cardiac Specialist career at all times, and, therefore, would be available to conduct some academic affairs within institutions.

Presently there are too few of these people in this category and from our study, it has been found that there are presently approximately two funded but unfilled positions in each of the 190 programs responding completely to the Training Program's Survey. Thus, there is an immediately definable and unmet need for this type of cardiologist, although some of the positions could also be filled presumably by the group identified as the Cardiac Specialist. A reasonable estimate is that from 400 to 500 additional Academic Cardiologists should be developed from the training programs within the next five years. These programs are most appropriate for sponsorship by the federal government.

In summary of this section, it appears that there are four types of training programs needed to provide the cardiology manpower for the future. The first is an improved program in cardiology for residents in internal medicine at any of the approximately 500 programs already approved. The second is a one or two year program in clinical cardiology which could be given at any of the 329 institutions providing longer training in cardiology. The third type of training could be given in perhaps 100-150 institutions which possess a relatively sophisticated department of cardiology providing excellence in specific skill areas such as indirect methods, stress testing, cardiac catheterization and coronary arteriography. The fourth type of program would be restricted to those institutions which, in addition to training Cardiac Specialists, can provide an academic atmosphere and opportunities for research. Government funding probably is required for the Academic Cardiologist training program and possibly also for the Cardiac Specialist program.

COMMENTS

From the Cardiologists' Training Survey it was determined that 70 to 80 percent of them were of the opinion that there were about the correct number of cardiologists in practice today. This may be true to accomplish today's goals, but it may not be true in view of the priority needs set forth in the report of the Chairman of the Heart and Blood Vessel Disease Panel of the National Heart and Lung Institute. The report of this panel made certain priority recommendations in various areas of cardiology requiring greater emphasis in the future. If one were to carry out these recommendations on atherosclerosis, thrombosis, hypertension, sudden death, myocardial ischemia, heart failure and vascular lesions, cardiologists will be needed in greater numbers than are present today.

There are variables which may alter the previous projections. Some tend to increase the needs while others decrease the needs for cardiologists.

1. Factors increasing needs for cardiologists:

   a. Improving standards of care; i.e., increasing emphasis on screening for risk factors for coronary disease, earlier treatment of hypertension in a greater segment of the population, improved prophylaxis for rheumatic fever, etc.

   b. Improved financing of health care for all with National Health Insurance - it is probable that greater opportunity for intake into the health care system will be available, and this will lead to an increased demand for more and better care.

   c. Development of new diagnostic and surgical techniques - a prime example is that of the coronary artery bypass operation and the development of an artificial heart.

   d. Restriction on numbers for foreign graduates entering the country.

2. Factors decreasing needs for cardiologists:

   a. Improved productivity of cardiologists such as better organization of group practice, use of computer techniques for history storage and retrieval, and general increased use of nurses, dietitians and physician-assistants for some aspects of cardiac care.

   b. Research developments such as improved pharmaceuticals with less toxicity and greater potency in anti-lipid treatment, anti-hypertensive treatment, etc., so that less observation of patients is necessary than at the present time.

Figure 1 is a schematic representation of factors affecting the prediction of the cardiologists' manpower needs.

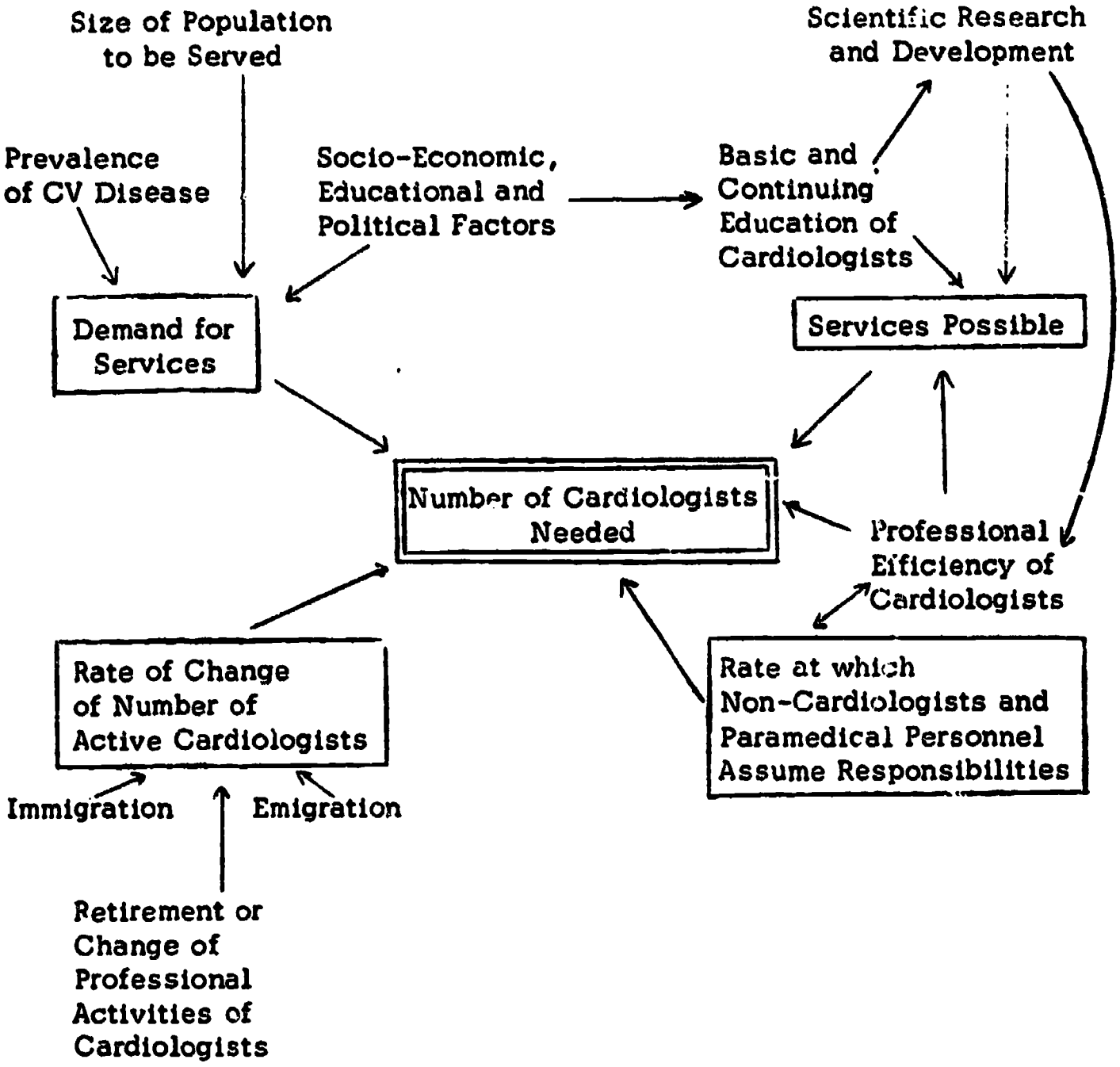
PROBLEMS OF DISTRIBUTION OF CARDIOLOGISTS

In projecting the future needs for the types of cardiologists referred to above another problem also arises - their regional distribution. We have already identified some maldistribution of all physicians including cardiologists. One might inquire whether there is any relationship of the geographical distribution of cardiologists and the prevalence of, and disability from, cardiovascular disease. Although this question may be considered pertinent to the evaluation of the relative adequacy of physician manpower needs, neither evaluation of data available nor acquisition of new data were within the scope of the study. Review of available mortality data, however, indicates that

Figure 1

Schematic Representation of Factors Affecting

The Prediction of Cardiologist Manpower Needs



significant regional differences exist in death rates from cardiovascular disease[2]. Thus, for example, the death rates for coronary heart disease for white males aged 45 to 64 years are highest in the Middle Atlantic region, followed by the rates for the South Atlantic and New England regions, and are lowest in the Mountain region[3], thus paralleling the distribution of cardiologists. On the other hand, the death rates from hypertensive disease are highest in the South Atlantic and East South Central regions, for both whites and non-whites, in no evident relation to distribution of cardiologists[4].

The question is--can one be assured that the projected numbers of cardiologists to be trained will locate in the areas of regional need? How can one prevent the North East and Middle Atlantic areas from further increasing their supply while at the same time be assured that other areas such as the East South Central will gather enough for its requirements? This is a fairly crucial question, but until national goals of distribution are set and methods to implement them developed, the present conditions will continue to operate to the disadvantage of the deprived areas and thus further aggravate the present situation.

It has been stated recently that location of doctors may be more directly related to a state's per capita income regardless of the presence of medical schools in the area. The finding that many states with higher per capita income have more doctors per 100,000 people than states with more medical schools could ease the agitation in some areas for the establishment of more schools to produce more physicians. If this be true, then improvement of per capita income of the states may be more important than additional medical schools to provide the attraction for physicians.

SUMMARY AND RECOMMENDATIONS

1. On the basis of a cardiologist to population ratio of 6 per 100,000, it is projected that approximately 4,600 more cardiologists are needed in the five year period ending December 1976.

2. Four functional types of cardiologists are identified and their suitable numbers and their training needs are suggested.

3. The problem of maldistribution and some factors altering the projected needs are briefly discussed.

4. The standards for cardiovascular diagnosis and surgical centers developed by the American Heart Association and the Inter-Society Commission for Heart Disease Resources should be implemented.

[2] Moriyama, I.A., Krueger, D.E., and Stamler, J., Cardiovascular Disease in the United States. Harvard University Press, Cambridge, 1971.

[3] Ibid., p. 65.

[4] Ibid., p. 172.

CHAPTER 8

THE ADVISORY COMMITTEE'S DATA BASE

Robert C. Mendenhall and the USC DRME Staff

INTRODUCTION

The discussions in the preceding chapters were necessarily selective. The Advisory Committee, assisted by USC DRME, worked with technical reports and analyses relating to each of the study's surveys and prepared the discussions deemed appropriate for a final report. In this chapter, the statistical tables and findings which support the preceding discussions are presented. However, data presented in earlier chapters are not repeated here unless their omission would create obvious gaps in the presentation. With these data and those presented in the previous chapters, the reader has access to all data believed to be important in the particular topical areas.

Data will be presented as they were obtained through each of the study phases. They will be presented for each of the survey instruments without regard to their application to any one of the study's research objectives. Integration of data obtained from the studies as it pertains to a research objective has been made in the Advisory Committee's presentations. Discussion will be limited to that necessary for an understanding of the data presented in a table or a series of tables. The utility of certain data will be noted as well as their limitations.

USC DRME CARDIOLOGY PROJECT STAFF

Many individuals within DRME and in organizations across the country performed important roles for this project. Some were involved almost continuously (as the DRME Staff), others assisted in a technical review capacity, and still others made the resources of their particular organization available as the study needed information. The list of individuals which follows is by no means exhaustive; rather it singles out those whose involvement was essential or whose contribution made a marked impact on the chapter and quality of the project.

Beginning with individuals not part of the DRME:

> Hilmon Castle, M.D., Chairman, Department of Family Medicine, University of Utah School of Medicine, contributed as a cardiologist, evaluator and physician who understands the characteristics of both small urban area and rural medicine. Many useful ideas regarding the design of study instruments were obtained from him.

George Mixter, M.D., Department of Medical Education, American Medical Association, assisted in the design of the Cardiovascular Training Programs Survey and made his resources regarding training programs available to us.

Cameron Brown, Department of Medical Education, American Medical Association, assisted with the location of those institutions which train cardiologists.

James Haug, Survey Research Center, American Medical Association, provided the physician biographical data and address information which constituted the source listing for over 95 percent of the physicians in the study. These data permitted comparisons which were important methodologically and practically. He and his staff made useful recommendations regarding content of study instruments as well.

Gene Roback, Survey Research Center, American Medical Association, reviewed study designs and provided extensive physician data. She was a ready and responsive source of information whenever requests were made.

Donald T. Fredrickson, M.D. and Irving S. Wright, M.D., Inter-Society Commission for Heart Disease Resources, were particularly helpful during the early months of the study in assessing the adequacy of existing statistics regarding cardiovascular disease and reports related to standards in cardiology.

David S. Blankenhorn, M.D., Professor of Medicine and Chief of Cardiology, USC School of Medicine, participated in study design plans and made his staff available for whatever pre-test activities were needed.

Francis Y.K. Lau, M.D., Professor of Medicine and Chief of Cardiology, Los Angeles County/USC Medical Center, was an active partner in all design, testing and analysis phases for the project. Dr. Lau's contributions to the Cardiology Professional Diary and the Cardiovascular Training Programs Survey designs were particularly important.

The DRME Staff participants:

Judilynn T. Foster, Ph.D., provided evaluation consultation and considerable encouragement at important study decision points. She developed the original DRME proposal and general design for the study.

Data preparation, statistical design, programming and computer processing was the responsibility of Roger A. Girard, Ph.D. In addition, he worked as a daily partner in formulating analysis plans and in

assessment of the data which were generated by those plans. Richard Neville, M.A., was equally involved in these activities. He worked closely with the analysis staff in formulating the specific statistical analyses and performed the necessary programming to accomplish them.

Individuals who worked in conceptual design areas, in study field testing, in analysis planning and in actual analysis and interpretation of results were with the project almost totally for no less than a year and in most instances for the entire time period.

Sharon Perrott, M.A., participated in the last three studies and had a major role in the log-diary analyses as well as the preparation of this report.

Kathryn McCreary, M.A., contributed to all study phases with primary responsibilities for the manpower reports.

Dana Rico, M.S., contributed to each of the study phases, particularly the log-diary phase.

Beth Augsburger, M.S., participated in both training studies with a primary involvement in the study addressed to cardiologists.

Brenda Svanberg, participated in the initial cardiology survey and the data preparation activities for each of the studies.

Technical editing assistance and advice regarding level of detail for reporting was given by Muriel Wolkov, M.A.

Data preparation activities were extensive. Data had to be checked, coded and then prepared for eventual computer processing. Those primarily involved in this activity included:

Phillip Abrami
Deborah Abrami
Monica Johansson
Jeff Mendenhall
Dorene Weinstein
Stuart Wilbur

The secretarial staff under Maria Radovitch has been outstanding. Those who were most involved in this work include:

Roberta Natschke
Monica Johansson
Angela Crew
Sherry Roodhouse

The Instructional Media Staff under William E. Millard, Ed.D., readily accommodated the project's demands for graphic works. Lynda Dummel, Dan Garcia and their artists did the countless art work and design tasks which were required.

CURRENT CARDIOLOGY MANPOWER AND ITS DISTRIBUTION

The tables and figures contained in Chapter Three were compiled from (1) statistics obtained through the Initial Cardiology Survey, (2) the "master file" of all eligible cardiologists, (3) the American Medical Association's statistics regarding physician distributions by type of specialty, (4) the U.S. Bureau of the Census, U.S. Census of Population: 1970 and (5) Rand-McNally's ZIP Code Atlas: 1969. Data generated in this study were always used in preference to data from other sources. Secondary corroborative statistics (such as from the American Board of Internal Medicine) were used as appropriate and are clearly so designated when used. Table 1 presents distributive statistics for physicians as of December, 1971.*

Statistical tables used by the Advisory Committee, but not included in their discussion chapters, pertain to distributions by community size, practice arrangements, age groupings and certification. They are included here with limited discussion for the reader who desires additional information.

Table 2 presents distributions for Primary Cardiologists and Secondary Cardiologists by community size.

The practice arrangements selected by cardiologists are summarized in Table 3. This table gives distributive statistics for Primary and Secondary Cardiologists by specific practice arrangements under either Non-Institutional or Institutional practice. The distributions in this table are basic to all presentations wherein discussions relate to the combination of Primary or Secondary and Institutional or Non-Institutional. It will be noted that:

- 64 percent of the Primary Cardiologists and 84 percent of the Secondary Cardiologists are in Non-Institutional practice.
- 31 percent of the Primary Cardiologists and 12 percent of the Secondary Cardiologists are in Institutional practice.

* This table also appears as Table 1 in Chapter Three.

TABLE 3

PHYSICIAN'S (MD) DISTRIBUTION AND RATIOS TO POPULATION[1]:
CENSUS DIVISION BY SELECTED SPECIALTY GROUPINGS

PHYSICIAN (MD) SPECIALTY GROUPINGS[1]	RATIOS per 100,000 POPULATION																							
	National Total Population 205,923,959 100%		New England Population 11,841,663 5.8%		Middle Atlantic Population 37,199,040 18.1%		South Atlantic Population 30,671,337 14.9%		East-South Central Population 12,803,470 6.2%		West-South Central Population 19,320,568 9.4%		East-North Central Population 46,252,476 19.5%		West-North Central Population 16,319,187 7.9%		Mountain Population 8,281,562 4.0%		Pacific Population 26,522,631 12.9%		Puerto Rico, V.I., Canal Zone Population 3,711,033 1.3%		APO and FPO	
	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Count Not Available	
All PHYSICIANS (includes retired)	330,824	160.7	23,438	197.9	74,435	200.1	48,585	158.4	14,036	109.6	24,574	127.2	53,485	132.9	21,574	132.2	12,747	153.9	51,342	195.8	6,006	221.5		
All Active Physicians																								
Federal	29,501		1,485		3,194		7,269		1,207		2,910		2,504		1,484		1,466		4,552		3,430		Count Not Available	
Non-Federal	281,344		20,391		67,250		37,560		12,155		20,463		48,162		18,831		10,368		43,675		2,489			
Total	310,845	150.9	21,876	184.7	70,444	189.4	44,829	146.2	13,362	104.4	23,373	121.0	50,666	125.9	20,315	124.5	11,834	142.9	48,227	181.3	5,919	218.2		
All Active Surgery		41.8		49.2		50.3		42.1		32.7		36.0		34.8		34.8		40.7		49.0		55.2		
All Active General Practice		28.1		25.7		28.2		24.0		24.7		27.6		26.6		28.9		30.7		35.9		42.2		
All Active Medical Specialties		81.0		109.9		110.8		80.0		47.0		57.6		64.5		61.6		71.5		97.0		120.8		
Within Medical Specialties	166,855	81.0	13,011	109.9	42,218	110.8	26,541	80.0	6,017	47.0	11,125	57.6	25,965	64.5	10,059	61.6	5,923	71.5	25,718	97.0	3,278	120.8		
Primary Cardiology[2]	5,661	3.0		4.5		4.6		3.3		1.3		2.1		2.2		1.8		2.7		3.4		2.5		
Internal Medicine		20.3		29.2		28.5		20.5		11.9		13.2		16.2		16.5		16.2		23.5		24.5		
Other Specialties		57.7		76.2		77.7		56.2		33.8		42.3		46.1		43.3		52.6		70.1		93.4		
Internal Medicine and Cardiology		23.3		33.7		33.1		23.8		13.2		15.3		18.4		18.3		18.9		26.9		27.4		
Primary Cardiology[2]		3.0		4.5		4.6		3.3		1.3		2.1		2.2		1.8		2.7		3.4		2.5		
Secondary Cardiology[2]		2.6		3.4		4.2		3.0		1.2		1.7		2.0		1.8		1.8		2.7		1.5		
Other Internal Medicine[3]		17.7		25.8		24.3		17.5		10.7		11.5		14.2		14.7		14.4		20.8		23.4		

[1] Specialty groupings and data pertaining to all except cardiologists obtained from American Medical Association, Distribution of Physicians in the United States 1970.

[2] Data obtained from Initial Cardiology Survey.

[3] "Other Internal Medicine" total is a little smaller than might be the case since 93 percent of our respondents were in this area rather than 100 percent.

*U.S. Bureau of the Census. U.S. Census of Population: 1970.
Number of Inhabitants. Final Report PC (1) - A1 United States Summary

TABLE 2

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS
WITHIN MEDICAL SERVICE COMMUNITY
BY SPECIALTY

MEDICAL SERVICE COMMUNITY SIZE INTERNAL	Primary Cardiology (CD)		Secondary Cardiology (CD)		All Cardiology (CD)	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
25,000	83	30.2	192	69.8	275	100.0
50,000	229	39.8	347	60.2	576	100.0
100,000	346	44.8	426	55.2	772	100.0
200,000	429	53.2	377	46.8	806	100.0
400,000	344	57.0	259	43.0	603	100.0
600,000	268	62.9	158	37.1	426	100.0
800,000	240	58.1	173	41.9	413	100.0
1,000,000	667	59.9	446	40.1	1113	100.0
2,000,000	386	61.6	241	38.4	627	100.0
3,000,000	238	59.9	159	40.1	397	100.0
4,000,000	120	55.6	96	44.4	216	100.0
5,000,000	479	55.8	379	44.2	858	100.0
TOTAL	3829		3253		7082	

Source: 2

TABLE 3

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE: BY SPECIALTY

PRACTICE MODE	Primary		Secondary		All Cardiologists	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
Non-Institutional						
Solo	1246	32.7	1494	47.1	2740	39.2
Partnership	520	13.7	551	17.4	1071	15.3
Group	508	13.3	489	15.4	997	14.3
Combination (Other)	149	3.9	90	2.8	239	3.4
Sub Total	2423	63.6	2624	82.7	5[illegible]	72.2
Institutional						
Hospital	559	14.7	201	6.3	760	10.9
Medical School	450	11.8	142	4.5	592	8.5
Combination (Other)	152	4.0	35	1.1	187	2.7
Sub Total	1161	30.5	378	11.9	1539	22.1
Other						
Majority Other	209	5.5	159	5.0	368	5.3
Combination Other	13	0.4	14	0.4	27	0.4
Sub Total	222	5.9	173	5.4	395	5.7
TOTAL	3806	100.0	3175	100.0	6981	100.0

Source: 2

Age as related to specialty and practice was important in several analyses. Table 4 provides age-grouped distributions by Non-Institutional and Institutional practice modes and by Primary and Secondary specialty. The 60 years-and-over group shows no significant differences. The 40 through 59 year age group differs from the other groups in important respects:

- 26 percent of Primary are in Institutional practices compared to 11 percent for Secondary;
- 70 percent of Primary have Non-Institutional practices while 85 percent of the Secondary are in this practice category.

The under 40 age group displays very large differences:

- 43 percent of the Primary and 71 percent of the Secondary are in Non-Institutional practices;
- 47 percent of the Primary and 22 percent of the Secondary have Institutional practices.

The differences noted in the under 40 group may be partially explained by the predominance of Primary Cardiologists in medical school and hospital-related clinical settings. Overall, the numbers are not very large and a preponderance of Primary Cardiologists in the teaching-related activities would account for most of the differences.

Age Distribution by Census Divisions

The age composition of the physician group will have a direct bearing on that group's stability over time. Ignoring for the moment the fact that the younger cardiologists will have the most recent exposure to the latest diagnostic and treatment techniques and hence constitute a group which is qualitatively different from the older cardiologists, the point at issue in the age distribution data at this time is the stability of the cardiologist population in a particular area. Tables 5, 6, and 7 provide age-grouped distribution by census division for all active cardiologists. These data were generated from both AMA statistics and survey findings. From inspection of Table 5 for cardiologists under age 40 and Table 7 for cardiologists over age 60 it is observed:

- Middle Atlantic has the least favorable profile - 22 percent under 40 and 29 percent over 60.
- New England has more under 40 (29 percent) than any area except the South Atlantic but also has the next largest group over 60 (22 percent). It would appear that this division is at least holding its own.

TABLE 4

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE: BY AGE GROUPINGS AND PRIMARY OR SECONDARY SPECIALTY CLASSIFICATION

PRACTICE MODE	UNDER 40 YEARS				40 THROUGH 59 YEARS				60 YEARS AND OVER			
	Primary		Secondary		Primary		Secondary		Primary		Secondary	
	N	%	N	%	N	%	N	%	N	%	N	%
NON-INSTITUTIONAL												
Solo	171	13.1	178	26.3	698	36.1	883	47.3	377	66.6	433	68.3
Partnership	181	13.8	147	21.7	287	14.8	342	18.3	52	9.2	62	9.8
Group	169	12.9	135	20.0	295	15.3	296	15.9	44	7.8	58	9.1
Combination (other)	44	3.4	21	3.1	82	4.2	57	3.1	23	4.1	12	1.9
Sub Total	565	43.2	481	71.1	1362	70.4	1578	84.6	496	87.7	565	89.1
INSTITUTIONAL												
Hospital	320	24.5	93	13.8	204	10.5	89	4.8	35	6.2	19	3.0
Medical School	218	16.7	39	5.8	221	11.4	89	4.8	11	1.9	14	2.2
Combination (other)	77	5.9	15	2.2	68	3.5	19	1.0	7	1.2	1	0.2
Sub Total	615	47.1	147	21.8	493	25.5	197	10.6	53	9.3	34	5.4
OTHER												
Majority other	126	9.6	47	7.0	70	3.7	80	4.3	13	2.3	32	5.0
Combined other	1	0.1	1	0.1	8	0.4	10	0.5	4	0.7	3	0.5
Sub Total	127	9.7	48	7.1	78	4.1	90	4.8	17	3.0	35	5.5
TOTAL	1307	100.0	676	100.0	1933	100.0	1865	100.0	566	100.0	634	100.0

Source: 2

TABLE 5

AGE-GROUPED DISTRIBUTION OF CARDIOLOGISTS BY CENSUS DIVISION: CARDIOLOGISTS UNDER FORTY YEARS OLD

Census Division		Age Groups				Division Total Manpower		
		25-29	30-34	35-39	Sub Total	Age Known	Other	All
New England	N	7	79	154	240	819	14	833
	% of Total				29.3	100.0		
Middle Atlantic	N	19	216	411	646	2942	56	2998
	% of Total				22.0	100.0		
South Atlantic	N	19	218	306	543	1747	26	1773
	% of Total				31.1	100.0		
East-South Central	N	1	22	54	77	307	11	318
	% of Total				25.1	100.0		
West-South Central	N	5	81	99	185	666	17	683
	% of Total				27.8	100.0		
East-North Central	N	11	134	239	384	1511	27	1538
	% of Total				25.4	100.0		
West-North Central	N	4	50	83	137	532	25	557
	% of Total				25.8	100.0		
Mountain	N	0	33	54	87	324	13	337
	% of Total				26.9	100.0		
Pacific	N	8	130	262	400	1495	28	1523
	% of Total				26.8	100.0		
Caribbean	N	0	7	20	27	102	1	103
	% of Total				26.5	100.0		
Military APO/FPO	N	2	12	7	21	28	0	28
	% of Total				75.0	100.0		
TOTAL	N	76	982	1689	2747	10473	218	10691
	% of Total	0.7	9.4	16.1	26.2	100.0		

Source: 1, 2

TABLE 6

AGE-GROUPED DISTRIBUTION OF CARDIOLOGISTS BY CENSUS DIVISION: CARDIOLOGISTS FROM FORTY THROUGH FIFTY-NINE YEARS OLD

Census Division		Age Groups					Division Total Manpower		
		40-44	45-49	50-54	55-59	Sub Total	Age Known	Other	All
New England	N	131	100	97	70	398	819	14	833
	% of Total					48.6	100.0		
Middle Atlantic	N	424	409	315	292	1440	2942	56	2998
	% of Total					48.9	100.0		
South Atlantic	N	272	294	222	145	933	1747	26	1773
	% of Total					53.4	100.0		
East-South Central	N	38	53	50	45	186	307	11	318
	% of Total					60.6	100.0		
West-South Central	N	117	104	98	57	376	666	17	683
	% of Total					56.5	100.0		
East-North Central	N	235	233	194	158	820	1511	27	1538
	% of Total					54.3	100.0		
West-North Central	N	79	86	80	52	297	532	25	557
	% of Total					55.8	100.0		
Mountain	N	56	67	44	32	199	324	13	337
	% of Total					61.4	100.0		
Pacific	N	243	244	197	177	861	1495	28	1523
	% of Total					57.6	100.0		
Caribbean	N	28	14	14	11	67	102	1	103
	% of Total					65.7	100.0		
Military APO/FPO	N	7	0	0	0	7	28	0	28
	% of Total					25.0	100.0		
TOTAL	N	1630	1604	1311	1039	5584	10473	218	10691
	% of Total	15.6	15.3	12.5	9.9	55.3	100.0		

Source: 1, 2

TABLE 7

AGE-GROUPED DISTRIBUTION OF CARDIOLOGISTS BY CENSUS DIVISION: CARDIOLOGISTS SIXTY YEARS OLD AND OVER

Census Division		Age Groups				Sub Total	Division Total Manpower		
		60-64	65-69	70-74	75 & Over		Age Known	Other	All
New England	N	85	56	23	17	181	819	14	833
	% of Total					22.1	100.0		
Middle Atlantic	N	382	242	153	79	856	2942	56	2998
	% of Total					29.1	100.0		
South Atlantic	N	122	78	39	32	271	1747	26	1773
	% of Total					15.5	100.0		
East-South Central	N	19	18	5	2	44	307	11	318
	% of Total					14.3	100.0		
West-South Central	N	56	27	12	10	105	666	17	683
	% of Total					15.8	100.0		
East-North Central	N	140	74	56	37	307	1511	27	1538
	% of Total					20.3	100.0		
West-North Central	N	41	26	18	13	98	532	25	557
	% of Total					18.4	100.0		
Mountain	N	17	11	8	2	38	324	13	337
	% of Total					11.7	100.0		
Pacific	N	121	63	28	22	234	1495	28	1523
	% of Total					15.7	100.0		
Caribbean	N	3	2	2	1	8	102	1	103
	% of Total					7.8	100.0		
Military APO/FPO	N	0	0	0	0	0	28	0	28
	% of Total					0.0	100.0		
TOTAL	N	986	597	344	215	2142	10473	218	10691
	% of Total	9.4	5.7	3.3	2.1	20.5	100.0		

Source: 1, 2

- o South Atlantic has the most favorable profile - 31 percent under 40 and 16 percent over 60. Much of this favorable status is explained by the relatively high concentration of federal physicians within this geographic area.

- o All other divisions have proportionately greater numbers under 40 and would thus tend to be in a relatively stable cardiologist manpower position.

One index of manpower stability which could be constructed from these data would consider only the cardiologists under age 60 in the effective manpower ratios. The obverse index would be based on those over 60 and would make the assumption that all of them needed to be replaced in a relatively short period of time. Certainly, manpower projections should not ignore the age-grouped data provided in these tables because longevity in practice is directly correlated with physician age.

Cardiologist's Age and Related Specialty Factors

Age is correlated with whether or not the cardiologist is Board Certified in Internal Medicine and Cardiovascular Disease. Analyses of professional activity data in the section to follow indicate that Certification in Internal Medicine has no greater effect on the characteristics of the cardiologist's practice than being a Primary Cardiologist but that Certification in Cardiovascular Disease has the effect of (1) increasing the number of patients obtained through referral; (2) increasing the range and sophistication of diagnostic procedures actually used and (3) increasing the number of patient encounters which are cardiac rather than non-cardiac as primary clinical problems.

Table 8 provides distribution statistics for cardiologists by practice mode and age groupings for those who are and those who are not specialty board certified. There is a direct correlation between age and certification for the Non-Institutional cardiologists; the younger they are the less likely that they will be certified. This relationship holds for all age groups where it will be noted that for cardiologists over 60, 85 percent are certified. Among Institutional cardiologists, the opposite relationship exists; 30 percent under 40 years old, 19 percent from 40 through 59 years, and 10 percent 60 years or over are certified. A partial explanation for the Institutional distribution may be that the under 40 age group are a group who will, upon completion of their cardiovascular disease training, go primarily into Non-Institutional practice and thus are "cardiologists in transition".

Subspecialty Board Certification in Cardiovascular Disease is presented in Table 9 in the same format as used for Board Certification in Internal Medicine. The direct correlation between age and percentage certified observed for board certification holds in this distribution. For Institutional practices, the two groups under age 60 have comparable distributions.

TABLE 8

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE:
BY AGE GROUPINGS AND SPECIALTY BOARD CERTIFICATION STATUS

PRACTICE MODE	UNDER 40 YEARS				40 THROUGH 59 YEARS				60 YEARS AND OVER			
	Not Board Certified		Board Certified		Not Board Certified		Board Certified		Not Board Certified		Board Certified	
	N	%	N	%	N	%	N	%	N	%	N	%
NON-INSTITUTIONAL												
Solo	217	18.5	132	16.3	762	50.9	819	35.6	447	77.2	363	58.5
Partnership	148	12.6	180	22.3	195	13.0	434	18.9	42	7.3	72	11.6
Group	137	11.7	167	20.7	165	11.0	426	18.5	31	5.4	71	11.4
Combination (Other)*	42	3.6	23	2.8	48	3.2	91	4.0	16	2.8	19	3.1
Sub Total	544	46.4	502	62.1	1170	78.1	1770	77.0	536	92.7	525	84.6
INSTITUTIONAL												
Hospital	298	25.4	115	14.2	118	7.9	175	7.6	19	3.3	35	5.6
Medical School	162	13.8	95	11.8	106	7.1	204	8.9	5	0.9	20	3.2
Combination (Other)*	60	5.1	32	4.0	25	1.7	52	2.7	2	0.3	6	1.0
Sub Total	520	44.3	242	30.0	249	16.7	441	19.2	26	4.5	61	9.8
OTHER												
Majority Other	110	9.2	63	7.8	67	4.5	83	3.6	16	2.6	29	4.6
Combination (Other)*	1	0.1	1	0.1	12	0.7	6	0.2	1	0.2	6	1.0
Sub Total	111	9.3	64	7.9	79	5.2	89	3.8	17	2.8	35	5.6
TOTAL	1175	100.0	808	100.0	1498	100.0	2300	100.0	579	100.0	621	100.0

Source: 2

TABLE 9

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE:
BY AGE GROUPINGS AND SUBSPECIALTY BOARD CERTIFICATION STATUS

PRACTICE MODE	UNDER 40 YEARS				40 THROUGH 59 YEARS				60 YEARS AND OVER			
	Not Certified		Subspecialty Board Certified		Not Certified		Subspecialty Board Certified		Not Certified		Subspecialty Board Certified	
	N	%	N	%	N	%	N	%	N	%	N	%
NON-INSTITUTIONAL												
Solo	340	18.1	9	8.3	1498	44.2	83	20.4	723	68.9	87	57.6
Partnership	309	16.5	19	17.4	562	16.6	67	16.5	98	9.3	16	10.6
Group	280	14.9	24	22.0	516	15.2	75	18.5	88	8.4	14	9.3
Combination (Other)*	60	3.2	5	4.6	119	3.5	20	4.9	29	2.8	6	4.0
Sub Total	989	52.7	57	52.3	2695	79.5	245	60.3	938	89.4	123	81.5
INSTITUTIONAL												
Hospital	396	21.1	17	15.6	251	7.4	42	10.3	48	4.6	6	4.0
Medical School	236	12.6	21	19.3	230	6.8	80	19.7	14	1.3	11	7.3
Combination (Other)*	88	4.7	4	3.7	67	2.0	20	4.9	4	0.4	4	2.6
Sub Total	720	38.4	42	38.6	548	16.2	142	34.9	66	6.3	21	13.9
OTHER												
Majority Other	163	8.7	10	9.1	132	3.8	18	4.4	38	3.6	7	4.6
Combination (Other)*	2	0.2	0	0.0	17	0.5	1	0.4	7	0.7	0	0.0
Sub Total	165	8.9	10	9.1	149	4.3	19	4.8	45	4.3	7	4.6
TOTAL	1874	100.0	109	100.0	3392	100.0	406	100.0	1049	100.0	151	100.0

* Age grouped cardiologist include only those whose age is known

Source: 2

Years Since Medical Degree Relating to Certification

The average non-federal cardiologist was 48 years old; the federal cardiologists were seven years younger. In Tables 10, 11, 12 and 13 the relationship of age to Board Certification in Internal Medicine and Subspecialty Board Certification in Cardiovascular Disease is noted.

Years of preparation for practice and the average amounts of time in preparation are noted in the section of this chapter devoted to the Cardiologist's Training Survey data and the Cardiovascular Training Programs Survey data.

General Characteristics of Cardiologists' Practices

The Advisory Committee in approaching the task of defining the roles which cardiologists perform has focused on the activities which characterize different practice modalities. In essence, what cardiologists do is the primary categorization factor.

In the preceding section, tables supporting the Advisory Committee's manpower distribution analyses were presented. These included distributions by census division, age and age-related factors, distributions by types of practice and distributions by medical service community size.

In this section, tables are presented pertaining to:

- Patient sources
- Distribution of time to professional activities
- Utilization of specialized skills and knowledge

The tables support the discussion of cardiologists' roles provided in Chapter 4. In the section to follow, comparable data from the log-diary study will be presented. The data have been tabulated in several ways to document the presence or absence of one factor as a primary contributor to the particular statistic.

- Tables 14 through 18 relate to referral
- Tables 19 through 22 relate to distance
- Tables 23 through 26 relate to practice mode
- Tables 27 through 33 present the proportion of time in professional activities

TABLE 10

AVERAGE YEARS SINCE DOCTOR OF MEDICINE DEGREE FOR FEDERAL PHYSICIANS:
BY SPECIALTY BOARD CERTIFICATION AND PRIMARY OR
SECONDARY SPECIALTY CLASSIFICATION

FEDERAL PHYSICIAN CLASSIFICATION	SPECIALTY				ALL FEDERAL CARDIOLOGISTS	
	Primary Cardiologist		Secondary Cardiologist			
	years	number (N)	years	number (N)	years	number (N)
Non-Board Certified	11	129	15	69	12	198
Board Certified	16	163	23	58	18	221
Average Years	14		19		15	
Total Number (N)		292		127		419

Source: 2

TABLE 11

AVERAGE YEARS SINCE DOCTOR OF MEDICINE DEGREE FOR NON-FEDERAL PHYSICIANS: BY SPECIALTY BOARD CERTIFICATION AND PRIMARY OR SECONDARY SPECIALTY CLASSIFICATION

NON-FEDERAL PHYSICIAN CLASSIFICATION	SPECIALTY				ALL NON-FEDERAL CARDIOLOGISTS	
	Primary Cardiologist		Secondary Cardiologist			
	years	number (N)	years	number (N)	years	number (N)
Non-Board Certified	19	1526	23	1637	21	3163
Board Certified	23	2144	25	1575	24	3719
Average Years	21		24		22	
Total Number (N)		3670		3212		6882

Source: 2

TABLE 12

AVERAGE YEARS SINCE DOCTOR OF MEDICINE DEGREE FOR FEDERAL PHYSICIANS: BY SUBSPECIALTY BOARD CERTIFICATION STATUS AND PRIMARY OR SECONDARY SPECIALTY CLASSIFICATION

FEDERAL PHYSICIAN CLASSIFICATION	SPECIALTY				ALL FEDERAL CARDIOLOGISTS	
	Primary Cardiologist		Secondary Cardiologist			
	years	number (N)	years	number (N)	years	number (N)
Non-subspecialty Certified	13	262	18	118	15	380
Subspecialty Certified	19	30	25	9	20	39
Average Years	14		19		15	
Total Number (N)		292		127		419

Source: 2

TABLE 13

AVERAGE YEARS SINCE DOCTOR OF MEDICINE DEGREE FOR NON-FEDERAL PHYSICIANS: BY SUBSPECIALTY BOARD CERTIFICATION STATUS AND PRIMARY OR SECONDARY SPECIALTY CLASSIFICATION

NON-FEDERAL PHYSICIAN CLASSIFICATION	SPECIALTY				ALL NON-FEDERAL CARDIOLOGISTS	
	Primary Cardiologist		Secondary Cardiologist			
	years	number (N)	years	number (N)	years	number (N)
Non-subspecialty Certified	20	3087	24	3127	22	6214
Subspecialty Certified	25	583	32	85	26	668
Average Years	21		24		22	
Total Number (N)		3670		3212		6882

Source: 2

TABLE 14

PERCENTAGE OF CARDIAC PATIENTS REFERRED TO PHYSICIAN
BY TYPE OF REFERRAL SOURCE:
CENSUS DIVISION BY PHYSICIAN AGE GROUPINGS

PHYSICIAN AGE GROUPINGS	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I. Canal Zone	APO and FPO
Less Than 40 Years Distribution (N)	1919	170	414	386	58	137	263	98	67	298	15	13
Type of Referral:												
own practice	44.4	46.6	46.4	46.3	44.3	37.9	39.9	50.8	46.6	43.5	48.0	17.7
from other physicians	43.7	44.0	40.1	42.6	47.9	44.2	47.7	47.2	40.6	46.4	30.7	27.3
other (agencies)	11.8	8.8	13.5	11.1	7.7	17.9	12.4	2.0	12.9	10.1	21.3	55.0
40 Through 59 Years Distribution (N)	3709	264	947	596	139	252	548	203	140	573	42	5
Type of Referral:												
own practice	64.5	67.5	66.5	65.0	60.1	61.7	63.4	60.6	68.7	63.3	67.5	34.0
from other physicians	29.3	27.0	26.6	29.1	32.6	31.8	31.9	35.8	27.5	29.2	23.1	50.0
other (agencies)	6.1	5.5	6.9	6.0	7.3	6.4	4.7	3.6	3.8	7.5	9.5	16.0
60 Years And Over Distribution (N)	1212	106	463	152	24	64	166	65	29	138	5	0.0
Type of Referral:												
own practice	75.0	76.2	77.9	71.7	68.6	78.4	74.2	70.0	78.2	70.7	54.0	0.0
from other physicians	18.8	19.9	16.9	18.2	15.3	16.5	22.1	24.0	16.9	20.0	42.0	0.0
other (agencies)	6.2	3.8	5.2	10.1	16.2	5.1	3.6	6.1	4.9	9.3	4.0	0.0

Source: 2

TABLE 15

PERCENTAGE OF CARDIAC PATIENTS REFERRED TO PHYSICIAN
BY TYPE OF REFERRAL SOURCE:
CENSUS DIVISION BY SPECIALTY

CARDIOLOGY SPECIALTY	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Primary Cardiologist Distribution (N)	3773	309	1008	599	123	265	516	193	149	564	42	5
Type of Referral:												
own practice	50.4	50.8	55.5	48.8	46.9	46.5	45.5	47.7	53.1	49.3	60.1	10.0
from other physicians	41.2	41.9	36.6	41.5	41.9	42.3	46.8	49.2	38.0	42.2	26.1	30.0
other (agencies)	8.4	6.9	7.9	9.7	11.2	11.2	7.7	3.2	8.9	8.5	13.8	60.0
Secondary Cardiologist Distribution (N)	3156	237	835	552	101	194	474	184	92	453	21	13
Type of Referral:												
own practice	72.9	77.3	75.8	70.8	68.9	70.6	73.2	71.9	81.1	69.8	66.6	26.9
from other physicians	19.9	17.1	15.8	21.9	25.6	21.4	21.5	23.6	15.8	21.7	25.8	35.0
other (agencies)	7.1	5.6	8.3	7.3	5.5	7.9	5.3	4.6	3.2	8.5	7.6	38.1

Source: 2

TABLE 16

PERCENTAGE OF CARDIAC PATIENTS REFERRED TO PHYSICIAN
BY TYPE OF REFERRAL SOURCE:
CENSUS DIVISION BY BOARD CERTIFICATION

BOARD CERTIFICATION	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Board Certified Distribution (N)	3769	315	944	647	122	241	556	210	144	556	23	11
Type of Referral:												
own practice	59.7	61.4	63.3	58.7	54.1	55.7	56.1	57.5	66.5	60.0	59.7	17.7
from other physicians	33.3	32.0	30.4	33.7	36.7	34.8	38.2	37.7	26.8	32.0	29.2	38.6
other (agencies)	7.1	6.6	6.4	7.6	9.1	9.5	5.7	4.8	6.7	8.0	11.1	43.6
Non-Board Certified Distribution (N)	3160	231	899	504	102	218	434	167	97	461	40	7
Type of Referral:												
own practice	61.8	63.6	66.3	60.2	60.0	57.7	62.2	61.9	59.7	56.6	63.8	29.3
from other physicians	29.4	29.9	23.9	30.1	32.0	32.1	30.1	35.5	33.5	34.3	24.2	25.7
other (agencies)	8.7	6.1	9.9	9.7	8.0	10.2	7.6	2.6	6.8	9.1	12.1	45.0

Source: 2

TABLE 17

PERCENTAGE OF CARDIAC PATIENTS REFERRED TO PHYSICIAN
BY TYPE OF REFERRAL SOURCE:
CENSUS DIVISION BY CARDIOLOGY SUBSPECIALTY BOARD IN CARDIOVASCULAR DISEASE CERTIFICATION

CARDIOLOGY SUBSPECIALTY BOARD IN CARDIOVASCULAR DISEASE CERTIFICATION	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Cardiology Certified Distribution (N)	670	52	164	118	26	60	96	45	30	72	5	2
Type of Referral:												
own practice	46.5	49.7	48.6	45.9	35.7	44.5	46.5	42.8	48.4	46.3	73.4	5.0
from other physicians	45.8	42.3	43.1	45.6	50.8	49.1	47.7	53.3	45.1	45.1	4.4	95.0
other (agencies)	7.7	7.9	8.3	8.5	13.6	6.4	5.8	3.9	6.5	8.6	22.2	0.0
Non-Cardiology Certified Distribution (N)	6259	494	1679	1033	198	399	894	332	211	945	58	16
Type of Referral:												
own practice	62.2	63.6	66.3	60.9	59.6	58.5	60.1	61.7	66.0	59.4	61.3	24.4
from other physicians	30.0	30.0	25.6	30.6	32.4	31.1	33.3	34.4	27.3	32.1	27.9	25.9
other (agencies)	7.9	6.2	8.1	8.5	8.0	10.4	6.6	3.8	6.8	8.5	10.8	49.7

Source: 2

TABLE 18

PERCENTAGE OF CARDIAC PATIENTS REFERRED TO PHYSICIAN
BY TYPE OF REFERRAL SOURCE:
CENSUS DIVISION BY AMERICAN COLLEGE OF CARDIOLOGY MEMBERSHIP

AMERICAN COLLEGE OF CARDIOLOGY (A.C.C.) MEMBERSHIP		NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
	Group Total	New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I. Canal Zone	APO and FPO
A.C.C. Membership Distribution (N)	2265	158	666	315	81	154	291	130	88	357	21	4
Type of Referral:												
own practice	58.0	56.4	66.6	52.6	48.6	46.4	54.5	54.6	58.8	58.1	60.2	27.5
from other physicians	34.8	36.9	27.0	37.6	41.4	44.4	39.1	40.9	34.2	35.1	31.9	27.5
other (agencies)	7.1	6.6	6.4	8.8	10.0	9.3	6.4	4.5	7.0	6.8	7.9	45.0
Non-A.C.C. Membership Distribution (N)	4664	388	1177	836	143	305	699	247	153	660	42	14
Type of Referral:												
own practice	61.9	64.7	63.7	61.5	61.5	61.9	60.6	62.0	66.7	58.7	63.3	20.7
from other physicians	29.9	28.8	27.3	30.1	30.7	28.0	32.8	34.5	26.8	31.9	23.1	35.4
other (agencies)	8.2	6.2	9.0	8.4	7.9	10.1	6.6	3.5	6.6	9.4	13.6	43.9

Source: 2

TABLE 19

PERCENTAGE OF CARDIAC PATIENTS BY MILEAGE DISTANCE FROM PHYSICIAN:
CENSUS DIVISIONS BY SPECIALTY

CARDIOLOGY SPECIALTY	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Primary Cardiologist Distribution (N)	3602	264	963	570	121	249	500	182	136	546	38	3
Mileage:												
less than 5	36.8	39.1	46.1	35.6	24.1	28.5	31.6	21.6	37.0	36.3	42.8	20.7
5 to 25	49.5	50.3	47.3	48.5	50.1	48.7	54.0	44.5	46.3	52.4	49.5	59.0
over 25	13.8	10.6	6.6	15.9	25.8	22.8	14.4	33.9	16.7	11.3	7.7	20.3
Secondary Cardiologist Distribution (N)	3004	226	798	521	98	186	454	172	90	426	22	11
Mileage:												
less than 5	46.4	53.4	55.0	43.3	31.4	38.5	42.8	36.3	48.0	45.5	38.6	46.8
5 to 25	47.6	42.7	42.2	49.8	55.1	49.7	52.6	49.2	45.6	49.3	52.8	36.4
over 25	6.0	3.9	2.8	6.9	13.5	11.8	4.6	14.5	6.4	5.2	8.5	16.8

Source: 2

TABLE 20

PERCENTAGE OF CARDIAC PATIENTS BY MILEAGE DISTANCE FROM PHYSICIAN:
CENSUS DIVISION BY BOARD CERTIFICATION

BOARD CERTIFICATION	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Board Certified Distribution (N)	3630	302	919	615	120	230	536	196	138	542	23	9
Mileage:												
less than 5	39.4	42.7	48.0	38.0	24.3	28.0	35.1	26.8	42.7	41.1	36.3	40.2
5 to 25	49.0	48.9	46.8	49.4	52.7	49.1	53.7	45.0	43.6	50.0	52.7	40.8
over 25	11.5	8.5	5.2	12.6	23.0	22.9	11.2	28.2	13.7	8.9	11.0	19.0
Non-Board Certified Distribution (N)	2976	218	842	476	99	205	418	158	88	430	37	5
Mileage:												
less than 5	43.3	49.0	52.5	40.9	31.1	38.2	39.2	31.2	39.3	39.5	44.4	43.0
5 to 25	48.1	44.5	43.0	48.7	52.0	49.1	52.9	49.0	49.8	52.3	49.5	42.0
over 25	8.6	6.6	4.5	10.4	16.9	12.7	7.9	19.8	11.0	8.2	6.1	15.0

Source: 2

TABLE 21

PERCENTAGE OF CARDIAC PATIENTS BY MILEAGE DISTANCE FROM PHYSICIAN:
CENSUS DIVISION BY CARDIOLOGY SUBSPECIALTY BOARD IN CARDIOVASCULAR DISEASE CERTIFICATION

CARDIOLOGY SUBSPECIALTY BOARD IN CARDIOVASCULAR DISEASE CERTIFICATION	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Cardiology Certified Distribution (N)	645	50	157	115	24	55	93	44	31	71	4	1
Mileage:												
less than 5	30.0	30.1	39.3	30.1	16.6	21.7	23.9	16.0	25.2	32.4	28.8	50.0
5 to 25	49.9	57.4	50.5	48.4	54.5	44.6	53.5	38.1	50.0	49.6	67.5	50.0
over 25	20.1	12.5	10.2	21.5	28.9	33.8	17.6	45.9	24.8	18.0	3.8	0.0
Non-Cardiology Certified Distribution (N)	5961	470	1604	976	195	380	861	310	195	901	56	13
Mileage:												
less than 5	42.4	46.9	51.2	40.4	28.7	34.4	37.8	30.6	43.9	41.0	42.2	40.5
5 to 25	48.5	45.9	44.4	49.2	52.1	49.8	53.3	48.0	45.4	51.1	49.5	40.5
over 25	9.1	7.1	4.4	10.5	19.2	15.8	8.9	21.4	10.7	7.9	8.3	18.9

Source: 2

TABLE 22

PERCENTAGE OF CARDIAC PATIENTS BY MILEAGE DISTANCE FROM PHYSICIANS:
CENSUS DIVISION BY AMERICAN COLLEGE OF CARDIOLOGY MEMBERSHIP

AMERICAN COLLEGE OF CARDIOLOGY (A.C.C.) MEMBERSHIP	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
A.C.C. Membership Distribution (N)	2164	147	636	298	79	143	277	126	86	350	19	3
Mileage:												
less than 5	38.3	41.1	48.0	36.6	23.8	26.5	35.0	23.3	35.0	37.6	40.6	58.3
5 to 25	49.1	48.5	46.2	48.6	50.9	47.8	53.0	49.0	49.7	52.2	50.1	28.3
over 25	12.6	10.5	5.7	14.9	25.4	25.7	12.0	27.7	15.3	10.2	9.4	13.3
Non-A.C.C. Membership Distribution (N)	4442	373	1125	793	140	292	677	238	140	622	41	11
Mileage:												
less than 5	42.6	47.0	51.3	40.3	28.4	35.9	37.7	31.8	45.2	41.9	41.6	36.5
5 to 25	48.4	46.5	44.3	49.3	53.2	49.8	53.5	45.6	43.8	50.4	51.1	44.7
over 25	9.1	6.6	4.1	10.4	17.4	14.4	8.9	22.7	11.0	7.7	7.4	18.7

Source: 2

TABLE 23

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE:
BY SPECIALTY
(PRIMARY AND SECONDARY IN CARDIOLOGY, INTERNAL MEDICINE AND OTHER SPECIALTIES)

PRACTICE MODE	SPECIALTY									
	PRIMARY CARDIOLOGY				SECONDARY CARDIOLOGY				ALL CARDIOLOGY	
	Secondary Internal Medicine		Secondary Other Specialties		Primary Internal Medicine		Primary Other Specialties			
	N	%	N	%	N	%	N	%	N	%
NON-INSTITUTIONAL:										
Solo	956	34.6	303	11.0	1282	46.0	226	8.2	2767	100
Partnership	403	37.1	122	11.2	504	46.4	57	5.2	1086	100
Group	406	40.3	106	10.5	457	45.3	39	3.9	1008	100
Sub Total	1765	36.3	531	10.9	2243	46.1	322	6.6	4861	100
INSTITUTIONAL:										
Hospital	397	51.0	170	21.0	158	20.3	53	6.8	778	100
Medical School	278	46.2	176	29.2	75	12.5	73	12.1	602	100
Sub Total	675	48.9	346	25.1	233	16.9	126	9.1	1380	100
OTHER	391	46.7	140	16.7	237	28.3	69	8.2	837	100
TOTAL	2831	40.0	1017	14.4	2713	38.3	517	7.3	7078	100

Source: 2

TABLE 24

PERCENTAGE OF CARDIOLOGISTS BY PRACTICE MODE:
CENSUS DIVISION BY MEDICAL SERVICE COMMUNITY POPULATION GROUPINGS*

PRACTICE MODE	Population Division	Group Total** N=6885	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS
			New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone
DISTRIBUTION (N)	under 150,000	1574	158	341	302	73	113	216	137	73	150	11
	over 150,000	5311	392	1488	837	156	350	764	234	174	863	53
NON-INSTITUTIONAL:												
Solo	under 150,000	742	53.8	64.2	40.7	35.6	43.4	44.0	27.7	47.9	45.3	36.4
	over 150,000	1996	42.1	49.7	30.8	25.0	28.9	36.6	22.6	25.3	34.0	45.3
Partnership	under 150,000	211	9.5	10.0	15.2	24.7	15.0	13.0	7.3	23.3	17.3	0.0
	over 150,000	868	8.7	12.4	20.0	23.1	18.0	15.1	18.4	21.3	21.7	3.8
Group	under 150,000	318	13.9	9.7	17.9	21.9	23.9	29.6	40.1	19.2	21.3	9.1
	over 150,000	681	11.7	5.6	14.5	20.5	19.4	13.4	24.4	17.2	16.2	1.9
Sub Total	under 150,000	1271	77.2	83.9	73.8	82.2	82.3	86.6	75.2	90.4	84.0	45.5
	over 150,000	3545	62.5	67.7	65.2	68.6	66.3	65.1	65.4	63.8	71.8	50.9
INSTITUTIONAL:												
Hospital	under 150,000	107	9.5	8.8	6.0	0.0	7.1	7.9	3.6	2.7	8.0	0.0
	over 150,000	621	19.1	13.6	10.4	5.1	7.4	13.6	8.5	9.2	8.7	15.1
Medical School	under 150,000	66	5.1	0.9	8.9	8.2	3.5	2.3	7.3	0.0	0.7	18.2
	over 150,000	507	6.6	7.1	11.0	18.6	13.4	9.3	16.7	12.6	8.1	9.4
Sub Total	under 150,000	173	14.6	9.7	14.9	8.2	10.6	10.2	10.9	2.7	8.7	18.2
	over 150,000	1128	25.8	20.7	21.4	23.7	20.9	22.9	25.2	21.8	16.8	24.5
OTHER:	under 150,000	125	8.2	6.5	11.3	9.5	7.1	3.2	13.9	6.8	7.3	36.4
	over 150,000	643	11.7	11.6	13.4	7.7	12.9	12.0	9.4	14.4	11.4	24.5
TOTAL	under 150,000	1569	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	over 150,000	5316	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Physician estimate of population within 25 mile radius of his office.
**Excludes 14 APO/FPO.

Source: 2

TABLE 25

CARDIOLOGISTS BY PRACTICE MODE:
PERCENTAGE OF CARDIAC PATIENTS BY MILEAGE DISTANCE FROM PHYSICIAN

PRACTICE MODE	Distribution (N)	DISTANCE		
		Less than 5 miles	5 to 25 miles	over 25 miles
NON-INSTITUTIONAL:				
Solo	2651	47.3	47.7	4.9
Partnership	1044	41.5	50.9	7.5
Group	964	38.9	48.3	12.8
Sub Total	4659	44.3	48.5	7.1
INSTITUTIONAL:				
Hospital	646	36.5	50.6	12.9
Medical School	482	28.3	42.8	28.9
Sub Total	1128	33.0	47.3	19.7
OTHER	664	33.0	50.3	15.9
ALL CARDIOLOGISTS	6451	41.1	48.5	10.2

Source: 2

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TABLE 26

CARDIOLOGISTS BY PRACTICE MODE:
PERCENTAGE OF PROFESSIONAL ACTIVITY TIME AND PROPORTION OF TIME TO CARDIOLOGY

PRACTICE MODE	Distribution (N) Total N=6987	Time Allocation	TYPE OF ACTIVITY: Direct Patient Care %	Research with Patient Care %	Teaching with Patient Care %	Sub Total Clinical %	Research without Patient Care %	Teaching without Patient Care %	Sub Total Non-Clinical Res. & Teach %	Administrative %	Professional %
NON-INSTITUTIONAL:											
Solo	N=2724	% of total	81.3	1.3	5.6	88.2	0.5	1.6	2.1	4.7	4.9
		% to CD	45.8	1.0	3.6	50.3	0.3	1.1	1.4	0.0	0.0
Partnership	N=1079	% of total	80.0	1.3	6.7	88.0	0.4	1.9	2.3	4.9	4.7
		% to CD	46.0	1.1	4.7	51.9	0.3	1.4	1.7	0.0	0.0
Group	N=997	% of total	79.2	1.7	6.7	87.6	0.7	1.7	2.4	5.0	4.9
		% to CD	45.6	1.3	4.5	51.5	0.6	1.2	1.8	0.0	0.0
Sub Total	N=4800	% of total	80.6	1.4	6.1	88.0	0.5	1.7	2.2	4.8	4.9
		% to CD	45.8	1.1	4.0	50.9	0.4	1.2	1.6	0.0	0.0
INSTITUTIONAL:											
Hospital	N=771	% of total	45.4	10.2	18.3	73.8	5.6	4.9	10.5	10.0	5.6
		% to CD	32.1	9.0	14.1	55.2	4.6	3.8	8.4	0.0	0.0
Medical School	N=597	% of total	19.5	14.8	22.3	56.7	16.2	8.9	25.1	12.6	5.7
		% to CD	15.8	13.2	17.3	46.2	12.8	6.1	18.9	0.0	0.0
Sub Total	N=1368	% of total	34.1	12.2	20.0	66.3	10.2	6.6	16.9	11.1	5.6
		% to CD	25.0	10.8	15.5	51.3	8.2	4.8	13.0	0.0	0.0
Other	N=819	% of total	45.6	7.3	15.4	68.3	7.1	4.8	11.9	13.9	5.8
		% to CD	29.6	6.3	12.1	47.9	5.9	7.4	13.3	0.0	0.0

Source: 2

TABLE 27

PERCENTAGE OF PROFESSIONAL ACTIVITY TIME
AND PROPORTION OF TIME TO CARDIOLOGY
BY SPECIALTY

TYPE OF ACTIVITY	SPECIALTY					
	Primary Cardiologist (N=3910)		Secondary Cardiologist (N=3256)		ALL CARDIOLOGISTS (N=7166)	
	% of total	% to CD	% of total	% to CD	% of total	% to CD
Direct Patient Care	60.8	48.8	75.3	28.9	67.3	39.9
Research with Patient Care	6.2	5.7	1.8	1.0	4.2	3.6
Teaching with Patient Care	12.6	10.5	6.6	3.0	9.9	7.1
Sub Total - Clinical	79.5	65.0	83.7	32.9	81.4	50.6
Research without Patient Care	4.4	4.0	1.9	0.9	3.3	2.6
Teaching without Patient Care	3.9	3.2	2.0	0.9	3.0	2.2
Sub Total - Non-Clinical Research and Teaching	8.3	7.2	3.9	1.8	6.3	4.8
Administrative	6.8	0.0	7.5	0.0	7.1	0.0
Professional	5.4	0.0	4.3	0.0	5.1	0.0
TOTAL	100.0	72.2	99.9	34.7	99.9	55.4

Source: 2

TABLE 28

PERCENTAGE OF PROFESSIONAL ACTIVITY TIME AND PROPORTION OF TIME TO CARDIOLOGY: CENSUS DIVISION BY PRIMARY CARDIOLOGIST

TYPE OF ACTIVITY	Time Allocation	Total Group	NORTHEAST		SOUTH			CENTRAL		WEST		POSSESSIONS APO/FPO	
			New England	Middle Atlantic	South Atlantic	East-South Atlantic	West-South Atlantic	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
		3910	329	1029	628	125	270	545	198	156	582	43	5
Direct Patient Care	% of total	60.8	55.3	62.0	60.3	67.9	62.0	59.0	56.9	65.6	61.8	59.3	50.0
	% to CD	48.8	44.4	49.7	48.3	54.6	50.6	47.6	45.5	54.6	48.9	45.8	43.6
Research with Patient Care	% of total	6.2	7.3	6.0	7.2	4.3	5.8	6.6	4.9	2.9	6.6	4.1	0.6
	% to CD	5.7	6.7	5.4	6.9	3.9	4.8	6.0	4.6	2.7	6.3	3.9	0.6
Teaching with Patient Care	% of total	12.6	13.0	12.7	11.3	10.2	13.3	14.1	17.0	11.2	10.7	15.3	30.0
	% to CD	10.5	10.5	10.5	9.8	8.1	10.9	11.4	14.3	10.0	9.1	12.2	30.0
Sub Total - Clinical	% of total	79.5	75.6	80.7	78.8	82.4	81.1	79.7	78.8	79.6	79.1	78.8	80.6
	% to CD	65.0	61.6	65.6	65.0	66.6	66.3	65.0	64.4	67.3	64.3	61.9	74.2
Research without Patient Care	% of total	4.4	8.5	3.6	5.0	3.1	3.6	3.9	5.8	4.2	4.1	2.1	1.0
	% to CD	4.0	7.8	3.3	4.7	2.7	3.2	3.5	4.9	3.7	3.7	2.0	1.0
Teaching without Patient Care	% of total	3.9	4.2	3.9	3.6	3.7	3.9	4.6	4.7	4.1	3.1	4.4	6.0
	% to CD	3.2	3.7	3.2	2.9	3.1	3.3	3.7	3.7	3.7	2.7	3.1	6.0
Sub Total - Non-Clinical Research and Teaching	% of total	8.3	12.7	7.5	8.6	6.8	7.5	8.5	10.5	8.3	7.2	6.5	7.0
	% to CD	7.2	11.5	6.5	7.6	5.8	6.5	7.2	8.6	7.4	6.4	5.1	7.0
Administrative	% of total	6.8	6.3	6.5	7.3	5.7	6.6	6.6	5.9	7.4	7.3	9.6	4.0
Professional	% of total	5.4	5.3	5.4	5.2	5.0	4.8	5.2	4.9	4.6	6.4	5.1	8.4
TOTAL		100.0	99.9	100.1	99.9	99.9	100.0	100.0	100.1	99.9	100.0	100.0	100.0
CD % OF TOTAL		72.2	73.1	72.1	72.6	72.4	72.8	72.2	73.0	74.7	70.7	67.0	81.2

Source: 2

TABLE 29

PERCENTAGE OF PROFESSIONAL ACTIVITY TIME AND PROPORTION OF TIME TO CARDIOLOGY: CENSUS DIVISION BY SECONDARY CARDIOLOGIST

TYPE OF ACTIVITY	Time Allocation	Total Group	NORTHEAST		SOUTH			CENTRAL		WEST		POSSESSIONS APO/FPO	
			New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
		3256	240	868	571	102	200	484	191	84	470	23	13
Direct Patient Care	% of total	75.3	77.0	74.8	76.9	75.1	77.5	74.4	72.2	83.0	73.4	69.3	72.9
	% to CD	28.9	28.8	28.9	30.2	30.9	30.2	29.1	26.0	29.6	27.8	29.7	14.5
Research with Patient Care	% of total	1.8	1.5	1.9	1.8	2.6	1.2	1.7	2.4	1.4	2.1	2.0	0.0
	% to CD	1.0	0.8	0.9	0.8	1.3	0.5	0.9	1.5	1.3	1.2	1.4	0.0
Teaching with Patient Care	% of total	6.6	6.1	6.9	5.3	6.8	5.5	8.5	7.6	3.2	6.7	7.0	3.1
	% to CD	3.0	3.1	3.0	2.4	2.6	2.5	4.1	3.5	2.0	3.1	4.4	1.7
Sub Total - Clinical	% of total	83.7	84.6	83.6	84.0	84.5	84.1	84.6	82.2	87.6	82.2	78.4	76.0
	% to CD	32.9	32.7	32.8	33.5	34.8	33.2	34.1	31.0	32.9	32.1	35.6	16.2
Research without Patient Care	% of total	1.9	2.0	2.2	1.9	3.4	1.7	1.5	1.6	0.4	2.3	1.1	0.0
	% to CD	0.9	1.1	1.0	0.6	1.6	0.6	0.6	1.0	0.4	1.2	0.3	0.0
Teaching without Patient Care	% of total	2.0	2.4	1.8	1.3	2.4	2.3	2.5	2.2	1.7	2.2	3.5	2.1
	% to CD	0.9	1.2	0.8	0.6	1.0	0.7	1.2	0.9	0.7	1.0	1.3	0.9
Sub-Total - Non-Clinical Research and Teaching	% of total	3.9	4.4	4.0	3.2	5.8	4.0	4.0	3.8	2.1	4.5	4.6	2.1
	% to CD	1.8	2.3	1.8	1.2	2.6	1.3	1.8	1.9	1.1	2.2	1.6	0.9
Administrative	% of total	7.5	6.6	7.5	8.0	5.9	8.0	7.0	8.3	5.7	7.7	10.9	15.4
Professional	% of total	4.3	4.3	4.9	4.8	3.9	3.9	4.4	5.7	4.6	5.6	6.1	6.5
TOTAL		99.9	99.9	100	100	100.1	100	100	100	100	100	100	100
CD % OF TOTAL		34.7	35.0	34.6	34.7	37.4	34.5	35.9	32.9	34.0	34.3	37.2	17.1

Source: 2

TABLE 30

PERCENTAGE OF PROFESSIONAL ACTIVITY TIME AND PROPORTION OF TIME TO CARDIOLOGY:
CENSUS DIVISION BY ALL CARDIOLOGISTS

TYPE OF ACTIVITY	Time Allocation	Total Group	NORTHEAST		SOUTH			CENTRAL		WEST		POSSESSIONS APO/FPO	
			New England	Middle Atlantic	South Atlantic	East-South Atlantic	West-South Atlantic	East-North Central	West-North Central	Mountain	Pacific	Caribbean	Military
		7166	569	1897	1199	227	470	1029	389	250	1052	66	18
Direct Patient Care	% of total	67.3	64.4	67.5	68.2	71.2	68.6	66.2	64.4	72.1	67.0	62.8	66.6
	% to CD	39.9	37.9	40.4	39.7	44.2	42.1	39.1	36.0	45.1	39.7	40.2	22.6
Research with Patient Care	% of total	4.2	4.9	4.1	4.6	3.5	3.8	4.3	3.6	2.4	4.6	3.4	.2
	% to CD	3.6	4.2	3.3	4.0	2.7	3.0	3.7	3.1	2.2	4.0	3.0	.2
Teaching with Patient Care	% of total	9.5	10.1	10.1	8.5	8.7	10.0	11.5	12.4	8.2	8.9	12.4	10.6
	% to CD	7.1	7.5	7.1	6.3	5.7	7.4	8.0	9.0	7.0	6.5	9.5	9.6
Sub Total - Clinical	% of total	81.4	79.4	82.0	81.3	83.4	82.4	82.0	80.5	82.7	80.5	78.6	77.3
	% to CD	50.6	49.6	50.8	50.0	52.6	52.4	50.8	48.1	54.3	50.2	52.7	32.3
Research without Patient Care	% of total	3.3	5.8	2.9	3.5	3.2	2.8	2.7	3.8	2.8	3.3	1.8	.3
	% to CD	2.6	5.0	2.2	2.7	2.2	2.1	2.2	3.0	2.5	2.6	1.5	.3
Teaching without Patient Care	% of total	3.0	3.5	2.9	2.5	3.1	3.2	3.6	3.4	3.2	2.7	4.1	3.2
	% to CD	2.2	2.6	2.1	1.8	2.2	2.2	2.6	2.3	2.6	1.9	2.5	2.3
Sub-Total - Non-Clinical Research and Teaching	% of total	6.3	9.3	5.8	6.0	6.3	6.0	6.3	7.2	6.0	6.0	5.9	3.5
	% to CD	4.8	7.6	4.3	4.5	4.4	4.3	4.8	5.3	5.1	4.5	4.0	2.6
Administrative	% of total	7.1	6.5	7.0	7.6	5.8	7.2	6.8	7.1	6.8	7.5	10.0	12.2
Professional	% of total	5.1	4.9	5.1	5.0	4.5	4.4	4.9	5.3	4.6	6.0	5.5	7.1
TOTAL		99.9	100.1	99.9	99.9	100	100	100	100.1	100.1	100	100	100.1
CD % OF TOTAL		55.4	57.2	55.1	54.5	57.0	56.7	55.6	53.4	59.4	54.7	56.7	34.9

Source: 2

TABLE 31

ALL ACTIVE CARDIOLOGISTS:
PERCENTAGE OF PROFESSIONAL ACTIVITY TIME AND PROPORTION OF TIME TO CARDIOLOGY BY SPECIALTY AND PHYSICIAN AGE GROUPINGS

TYPE OF ACTIVITY	PRIMARY						SECONDARY						ALL CARDIOLOGISTS (N=7069)	
	Less Than 40 Years (N=1324)		40 to 60 Years (N=1959)		60 Years and Over (N=584)		Less Than 40 Years (N=672)		40 to 60 Years (N=1893)		60 Years and Over (N=632)			
	% of total	% to CD	% of total	% to CD	% of total	% to CD	% of total	% to CD	% of total	% to CD	% of total	% to CD	% of total	% to CD
Direct Patient Care	54.3	45.2	60.6	48.1	76.1	59.5	72.5	26.1	74.9	29.3	81.0	31.7	67.5	40.0
Research with Patient Care	8.9	8.3	5.4	4.5	2.8	2.4	1.9	1.1	1.8	.9	1.6	.9	4.2	3.6
Teaching with Patient Care	15.2	13.2	12.5	10.2	6.7	5.0	9.2	4.3	6.6	3.0	3.7	1.5	9.9	7.1
Sub Total - Clinical	78.4	66.7	78.5	63.2	85.6	66.9	83.6	31.5	83.3	33.2	86.3	34.1	81.6	50.7
Research without Patient Care	6.5	6.1	3.9	3.4	1.7	1.5	2.8	1.2	1.8	.9	.9	.2	3.3	2.6
Teaching without Patient Care	4.2	3.6	4.1	3.4	2.3	1.8	2.9	1.3	2.0	.9	.9	.4	3.0	2.2
Sub Total - Non-Clinical	10.7	9.7	8.0	6.8	4.0	3.3	5.7	2.5	3.8	1.8	1.8	.6	6.3	4.8
Administrative	5.3		8.2		5.4		5.5		8.2		7.2		7.0	
Professional	5.6		5.3		5.0		5.2		4.7		4.7		5.1	
TOTAL	100.0	76.4	100.0	70.0	100.0	70.2	100.0	34.0	100.0	35.0	100.0	34.7	100.0	55.5

Source: 2

TABLE 32

ALL ACTIVE CARDIOLOGISTS:
PERCENTAGE OF PROFESSIONAL ACTIVITY TIME AND PROPORTION OF TIME TO CARDIOLOGY BY SPECIALTY AND BOARD CERTIFICATION STATUS

TYPE OF ACTIVITY	PRIMARY				SECONDARY				ALL CARDIOLOGISTS	
	Board Certified (N=2277)		Non-Certified (N=1633)		Board Certified (N=1597)		Non-Certified (N=1659)		(N=7166)	
	% of total	% to CD	% of total	% to CD	% of total	% to CD	% of total	% to CD	% of total	% to CD
Direct Patient Care	61.0	49.3	60.4	48.1	72.8	29.3	77.6	28.6	67.3	39.9
Research with Patient Care	5.3	4.9	7.4	6.8	1.8	.9	1.9	1.0	4.2	3.6
Teaching with Patient Care	13.5	11.2	11.3	9.5	8.1	3.7	5.2	2.4	9.9	7.1
Sub Total - Clinical	79.8	65.4	79.1	64.4	82.7	33.9	84.7	32.0	81.4	50.6
Research without Patient Care	3.3	3.0	6.0	5.5	1.6	.7	2.3	1.1	3.3	2.6
Teaching without Patient Care	4.0	3.3	3.8	3.1	2.3	1.0	1.8	.8	3.0	2.2
Sub Total - Non-Clinical	7.3	6.3	9.8	8.6	3.9	1.7	4.1	1.9	6.3	4.8
Administrative	7.5		5.8		8.6		6.5		7.2	
Professional	5.4		5.3		4.8		4.4		5.1	
TOTAL	100.0	71.7	100.0	73.0	100.0	35.6	100.0	33.9	100.0	55.4

Source: 2

TABLE 33

ALL ACTIVE CARDIOLOGISTS: PERCENTAGE OF PROFESSIONAL ACTIVITY TIME AND PROPORTION OF TIME TO CARDIOLOGY BY SPECIALTY AND SUBSPECIALTY BOARD CERTIFICATION STATUS

TYPE OF ACTIVITY	PRIMARY				SECONDARY				ALL CARDIOLOGISTS (N=7166)	
	Subspecialty Certified (N=598)		Non-Certified (N=3312)		Subspecialty Certified (N=91)		Non-Certified (N=3165)			
	% of total	% to CD	% of total	% to CD	% of total	% to CD	% of total	% to CD	% of total	% to CD
Direct Patient Care	55.4	48.5	61.7	48.8	53.0	23.5	75.9	29.1	67.3	39.9
Research with Patient Care	6.4	6.0	6.1	5.6	4.6	2.2	1.8	.9	4.2	3.6
Teaching with Patient Care	16.4	13.9	11.9	9.8	11.0	5.2	6.5	3.0	9.9	7.1
Sub Total - Clinical	78.2	68.4	79.7	64.2	68.6	30.9	84.2	33.0	81.4	50.6
Research without Patient Care	3.6	3.4	4.6	4.1	1.0	.6	2.0	.9	3.3	2.6
Teaching without Patient Care	4.6	3.8	3.8	3.1	3.5	1.6	2.0	.9	3.0	2.2
Sub Total - Non-Clinical	8.2	7.2	8.4	7.2	4.5	2.2	4.0	1.8	6.3	4.8
Administrative	8.1		6.6		21.3		7.1		7.2	
Professional	5.5		5.3		5.6		4.7		5.1	
TOTAL	100.0	75.6	100.0	71.4	100.0	33.1	100.0	34.8	100.0	55.4

Source: 2

- Tables 34 through 38 present statistics related to performance of selected cardiology activities

Total Professional Time Compared to Total Cardiology Professional Time

The Initial Cardiology Survey questionnaire asked for two estimates of professional time. The first was an estimate of total professional time allocated to the indicated category. The second was an estimate of the proportion of that time which pertained to cardiology. Thus, an individual could report "70 percent time in direct care of patients" and the proportion of that time allocated to cardiology might be 100 percent. The calculation, which is necessary to determine total percent of professional activity time in a category which is cardiology-specific, i.e., column 3 below, was made to permit rapid comparisons and derivation of ratios.

Specialty	(1) Percent of Total Professional Time Commited to		(2) Percent of Activity Time Applied to Cardiology		(3) Percent of Total Time Applied to CD
Primary	60.8	x	80.3	=	48.8
Secondary	75.3	x	38.4	=	28.9

Under the assumption that the Primary Cardiologist is, by definition, a specialist in cardiovascular disease, one could consider the difference between the total activity time (60.8 percent) and the total activity time which is cardiovascular (48.8 percent) as a measure of non-specialist patient care. This difference amounts to 12 percent.

The example given of alternative ways of viewing the data contained in Table 27 pertains to all professional activity tables in this section of the report.

CARDIOLOGY PROFESSIONAL DIARY

As noted previously, the data obtained through the Cardiology Professional Diary study provided the most reliable information regarding the time devoted to types of professional activities as well as the actual activities themselves. It would not have been possible, of course, to arrive at this conclusion concerning quality of data obtained without data both from a questionnaire and from a log-diary for comparisons.

In this section we will present those statistics regarding professional activities obtained through use of the log-diary which are believed most pertinent to cardiologist's role definition.

TABLE 34

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES: BY SPECIALTY

TYPE OF ACTIVITY	SPECIALTY		ALL CARDIOLOGISTS (N=7045)
	Primary Cardiologist (N=3876)	Secondary Cardiologist (N=3169)	
Office Consultant for Cardiac Patients	84.1	87.7	85.7
Office ECG Reader	71.5	81.7	76.1
Hospital Consultant for Cardiac Patients	92.9	80.6	87.4
Hospital ECG Reader	77.0	60.9	69.8
Hospital CCU Committee	64.8	53.2	59.6
Cardiac Diagnostic Roentgenography	37.3	14.8	27.2
Cardiac Catheterization	40.9	7.9	26.0

Source: 2

TABLE 35

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES: BY PHYSICIAN AGE GROUPINGS AND PRIMARY OR SECONDARY SPECIALTY CLASSIFICATION

TYPE OF ACTIVITIES	LESS THAN 40 YEARS (N= 1964)		40 TO 59 YEARS (N= 3782)		60 YEARS AND OVER (N= 1208)		ALL AGES (N= 6954)	
	PRIMARY (N= 1310)	SECONDARY (N= 654)	PRIMARY (N= 1937)	SECONDARY (N= 1845)	PRIMARY (N= 586)	SECONDARY (N= 622)	PRIMARY (N= 3833)	SECONDARY (N= 3121)
Office Consultant for Cardiac Patients	73.0	82.0	89.3	90.9	91.8	84.6	84.1	87.8
Office ECG Reader	61.0	76.3	77.2	83.6	76.3	82.2	71.5	81.8
Hospital Consultant for Cardiac Patients	94.1	84.7	95.0	84.4	83.3	65.9	92.9	80.8
Hospital ECG Reader	80.3	68.8	78.7	63.1	64.7	46.8	77.1	61.1
Hospital CCU Committee	62.6	59.0	71.6	56.4	47.1	38.4	64.8	53.4
Cardiac Diagnostic Roentgenography	52.1	22.0	33.6	13.3	15.7	12.1	37.2	14.9
Cardiac Catheterization	70.0	20.6	35.1	7.9	4.9	1.0	42.4	9.1

Source: 2

TABLE 36

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES: BY PHYSICIAN AGE GROUPINGS AND SPECIALTY BOARD CERTIFICATION STATUS

TYPE OF ACTIVITIES	LESS THAN 40 YEARS (N= 1964)		40 TO 59 YEARS (N= 3782)		60 YEARS AND OVER (N= 1208)		ALL AGES (N= 6954)	
	BOARD CERTIFIED (N= 818)	NON-CERTIFIED (N= 1146)	BOARD CERTIFIED (N= 2309)	NON-CERTIFIED (N= 1473)	BOARD CERTIFIED (N= 638)	NON-CERTIFIED (N= 570)	BOARD CERTIFIED (3765)	NON-CERTIFIED (3189)
Office Consultant or Cardiac Patients	86.1	68.8	91.4	88.0	91.8	83.9	90.3	86.3
Office ECG Reader	72.9	61.3	79.8	81.1	77.6	81.2	77.9	74.0
Hospital Consultant for Cardiac Patients	94.0	88.8	92.9	85.0	83.7	63.9	91.6	82.6
Hospital ECG Reader	80.7	73.5	75.4	64.4	59.9	50.5	73.9	65.2
Hospital CCU Committee	69.8	55.4	69.5	55.9	48.1	36.5	65.9	52.2
Cardiac Diagnostic Roentgenography	43.5	41.1	25.4	21.0	14.4	13.2	27.5	26.8
Cardiac Catheterization	54.3	53.0	24.1	18.3	4.1	1.6	27.2	27.8

Source: 2

TABLE 37

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES: BY PHYSICIAN AGE GROUPINGS AND SUBSPECIALTY BOARD IN CARDIOVASCULAR DISEASE CERTIFICATION STATUS

TYPE OF ACTIVITIES	LESS THAN 40 YEARS (N= 1964)		40 TO 59 YEARS (N= 3782)		60 YEARS AND OVER (N= 1208)		ALL AGES (N= 6954)	
	SUBSPECIALTY CERTIFIED (N= 110) 5.6%	NON-CERTIFIED (N= 1854) 94.4%	SUBSPECIALTY CERTIFIED (N= 406) 10.7%	NON-CERTIFIED (N= 3376) 89.3%	SUBSPECIALTY CERTIFIED (N= 156) 12.9%	NON-CERTIFIED (N= 1052) 87.1%	SUBSPECIALTY CERTIFIED (N= 672) 9.7%	NON-CERTIFIED (N= 6282) 90.3%
Office Consultant for Cardiac Patients	88.2	75.2	91.9	89.8	89.7	87.8	90.8	85.2
Office ECG Reader	71.8	65.7	73.2	81.2	63.5	81.7	70.7	76.7
Hospital Consultant for Cardiac Patients	97.3	90.6	97.0	89.0	88.5	72.2	95.1	86.7
Hospital ECG Reader	82.7	76.1	83.0	69.7	59.6	54.8	77.5	59.1
Hospital CCU Committee	74.5	60.6	74.9	62.9	44.9	42.3	67.9	58.8
Cardiac Diagnostic Roentgenography	59.1	41.1	41.6	21.6	16.0	13.5	38.5	26.0
Cardiac Catheterization	74.5	52.3	49.5	18.5	5.1	2.6	43.3	25.8

Source: 2

TABLE 38

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED
TYPES OF CARDIOLOGY ACTIVITIES:
BY MEDICAL SERVICE COMMUNITY POPULATION GROUPINGS*

TYPE OF ACTIVITY	MEDICAL SERVICE COMMUNITY		ALL CARDIOLOGISTS (N=6888)
	Population under 150,000 (N=1590)	Population over 150,000 (N=5298)	
Office Consultant for Cardiac Patients	88.6	85.9	86.5
Office ECG Reader	83.9	74.7	76.8
Hospital Consultant for Cardiac Patients	88.6	87.2	87.6
Hospital ECG Reader	79.4	67.1	70.0
Hospital CCU Committee	71.8	56.5	60.0
Cardiac Diagnostic Roentgenography	22.8	28.5	27.2
Cardiac Catheterization	15.0	29.0	25.8

*Physician estimate of population within a twenty-five mile radius of his office.

Source: 2

This study was the principal method used to determine what the cardiologists do within the context of a professional day. The characteristics of the log-diary, design considerations, sampling and analysis issues were discussed in Chapter Two, pages 18 through 39.

It will be remembered that there were 364 cardiologists who kept this log-diary during an assigned five-day time period. The recording times were selected to ensure coverage of all days of the week at the same level. Having sampled days as well as individuals, the resultant statistics reflect a typical day within a typical week.

The data are presented by the log-diary sections:

- Activity Overview
- Patient Care
- Laboratory & Diagnostic Testing
- Research
- Teaching

Activity Overview Data

Data are presented in this section by cardiologists days and by units applicable to activities which occurred on those days. It is important, therefore, to consider the base for the table in interpreting the data which it contains. For example, there were 1,906 cardiologist days; about 23,000 patient encounters; and approximately 17,000 patients involved. Footnotes indicate data that has been weighted to provide a distribution equivalent to that which would have been obtained if the cardiologists had been surveyed in proportion to their actual numbers within a cardiologist-type.

Activity Overview Content Analysis Categories

The content analysis plan employed seven primary and six secondary classification variables. The variable, "direct patient care", was expanded to five; unspecified "personal time" was expanded to two; "travel" was expanded to three. In all, 49 recording classification possibilites were established, of which only 29 categories were required. The content analysis plan is summarized below.

Figure 1

Diary Activity Overview Content Analysis
Classification Categories

Primary Classification Category	Secondary Classification Category
Direct Patient Care	General (unspecificed)
Teaching	Direct Patient Care
Research	1. Hospital Patients
Professional	2. Office Patients
Administration	3. Emergency Patients
Personal	4. Laboratory and Diagnostic Testing
1. Less than 1/2 day	5. Other
2. 1/2 day or more	Teaching
Travel	Research
1. Local Professional	Professional
2. Long Distance Professional	Administration
3. Personal	

The combinations of a primary with a secondary classification category had unique alpha numeric codes designated for ease of memorization and similarity to that which they described. The personal classification categories employed to account for the total recorded time have not been used in any of the analyses which follow.

Allocation of Time to Professional Activities Comparing Classification Questionnaire Responses to Log-Diary Responses

Table 39 provides percentages of time obtained from the Cardiology Professional Diary and the Initial Classification Questionnaire for the same cardiologists. The differences in assessments based on retrospective judgment (classification questionnaire) and recordings as events occur (log-diary) are quite evident. The most significant conclusions from this table are as follows.

The analysis of this table indicates the areas in which the cardiologists' estimates of time were least consistent with their recorded time. The cardiologists who's major commitment is in patient care over-estimated this category more than others (even with adjustments for travel); those whose unique expertise is in specialized research and teaching over-estimated these activities more than others. Perhaps an individual's assessment of the amount of time allocated to activities is directly correlated with is personal assessment of the particular activity's importance; such a hypothesis is supported by the findings in this tabulation. Clearly, the table shows individuals do not consistently estimate their activity time accurately; that if precision is required, then an approach such as the log-diary is necessary.

TABLE 39

CARDIOLOGISTS' ACTIVITY TIME AS REPORTED ON CLASSIFICATION QUESTIONNAIRE AND RECORDED IN LOG-DIARY:* ACTIVITIES BY SPECIALTY AND TYPE OF PRACTICE

Type of Activity	Non-Institutional				Institutional			
	Primary N=111		Secondary N=102		Primary N=97		Secondary N=54	
	Classification Questionnaire	Log-Diary	Classification Questionnaire	Log-Diary	Classification Questionnaire	Log-Diary	Classification Questionnaire	Log-Diary
	%	%	%	%	%	%	%	%
Direct Patient Care	76.6	70.9	82.5	75.7	27.7	36.9	34.6	40.3
Teaching with Patients	8.3	6.6	5.5	4.0	23.6	13.2	18.1	8.5
Teaching without Patients	2.1	2.4	1.3	1.2	7.3	6.8	8.3	9.5
Research with Patients	2.4	0.2	0.8	0.2	14.8	2.0	8.6	1.8
Research without Patients	0.4	1.4	0.1	0.8	11.0	16.0	4.5	5.5
Professional	5.3	10.1	4.0	9.3	5.9	13.7	5.1	12.5
General Administration	4.9	8.4	5.8	8.8	9.7	11.4	20.8	21.9
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Comparative differences are conservative since log-diary travel time was not included in percentage calculations.

A most important conclusion for this project is that the estimated activity times obtained from the Initial Cardiology Survey requires some adjustment before they are used in manpower projections based on time commitments to professional activities.

Patient Care General Time Allocations

Table 40 provides the summary statistics for assessment of the detailed patient-related data presented in the patient care section. It is apparent from this table that:

- Non-Institutional cardiologists devote twice as much time to patient care as Institutional cardiologists. Their hospital-based time is 50 percent greater and with the exception of the Primary Institutional cardiologists, their time in laboratory and diagnostic testing work is equal.

- Patient-related administration consumes about the same percentage of time for all cardiologists.

- Teaching activities for Non-Institutional cardiologists consume about 8 percent of their time and are primarily focused on teaching support staffs to perform specific tasks.

- Teaching for the Institutional cardiologist accounts for 19 percent of their time and applies to all levels of physicians and support staffs.

- Research is an insignificant time consumer for the Non-Institutional cardiologist.

- Research for Institutional cardiologists accounts for about 13 percent of their time; for the Primary cardiologist it accounts for 18 percent of his time.

- Professional time percentages are quite similar for Non-Institutional as a group and for Institutional as a group. Institutional cardiologists devote approximately 3 percent more time to professional activities than Non-Institutional - a very modest difference in time.

- General administration consumes close to 9 percent of Non-Institutional cardiologist's time, 11 percent of Primary Institutional's and 22 percent of the Secondary Institutional cardiologist's time. The very large amount of time for the Secondary Institutional cardiologist is partially explained by his role as a medical school and/or hospital administrator and planner.

TABLE 40

CATEGORIES OF CARDIOLOGISTS' AVERAGE DAILY ACTIVITY TIME:
TYPE OF ACTIVITY BY SPECIALTY AND PRACTICE

Type of Activity	Non-Institutional				Institutional				All Cardiologists*	
	Primary		Secondary		Primary		Secondary			
	% of Time	Hours	% of Time	Hours	% of Time	Hours	% of Time	Hours	% of Time	Hours
DIRECT PATIENT CARE										
Unspecified	1.8		5.0		1.6		4.2		3.1	
Hospital	23.7		21.0		15.3		15.0		20.9	
Office	30.3		36.7		3.2		6.7		27.2	
Non-scheduled, Emergency	1.8		2.1		0.8		1.6		1.8	
Lab and Diagnostic Tests	5.4		3.8		9.0		4.7		5.3	
Extended Care Facilities	0.4		1.0		0.0		1.8		0.6	
Patient Records, Charts	7.5		6.1		7.0		6.3		6.7	
Subtotal	70.9	5.9	75.7	6.6	36.9	3.1	40.3	3.4	65.6	5.6
TEACHING										
With Patients	6.6		4.0		13.2		8.5		6.7	
Without Patients	2.4		1.2		6.8		9.5		3.0	
Subtotal	9.0	0.8	5.2	0.5	20.0	1.7	18.0	1.5	9.7	0.8
RESEARCH										
With Patients	0.2		0.2		2.0		1.8		0.9	
Without Patients	1.4		0.8		16.0		5.5		3.9	
Subtotal	1.6	0.1	1.0	0.1	18.0	1.5	7.3	0.6	4.5	0.4
PROFESSIONAL	10.1	0.8	9.3	0.8	13.7	1.2	12.5	1.1	10.4	0.9
GENERAL ADMINISTRATION	8.4	0.7	8.8	0.8	11.4	1.0	21.9	1.9	9.8	0.8
TOTAL	100.0	8.3	100.0	8.8	100.0	8.5	100.0	8.5	100.0	8.5

*Percentages based on weighted frequencies, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Souce: 3

Tables 41 and 42 examine differences in proportion of time allocated to professional activities by medical community size for each of the four types of cardiology practices.

Patient Care Overview

As with the activity overview section, the data are based on 1,906 cardiologist days, approximately equally distributed across each of the seven days in a week. Whereas the unit for presenting data in the preceding section was the cardiologist day, in this section it is based on patients or patient encounters.

An encounter describes each time a cardiologist saw a patient. A patient, on the other hand, might be seen several times. If the interest is in practice volume, then the encounter measure is used. On the other hand, if it is in the relative occurrence of a particular condition within the patient population then the patient measure is used. The proportion of each type of cardiologist's practice which involved seeing a patient more than once during the five-day period is shown in Table 43.

Weighting the data (assigning frequency counts by each specialty type) is probably more important in this section than in any other because by far the greatest number of patients are seen and treated by the Non-Institutional cardiologists. Table 44 presents patient encounter statistics for each type of cardiologist and as a combined statistic for all cardiologists on (1) the base as actually obtained through the study and (2) adjusted to reflect the proportion of all cardiologists that each type of specialist actually represents. Through weighting, only the frequency count changes; there are no changes of a proportionate nature within a particular type of specialist's profile. There are changes of both a frequency count character and a proportionate character as one specialist type is compared to another. These changes are shown quite clearly in Table 44 and illustrate why weighting is required.

Secondary Non-Institutional cardiologists contributed 8,008 patient encounters which, when weighted, is a contribution of 12,251. The proportion of each statistic allocated between office and hospital for encounter setting and the proportion in percentage terms is:

	Unweighted		Weighted	
	Number	Percent	Number	Percent
Office	5,334	66.6	8,160	66.6
Hospital	2,674	33.4	4,091	33.4
Total	8,008	100.0	12,251	100.0

TABLE 41

CARDIOLOGISTS IN NON-INSTITUTIONAL PRACTICE:
DISTRIBUTION OF AVERAGE TIME (MINUTES) IN PROFESSIONAL ACTIVITIES
PER DAY BY SPECIALTY AND PRACTICE BY COMMUNITY SIZE*

Type of Activity	Primary			Secondary			All		
	over 150,000	under 150,000	Combined	over 150,000	under 150,000	Combined	over 150,000	under 150,000	Combined
Doctor Days (N_w)	547	161	708	509	257	766	1426	480	1906
Direct Patient Care	348.2	371.0	353.4	385.4	416.8	395.9	320.0	373.8	333.6
Research with Patients	1.1	2.1	1.3	1.2	-	0.8	3.6	1.5	3.1
Research without Patients	6.1	8.8	6.7	4.7	1.1	3.5	22.0	9.9	19.0
Teaching with Patients	34.8	27.7	33.2	24.1	15.1	21.1	36.3	28.8	34.4
Teaching without Patients	11.0	16.3	12.2	4.1	7.5	5.3	15.2	14.5	15.0
Administration	44.2	35.0	42.1	44.8	48.6	46.1	51.3	46.0	49.9
Professional	48.5	49.1	48.6	53.9	38.3	49.8	56.2	44.0	53.1
Travel	46.6	35.8	44.2	47.8	32.7	41.6	47.2	36.4	44.5
Total Average Minutes per Day	540.5	545.8	541.7	566.0	560.1	564.1	551.8	554.9	552.6
Average Hours per Day	9.0	9.1	9.0	9.4	9.3	9.4	9.2	9.3	9.2

* Community size defined by the physicians as approximate number of people within a radius of 25 miles of their practice location.
N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 42

CARDIOLOGISTS IN INSTITUTIONAL PRACTICE:
DISTRIBUTION OF AVERAGE TIME (MINUTES) IN PROFESSIONAL ACTIVITIES
PER DAY BY SPECIALTY AND PRACTICE BY COMMUNITY SIZE**

Type of Activity	Primary			Secondary			All		
	over 150,000	under 150,000	Combined	over 150,000	under 150,000	Combined	over 150,000	under 150,000	Combined
Doctor Days (N_w)	283	41*	324	87	21*	108	1426	480	1906
Direct Patient Care	184.0	193.4	185.2	201.1	217.3*	204.2	320.0	373.8	333.6
Research with Patients	10.8	6.7*	10.3	10.1	4.5*	9.0	3.6	1.5	3.1
Research without Patients	81.1	71.7*	79.9	32.7	5.8*	27.5	22.0	9.9	19.0
Teaching with Patients	59.9	107.1*	65.8	40.8	53.9*	43.4	36.3	28.8	34.4
Teaching without Patients	32.3	40.6*	33.4	51.2	35.5*	48.1	15.2	14.5	15.0
Administration	58.4	40.1*	56.1	110.5	109.5*	110.3	51.3	46.0	49.9
Professional	71.3	53.7*	69.1	65.2	54.5*	63.1	56.2	44.0	53.1
Travel	46.0	54.9*	47.1	54.9	50.4*	54.0	47.2	36.4	44.5
Total Average Minutes per Day	543.8	568.2*	546.9	566.5	531.4*	559.6	551.8	554.9	552.6
Average Hours per Day	9.1	9.5*	9.1	9.4	8.9*	9.3	9.2	9.3	9.2

* The frequencies are too small to use these data with the confidence established for the total study.
** Community size defined by the physicians as approximate number of people within a radius of 25 miles of their practice location.
N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 43

SINGLE AND MULTIPLE PATIENT ENCOUNTERS
DISTRIBUTION AND PERCENT BY SETTING AND BY SPECIALTY AND PRACTICE

Setting	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
Office					
Single Encounters (Patients)	4255 (92.3)	7197 (88.3)	324 (85.3)	202 (92.4)	11978 (89.6)
Repeat Encounters	355 (7.7)	958 (11.7)	56 (14.7)	16 (7.6)	1385 (10.4)
Office Encounters Total	4610 (100.0)	8155 (100.0)	380 (100.0)	218 (100.0)	13363 (100.0)
Hospital					
Single Encounters (Patients)	2116 (51.0)	2029 (49.6)	669 (66.2)	265 (65.6)	5079 (52.6)
Repeat Encounters	2029 (49.0)	2062 (50.4)	342 (33.8)	139 (34.4)	4572 (47.4)
Hospital Encounters Total	4145 (100.0)	4091 (100.0)	1011 (100.0)	404 (100.0)	9651 (100.0)
Combined					
Single Encounters (Patients)	6371 (72.8)	9226 (75.3)	993 (71.4)	467 (75.0)	17057 (74.1)
Repeat Encounters	2384 (27.2)	3020 (24.7)	398 (28.6)	155 (25.0)	5957 (25.9)
Combined Encounters Total	8755 (100.0)	12246 (100.0)	1391 (100.0)	622 (100.0)	23014 (100.0)

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 44

CARDIOLOGIST'S CONTACTS WITH PATIENTS:
WEIGHTED AND UNWEIGHTED PATIENT ENCOUNTERS
BY TYPE OF SETTING
BY SPECIALTY AND PRACTICE

Type of Setting	Non-Institutional				Institutional				All Cardiologists	
	Primary		Secondary		Primary		Secondary			
	N	%	N	%	N	%	N	%	N	%
Office										
Unweighted	3748	36.3	5334	51.7	655	6.3	590	5.7	10327	100.0
Weighted	4610	34.5	8155	61.1	380	2.8	218	1.6	13363	100.0
Hospital										
Unweighted	3370	38.0	2674	30.1	1743	19.6	1092	12.3	8879	100.0
Weighted	4145	42.9	4091	42.4	1011	10.5	404	4.2	9651	100.0
Combined										
Unweighted	7118	37.0	8008	41.7	2398	12.5	1682	8.8	19206	100.0
Weighted	8755	38.1	12251	53.2	1391	6.0	622	2.7	23014	100.0

Source: 3

The effect of weighted and non-weighted frequencies in comparisons between groups is shown in the table above.

In no instance is log-diary data presented that has not been weighted where failure to do so would permit incorrect conclusions if the statistics presented were extended to all cardiologists.

Patient Care Statistics

Statistical tables have been prepared with each of the primary analysis variables and patient descriptors as a major analysis dimension.

Age of patients for both cardiac and non-cardiac patients is presented in Tables 45 and 46.

Sex of patients for both cardiac and non-cardiac patients is presented in Tables 47 and 48.

Patient Ethnicity. White (W), Black (B) and Other (O) were used in the patient descriptors to denote ethnic and/or racial differences. The categories did not produce the differentiation desired - possibly because of the ambiguity related to what constitutes "White" and what constitutes "Other". Keeping in mind the fact that "Other" is badly under-reported, Table 49 summarizes patient encounters by this ethnic classification.

Distant to Care. It was expected that patients would travel farther to see a Primary Cardiologist than to see a Secondary Cardiologist, and that, in turn, proportionately more time would be given to those coming greater distances than to those in close proximity to the cardiologist. Tables 50 and 51 present distance related statistics which support this assumption.

Patient Sources and Time. Tables 52, 53, and 54 examine cardiologist's patients by where seen and by whether they are referral patients or patients within the cardiologist's practice. The time given to these classes of patients in either the office or hospital setting is presented in Tables 55 and 56. The relatively larger number of patients seen by the specialist as referral patients is not unexpected. One should not conclude that those noted as "own practice" are not primarily cardiac; this latter allocation is discussed in a later section.

Cardiologists' Patients Clinical Conditions

The clinical conditions encountered and reported by the cardiologists provide

TABLE 45

PRIMARY CARDIAC PATIENT'S AGE:
COMBINED OFFICE AND HOSPITAL AGE-GROUPED PATIENTS
BY SPECIALTY AND PRACTICE
(DISTRIBUTION IN PERCENT)

Age Groups	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
Combined N_W	3683	3346	720	200	7949
Percent of Total %	46.4	42.1	9.0	2.5	100.0
4 years and under	0.3	0.3	0.6	0.4	0.3
5 through 14 years	0.7	0.5	1.1	1.8	0.7
15 through 24 years	2.3	2.7	4.7	3.7	2.7
25 through 34 years	4.1	2.4	6.1	4.6	3.6
35 through 44 years	8.1	8.4	14.3	12.2	8.9
45 through 54 years	18.2	14.7	23.3	19.3	17.2
55 through 64 years	25.0	21.8	21.9	23.1	23.3
65 through 74 years	24.8	29.2	19.3	20.7	26.1
75 through 84 years	13.8	16.1	7.2	12.2	14.1
85 years and over	2.7	3.9	1.5	2.0	3.1
Total	100.0	100.0	100.0	100.0	100.0

N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 46

PRIMARY NON-CARDIAC PATIENT'S AGE:
COMBINED OFFICE AND HOSPITAL AGE-GROUPED PATIENTS
BY SPECIALTY AND PRACTICE
(DISTRIBUTION IN PERCENT)

Age Groups	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
Combined N_w	2595	5716	263	264	8838
Percent of Total %	29.4	64.6	3.0	3.0	100.0
4 years and under	0.8	0.9	0.4	1.8	0.9
5 through 14 years	2.1	2.7	0.4	3.5	2.5
15 through 24 years	7.7	12.4	8.6	20.1	11.1
25 through 34 years	8.5	10.3	11.5	11.1	9.7
35 through 44 years	11.7	12.1	11.0	12.3	12.0
45 through 54 years	17.7	16.7	20.4	18.3	17.1
55 through 64 years	19.2	16.6	19.8	15.6	17.5
65 through 74 years	19.3	17.6	18.7	11.1	18.0
75 through 84 years	10.9	9.0	7.0	4.8	9.4
85 years and over	2.1	1.7	2.2	1.4	1.8
Total	100.0	100.0	100.0	100.0	100.0

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 47

CARDIOLOGISTS' CARDIAC PATIENTS BY SEX:
PATIENTS' SETTING BY TYPE BY SPECIALTY AND PRACTICE

Patient and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_W	2439	2526	244	78	5287
Male	%	50.1	46.9	56.3	53.6	48.9
Female	%	49.9	53.1	43.7	46.4	51.1
Total	%	100.0	100.0	100.0	100.0	100.0
Hospital	N_W	1256	843	476	123	2698
Male	%	52.3	50.6	58.7	57.7	53.2
Female	%	47.7	49.4	41.3	42.3	46.8
Total	%	100.0	100.0	100.0	100.0	100.0
Combined	N_W	3695	3369	720	201	7985
Male	%	50.8	47.9	57.9	56.1	50.3
Female	%	49.2	52.1	42.1	43.9	49.7
Total	%	100.0	100.0	100.0	100.0	100.0

N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 48

CARDIOLOGISTS' NON-CARDIAC PATIENTS BY SEX:
PATIENTS' SETTING BY TYPE BY SPECIALTY AND PRACTICE

Patient and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_w	1761	4592	78	123	6554
Male	%	46.4	41.5	56.0	38.1	42.9
Female	%	53.6	58.5	44.0	61.9	57.1
Total	%	100.0	100.0	100.0	100.0	100.0
Hospital	N_w	846	1160	186	141	2333
Male	%	48.0	44.7	51.6	52.9	46.9
Female	%	52.0	55.3	48.4	47.1	53.1
Total	%	100.0	100.0	100.0	100.0	100.0
Combined	N_w	2607	5752	264	264	8887
Male	%	46.9	42.1	52.9	46.0	44.0
Female	%	53.1	57.9	47.1	54.0	56.0
Total	%	100.0	100.0	100.0	100.0	100.0

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 49

PATIENT ENCOUNTERS:
DISTRIBUTION BY SETTING AND ETHNICITY BY SPECIALTY AND PRACTICE

Ethnicity and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_w	4536	7928	366	216	13046
White	%	32.2	57.2	2.3	1.3	93.0
Black	%	2.0	3.0	0.4	0.4	5.8
Other	%	0.6	0.5	-	0.1	1.2
Total	%	34.8	60.7	2.7	1.8	100.0
Hospital	N_w	4005	3891	983	403	9282
White	%	39.2	38.5	8.8	3.9	90.4
Black	%	2.7	3.4	1.6	0.4	8.1
Other	%	1.0	0.3	0.2	-	1.5
Total	%	42.9	42.2	10.6	4.3	100.0
Combined	N_w	8541	11819	1349	619	22328
White	%	35.1	49.5	5.0	2.3	91.9
Black	%	2.3	3.2	0.9	0.4	6.8
Other	%	0.8	0.4	0.1	-	1.4
Total	%	38.2	53.1	6.0	2.7	100.0

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 50

PATIENT DISTANCE TO CARE:
ENCOUNTER SETTING AND DISTANCE INTERVALS BY SPECIALTY AND PRACTICE

Distance and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	Overall %	34.5	61.0	2.9	1.6	100.0
0-4 miles	%	49.8	56.7	54.4	77.5	54.6
5-25 miles	%	41.8	40.1	34.0	18.6	40.2
26 miles and over	%	8.4	3.2	11.6	3.9	5.2
Total	%	100.0	100.0	100.0	100.0	100.0
Hospital	Overall %	43.0	42.3	10.5	4.2	100.0
0-4 miles	%	68.0	66.0	47.4	61.0	64.7
5-25 miles	%	22.8	27.3	34.1	29.7	26.2
26 miles and over	%	9.2	6.7	18.5	9.3	9.1
Total	%	100.0	100.0	100.0	100.0	100.0
Combined	Overall %	38.0	53.3	6.0	2.7	100.0
0-4 miles	%	58.4	59.8	49.3	66.8	58.8
5-25 miles	%	32.8	35.8	34.1	25.8	34.3
26 miles and over	%	8.8	4.4	16.6	7.4	6.9
Total	%	100.0	100.0	100.0	100.0	100.0

Source: 3

TABLE 51

AVERAGE ENCOUNTER TIME BY PATIENT DISTANCE TO CARE:
ENCOUNTER SETTING BY SPECIALTY AND PRACTICE
(AVERAGE TIME IN MINUTES)

Distance to Care and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_W	4610	8159	380	218	13367
0-4 miles	(Min.)	22.2	18.1	30.1	21.3	19.8
5-25 miles	(Min.)	24.2	20.3	34.5	27.7	22.1
26 miles and over	(Min.)	27.4	23.5	36.9	38.5	26.7
Hospital	N_W	4145	4091	1011	404	9651
0-4 miles	(Min.)	16.5	15.2	21.4	20.9	16.5
5-25 miles	(Min.)	19.6	16.1	26.8	17.4	18.9
26 miles and over	(Min.)	19.4	10.9	32.6	24.6	19.8
Combined	N_W	8755	12250	1391	622	23018
0-4 miles	(Min.)	19.1	17.1	24.0	21.1	18.3
5-25 miles	(Min.)	22.7	19.3	28.9	20.0	21.1
26 miles and over	(Min.)	23.4	17.0	33.5	27.2	22.8

N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 52

CARDIOLOGISTS' PATIENT SOURCES:
ENCOUNTER SETTING BY SOURCE BY SPECIALTY AND PRACTICE

Patient Source and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_W	4309	7874	361	210	12754
Referral	%	21.5	13.6	44.2	21.1	17.2
Own Practice	%	78.5	86.4	55.8	78.9	82.8
Total	%	100.0	100.0	100.0	100.0	100.0
Hospital	N_W	3862	3829	908	388	8987
Referral	%	49.7	32.7	70.4	58.9	44.9
Own Practice	%	50.3	67.3	29.6	41.1	55.1
Total	%	100.0	100.0	100.0	100.0	100.0
Combined	N_W	8171	11703	1269	598	21741
Referral	%	34.8	19.8	63.1	45.7	28.7
Own Practice	%	65.2	80.2	36.9	54.3	71.3
Total	%	100.0	100.0	100.0	100.0	100.0

N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 53

CARDIOLOGISTS' CARDIAC PATIENT SOURCES:
ENCOUNTER SETTING BY SOURCE BY SPECIALTY AND PRACTICE

Patient Source and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_W	2471	2838	273	80	5662
Referral	%	25.0	13.9	44.1	21.7	20.3
Own Practice	%	75.0	86.1	55.9	78.3	79.7
Total	%	100.0	100.0	100.0	100.0	100.0
Hospital	N_W	2392	1654	661	192	4899
Referral	%	53.3	37.6	73.9	70.4	51.4
Own Practice	%	46.7	62.4	26.1	29.6	48.6
Total	%	100.0	100.0	100.0	100.0	100.0
Combined	N_W	4863	4492	934	272	10561
Referral	%	38.9	22.6	65.2	56.0	34.7
Own Practice	%	61.1	77.4	34.8	44.0	65.3
Total	%	100.0	100.0	100.0	100.0	100.0

N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 54

CARDIOLOGISTS' NON-CARDIAC PATIENT SOURCES:
ENCOUNTER SETTING BY SOURCE BY SPECIALTY AND PRACTICE

Patient Source and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_W	1838	5036	88	130	7092
Referral	%	16.3	13.3	43.4	20.7	14.6
Own Practice	%	83.7	86.7	56.6	79.3	85.4
Total	%	100.0	100.0	100.0	100.0	100.0
Hospital	N_W	1470	2175	247	196	4088
Referral	%	44.0	29.8	65.0	47.9	37.9
Own Practice	%	56.0	70.2	35.0	52.1	62.1
Total	%	100.0	100.0	100.0	100.0	100.0
Combined	N_W	3308	7211	335	326	11180
Referral	%	28.6	18.3	59.3	37.1	23.1
Own Practice	%	71.4	81.7	40.7	62.9	76.9
Total	%	100.0	100.0	100.0	100.0	100.0

N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

FIGURE 55

AVERAGE ENCOUNTER TIME WITH CARDIAC PATIENTS:
ENCOUNTER SETTING BY PATIENT SOURCE BY SPECIALTY AND PRACTICE
(AVERAGE TIME IN MINUTES)

Patient Source and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_w	2471	2838	273	80	5662
Source:						
Referral	(Min.)	33.5	22.9	40.7	32.9	30.6
Own Practice	(Min.)	23.7	19.1	26.5	23.7	21.3
Hospital	N_w	2392	1654	661	192	4899
Source:						
Referral	(Min.)	19.2	15.5	28.9	18.6	20.1
Own Practice	(Min.)	16.9	15.4	22.2	20.8	16.7
Combined	N_w	4863	4492	934	272	10561
Source:						
Referral	(Min.)	23.9	18.3	31.2	20.2	23.4
Own Practice	(Min.)	21.1	18.0	24.2	22.3	19.7

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 56

AVERAGE ENCOUNTER TIME WITH NON-CARDIAC PATIENTS:
ENCOUNTER SETTING BY PATIENT SOURCE BY SPECIALTY AND PRACTICE
(AVERAGE TIME IN MINUTES)

Patient Source and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_W	1838	5036	88	130	7092
Source:						
Referral	(Min.)	26.0	23.4	44.0	25.9	25.0
Own Practice	(Min.)	18.9	18.6	27.6	20.2	18.8
Hospital	N_W	1470	2175	247	196	4088
Source:						
Referral	(Min.)	18.0	15.0	28.0	21.3	18.0
Own Practice	(Min.)	16.0	15.2	15.4	20.3	15.7
Combined	N_W	3308	7211	335	326	11180
Source:						
Referral	(Min.)	20.5	19.3	31.0	22.3	20.8
Own Practice	(Min.)	17.9	17.7	19.9	20.2	17.9

N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

indices of the prevalence of cardiac disease within practices and the possible emphases which should be given in the training of individuals to manage these conditions. If one assumes that the situations cardiologists actually encounter are indicators of what they should be able to manage, then programs can be developed in those areas which (1) represent high occurrence conditions and/or (2) are sufficiently serious in their actual recognized setting to warrant training going beyond the ability to identify the condition. The data which have been analyzed may permit judgments regarding which of the conditions constitute the core which all cardiologists should be capable of handling and which could be handled on a referral basis by others.

Tables 57 and 58 for primary cardiac conditions and Tables 59 and 60 for primary non-cardiac conditions present the percentage distribution by each type of specialist for each of the diagnostic conditions. Tables 57 and 59 give these percentages for all encounter locations. Tables 58 and 60 provide the percentages for patients seen in the office and in the hospital. The first (general) table for cardiac or non-cardiac is the overall choice frequency. The second (allocating patients by location) provides inferential data related to severity of the problem, i.e., those in the hospital are presumably sicker than those who are seen and released from the office. The data contained in these tables may be seen as summary patient profiles according to the disease categories indicated for each of the types of cardiologist and for all cardiologists. Viewed as such they provide interesting insights regarding the primacy of either cardiac or non-cardiac conditions within cardiologists' practices. However, these summaries are overly simplistic since they do not take secondary cardiac or non-cardiac condtions into account - they are limited exclusively to primacy of disease condition.

Seventy-four percent of all primary cardiac patients have one of six cardiac conditions. (Table 57.) These are:

o	Coronary atherosclerosis, without infarction	26.1 percent
o	Hypertension	20.7 percent
o	Acute myocardial infarction	9.4 percent
o	Heart failure: chronic, severe	8.1 percent
o	Rheumatic	5.1 percent
o	Arrhythmia	4.1 percent

Table 58 provides distributions for the cardiologists' patients in the office and in the hospital. Each column totals 100 percent to permit comparisons of occurrence by encounter setting (office or hospital) for a particular disease condition. For example, acute myocardial infarction is reported by all cardiologists 4.9

TABLE 57

PATIENTS WITH PRIMARY CARDIAC DIAGNOSIS:
CARDIAC DIAGNOSIS PERCENTAGE BY SPECIALTY AND PRACTICE

Primary Cardiac Diagnosis	Non-Institutional		Institutional		All Cardiologists
	Primary	Secondary	Primary	Secondary	
Percent of All Cardiac Diagnoses	46.3	42.2	9.0	2.5	100.0
Heart Failure: Acute, Severe	2.6	3.2	3.5	2.4	2.9
Heart Failure: Chronic, Severe	6.8	9.7	7.6	7.5	8.1
Acute Myocardial Infarction	9.5	8.7	10.5	14.2	9.4
Pulmonary Embolism	1.9	1.1	2.2	0.9	1.6
Pericardial Disease	0.6	0.5	1.0	0.9	0.5
Coronary Atherosclerosis, without infarction	28.0	24.1	27.6	20.2	26.1
Hypertension	20.5	23.4	8.0	23.0	20.7
Rheumatic	5.2	3.5	11.5	5.7	5.1
Cardiomyopathy	1.5	0.9	3.1	2.8	1.4
Arrhythmia	5.4	2.8	4.3	1.7	4.1
Infectious	0.1	-	0.6	-	0.1
Peripheral Vascular Disease	3.3	3.1	1.6	3.9	3.1
Cerebral Vascular Disease	2.6	4.7	1.3	2.9	3.4
Psychosomatic (Cardiac)	1.4	1.9	1.3	1.3	1.6
Post Cardiac Surgery	2.1	0.9	2.5	2.0	1.6
Pacemaker Evaluation	1.0	0.4	2.2	1.3	0.9
Congenital	1.7	0.7	4.5	0.4	1.5
None	3.7	9.0	1.9	6.7	5.8
Other	2.1	1.4	4.8	2.2	2.0
TOTAL	100.0	100.0	100.0	100.0	100.0
N_w	3573	3126	719	194	7613

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 58

PATIENTS WITH PRIMARY CARDIAC DIAGNOSIS:
CARDIAC DIAGNOSIS PERCENTAGE BY SPECIALTY AND PRACTICE
BY TYPE OF SETTING

Primary Cardiac Diagnosis	Non-Institutional				Institutional				All Cardiologists	
	Primary		Secondary		Primary		Secondary			
	Office	Hospital	Office	Hospital	Office	Hospital	Office	Hospital	Office	Hospital
Percent of All Cardiac Diagnoses by Setting	46.1	46.5	47.8	31.2	4.6	17.7	1.5	4.6	100.0	100.0
Percent of Diagnostic Categories within Settings:										
Heart Failure: Acute, Severe	0.8	6.2	1.9	7.1	0.2	5.1	-	3.9	1.3	6.1
Heart Failure: Chronic, Severe	5.8	8.6	8.5	13.1	4.5	9.2	2.8	10.5	7.0	10.2
Acute Myocardial Infarction	4.5	19.1	5.3	18.9	4.0	13.8	5.7	19.5	4.9	18.1
Pulmonary Embolism	1.2	3.4	0.5	2.9	1.2	2.8	-	1.5	0.8	3.1
Pericardial Disease	0.3	1.3	0.4	0.9	0.2	1.5	0.5	1.2	0.3	1.2
Coronary Atherosclerosis, without Infarction	31.5	21.1	26.3	17.4	39.0	21.7	24.2	17.7	29.3	19.9
Hypertension	26.4	9.1	27.5	11.1	14.0	5.0	40.3	12.0	26.5	9.1
Rheumatic	5.8	4.6	3.6	3.4	13.1	10.7	2.8	7.5	5.0	5.2
Cardiomyopathy	1.6	1.4	0.7	1.6	2.4	3.5	1.9	3.3	1.2	1.9
Arrhythmia	5.2	5.8	2.8	2.7	3.6	4.6	0.5	2.4	3.9	4.5
Infectious	0.1	0.2	-	0.2	-	1.0	-	-	-	0.3
Peripheral Vascular Disease	3.3	3.3	2.8	3.8	1.2	1.8	2.4	4.8	3.0	3.3
Cerebral Vascular Disease	2.5	2.8	3.6	7.8	1.7	1.1	3.8	2.4	3.0	4.1
Psychosomatic (Cardiac)	1.4	1.3	2.1	1.3	1.0	1.5	2.8	0.3	1.7	1.3
Post Cardiac Surgery	1.7	3.0	0.7	1.3	1.9	2.8	-	3.4	1.2	2.5
Pacemaker Evaluation	0.9	1.3	0.4	0.4	0.7	3.0	2.4	0.6	0.6	1.3
Congenital	1.8	1.6	0.8	0.5	3.3	5.1	0.5	0.3	1.3	1.8
None	3.2	4.2	10.6	4.7	2.3	1.4	7.0	6.7	7.1	3.8
Other	2.0	2.3	1.5	0.9	5.7	4.4	2.4	2.1	1.9	2.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: 3

TABLE 59

PATIENTS WITH PRIMARY NON-CARDIAC DIAGNOSIS:
NON-CARDIAC DIAGNOSIS PERCENTAGE BY SPECIALTY AND PRACTICE

Primary Non-Cardiac Diagnosis	Non-Institutional		Institutional		All Cardiologists
	Primary	Secondary	Primary	Secondary	
Percent of All Non-Cardiac Diagnoses	29.4	64.6	3.0	3.0	100.0
Respiratory	14.0	13.6	17.1	14.7	13.8
Renal	2.4	1.9	4.6	2.9	2.2
Neurological	5.8	5.0	10.1	5.7	5.4
Gastro-Intestinal	15.2	13.1	14.9	10.3	13.7
Musculoskeletal	12.7	12.3	9.0	11.9	12.3
Psychiatric	7.0	8.4	5.1	8.8	7.9
Genito-Urinary	4.5	4.4	3.1	3.9	4.4
Dermatological	2.0	3.7	0.4	4.1	3.1
Obstetrics/ Gynecology	2.0	3.7	2.2	1.4	3.1
Endocrine	9.9	8.2	7.7	11.7	8.8
EENT	1.8	3.8	2.4	3.5	3.2
None	8.3	4.4	10.7	2.8	5.6
Checkup, Physical Exam	7.0	11.0	4.6	4.9	9.4
Other	4.9	5.3	5.5	11.2	5.4
Hemic and Lymphatic	2.5	1.2	2.6	2.2	1.7
TOTAL	100.0	100.0	100.0	100.0	100.0
N_w	2431	5643	249	259	8580

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 60

PATIENTS WITH PRIMARY NON-CARDIAC DIAGNOSIS:
NON-CARDIAC DIAGNOSIS PERCENTAGE BY SPECIALTY AND PRACTICE
BY TYPE OF SETTING

Primary Non-Cardiac Diagnosis	Non-Institutional				Institutional				All Cardiologists	
	Primary		Secondary		Primary		Secondary			
	Office	Hospital	Office	Hospital	Office	Hospital	Office	Hospital	Office	Hospital
Percent of All Non-Cardiac Diagnoses by Setting	26.9	36.3	70.1	49.7	1.2	7.9	1.9	6.0	100.0	100.0
Percent of Diagnostic Categories within Settings:										
Respiratory	13.6	14.8	13.5	13.9	11.1	19.7	11.1	17.8	13.5	14.9
Renal	1.8	3.8	1.4	4.0	1.5	5.9	3.0	2.9	1.5	4.0
Neurological	4.5	8.4	4.0	9.0	8.9	10.6	3.9	7.3	4.2	8.8
Gastro-Intestinal	12.1	21.6	11.4	19.9	14.8	15.0	9.9	10.8	11.6	19.6
Musculoskeletal	14.5	8.8	12.9	9.9	13.3	7.2	10.2	13.4	13.3	9.5
Psychiatric	8.0	4.9	9.1	5.8	5.9	4.7	11.1	6.8	8.8	5.5
Genito-Urinary	3.8	5.9	4.2	5.1	3.0	3.1	6.3	1.8	4.1	5.1
Dermatological	2.6	0.7	4.2	1.6	1.5	-	5.1	3.1	3.8	1.2
Obstetrics/ Gynecology	1.9	2.2	4.0	2.6	2.2	2.2	0.9	1.8	3.4	2.4
Endocrine	11.1	7.4	8.2	8.2	8.1	7.5	18.0	6.3	9.1	7.7
EENT	2.1	1.3	3.8	4.1	3.0	2.2	4.2	2.9	3.3	2.9
None	7.1	10.8	4.9	2.1	8.9	11.3	1.0	4.0	5.4	6.0
Checkup, Physical Exam	9.8	1.2	12.6	4.5	11.9	1.6	8.7	1.6	11.8	2.9
Other	4.2	6.5	4.9	6.9	4.4	5.9	4.5	17.1	4.7	7.3
Hemic and Lymphatic	2.9	1.7	0.9	2.4	1.5	3.1	2.1	2.4	1.5	2.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: 3

percent of the time for office patients and 18.1 percent of the time for hospital patients. There are no apparent anomalies in these distributions; conditions of a minor nature are seen proportionately more in the office and those which would require extensive treatment facilities, at least in their advanced stages, are found more commonly in the hospital.

The primary non-cardiac distribution tables follow exactly the same format as has been discussed for cardiac. Table 59 provides frequency of occurrence for conditions by each type of specialty. Table 60 gives the same patient data except that they are distributed between office and hospital.

The primary non-cardiac diagnostic data are presented (1) to complete the description of cardiologists' practice and (2) as contributory conditions to other, secondary cardiac conditions. The relationship of cardiac to non-cardiac is discussed and presented for selected primary conditions in the section which follows.

While the occurrence of non-cardiac primary conditions has a wider distributive range (more conditions with relatively high occurrence rates), five conditions account for 58 percent of all primary non-cardiac patient diagnoses. These are:

- o Respiratory 13.8 percent
- o Gastro-intestinal 13.7 percent
- o Musculoskeletal 12.3 percent
- o Check up (physical) 9.4 percent
- o Endocrine 8.8 percent

Cardiac Specialty and Non-Specialty Care

The log-diary obtained a cardiologist classification as to whether or not the series of patient problem conditions noted was primarily cardiac or primarily non-cardiac. This classification permitted analysis by the permutations noted in Tables 61, 62 and 63. There are eight patient condition groupings used in these tables. The eight may be summarized by three categories, it may be noted that for all cardiologists, approximately 47 percent of the patients were primary cardiac patients. (Table 61.) It is assumed that for both the Primary Cardiologists and the Secondary Cardiologists that specialized care is being provided. It is not possible to differentiate between those patients which are referral and those which are not from these particular tables.

The primary non-cardiac with associated cardiac statistics describe patients with multiple clinical problems. It is assumed that both specialized and general

TABLE 61

COMBINED OFFICE AND HOSPITAL DIAGNOSTIC CONDITIONS: PRIMARY CARDIAC AND NON-CARDIAC WITH ASSOCIATED SECONDARY CONDITIONS DISTRIBUTION BY PHYSICIAN SPECIALTY AND PRACTICE

Diagnostic Conditions	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
N_w	6004	8769	969	453	16195
Primary Cardiac					
Cardiac Only	26.1	11.9	33.2	20.3	18.7
Cardiac with Cardiac	12.9	5.5	9.2	7.2	8.5
Cardiac with Non-Cardiac	12.8	11.4	19.2	11.5	12.4
Cardiac with Cardiac and Non-Cardiac	7.7	6.9	12.6	3.8	7.4
Cardiac Subtotal	59.5	35.7	74.2	42.8	47.0
Primary Non-Cardiac with Cardiac					
Non-Cardiac with Cardiac	21.0	28.7	18.4	26.3	25.2
Non-Cardiac with Non-Cardiac and Cardiac	4.8	8.2	4.0	3.3	6.5
Non-Cardiac and Associated Cardiac Subtotal	25.8	36.9	22.4	29.6	31.7
Primary Non-Cardiac					
Non-Cardiac Only	12.8	23.5	2.7	24.4	18.3
Non-Cardiac with Non-Cardiac	1.9	3.9	0.7	3.2	3.0
Non-Cardiac Subtotal	14.7	27.4	3.4	27.6	21.3
Total Diagnostic Conditions	100.0	100.0	100.0	100.0	100.0

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 62

OFFICE DIAGNOSTIC CONDITIONS:
PRIMARY CARDIAC AND NON-CARDIAC WITH ASSOCIATED SECONDARY CONDITIONS
DISTRIBUTION BY PHYSICIAN SPECIALTY AND PRACTICE

Diagnostic Conditions	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
N_w	4027	6789	321	200	11337
Primary Cardiac					
Cardiac Only	26.7	12.0	35.7	19.1	18.0
Cardiac with Cardiac	12.3	5.2	9.6	4.2	7.8
Cardiac with Non-Cardiac	12.2	10.5	20.4	10.6	11.3
Cardiac with Cardiac and Non-Cardiac	7.5	6.1	9.8	4.3	6.7
Cardiac Subtotal	58.7	33.8	75.5	38.2	43.8
Primary Non-Cardiac with Cardiac					
Non-Cardiac with Cardiac	20.0	29.0	17.0	30.2	25.5
Non-Cardiac with Non-Cardiac and Cardiac	4.3	7.0	3.1	2.2	5.8
Non-Cardiac and Associated Cardiac Subtotal	24.3	36.0	20.1	32.4	31.3
Primary Non-Cardiac					
Non-Cardiac Only	15.1	26.1	3.1	25.7	21.7
Non-Cardiac with Non-Cardiac	1.9	4.1	1.1	3.7	3.2
Non-Cardiac Subtotal	17.0	30.2	4.4	29.4	24.9
Total Diagnostic Conditions	100.0	100.0	100.0	100.0	100.0

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 63

HOSPITAL DIAGNOSTIC CONDITIONS:
PRIMARY CARDIAC AND NON-CARDIAC WITH ASSOCIATED SECONDARY CONDITIONS
DISTRIBUTION BY PHYSICIAN SPECIALTY AND PRACTICE

Diagnostic Conditions	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
N_w	1977	1980	647	253	4857
Primary Cardiac					
Cardiac Only	24.9	11.6	32.0	21.2	20.2
Cardiac with Cardiac	14.3	6.4	9.0	9.5	10.1
Cardiac with Non-Cardiac	14.3	14.5	18.6	12.3	14.8
Cardiac with Cardiac and Non-Cardiac	7.7	9.6	14.0	3.4	9.1
Cardiac Subtotal	61.2	42.1	73.6	46.4	54.2
Primary Non-Cardiac with Cardiac					
Non-Cardiac with Cardiac	23.0	27.6	19.1	23.2	24.4
Non-Cardiac with Non-Cardiac and Cardiac	5.6	12.5	4.3	4.2	8.2
Non-Cardiac and Associated Cardiac Subtotal	28.6	40.1	23.4	27.4	32.6
Primary Non-Cardiac					
Non-Cardiac Only	8.1	14.6	2.5	23.4	10.8
Non-Cardiac with Non-Cardiac	2.1	3.2	0.5	2.8	2.4
Non-Cardiac Subtotal	10.2	17.8	3.0	26.2	13.2
Total Diagnostic Conditions	100.0	100.0	100.0	100.0	100.0

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

care is being provided in these instances. For all cardiologists, the 31.7 percent are in this category. There is little difference between the two types of Primary Cardiologists in the percentages - 25.8 compared to 22.4 percent.

The primary non-cardiac patient percentages describe a cla[illegible] patients whose problems are predominantly non-specialty in character so far as diagnosis and treatment is concerned. They clearly are not cardiac, although they might be complex. Since the participants in this study have major commitments to cardiology, it is reasonable to assume that the majority of these patient's problem profiles would be general in character and hence can be viewed as a measure of primary health care service provided.

Comparing Table 62 for office patients with Table 63 for hospital patients, it is clear that the significant bulk of the non-cardiac patients are seen in the office. This is particularly true for the Secondary Cardiologist in Non-Institutional practice (30.2 percent compared to 17.8 percent). Overall, 24.9 percent of the office patients seen by cardiologists are primarily non-cardiac and 13.2 percent of their hospital patients are in this category.

Time Related to Patient Problem Profile

Tables 64, 65 and 66 for patients in the office, hospital and as a combined distribution, and with the patients grouped by primary and associated clinical conditions, show a profile of almost no difference in the amount of time a particular type of specialist gives to patients. For the two Non-Institutional types, the profiles strongly suggest that time allocated is associated with a visit schedule. The Primary Cardiologist in Non-Institutional practice gives about the same amount of time to all of his patient types. The total time spent with patients for the Secondary Cardiologists in Institutional practice is more akin to that given by the Primary Cardiologists in Non-Institutional practice. The Primary Cardiologist in Institutional practice gives significantly more time to patients than any of the others; in fact, so much more time that on this dimension alone it is safe to conclude that on the average his patients have more complex problems. This specialist exceeds the average for all cardiologists in the primary cardiac categories by from seven to fifteen minutes - 30 to 70 percent more average time per patient.

Association of a Primary Patient Problem with a Secondary Patient Problem

Tables 67, 68, 69 and 70 present the percent of occurrence for a secondary condition in association with a primary condition. They also contain weighted frequency counts for the particular primary condition to assist in evaluating the importance of a particular percentage. The tables are read from left to right. The rows of figures pertain to a particular primary condition and its relationship to all secondary conditions in that table. The percentages note the frequency

TABLE 64

CARDIOLOGISTS' OFFICE PATIENT ENCOUNTERS:
AVERAGE TIME (IN MINUTES) WITH PATIENTS BY CARDIAC AND
NON-CARDIAC CONDITIONS BY SPECIALTY AND PRACTICE

Time and Diagnostic Conditions	Non-Institutional		Institutional		All
	Primary (minutes)	Secondary (minutes)	Primary (minutes)	Secondary (minutes)	(minutes)
Primary Cardiac					
Cardiac Only	25.3	17.6	33.0	24.5	22.5
Cardiac with Cardiac	27.2	18.9	30.8	20.8	23.9
Cardiac with Non-Cardiac	26.2	19.9	33.0	28.3	23.1
Cardiac with Cardiac and Non-Cardiac	25.8	20.7	30.6	27.0	23.1
Primary Non-Cardiac with Cardiac					
Non-Cardiac with Cardiac	20.7	19.8	35.2	22.6	20.3
Non-Cardiac with Non-Cardiac and Cardiac	20.4	21.2	31.8	20.0	21.2
Primary Non-Cardiac					
Non-Cardiac Only	19.8	17.4	26.0	20.5	18.1
Non-Cardiac with Non-Cardiac	24.7	21.7	26.0	22.4	22.3

Source: 3

TABLE 65

CARDIOLOGISTS' HOSPITAL PATIENT ENCOUNTERS:
AVERAGE TIME (IN MINUTES) WITH PATIENTS BY CARDIAC AND
NON-CARDIAC CONDITIONS BY SPECIALTY AND PRACTICE

Time and Diagnostic Conditions	Non-Institutional		Institutional		All
	Primary (minutes)	Secondary (minutes)	Primary (minutes)	Secondary (minutes)	(minutes)
Primary Cardiac					
Cardiac Only	17.2	15.1	28.9	21.4	18.6
Cardiac with Cardiac	18.6	15.9	24.3	18.7	18.4
Cardiac with Non-Cardiac	18.5	14.5	28.1	17.3	18.1
Cardiac with Cardiac and Non-Cardiac	17.7	17.1	21.8	18.6	18.2
Primary Non-Cardiac with Cardiac					
Non-Cardiac with Cardiac	15.3	15.2	23.9	21.6	16.2
Non-Cardiac with Non-Cardiac and Cardiac	16.8	14.6	21.9	21.9	15.7
Primary Non-Cardiac					
Non-Cardiac Only	16.2	15.8	18.1	19.9	16.3
Non-Cardiac with Non-Cardiac	16.6	15.4	13.7	19.7	16.0

Source: 3

TABLE 66

CARDIOLOGISTS' OFFICE AND HOSPITAL PATIENT ENCOUNTERS: AVERAGE TIME (IN MINUTES) WITH PATIENTS BY CARDIAC AND NON-CARDIAC CONDITIONS BY SPECIALTY AND PRACTICE

Time and Diagnostic Conditions	Non-Institutional		Institutional		All
	Primary (minutes)	Secondary (minutes)	Primary (minutes)	Secondary (minutes)	(minutes)
Primary Cardiac					
Cardiac Only	21.4	16.8	30.2	22.4	20.7
Cardiac with Cardiac	22.9	17.8	26.2	19.1	21.2
Cardiac with Non-Cardiac	22.3	17.6	29.6	20.4	20.7
Cardiac with Cardiac and Non-Cardiac	21.9	19.2	23.4	22.5	20.7
Primary Non-Cardiac with Cardiac					
Non-Cardiac with Cardiac	18.1	18.2	26.9	22.0	18.7
Non-Cardiac with Non-Cardiac and Cardiac	18.5	18.0	24.1	21.4	18.4
Primary Non-Cardiac					
Non-Cardiac Only	18.8	17.0	21.4	20.0	17.6
Non-Cardiac with Non-Cardiac	20.6	19.9	19.8	21.0	20.1

Source: 3

TABLE 67

ALL CARDIOLOGISTS:
PATIENTS WITH PRIMARY CARDIAC DIAGNOSIS AND PERCENTAGE DISTRIBUTION FOR ASSOCIATED SECONDARY CARDIAC DIAGNOSIS

PRIMARY DIAGNOSIS CARDIAC	Type of Setting*	Number (N_w) of Cases	No Secondary Condition	SECONDARY ASSOCIATED CARDIAC DIAGNOSIS (Percent of Total for Each Condition)															
				Heart Failure: Acute, Severe	Heart Failure: Chronic, Severe	Acute Myocardial Infarction	Pulmonary Embolism	Pericardial Disease	Coronary Atherosclerosis, without infarction	Hypertension	Rheumatic	Cardiomyopathy	Arrhythmia	Infectious	Peripheral Vascular Disease	Cerebral Vascular Disease	Psychosomatic (Cardiac)	Post Cardiac Surgery	Pacemaker Evaluation	Congenital	Other	TOTAL
Heart Failure: Acute, Severe	O	68	36.8	-	10.4	1.8	5.9	-	18.0	7.6	1.8	1.8	-	-	-	-	-	-	2.3	100.0
	H	166	26.7	-	13.7	18.1	2.0	1.0	16.4	4.1	5.0	0.3	-	-	-	-	-	-	1.7	100.0
Heart Failure: Chronic, Severe	O	372	33.8	-	-	4.8	0.8	-	31.6	11.1	7.3	2.7	-	-	-	-	-	-	-	100.0
	H	275	35.5	0.6	-	5.3	2.2	0.1	24.9	12.0	7.5	1.6	-	-	-	-	-	-	-	100.0
Acute Myocardial Infarction	O	260	62.0	0.9	4.4	-	1.7	-	9.5	7.3	0.2	-	-	-	-	-	-	-	-	100.0
	H	489	73.1	3.7	1.4	-	1.3	0.3	2.6	1.6	0.6	-	-	-	-	-	-	-	-	100.0
Pulmonary Embolism	O	45	73.3	-	2.7	-	-	-	14.3	4.0	-	-	-	-	-	-	-	-	-	100.0
	H	83	77.1	-	-	3.3	-	0.7	4.8	6.7	4.4	-	-	-	-	-	-	-	-	100.0
Pericardial Disease	O	16	69.5	-	-	-	-	-	18.8	-	11.7	-	-	-	-	-	-	-	-	100.0
	H	32	58.7	4.8	4.8	7.7	3.8	-	5.6	8.4	-	1.2	-	-	-	-	-	-	-	100.0
Coronary Atherosclerosis, w/thout infarction	O	1548	60.0	0.2	2.2	0.6	0.3	-	-	18.2	0.5	0.3	-	-	-	-	-	-	-	100.0
	H	538	68.8	1.1	2.6	0.8	0.5	-	-	7.1	0.8	0.3	-	-	-	-	-	-	-	100.0
Hypertension	O	1405	78.0	0.2	1.1	0.7	0.3	0.1	6.5	-	0.7	0.5	-	-	-	-	-	-	-	100.0
	H	246	71.4	0.7	1.8	0.5	-	0.2	6.3	-	-	1.1	-	-	-	-	-	-	-	100.0
Rheumatic	O	267	63.3	-	7.2	-	-	-	2.7	0.8	-	0.9	-	-	-	-	-	-	-	100.0
	H	140	52.9	1.9	4.6	0.9	0.9	-	4.4	-	-	0.4	-	-	-	-	-	-	-	100.0
Cardiomyopathy	O	62	73.1	-	5.8	-	-	-	2.5	2.0	-	-	-	-	-	-	-	-	-	100.0
	H	52	80.5	-	6.3	0.7	-	2.9	0.7	-	-	-	-	-	-	-	-	-	-	100.0
Arrhythmia	O	206	76.5	-	2.8	-	-	-	5.0	6.4	0.6	0.6	-	-	-	-	-	-	-	100.0
	H	121	70.4	-	3.5	2.0	-	-	5.0	-	3.3	0.5	-	-	-	-	-	-	-	100.0
Infectious	O	1	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0
	H	9	68.0	-	-	-	-	-	-	14.3	-	-	17.7	-	-	-	-	-	-	100.0
Peripheral Vascular Disease	O	157	71.3	-	1.8	0.8	0.8	-	5.5	4.5	-	-	-	-	-	-	-	-	-	100.0
	H	89	73.7	-	-	-	-	-	8.6	3.8	-	-	4.5	-	-	-	-	-	-	100.0
Cerebral Vascular Disease	O	159	71.3	-	1.9	-	-	-	7.7	12.5	-	-	-	-	-	-	-	-	-	100.0
	H	110	64.6	-	2.8	1.4	-	-	9.8	9.8	1.1	-	2.8	-	-	-	-	-	-	100.0
Psychosomatic (Cardiac)	O	91	92.5	-	-	-	-	-	2.3	3.4	-	0.4	-	-	-	-	-	-	-	100.0
	H	34	86.3	-	4.5	-	-	-	9.2	-	-	-	1.4	-	-	-	-	-	-	100.0
Post Cardiac Surgery	O	62	75.1	1.9	-	1.9	-	-	3.9	-	1.9	-	-	-	-	-	-	-	-	100.0
	H	66	67.9	-	2.4	-	0.8	-	9.0	-	9.8	-	1.9	-	-	-	-	-	-	100.0
Pacemaker Evaluation	O	34	61.6	-	7.3	-	-	-	20.0	3.7	-	3.7	-	-	-	-	-	-	-	100.0
	H	34	79.7	-	1.7	-	-	-	18.6	-	-	-	-	-	-	-	-	-	-	100.0
Congenital	O	71	79.1	-	-	-	-	-	5.1	-	-	-	-	-	-	-	-	-	-	100.0
	H	49	77.8	-	-	-	2.5	-	2.4	-	-	-	-	-	-	-	-	-	-	100.0
Other	O	102	85.4	1.2	-	-	-	-	8.6	1.2	-	1.2	-	-	-	-	-	-	-	100.0
	H	59	89.5	-	-	-	2.1	-	2.1	-	-	-	-	-	-	-	-	-	-	100.0

*"Type of Setting": O=office; H=hospital.
N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 68

ALL CARDIOLOGISTS:
PATIENTS WITH PRIMARY CARDIAC DIAGNOSIS AND PERCENTAGE DISTRIBUTION FOR ASSOCIATED SECONDARY NON-CARDIAC DIAGNOSIS

PRIMARY DIAGNOSIS CARDIAC: TYPE	Type of Setting*	Number (N_w) of Cases	SECONDARY ASSOCIATED NON-CARDIAC DIAGNOSIS (Percent of Total for Each Condition): No Secondary Condition	Respiratory	Renal	Neurological	Gastro-Intestinal	Musculoskeletal	Psychiatric	Genito-Urinary	Dermatological	Obstetrics/ Gynecology	Endocrine	ENT	Checkup, Physical Exam	Other	Hemic and Lymphatic	TOTAL
Heart Failure: Acute, Severe	O	68	52.9	21.6	-	4.5	4.1	2.3	4.5	-	-	-	-	6.8	-	-	2.3	-	100.0
	H	166	60.6	13.3	2.6	2.6	3.5	2.7	2.2	2.2	0.3	1.5	5.8	0.9	-	-	1.8	-	100.0
Heart Failure: Chronic, Severe	O	372	53.7	11.4	1.4	3.1	5.4	5.2	1.0	2.6	-	0.4	11.7	1.2	1.2	0.6	0.6	1.1	100.0
	H	275	53.2	9.6	5.0	1.9	6.9	3.0	2.2	3.1	-	0.4	9.7	-	1.0	1.2	1.2	2.8	100.0
Acute Myocardial Infarction	O	260	74.6	2.3	1.2	3.8	2.8	1.8	0.9	-	0.6	-	6.8	0.5	1.2	1.1	-	1.2	100.0
	H	489	74.8	5.3	0.7	2.0	3.6	1.8	0.9	1.7	-	0.1	5.2	0.2	0.1	1.1	-	0.5	100.0
Pulmonary Embolism	O	45	67.4	10.9	-	1.3	5.5	7.4	3.4	-	-	1.3	-	-	-	6.3	-	2.7	100.0
	H	83	49.7	25.4	1.8	1.8	1.4	8.5	0.7	1.5	-	-	-	1.1	-	-	-	1.8	100.0
Pericardial Disease	O	16	75.3	9.4	-	-	-	-	9.4	-	-	-	-	-	-	-	-	3.6	100.0
	H	32	73.5	-	-	4.8	9.5	3.8	-	-	3.6	-	2.3	-	-	-	-	-	100.0
Coronary Atherosclerosis, without Infarction	O	1348	82.9	4.0	0.7	1.9	6.7	6.9	3.0	1.2	0.3	0.4	8.2	0.7	1.8	0.8	0.3	0.3	100.0
	H	538	63.7	6.2	1.3	2.9	6.8	4.7	3.1	3.0	0.2	0.5	3.9	0.3	1.0	1.4	1.0	1.0	100.0
Hypertension	O	1485	61.1	3.2	1.9	2.1	4.2	6.6	3.3	2.4	0.5	0.9	9.7	1.4	1.1	0.9	0.8	0.8	100.0
	H	246	52.7	3.3	1.4	2.6	7.3	2.7	3.4	6.1	0.9	2.5	16.1	0.8	-	-	0.2	0.2	100.0
Rheumatic	O	267	77.6	2.0	0.6	1.5	3.2	2.7	3.0	-	-	1.6	4.7	-	2.1	0.4	0.5	0.5	100.0
	H	140	78.1	3.6	0.4	8.0	2.4	1.9	0.9	-	1.1	0.4	2.8	0.4	-	-	-	-	100.0
Cardiomyopathy	O	62	84.1	4.0	-	-	2.0	2.0	2.0	-	-	-	-	-	2.5	2.5	0.9	0.9	100.0
	H	52	85.5	-	1.1	4.1	-	6.2	1.1	-	-	-	-	-	-	-	-	-	100.0
Arrhythmia	O	206	68.8	3.3	0.7	1.6	4.9	1.5	4.7	0.7	0.7	1.3	9.4	0.6	-	0.6	1.2	1.2	100.0
	H	121	74.5	3.4	-	2.3	4.1	4.8	4.8	1.0	-	-	2.3	-	0.3	0.3	-	-	100.0
Infectious	O	1	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0
	H	2	73.3	13.4	-	-	-	-	-	-	-	-	14.3	-	-	-	-	-	100.0
Peripheral Vascular Disease	O	157	55.1	6.3	-	1.6	4.3	9.8	2.0	1.0	1.6	0.8	5.1	2.5	3.3	0.8	1.8	1.8	100.0
	H	89	55.7	4.9	-	0.7	7.3	11.1	2.8	-	-	-	12.3	1.7	-	1.8	1.7	1.7	100.0
Cerebral Vascular Disease	O	159	67.0	3.2	1.0	5.0	2.5	5.6	2.2	2.5	-	-	8.6	0.8	-	0.8	-	-	100.0
	H	110	46.9	7.0	2.8	17.2	4.2	7.0	0.5	5.3	1.1	-	3.7	-	1.4	2.5	-	-	100.0
Psychosomatic (Cardiac)	O	91	56.4	1.4	-	1.4	3.4	18.9	8.1	1.7	-	-	1.3	-	7.4	-	-	-	100.0
	H	34	54.4	8.1	4.5	-	-	13.4	12.6	-	-	-	3.4	-	3.6	-	-	-	100.0
Post Cardiac Surgery	O	62	80.4	-	2.4	3.9	-	0.9	0.9	1.9	-	-	2.4	-	-	2.4	4.8	4.8	100.0
	H	66	79.2	-	-	4.2	0.6	3.6	4.6	0.9	-	-	6.9	-	-	-	-	-	100.0
Pacemaker Evaluation	O	34	91.8	8.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0
	H	34	81.3	1.7	1.7	3.6	-	7.2	-	-	-	-	4.5	-	-	-	-	-	100.0
Congenital	O	71	85.2	5.1	1.7	-	2.1	1.7	-	2.1	-	-	-	-	-	2.1	-	-	100.0
	H	49	82.6	3.1	-	-	2.5	-	-	-	-	-	-	-	-	6.1	2.5	2.5	100.0
Other	O	102	73.7	1.5	1.2	1.2	4.6	2.4	3.0	0.4	1.5	-	1.2	1.2	4.5	3.5	-	-	100.0
	H	59	74.8	4.1	-	-	2.8	6.7	1.8	4.8	-	-	4.1	-	0.6	2.7	-	-	100.0

*"Type of Setting": O=office; H=hospital.
N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 69

ALL CARDIOLOGISTS:
PATIENTS WITH PRIMARY NON-CARDIAC DIAGNOSIS AND PERCENTAGE DISTRIBUTION FOR ASSOCIATED SECONDARY CARDIAC DIAGNOSIS

PRIMARY DIAGNOSIS NON-CARDIAC TYPE	Type of Setting*	Number (N_w) of Cases	SECONDARY ASSOCIATED CARDIAC DIAGNOSIS (Percent of Total for Each Condition) No Secondary Condition	Heart Failure: Acute, Severe	Heart Failure: Chronic, Severe	Acute Myocardial Infarction	Pulmonary Embolism	Pericardial Disease	Coronary Atherosclerosis, without Infarction	Hypertension	Rheumatic	Cardiomyopathy	Arrhythmia	Infectious	Peripheral Vascular Disease	Cerebral Vascular Disease	Psychosomatic (Cardiac)	Post Cardiac Surgery	Pacemaker Evaluation	Congenital	Other	TOTAL
Respiratory	O	883	66.6	0.7	2.9	0.7	1.5	0.3	11.6	8.4	1.2	0.2	1.6	0.2	1.8	0.5	0.5	0.2	-	0.3	0.8	100.0
	H	348	44.9	2.0	9.9	1.1	5.0	0.6	15.3	8.0	2.0	0.9	5.7	-	1.9	1.4	-	-	-	-	1.3	100.0
Renal	O	101	40.9	1.2	3.0	1.2	-	-	8.1	31.1	-	3.0	4.5	-	0.4	2.4	-	-	2.1	0.6	1.5	100.0
	H	93	39.2	1.9	6.3	1.3	1.6	2.0	17.4	20.4	2.6	-	6.9	-	0.4	-	-	-	-	-	-	100.0
Neurological	O	277	57.1	0.4	0.9	0.9	0.1	-	11.1	13.0	1.2	0.4	3.6	-	2.9	6.3	0.4	-	-	0.9	0.2	100.0
	H	205	39.0	2.6	0.6	2.3	2.3	0.6	15.5	15.7	0.9	1.3	6.4	0.2	0.6	8.7	0.3	-	1.3	0.6	0.8	100.0
Cardiovascular	O	758	68.6	0.7	1.5	0.8	0.4	-	9.2	11.1	0.9	0.2	1.9	0.1	0.9	1.4	1.1	0.3	-	-	0.4	100.0
	H	457	55.8	1.6	1.9	1.7	0.8	0.1	18.8	7.2	1.3	0.1	5.1	-	0.9	0.6	2.4	0.3	-	-	0.3	100.0
Musculoskeletal	O	871	65.6	0.1	0.7	0.3	0.2	0.2	10.0	10.7	1.2	0.5	3.7	-	2.2	2.3	1.8	0.2	-	-	0.3	100.0
	H	222	47.0	2.0	1.8	1.5	1.5	1.4	18.5	14.6	2.2	1.0	4.8	0.7	0.7	-	0.3	0.7	0.6	-	1.0	100.0
Psychiatric	O	575	68.3	0.8	-	0.1	0.1	0.3	3.5	14.8	0.4	-	3.8	-	1.0	1.3	4.1	0.3	-	-	1.2	100.0
	H	127	56.1	-	1.0	1.8	1.2	-	7.2	17.1	0.5	2.9	2.1	-	-	-	2.2	0.9	-	1.5	5.5	100.0
Genito-Urinary	O	269	68.7	-	0.6	-	0.6	-	14.4	12.4	1.1	-	0.6	-	1.0	0.6	-	-	-	-	-	100.0
	H	118	38.1	-	3.1	2.3	2.6	0.5*	19.7	20.2	0.5	1.3	5.7	-	2.1	1.3	2.1	-	-	-	0.5	100.0
Dermatological	O	247	87.6	-	-	-	-	0.1	2.3	7.6	-	-	1.2	-	-	-	0.6	-	-	-	0.1	100.0
	H	29	67.7	-	-	-	-	1.3	11.8	5.5	-	-	4.2	-	4.2	5.3	-	-	-	-	-	100.0
Obstetrics/ Gynecology	O	221	75.0	-	0.7	1.4	-	-	2.8	8.9	1.4	-	0.7	-	1.8	-	0.7	0.6	-	-	-	100.0
	H	56	52.6	-	1.0	-	0.7	-	11.0	6.9	0.9	-	2.7	-	-	-	-	-	-	4.8	3.9	100.0
Endocrine	O	599	51.6	0.8	0.8	0.3	-	0.2	13.1	21.6	0.5	1.5	3.7	-	2.9	1.2	1.1	0.2	-	0.2	0.3	100.0
	H	180	47.4	0.2	4.7	1.5	1.5	-	11.5	17.3	-	1.7	5.1	0.2	4.4	2.5	-	-	-	0.2	1.8	100.0
EENT	O	217	85.6	-	-	0.3	-	-	2.4	8.9	1.4	-	0.7	-	-	0.7	-	-	-	-	-	100.0
	H	67	82.2	-	0.9	-	1.2	-	4.1	6.9	0.9	-	2.7	-	-	-	-	-	-	-	2.3	100.0
Checkup, Physical Exam	O	772	87.8	-	1.2	0.4	0.2	-	3.3	4.1	0.4	-	0.7	-	0.2	0.4	0.6	0.2	-	0.5	-	100.0
	H	67	77.0	-	-	0.9	-	-	6.5	7.4	0.9	-	1.8	-	-	-	2.3	0.9	-	-	2.3	100.0
Other	O	308	82.7	0.4	0.6	-	0.4	0.5	3.4	6.4	-	0.5	1.4	-	0.5	-	0.2	-	0.5	0.5	1.9	100.0
	H	170	68.0	2.4	1.8	0.9	-	-	8.6	4.1	1.6	1.2	3.3	-	1.5	1.8	-	0.7	-	-	3.5	100.0
Hemic and Lymphatic	O	97	70.0	-	3.2	-	-	-	8.5	6.6	-	-	2.5	-	-	6.3	1.3	-	-	-	-	100.0
	H	51	61.1	-	8.3	1.1	-	1.1	10.7	7.6	1.1	-	0.7	-	8.3	-	-	-	-	-	-	100.0

Type of Setting: O=office; H=hospital.
N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 70

ALL CARDIOLOGISTS:
PATIENTS WITH PRIMARY NON-CARDIAC DIAGNOSIS AND PERCENTAGE DISTRIBUTION FOR ASSOCIATED SECONDARY NON-CARDIAC DIAGNOSIS

PRIMARY DIAGNOSIS NON-CARDIAC				SECONDARY ASSOCIATED NON-CARDIAC DIAGNOSIS (Percent of Total for Each Condition)																
TYPE	Type of Setting*	Number (N_w) of Cases	No Secondary Condition	Respiratory	Renal	Neurological	Gastro-Intestinal	Musculoskeletal	Psychiatric	Genito-Urinary	Dermatological	Obstetrics/ Gynecology	Endocrine	EENT	Checkup, Physical Exam	Other	Hemic and Lymphatic	TOTAL
Respiratory	O	883	79.1	-	1.2	0.8	4.0	4.5	2.7	1.1	0.3	0.5	3.4	1.0	1.0	0.2	0.2	100.0
	H	348	68.0	-	3.7	4.9	8.3	4.0	1.2	2.8	0.2	-	1.5	1.4	0.4	3.6	-	100.0
Renal	O	101	71.5	-	-	-	6.4	2.7	1.5	-	-	1.5	5.5	1.5	1.2	1.9	1.2	100.0
	H	93	60.7	1.6	-	5.5	5.0	6.6	-	9.2	-	-	5.2	1.6	1.6	3.0	-	100.0
Neurological	O	277	66.2	1.1	-	-	-	12.3	3.8	1.7	2.8	0.6	2.8	0.5	1.6	0.6	0.2	100.0
	H	205	77.5	4.1	1.8	-	4.3	3.5	1.5	1.9	0.5	-	2.4	0.9	-	0.4	1.2	100.0
Gastro-Intestinal	O	758	78.6	0.8	0.2	0.3	-	5.0	5.3	2.7	0.5	0.8	2.6	1.0	1.6	0.3	0.2	100.0
	H	457	81.7	1.8	1.3	1.0	-	4.7	2.8	1.0	-	0.4	3.7	0.3	0.3	0.8	0.2	100.0
Musculoskeletal	O	871	84.0	0.8	0.2	0.4	1.9	-	4.3	0.5	0.8	0.4	3.6	0.5	1.3	0.3	1.0	100.0
	H	222	75.8	2.8	1.4	2.1	1.4	-	2.5	0.5	0.7	-	5.2	0.3	0.7	3.0	0.7	100.0
Psychiatric	O	575	80.8	1.1	0.2	0.5	1.1	2.1	-	0.9	1.1	2.0	5.8	0.5	3.3	0.3	0.3	100.0
	H	127	76.7	2.9	-	1.2	3.6	4.3	-	1.0	1.0	0.3	6.6	-	-	2.4	-	100.0
Genito-Urinary	O	269	87.8	-	0.6	-	1.1	2.6	0.6	-	0.6	1.3	2.7	-	0.6	1.1	1.0	100.0
	H	118	78.9	-	1.0	3.6	1.6	1.0	0.6	-	-	1.0	9.0	-	0.3	1.3	-	100.0
Dermatological	O	247	92.3	-	-	-	0.1	0.6	1.2	0.4	0.6	0.6	2.9	0.5	1.2	0.6	-	100.0
	H	29	73.3	-	-	-	5.3	5.3	5.3	4.2	-	-	1.3	-	-	5.3	-	100.0
Obstetrics/ Gynecology	O	221	83.0	0.7	-	0.7	0.7	0.7	2.1	-	-	-	5.4	0.7	4.8	0.6	0.4	100.0
	H	56	75.8	5.5	-	-	-	-	2.7	-	-	-	5.0	-	-	11.0	-	100.0
Endocrine	O	599	86.2	1.1	0.9	0.6	1.6	1.4	2.7	1.1	1.4	0.7	-	0.8	1.6	0.6	0.4	100.0
	H	180	74.7	2.9	1.7	2.6	4.7	3.1	1.1	1.4	1.2	0.8	-	2.4	0.8	2.3	0.3	100.0
EENT	O	217	92.3	0.7	-	-	-	0.7	-	0.7	-	-	3.5	-	2.1	-	-	100.0
	H	67	68.4	3.2	-	-	4.1	4.6	-	-	-	-	8.7	-	-	4.1	6.9	100.0
Checkup, Physical Exam	O	772	90.8	1.1	-	0.7	0.2	1.5	0.4	0.4	0.6	1.0	1.5	0.2	-	0.2	-	100.0
	H	67	74.8	4.6	-	-	2.3	-	2.6	2.3	-	-	9.1	2.3	-	-	-	100.0
Other	O	308	92.2	-	-	0.5	1.5	-	-	-	-	1.1	3.6	0.1	1.0	-	-	100.0
	H	170	87.5	0.7	-	1.2	0.2	2.4	0.9	0.9	-	0.7	2.0	0.9	-	-	2.6	100.0
Hemic and Lymphatic	O	97	98.4	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0
	H	51	97.6	-	-	-	-	-	-	-	-	-	-	-	-	2.4	-	100.0

*"Type of Setting": O=office; H=hospital.
N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

of occurrence of a particular primary and secondary relationship. "All cardiologists" is the level for data presentation. Other permutation are available, such as Primary Non-Institutional, Primary Institutional, etc.

Patient Treatments and Dispositions

Two levels of data are available regarding what the physician does with his patients once the clinical profile has been established. The first at a summary level and was presented immediately adjacent to the columns where the physician recorded the diagnostic characteristics and hence could be completed with very little effort. Table 71 presents these data for cardiac, Table 72 for non-cardiac and Table 73 for all disposition actions.

From the statistics for cardiac patients, Table 71, the following are noted:

- Drugs are prescribed for 76.0 percent of office patients and 66.4 percent of hospital patients. Differences are pronounced between institutional practices and non-institutional practices:
  - both types of Institutional practice use drugs with approximately 55 percent of their patients;
  - in the Non-Institutional settings,
    - primary specialists use drugs about 70 percent of the time;
    - secondary specialists use drugs about 78 percent of the time.
- Routine laboratory tests are ordered by all cardiologists for approximately 33 percent of office patients and 40 percent of hospital patients. Secondary Cardiologists in Non-Institutional practice have comparable rates in the office but much higher in the hospital - 49 percent.
- ECGs are ordered by all cardiologists for about 26 percent of office patients and 28 percent of hospital patients.
- Other non-invasive studies are ordered by all cardiologists in about 3 percent of the office situations and approximately 6 percent of the hospital cases.
- Catheterizations were ordered to a limited extent for office patients (less than 2 percent) and for approximately 5 percent of the hospital patients.

TABLE 71

CARDIOLOGISTS' PATIENTS WITH PRIMARY CARDIAC CONDITIONS:
AVERAGE DISPOSITION ACTIONS BY SPECIALTY AND PRACTICE

Patient Disposition	Type of Setting**	Non-Institutional		Institutional		All Cardiologists
		Primary Average Use	Secondary Average Use	Primary Average Use	Secondary Average Use	Average Use
Prescribed Drugs	O	73.6	80.6	53.9	42.0	76.0
	H	64.6	76.4	57.5	52.0	66.4
Ordered Routine Lab Tests	O	30.8	34.4	33.5	26.1	32.6
	H	35.2	49.4	36.7	31.8	39.7
Ordered ECG	O	27.3	23.4	32.3	28.0	25.7
	H	25.8	28.5	31.9	25.8	27.7
Ordered Other Non-Invasive Studies	O	3.7	1.5	7.8	1.4	2.8
	H	4.7	5.8	9.2	9.9	6.1
Ordered Catheterization Test	O	1.1	0.4	12.4	1.4	1.3
	H	2.3	4.2	12.7	5.7	4.9
Evaluation for Cardiovascular Surgery	O	1.2	0.2	3.3	0.5	0.8
	H	1.3	2.7	9.3	4.2	3.3
Evaluation for Other Surgery	O	0.6	0.2	1.7	0.9	0.5
	H	0.6	1.1	2.3	2.1	1.1
N_W*	O	2364	2294	244	77	4976
N_W*	H	1211	832	476	118	2636

*Includes all patients, whether or not diagnosis reported. (Approximately five (5) per cent have no diagnosis.)

**"Type of Setting": O=office; H=hospital.

N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents. Source: 3

TABLE 72

CARDIOLOGISTS' PATIENTS WITH PRIMARY NON-CARDIAC CONDITIONS:
AVERAGE DISPOSITION ACTIONS BY SPECIALTY AND PRACTICE

Patient Disposition	Type of Setting**	Non-Institutional		Institutional		All Cardiologists
		Primary Average Use	Secondary Average Use	Primary Average Use	Secondary Average Use	Average Use
Prescribed Drugs	O	65.9	65.4	49.6	63.5	65.3
	H	61.4	61.4	45.3	55.1	59.6
Ordered Routine Lab Tests	O	28.9	35.8	37.0	33.2	33.9
	H	34.6	35.4	34.4	38.8	35.2
Ordered ECG	O	13.5	10.6	23.0	9.9	11.5
	H	17.7	12.9	18.8	14.2	15.2
Ordered Other Non-Invasive Studies	O	1.2	0.9	3.0	3.9	1.0
	H	3.9	3.6	5.9	2.9	3.8
Ordered Catheterization Test	O	-	0.1	3.7	0.3	0.1
	H	0.7	0.3	3.1	-	0.6
Evaluation for Cardiovascular Surgery	O	0.1	0.1	2.2	-	0.2
	H	0.7	0.1	2.5	0.3	0.5
Evaluation for Other Surgery	O	1.0	0.8	3.0	0.6	0.9
	H	3.2	5.7	6.9	3.4	4.7
N_w*	O	1664	4495	78	122	6361
N_w*	H	767	1147	171	136	2220

*Includes all patients, whether or not diagnosis reported. (Approximately five (5) per cent have no diagnosis.)

**"Type of Setting": O=office; H=hospital.

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents. Source: 3

TABLE 73

DISPOSITIONS APPLIED TO PATIENTS
BY SPECIALTY AND PRACTICE BY TYPE OF SETTING

Patient Disposition	Type of Setting**	Non-Institutional		Institutional		All Cardiologists
		Primary	Secondary	Primary	Secondary	
Prescribed Drugs	O	69.5	70.2	52.8	66.8	69.4
	H	63.2	67.0	53.7	53.6	63.0
Ordered Routine Lab Tests	O	29.7	35.0	34.3	30.5	33.0
	H	34.9	40.9	25.9	35.5	37.5
Ordered ECG	O	21.5	15.1	29.9	16.9	17.8
	H	22.6	19.3	28.1	19.6	21.8
Ordered Other Non-Invasive Studies	O	2.7	1.1	6.6	2.9	1.8
	H	4.4	4.4	8.2	6.1	5.0
Ordered Catheterization Test	O	0.7	0.2	10.2	0.7	0.7
	H	1.7	1.9	10.0	2.7	2.9
Evaluation for Cardiovascular Surgery	O	0.7	0.1	3.0	0.2	0.4
	H	1.0	1.2	7.4	2.1	2.0
Evaluation for Other Surgery	O	0.8	0.6	2.0	0.7	0.7
	H	1.6	3.7	3.6	2.8	2.8
Other (Specify)	O	8.2	7.2	9.5	9.4	7.7
	H	11.0	10.9	10.6	16.2	11.2
Referral to MD or Hospital	O	1.0	1.1	0.7	2.2	1.1
	H	1.3	0.5	0.4	0.8	0.8
N_w*	O	4256	7201	324	202	11982
N_w*	H	2116	2029	669	265	5078

*Includes all patients, whether or not diagnosis reported. (Approximately five (5) per cent have no diagnosis.)

**"Type of Setting": O=office; H=hospital.

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

- Surgical evaluations had relatively low occurrence rates.
- The Primary Cardiologist in Institutional practice exceeded the averages noted for the hospital-based procedures. Specifically, for his hospital patients he had:

- Other non-invasive studies	9.2 percent
- Catheterization test	12.7 percent
- Cardiovascular surgical evaluation	9.3 percent
- Other surgical evaluation	2.3 percent

Laboratory Testing Procedures Performed

A specific section within the diary was provided for use by those ordering and performing diagnostic testing. As actually used, this section captures information related exclusively to patients who had tests performed and, with minor exceptions, represents the test utilization profiles for cardiologists who actually do these tests. It specifically excludes any patient who did not require one or more of the tests and who did not have the test(s) performed during the diary recording period.

Table 74 summarizes the test utilization profiles for each of the types of cardiologists. The reader will note a difference in the percentages for tests of comparable character as reported in the patient clinical care summary (Tables 71-73) and as noted in this table. For example, in the patient clinical summary the ECG percentages are less than 30 percent and in this laboratory testing summary they account for 77 percent. For cardiac catheterizations in the patient clinical summary about 2 percent of the office patients and 5 percent of the hospital patients had such tests prescribed compared to an overall utilization within the laboratory summary of about 3 percent. The differences in these two data sources are explained by differences in the data bases from which they were derived. For Tables 71-72, the data apply to all patients and therefore are percentages applicable to that portion of a cardiologist's patients which needed the procedure(s). For Table 74, on the other hand, only those tests which actually were performed on patients were reported.

Cardiologist's Research Activities

Table 75 summarizes the topical-content areas for cardiologist's research as reported in the log-diary research section. Table 76 summarizes the proportion of the reported research which was recorded by each type of cardiologist as well as the subjects used, the location and involvement of drugs and/or devices in that research.

TABLE 74

CARDIOLOGISTS' UTILIZATION OF CARDIAC
DIAGNOSTIC TESTS AND PROCEDURES
PERCENT OF USE BY SPECIALTY AND PRACTICE

Type of Test	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
Electrocardiogram	78.4	75.5	77.2	77.4	77.1
Vectorcardiogram	1.1	0.9	8.8	0.2	2.0
Phonocardiogram	2.2	0.4	5.5	0.5	1.8
Non-Invasive Techniques	1.8	0.2	5.9	0.4	1.6
Exercise Testing	3.8	4.0	5.2	1.6	3.9
Cardiac Fluoroscopy	3.0	2.4	5.4	0.4	2.8
Chest X-ray	18.9	28.3	15.5	17.6	22.2
R or L Heart Catheterization	0.5	0.7	3.3	0.3	0.9
R or L Heart Catheterization with Angiogram	1.4	0.4	9.3	2.0	1.9
Flotation Catheterization	-	-	0.5	0.1	-
Selective Coronary Arteriogram	1.2	0.4	6.2	0.5	1.4
Pulmonary Angiogram	0.1	-	1.1	0.5	0.1
Non-Coronary Arteriogram	0.3	-	0.7	0.8	0.2
HIS Bundle Recording	0.1	-	1.2	-	0.1
Pacemaker Insertion	0.6	-	1.3	0.2	0.4
Pacemaker Evaluation	0.7	0.1	1.5	0.4	0.5
Other	2.8	3.6	2.3	10.1	3.7
Routine Lab Tests	12.2	20.1	3.2	7.4	14.1

Source: 3

TABLE 75

CARDIOLOGISTS' RESEARCH
TOPICAL AREAS PERCENTAGE OF USE BY SPECIALTY AND PRACTICE

Research Topics		Non-Institutional		Institutional		All
		Primary	Secondary*	Primary	Secondary	
Proportion of Research	N_W	37	11	189	41	278
	%	13.3	3.9	68.1	14.8	100.0
Research Topics:						
Physiology-Cardiology		10.0	-	21.5	20.7	19.0
General Research Activity, Non-Specific (Administrative, Discuss)		3.3	14.3*	18.4	12.6	15.4
Chronic Ischemic Heart Disease		6.7	28.6*	16.0	12.6	14.7
Other Research (Non-Cardiology)		-	-	12.9	15.3	11.0
Acute Myocardial Infarction		3.3	28.6*	6.7	22.5	9.5
Other General Cardiology Research		30.0	28.6*	4.3	9.0	9.3
Testing and Diagnostic Techniques		3.3	-	6.4	4.5	5.5
Symptomatic (Arrhythmia)		3.3	-	4.9	-	3.8
Peripheral Vascular Disease		20.0	-	-	-	2.7
Cardiac Surgery		-	-	3.4	-	2.3
Not Specified		-	-	3.1	-	2.1

*The frequencies are too small to use these data with the confidence established for the total study.

N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 76

CARDIOLOGISTS' RESEARCH UTILIZATION OF SUBJECTS, FACILITIES, DRUGS AND EQUIPMENT: PERCENTAGE OF USE BY SPECIALTY AND PRACTICE

Research Descriptors		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Proportion of Research	N_W	37	11	189	41	278
	%	13.3	3.9	68.1	14.8	100.0
Research Subjects:						
Human		96.7	100.0	56.7	74.8	66.4
Animal		1.8	-	32.2	20.7	25.4
Other*		-	-	8.3	2.7	6.0
Research Location:						
Laboratory		23.3	57.1	49.4	36.9	44.4
Bedside		16.7	57.1	13.8	18.0	16.5
Emergency - CCU/ICU		3.3	28.6	1.2	10.8	4.0
Office		70.0	42.9	41.1	38.7	44.7
Research Utilization:						
Drugs		33.3	85.7	28.5	39.6	33.0
Prosthetic Devices		3.3	-	4.3	0.9	3.5
Equipment		33.3	57.1	51.2	44.1	48.0

* N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

Cardiologist's Teaching Activities

Table 77 presents data related to teaching topics as presented by each of the types of cardiologists in the log-diary section related to teaching activities. Table 78 presents percentages of use of different facilities and locations in teaching.

CARDIOLOGIST'S TRAINING STUDY

This study was the last of three addressed to cardiologists. Its rationale and the associated methodological issues are discussed in Chapter Two, pages 39 through 57. The discussion in Chapter Six highlights findings as these relate to indicated deficiencies in training. Data selected for presentation supplement the discussion in Chapter Five as well as the manpower projections discussion in Chapter Seven.

It will be remembered that the eight study strata were selected on a stratified random basis with different sampling fractions for each strata. For these reasons, it is inappropriate to generate statistics other than those presented in the tables since to do so would give one or more groups a distorted weighting in such calculations.

Years of Formal Training

Tables 79, 80, and 81 provide statistics regarding the average amount of training received. Table 79 is a tabulation of the cardiologist's estimates of total time in training; Table 80 is derived from detailed enumeration of types of training and documents a slight tendency to overestimating total training years (differences between the value in the two tables). Table 81 is important in that it is based on only those who actually had formal cardiovascular disease training. Of significance to training program planners is the fact that over 75 percent of all who are under 40 years old had about one and one-half years of formal cardiovascular disease training.

Training Insufficient or Inadequate

Cardiologists were asked to indicate where training needed to be augmented for someone who would enter a practice similar to their own. Emphasis was given to their practice as the reference point, both for assessment of the training's adequacy and for assessment of its importance to others. Given this perspective for the assessment, it is reasonable to expect differences which are attributable to the type of practice involved, the training received, and the age of the cardiologist responding. DRME defined training in an area as being inappropriate if (1) the respondent found his training "too limited" for his practice

TABLE 77

CARDIOLOGISTS' TEACHING TOPICS
TYPES OF TEACHING PERCENTAGES* BY SPECIALTY AND PRACTICE

Teaching Topics	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
N_w	228	181	308	88	804
%	28.3	22.5	38.3	11.0	100.0
Clinical Applications					
Rounds and Case Reviews	51.5	41.1	43.9	46.7	45.7
Testing and Dx Techniques	20.5	11.0	30.9	17.7	22.0
Pacemaker, Artificial Valve	1.6	1.7	0.7	-	1.1
Subtotal	73.6	53.8	75.5	64.4	68.8
Formal Lectures					
Non-Cardiovascular Teaching	1.6	11.4	2.8	10.6	5.3
Non-Specific Cardiac Teaching	1.6	2.5	3.6	10.1	3.5
General Medical Cardiology	3.8	5.1	2.1	3.4	3.4
CV Physiology	2.2	0.8	4.0	2.5	2.6
Administrative Meetings	3.8	-	2.6	1.7	2.3
Cardiac Surgery	0.5	-	0.6	0.8	0.5
Subtotal	13.5	19.8	15.7	29.1	17.6
Specific Disease Conditions					
Acute Myocardial Infarction	9.2	18.1	1.5	3.9	7.6
Symptomatic (Arrhythmia)	1.6	3.4	1.9	1.3	2.1
Hypertensive Disease	1.1	-	1.3	-	0.8
Congenital Heart Disease	0.5	1.7	0.6	-	0.7
Chronic Rheumatic Heart Disease	-	0.8	0.9	-	0.6
Chronic Ischemic Heart Disease	0.5	0.8	0.8	-	0.6
Pulmonary Heart Disease	-	0.8	0.6	1.3	0.5
Cardiomyopathy	-	-	0.8	-	0.3
Peripheral Vascular Disease	-	0.8	-	-	0.2
Angina Pectoris	-	-	0.2	-	0.1
Arteriosclerosis	-	-	0.2	-	0.1
Subtotal	12.9	26.4	8.8	6.5	13.6
TOTAL	100.0	100.0	100.0	100.0	100.0

* Percentages based on data weighted to adjust the respective specialty and practice types to the proportion they represent within the total cardiologist population.

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 78

CARDIOLOGISTS' USE OF TEACHING SETTINGS:
TEACHING SETTING PERCENTAGE* OF USE BY SPECIALTY AND PRACTICE

Teaching Setting	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
Rooms					
Classroom	10.8	13.6	6.2	4.6	9.0
Lecture Hall	7.6	5.1	5.3	8.0	6.2
Conference Room	10.3	23.7	23.4	22.3	19.6
Office	4.3	4.2	13.6	18.9	9.4
Room Total	33.0	46.6	48.5	53.8	44.2
Clinical-Patient					
Bedside	50.2	63.6	44.6	33.6	49.3
Emergency or Intensive Care	5.9	3.4	1.9	8.8	4.1
Laboratory	15.1	8.5	17.5	10.9	14.1
Clinical-Patient Total	71.2	75.5	64.0	53.3	67.5
Percentage Overlap Between Types of Setting**	4.2	22.1	12.5	7.1	11.7

*Percentages based on data weighted to adjust the respective specialty and practice types to the proportion they represent within the total cardiologist population.

**The percentage overlap could occur between the "Clinical-Patient" categories or between the "Room" and one or more of the "Clinical-Patient" categories.

Source: 3

TABLE 79

ALL ACTIVE CARDIOLOGISTS INDICATING
MEAN NUMBER OF YEARS OF POST-DOCTORAL
CLINICAL TRAINING BEFORE ENTERING CONTINUOUS
PRACTICE BY SPECIALTY AND PRACTICE AND AGE GROUPS

Specialty/Practice Type and Age Groups	Number	Mean Years
Under 40 years		
Primary Non-Institutional	282	4.7
Primary Institutional	288	5.0
Secondary Non-Institutional	243	4.4
Secondary Institutional	100	4.6
Over 40 Years		
Primary Non-Institutional	178	4.6
Primary Institutional	142	5.5
Secondary Non-Institutional	173	3.9
Secondary Institutional	103	4.7
All Cardiologists	1509	4.5
Fellows	234	5.1

Source: 5

TABLE 80

CARDIOLOGISTS' AGE GROUP, SPECIALTY AND PRACTICE TYPE BY MEAN NUMBER OF YEARS OF INTERNSHIP, RESIDENCY AND FELLOWSHIP TRAINING

Age Group, Specialty and Type of Practice	Internship	Residency	CD Fellowship	Total Clinical Training
	$\bar{X}$ Years	$\bar{X}$ Years	$\bar{X}$ Years	$\bar{X}$ Years
UNDER 40 YEARS				
Primary:				
Non-Institutional	1.0	1.8	1.6	4.4
Institutional	1.0	1.8	2.0	4.8
Secondary:				
Non-Institutional	1.1	1.9	1.0	4.0
Institutional	1.0	1.9	1.3	4.2
40 AND OVER				
Primary:				
Non-Institutional	1.2	2.0	0.8	4.0
Institutional	1.1	2.1	1.7	4.9
Secondary:				
Non-Institutional	1.1	1.9	0.4	3.4
Institutional	1.2	2.1	0.7	4.0
ALL CARDIOLOGISTS	1.1	2.0	1.3	4.4
FELLOWS	1.0	1.7	1.8	4.5

Source: 5

TABLE 81

CARDIOLOGISTS WHO HELD A CARDIOVASCULAR DISEASE FELLOWSHIP: CARDIOLOGISTS' AGE GROUP, SPECIALTY AND PRACTICE TYPE BY MEAN NUMBER OF YEARS IN FELLOWSHIP PROGRAM AND PERCENTAGE IN SUCH PROGRAMS

Age Group, Specialty, and Type of Practice	CD Fellowship X Years	Fellowship Held Percentage
Under 40 Years		
Primary Non-Institutional	1.7	94.3
Primary Institutional	2.1	97.6
Secondary Non-Institutional	1.3	76.5
Secondary Institutional	1.7	78.0
Over 40 Years		
Primary Non-Institutional	1.6	48.3
Primary Institutional	2.2	80.3
Secondary Non-Institutional	1.4	28.9
Secondary Institutional	1.6	46.6
All Cardiologists	1.7	56.6
Fellows	1.9	94.0

Source: 5

and of "medium" to "high" importance for the training of a physician going into a similar practice or (2) the respondent found his training "too much" in an area and of "low" importance to others.

Tables 82 and 83 provide statistics for those who (1) indicated that their training was deficient in some respect and (2) said that such training was of moderate to high importance to others. The percentage for "insufficient" is calculated only from those who indicated that they had that training. Table 82 shows the number and percent of respondents who were trained in each area as well as the percent who found that training insufficient. Thus, looking at Table 82, the first entry, 34.2 percent of the 53.2 percent trained in the area found that training insufficient.

The types of deficient training considered most important are underscored in Table 82. These underscored values are found in Table 83 as the far right ("All") column entry. Table 83 presents the summary tabulations from the preceding table by (1) population, (2) practice, (3) age, (4) specialty and (5) fellowship, as discriminant variables. It is clear that the areas with greatest perceived deficiency are those which represent relatively new advances in cardiology. With Table 83, the educational planner can determine whether programs for all cardiologists are sufficient or whether select programs, focusing on any one of the analytical variables noted would be more appropriate.

Population Related to Educational Needs

Population size was considered a potentially important dimension for educational program planning. Tables 84, 85, 86, 87, and 88 provide the percentages indicating training desired, opinions regarding adequacy of training which they received and desires for, as well as actual participation in, continuing education programs of a national and/or regional character.

Assessment of Manpower Adequacy

Cardiologists were asked to indicate whether there were "too few", "about right" or "too many" cardiologists in their respective area. They were asked this question for Primary Cardiologists and for Secondary Cardiologists. Tables 89 and 90 provide summary statistics for each of the types of cardiologist studied. Tables 91 and 92 provide similar statistics for all cardiologists divided into two population groupings. These data generally portray a level of assessment indicating that the numbers are "about right"; however, on a census division basis, the Eastern Seaboard and the West Coast respondents more often indicated "too many" cardiologists. These data are more suggestive than definitive. To be most useful the data would require further analyses to the level of metropolitan areas which, if done, would result in extremely small numbers that could only be used as indicators of possible over concentration of cardiologists.

TABLE 82

ALL ACTIVE CARDIOLOGISTS TRAINED IN CARDIOVASCULAR TOPICAL AREAS AND PROPORTION OF THOSE TRAINED WHO FOUND THEIR TRAINING INSUFFICIENT

Cardiovascular Training Program Experiences and Training Topics	Respondents Indicating Training		Training Found Insufficient
	N	%	%
Experience in Clinical Care, Research, and Teaching			
Cardiac patient care: pediatric	803	53.2	34.2*
Cardiac patient care: medical	1227	81.3	8.7
Cardiac patient care: surgical	796	52.8	29.1
Cardiac patient care: coronary care unit	571	37.8	27.7
Pacemaker insertion	565	37.4	25.7
Pacemaker follow-up	551	36.5	34.9
Cardiovascular research: basic	495	32.8	21.2
Cardiovascular research: clinical	843	55.9	21.0
Teaching: clinical	1072	71.0	13.1
Teaching: didactic	854	56.6	17.3
Laboratory Diagnostic Techniques			
Electrocardiography	1133	75.1	11.0
Phonocardiography	828	54.9	30.2
Echocardiography	290	19.2	55.3
Exercise tolerance testing	821	54.4	28.0
Vectorcardiography	595	39.4	33.9
Angiography: cardiac	671	44.5	24.2
Angiography: coronary	469	31.1	42.0
Angiography: peripheral	406	26.9	38.8
Cardiac catheterization	669	44.3	22.1
Swan-Ganz right heart catheterization	260	17.2	44.0
Laboratory and Classroom Instruction			
CV anatomy	836	55.4	27.7
CV physiology	893	59.2	21.7
CV biochemistry	710	47.1	37.7
CV pathology	876	58.1	26.4
CV epidemiology	665	44.1	28.8
CV pharmacology	827	54.8	27.5
CV radiology	888	58.8	24.5
Pulmonary physiology	792	52.5	39.8
Hypertensive renal disease	839	55.6	21.3
Peripheral vascular disease	803	53.2	27.1
Cerebral vascular disease	741	49.1	24.5
Biostatistics	438	29.0	38.8
Bioengineering	371	24.6	41.4

* Values underlined indicate that 1/3 or more of those having training in an area found that training insufficient.

Source: 5

TABLE 83

CARDIOLOGISTS' TRAINING EXPERIENCES:
PERCENTAGE OF RESPONDENTS FINDING TRAINING INSUFFICIENT
BY SELECTED PRACTICE CHARACTERISTICS

Cardiovascular Training Program Experiences and Training Topics	Practice Characteristics										All
	Population		Practice		Age		Specialty		Fellowship		
	Under 150 M	Over 150 M	Professional	Institutional	Under 40	Over 40	Primary	Secondary	Held	Not Held	
A. Experience in Clinical Care, Research and Teaching											
Cardiac patient care: Pediatric	39.2	33.1	35.6	31.3	34.1	36.3	31.5	39.1	27.3	51.9	34.2
Medical	11.9	7.9	10.7	3.8	3.0	11.4	6.1	12.3	4.6	16.7	8.7
Surgical	27.8	29.4	29.1	28.9	26.8	30.8	27.7	31.5	27.8	32.7	29.1
Coronary Care Unit	34.0	28.1	30.6	23.4	32.1	35.5	24.8	33.7	25.6	34.8	27.7
Pacemaker insertion	25.8	25.7	30.5	18.9	16.9	40.0	21.8	33.4	20.8	47.0	25.7
Pacemaker follow-up	30.3	35.9	37.2	31.6	32.6	38.2	31.1	42.6	34.9	34.2	34.9
Cardiovascular research: Basic	20.8	21.3	19.1	24.8	20.5	21.7	21.5	20.5	18.7	29.4	21.2
Clinical	15.1	22.3	20.4	23.3	23.3	20.3	21.2	20.7	20.1	23.9	21.0
Teaching: Clinical	13.9	13.0	15.6	7.7	8.7	15.6	9.1	18.2	9.7	20.7	13.1
Didactic	19.2	16.8	17.8	16.1	17.5	17.1	15.3	20.3	16.1	20.4	17.3
B. Laboratory Diagnostic Techniques											
Electrocardiography	13.4	10.4	11.1	10.8	9.2	11.8	8.4	14.3	7.8	16.3	11.0
Phonocardiography	26.1	31.2	33.4	24.1	23.6	35.1	27.7	34.5	35.8	41.3	30.2
Echocardiography	51.3	54.1	59.3	50.4	52.1	61.3	55.2	55.4	54.3	57.6	55.3
Exercise tolerance testing	33.0	26.6	28.9	30.6	30.8	36.3	26.1	30.8	28.2	27.8	28.0
Vectorcardiography	33.0	34.1	35.8	30.8	32.0	35.8	30.4	39.8	31.2	44.9	33.8
Angiography: Cardiac	19.8	25.6	27.9	19.8	13.5	35.1	20.2	31.3	19.6	44.0	24.2
Coronary	43.8	41.7	48.6	34.0	33.8	55.8	40.1	45.6	40.7	47.6	42.0
Peripheral	39.0	38.8	42.3	33.0	32.7	44.1	33.6	45.7	35.0	49.8	38.8
Cardiac catheterization	23.5	22.1	26.7	14.9	12.7	31.2	17.5	31.2	17.0	47.3	22.1
Swan-Ganz right heart catheterization	43.1	44.1	49.4	38.2	36.9	55.3	40.3	51.1	38.0	65.5	44.0
C. Laboratory and Classroom Instruction											
CV anatomy	23.4	28.9	27.5	33.1	31.3	25.6	31.0	23.2	28.8	25.3	27.7
CV physiology	18.8	23.0	20.8	23.7	23.0	20.9	20.0	24.2	20.7	23.9	21.7
CV biochemistry	37.3	40.4	35.6	42.9	33.4	40.3	40.9	33.3	36.5	40.5	37.7
CV pathology	23.5	27.1	25.1	29.5	31.7	23.3	27.8	24.4	27.2	24.4	26.4
CV epidemiology	28.7	30.9	25.7	36.5	33.6	26.0	31.7	24.9	30.2	25.8	28.6
CV pharmacology	23.1	28.7	26.3	30.9	27.2	27.7	27.9	27.0	29.0	24.3	27.5
CV radiology	14.5	27.2	25.0	23.4	26.4	23.4	23.6	25.9	24.1	25.5	24.5
Pulmonary physiology	35.1	41.0	40.1	38.9	38.6	39.7	40.5	38.7	39.8	39.7	39.8
Hypertensive renal disease	20.1	21.7	20.3	24.1	23.7	20.0	24.0	17.9	22.3	18.5	21.3
Peripheral vascular disease	26.8	27.2	25.2	31.4	35.0	23.0	29.6	24.0	29.0	23.5	27.1
Cerebral vascular disease	19.1	26.0	22.2	31.2	31.1	21.3	27.6	20.8	27.7	18.6	24.5
Biostatistics	40.0	38.7	35.2	44.2	38.0	40.9	39.8	37.4	36.1	47.1	38.8
Bioengineering	43.8	40.9	41.7	41.9	35.2	46.4	41.5	41.2	37.6	52.5	41.4

Source: 5

TABLE 84

PERCENT OF ALL ACTIVE CARDIOLOGISTS INDICATING TYPE OF TRAINING DESIRED IN CONTINUING EDUCATION BY COMMUNITY SIZE

TYPE OF TRAINING	ALL ACTIVE CARDIOLOGISTS		
	Community Size		All
	Under 150M	Over 150M	
	N=327	N=1182	N=1509
	%	%	%
Classroom Instruction or Seminars			
General medical cardiology	80.8	81.3	81.1
CV surgery	24.8	33.6	31.7
Pediatric cardiology	28.3	30.4	29.9
CV anatomy	35.4	28.5	29.9
CV physiology	65.5	62.3	63.0
CV biochemistry	38.6	40.6	40.1
CV pathology	42.3	38.1	39.0
CV epidemiology	29.6	28.4	28.6
CV pharmacology	63.7	60.8	61.4
CV radiology	46.1	48.4	47.9
Pulmonary physiology	60.6	56.9	57.6
Hypertensive renal disease	65.3	53.8	56.2
Peripheral vascular disease	53.1	42.2	44.5
Cerebral vascular disease	53.3	39.7	42.6
Biostatistics	17.7	21.3	20.5
Bioengineering	20.4	24.0	23.2
Electrocardiology	76.9	61.7	64.9
Phonocardiology	38.8	41.6	40.9
Echocardiography	46.2	52.9	51.4
Exercise tolerance testing	56.9	51.2	52.4
Vectorcardiography	40.7	40.7	40.7
Angiography	31.2	37.5	36.1
Cardiac catheterization	22.5	29.7	28.1
Actual Personal Supervised Experience in Cardiac Patient Care			
Pediatric	14.8	13.1	13.4
Medical	45.6	36.7	38.6
Surgical	13.0	13.8	13.6
Coronary care unit	45.0	34.5	36.8
Pacemaker insertion and follow-up	44.3	32.8	35.2
Laboratory Diagnostic Techniques			
Electrocardiography	58.1	44.2	47.1
Phonocardiography	31.7	30.7	30.9
Echocardiography	39.3	41.6	41.1
Exercise tolerance testing	49.1	37.0	39.6
Vectorcardiography	34.8	29.0	30.3
Angiography: cardiac	25.5	24.3	24.6
Angiography: coronary	28.2	26.6	26.9
Angiography: peripheral	20.6	15.4	16.5
Cardiac catheterization	18.5	24.8	23.4
Swan-Ganz right heart catheterization	26.7	26.2	26.3

Source: 5

TABLE 85

ALL ACTIVE CARDIOLOGISTS' PERCENTAGE OF OPINIONS REGARDING CONTINUING EDUCATION OPPORTUNITIES BY CENSUS DIVISION AND COMMUNITY SIZE

CENSUS DIVISION	Community Size	N	Adequate	In-adequate	No Opinion
			%	%	%
NEW ENGLAND	Over 150M	93	77	17	6
	Under 150M	28	76	11	13
MIDDLE ATLANTIC	Over 150M	323	79	8	13
	Under 150M	68	60	27	13
SOUTH ATLANTIC	Over 150M	213	79	14	7
	Under 150M	61	63	30	7
EAST SOUTH CENTRAL	Over 150M	34	60	24	16
	Under 150M	16	67	25	8
WEST SOUTH CENTRAL	Over 150M	72	65	24	11
	Under 150M	26	72	25	3
EAST NORTH CENTRAL	Over 150M	172	77	18	5
	Under 150M	45	64	22	14
WEST NORTH CENTRAL	Over 150M	49	63	8	29
	Under 150M	24	81	0	19
MOUNTAIN	Over 150M	40	68	15	12
	Under 150M	14	97	3	0
PACIFIC	Over 150M	171	83	15	2
	Under 150M	36	62	31	7
CARIBBEAN	Over 150M	12	73	27	0
	Under 150M	6	57	43	0
MILITARY	Over 150M	4	56	11	33
	Under 150M	1	50	50	0
ALL CARDIOLOGISTS	Over 150M	1181	77	14	9
	Under 150M	327	67	23	10

Source: 5

TABLE 86

ALL ACTIVE CARDIOLOGISTS' PERCENTAGE OF ATTENDANCE
ONCE A YEAR OR MORE AT NATIONAL OR REGIONAL MEETINGS
HAVING SUBSTANTIAL CARDIOLOGY SESSIONS
BY CENSUS DIVISION AND COMMUNITY SIZE

CENSUS DIVISION	Community Size	N	More than Once a Year	Once a Year
			%	%
NEW ENGLAND	Over 150M	93	40	28
	Under 150M	28	28	19
MIDDLE ATLANTIC	Over 150M	323	36	30
	Under 150M	68	29	30
SOUTH ATLANTIC	Over 150M	213	35	28
	Under 150M	61	35	40
EAST SOUTH CENTRAL	Over 150M	34	26	28
	Under 150M	16	20	45
WEST SOUTH CENTRAL	Over 150M	72	40	24
	Under 150M	26	40	21
EAST NORTH CENTRAL	Over 150M	172	34	35
	Under 150M	45	43	24
WEST NORTH CENTRAL	Over 150M	49	30	26
	Under 150M	24	39	32
MOUNTAIN	Over 150M	40	34	20
	Under 150M	14	49	43
PACIFIC	Over 150M	171	43	26
	Under 150M	36	27	39
CARIBBEAN	Over 150M	12	63	18
	Under 150M	6	43	21
MILITARY	Over 150M	4	0	59
	Under 150M	1	0	50
ALL CARDIOLOGISTS	Over 150M	1181	37	29
	Under 150M	327	34	32

Source: 5

TABLE 87

ALL ACTIVE CARDIOLOGISTS' PERCENTAGE OF ATTENDANCE ONCE A YEAR OR MORE AT NATIONAL MEETINGS DEVOTED EXCLUSIVELY TO CARDIOLOGY BY CENSUS DIVISION AND COMMUNITY SIZE

CENSUS DIVISION	Community Size	N	More than Once a Year	Once a Year
			%	%
NEW ENGLAND	Over 150M	93	34	38
	Under 150M	28	8	41
MIDDLE ATLANTIC	Over 150M	323	28	45
	Under 150M	68	12	42
SOUTH ATLANTIC	Over 150M	213	26	40
	Under 150M	61	26	29
EAST SOUTH CENTRAL	Over 150M	34	22	30
	Under 150M	16	6	28
WEST SOUTH CENTRAL	Over 150M	72	44	26
	Under 150M	26	12	39
EAST NORTH CENTRAL	Over 150M	172	38	33
	Under 150M	45	39	29
WEST NORTH CENTRAL	Over 150M	49	24	35
	Under 150M	24	44	35
MOUNTAIN	Over 150M	40	29	36
	Under 150M	14	4	71
PACIFIC	Over 150M	171	45	32
	Under 150M	36	11	40
CARIBBEAN	Over 150M	12	20	77
	Under 150M	6	58	7
MILITARY	Over 150M	4	11	79
	Under 150M	1	0	50
ALL CARDIOLOGISTS	Over 150M	1181	33	38
	Under 150M	327	21	37

Source: 5

TABLE 88

ALL ACTIVE CARDIOLOGISTS' PERCENTAGE PARTICIPATING IN CARDIOVASCULAR DISEASE CONTINUING EDUCATION COURSES ONCE A YEAR OR MORE BY CENSUS DIVISION AND COMMUNITY SIZE

CENSUS DIVISION	Community Size	N	More than Once a Year	Once a Year
			%	%
NEW ENGLAND	Over 150M	93	59	22
	Under 150M	28	58	18
MIDDLE ATLANTIC	Over 150M	323	52	24
	Under 150M	68	47	25
SOUTH ATLANTIC	Over 150M	213	57	21
	Under 150M	61	43	39
EAST SOUTH CENTRAL	Over 150M	34	57	14
	Under 150M	16	43	25
WEST SOUTH CENTRAL	Over 150M	72	44	26
	Under 150M	26	67	9
EAST NORTH CENTRAL	Over 150M	172	57	25
	Under 150M	45	67	18
WEST NORTH CENTRAL	Over 150M	49	32	27
	Under 150M	24	76	18
MOUNTAIN	Over 150M	40	58	17
	Under 150M	14	71	30
PACIFIC	Over 150M	171	68	17
	Under 150M	36	71	11
CARIBBEAN	Over 150M	12	67	33
	Under 150M	6	64	36
MILITARY	Over 150M	4	26	48
	Under 150M	1	100	0
ALL CARDIOLOGISTS	Over 150M	1181	56	22
	Under 150M	327	58	23

Source: 5

TABLE 89

CARDIOLOGISTS' AGE SPECIALTY, AND PRACTICE TYPE BY PERCENTAGE ASSESSMENT OF PRIMARY CARDIOLOGY MANPOWER NEEDS

Age Group, Specialty, and Type of Practice	Too Few	About Right	Too Many	No Response
Under 40 Years				
Primary Non-Institutional	19	62	16	3
Primary Institutional	18	55	24	3
Secondary Non-Institutional	14	68	16	2
Secondary Institutional	24	51	19	6
Over 40 Years				
Primary Non-Institutional	18	65	15	2
Primary Institutional	22	62	13	4
Secondary Non-Institutional	17	73	8	2
Secondary Institutional	18	59	17	6
All Cardiologists	18	66	14	3
Fellows	19	50	17	14

Source: 5

TABLE 90

CARDIOLOGISTS' AGE, SPECIALTY, AND PRACTICE TYPE BY PERCENTAGE ASSESSMENT OF SECONDARY MANPOWER NEEDS

Age Group, Specialty, and Type of Practice	Too Few	About Right	Too Many	No Response
Under 40 Years				
Primary Non-Institutional	14	56	25	5
Primary Institutional	14	56	26	5
Secondary Non-Institutional	10	68	18	4
Secondary Institutional	20	56	15	9
Over 40 Years				
Primary Non-Institutional	12	63	21	4
Primary Institutional	16	65	13	6
Secondary Non-Institutional	14	76	9	2
Secondary Institutional	16	61	17	2
All Cardiologists	14	66	17	4
Fellows	11	53	20	16

Source: 5

TABLE 91

ALL ACTIVE CARDIOLOGISTS' PERCENTAGE ASSESSMENT OF PRIMARY CARDIOLOGY MANPOWER BY CENSUS DIVISION AND COMMUNITY SIZE

CENSUS DIVISION	Community Size	N	Too Few	About Right	Too Many	No Response
			%	%	%	%
NEW ENGLAND	Over 150M	93	15	62	18	5
	Under 150M	28	14	81	3	2
MIDDLE ATLANTIC	Over 150M	323	10	69	19	2
	Under 150M	68	26	68	5	1
SOUTH ATLANTIC	Over 150M	213	12	69	15	4
	Under 150M	61	37	50	10	3
EAST SOUTH CENTRAL	Over 150M	34	36	59	4	1
	Under 150M	16	20	52	6	22
WEST SOUTH CENTRAL	Over 150M	72	13	71	16	0
	Under 150M	26	31	69	0	0
EAST NORTH CENTRAL	Over 150M	172	18	73	8	1
	Under 150M	45	30	67	3	0
WEST NORTH CENTRAL	Over 150M	49	21	62	9	8
	Under 150M	24	56	40	0	4
MOUNTAIN	Over 150M	40	24	55	16	5
	Under 150M	14	5	93	0	4
PACIFIC	Over 150M	171	11	62	23	4
	Under 150M	36	18	63	18	1
CARIBBEAN	Over 150M	12	*	*	*	*
	Under 150M	6	*	*	*	*
MILITARY	Over 150M	4	*	*	*	*
	Under 150M	1	*	*	*	*
ALL CARDIOLOGISTS	Over 150M	1181	15	67	16	2
	Under 150M	327	29	62	6	3

* Numbers inadequate for analysis.

Source: 5

TABLE 92

ALL ACTIVE CARDIOLOGISTS' PERCENTAGE ASSESSMENT OF SECONDARY CARDIOLOGY MANPOWER BY CENSUS DIVISION AND COMMUNITY SIZE

CENSUS DIVISION	Community Size	N	Too Few	About Right	Too Many	No Response
			%	%	%	%
NEW ENGLAND	Over 150M	93	7	71	16	6
	Under 150M	28	13	82	3	2
MIDDLE ATLANTIC	Over 150M	323	7	67	23	3
	Under 150M	68	17	68	14	1
SOUTH ATLANTIC	Over 150M	213	13	64	17	6
	Under 150M	61	33	49	12	6
EAST SOUTH CENTRAL	Over 150M	34	17	63	19	1
	Under 150M	16	11	80	0	9
WEST SOUTH CENTRAL	Over 150M	72	11	70	18	1
	Under 150M	26	24	76	0	0
EAST NORTH CENTRAL	Over 150M	172	14	73	13	0
	Under 150M	45	19	68	8	5
WEST NORTH CENTRAL	Over 150M	49	15	71	8	6
	Under 150M	24	58	36	0	6
MOUNTAIN	Over 150M	40	10	68	15	7
	Under 150M	14	11	86	0	3
PACIFIC	Over 150M	171	14	55	26	5
	Under 150M	36	21	59	17	3
CARIBBEAN	Over 150M	12	*	*	*	*
	Under 150M	8	*	*	*	*
MILITARY	Over 150M	4	*	*	*	*
	Under 150M	1	*	*	*	*
ALL CARDIOLOGISTS	Over 150M	1181	11	66	19	4
	Under 150M	327	23	65	9	3

* Numbers inadequate for analysis.

Source: 5

Practice Location Related to Where Trained

It is noted in Chapter Five that the majority of cardiologists trained within an area practice in the same general area. Looking at where cardiologists practice in relation to where trained as the next level of movement, i.e., percentages going to a postal area census division other than were trained, the Eastern Seaboard does quite well in retaining its manpower resources (movements are up and down the coast) and the Area 9 (Pacific) is the major choice area for all other training areas. Specifically, the Pacific obtains the following percentages of those trained in indicated postal areas:

Movement from Area 4	8.3 percent
Movement from Area 5	11.9 percent
Movement from Area 6	13.3 percent
Movement from Area 7	10.9 percent
Movement from Area 8	22.6 percent

The magnitude of this migration to the Pacific is seen when the cardiologists from other areas are combined with those trained in the area; the Pacific retains 75.5 percent of all that they train but this number is only 56.5 percent of all that they have.

CARDIOVASCULAR DISEASE TRAINING PROGRAMS STUDY

The methodology for this study is discussed in Chapter Two, pages 57 through 78. Estimates were obtained concerning the availability of facilities within and/or in association with training institutions, the number of diagnostic and testing procedures performed, the type and number of clinical conditions seen and treated (a measure of training resources), as well as, an enumeration of staffs and their capabilities. These data are presented in Chapter Five. Statistics regarding requirements for training programs, the amount of time in training programs and the objectives which directors have for their programs are also presented in Chapter Five.

Physicians Trained in Cardiology

Tables 93, 94 and 95 summarize past, current and planned cardiovascular training program trainee statistics. Table 93 presents mean statistics for the 190 programs which answered the survey form. Tables 94 and 95 extend these data to the 329 national programs. With these tables, the trends related to growth as well as differences in growth patterns for types of programs are documented.

TABLE 93

AVERAGE NUMBER OF CARDIOVASCULAR TRAINEES
BY PROGRAM LENGTH

Number of Cardiovascular Trainees by Category and Program Year	PROGRAM LENGTH *	
	Less than 24 Months (N=51)	24 Months or More (N=139)
	$\bar{X}$ Number	$\bar{X}$ Number
Number of Positions:		
1972-73	2.08	5.07
1971-72	1.78	4.62
1970-71	1.34	3.99
Number Positions Filled:		
1972-73	1.86	4.91
1971-72	1.74	4.56
1970-71	1.32	3.76
Number Completing Program this Year:		
1972-73	1.64	2.86
1971-72	1.66	2.50
1970-71	1.28	2.23
Number of Applicants (1972-73)	9.93	26.51

*Length for majority of candidates.

Source: 4

TABLE 94

NUMBER OF TRAINEES BY TRAINING PROGRAM LENGTH:
1970-71 THROUGH 1972-73

Number of Cardiovascular Trainees by Category and Program Year	Program Length*		
	Less than 24 Months	24 Months or More	Total
	N=88	N=241	
	Number	Number	Number
Number of Positions:			
1972-73	174	1159	1333
1971-72	149	1056	1205
1970-71	112	912	1024
Number Positions Filled:			
1972-73	155	1123	1278
1971-72	145	1043	1188
1970-71	110	860	970
Number Completing Program this Year:			
1972-73	137	654	791
1971-72	139	572	711
1970-71	107	510	617

*Based on "usual amount of time" in program.

Source: 4

TABLE 95

CARDIOVASCULAR TRAINEES COMPLETING PROGRAM:
GROWTH BASED ON PROGRAM DIRECTORS' ESTIMATES*
BY PROGRAM LENGTH

Program Years	Program Length		
	Less than 24 Months	24 Months or More	Total
	N=88	N=241	
	Number	Number	Number
Completed Program:			
1971-72	139	572	711
1972-73	137	654	791
Subtotal	276	1226	1502
Estimated Completion:			
1973-74	150	719	869
1974-75	165	791	956
1975-76	182	870	1052
Subtotal	497	2380	2877
Five Year Total	773	3606	4379
Estimated Completion			
1976-77	200	957	1157
1977-78	220	1053	1273
Subtotal	420	2010	2430
Seven Year Total	1193	5616	6809

*58 percent estimate in five years, computed as 10 percent per year.

Source: 4

Training Program Directors' Program Objectives

Directors were asked whether or not their program graduates had capabilities in selected areas of cardiology upon completion of training. These responses can be considered a statement of program objectives. Table 96 provides the response percentages for directors of both types of programs.

Directors were also given the opportunity to make written recommendations concerning changes which they felt should occur in cardiovascular training programs. These comments were used by the Advisory Committee in their evaluations.

Suggested Cardiology Training Program Guidelines Prepared by the Cardiovascular Subspecialty Board

The guidelines prepared by the Cardiovascular Subspecialty Board were cited by many program directors. The statements below regarding guidelines for training programs were provided by the current Chairman of the Subspecialty Board in Cardiovascular Diseases and are recommended by the Advisory Committee for adoption.

Clinical training program in cardiology must of necessity be varied in content and emphasis reflecting the differing backgrounds, talents and ambitions of trainees, as well as the large spectrum of opportunities that may be found in training centers. Therefore it is difficult to compose a description of an ideal program without running the risk of imposing a uniformity that could be suppressive of innovation and progress. The following general guidelines are offered with the realization that good programs may exist with various emphasis and that periodic review is necessary to avoid obsolescence.

1. Objectives of a Clinical Training Program in Cardiology. In general the trainees entering a clinical training program will embark on careers in either a practice of cardiology, or academic medicine or some combination of the two. If the goal is practice of cardiology, the extent to which this is possible as a specialty is determined by the locale of the practice, hospital facilities, associates, etc. Therefore the technical procedures which must be mastered will be affected to some extent by the opportunities that will exist in the practice area. Often, however, the ultimate goal is unclear to the trainee at first. Not infrequently goals change as the traineeship unfolds. Therefore a certain core experience would seem indicated for all trainees. This should be provided in sufficient depth and with sufficient emphasis or scholarship, self-instruction and development of critical judgment , so that the trainee-product of the program will not become dated after he has entered his chosen profession on completion of the experience.

TABLE 96

PERCENT OF CARDIOVASCULAR TRAINING PROGRAMS INDICATING TRAINEE SKILLS IN VARIOUS AREAS BY PROGRAM LENGTH

Trainee Skills Upon completion of our program, the majority of our trainees are able to:	Program Length Less than 24 Months (N=51) % Yes	Program Length 24 Months or More (N=139) % Yes
Manage an intensive care and/or coronary care facility	97.9	96.8
Conduct diagnostic cardiac catheterizations	59.6	96.0
Direct a hemodynamics lab	23.4	60.8
Serve as cardiologist consultant on a CCU committee	93.6	98.4
Perform as a cardiologist consultant in all clinical areas	87.2	98.4
Conduct clinical research	66.0	82.4
Conduct basic laboratory research	6.4	16.0
Teach graduate students and residents in clinical and laboratory settings	83.0	92.8
Teach medical students, residents and fellows in both clinical and formal classroom settings	93.6	98.4
Participate in professional seminars, workshops and symposia as consultant cardiologists	85.1	85.6
Are eligible for subspecialty board certification in cardiovascular diseases	51.1	99.2
Perform and teach others to perform cardiac diagnostic x-ray procedures	48.9	84.0
Perform and teach others to perform non-invasive laboratory techniques	83.0	89.6

Source: 4

2. Prerequisites. Trainees must have a thorough grounding in internal medicine before embarking on the clinical training program. The proper understanding of the complications in fluid and electrolyte problems, hematology, infectious disease, etc., occurring for instance in post-operative open-heart surgical patients, indicates the need for mastery in-depth of the appropriate major areas of internal medicine. This type of competence has in most instances been best provided by an internship plus two years of residency in an approved program in internal medicine prior to starting the cardiology traineeship.

3. Location of the Program. Although many of the best known programs occur in university teaching hospitals it is certainly possible for a superb program to be provided in a hospital not affiliated with a university center.

4. Contents of the Program.

a. The principal ingredients of a good clinical traineeship program in cardiology may be divided into four areas:

(1) Acquisition of clinical skills used in diagnosis.

(2) Mastery of laboratory techniques.

(3) Instruction and experience in management of various types of heart disease.

(4) Opportunity for research.

The first three of these are obvious. The inclusion of research as an important part of a clinical training program may require a word of explanation. Obviously most graduates of clinical training programs will, in the end, engage in practice. Is participation in clinical investigation worthwhile for such an individual? It is eminently worthwhile. The experience of identifying a problem worthy of study, going through the literature to see what is already known, working out a protocol to study the probelm under skillful supervision, executing the necessary studies, evaluating the results and writing up the whole study for presentation to colleagues in verbal or written form is an important and instructive exercise. It may affect one's career goals by attracting toward (or repelling from) academic medicine. Although proof of this is lacking, we believe that such an experience is one of the best ways of encouraging life-long habits of scholarship and critical thinking so necessary in the evaluation of newly proposed therapeutic modalities, etc. It is recognized, however, that some trainees have no interest in research and it is quite possible that their forced immersion in on-going investigative programs will be tedious and time wasting for all concerned.

b. Details of the core experience of a satisfactory training program. Besides knowledge of basic subjects such as cardiovascular anatomy, physiology, pathology, pharmacology, the following areas and subjects are considered important:

(1) Acquisition of clinical skills in diagnosis. The proper care of patients seen by a cardiologist requires accuracy in diagnosis. Even in the modern era of more and more precise laboratory methods, the bedside skills contained in history taking and physical examination remain of crucial importance. Therefore it is imperative that, through the experiences afforded by abundant patient contacts, the trainee sharpen his ability to utilize profitably these basic clinical methods. The setting may vary with the institution. However, an experienced director who can check the findings and correct errors is of course necessary for the proper development of these important skills.

(2) Mastery of laboratory techniques. This list changes rapidly with the introduction of new methods. In many instances the laboratory methods supplement and strengthen the clinical skills mentioned in (1) above. For instance, electrocardiography permits the verification of clinically diagnosed arrhythmias, phonocardiography enhances auscultation - while graphic records of pulsatile phenomena improve the art of palpation of blood vessels and precordium. Catheterization and angiography provide physiologic and anatomic confirmation of conditions diagnosed at the bedside. Therefore for the optimal use of these technical methods as educational (as well as diagnostic) tools the trainee should always be required to state his opinion in writing in detail before resorting to the laboratory method.

A list of more important laboratory methods contained in the care of a good program follows:

a. Electrocardiography - This remains the principal laboratory method used in cardiology. Mastery of electrocardiography is imperative. The interpretation of tracings under experienced supervision, coupled with reading from standard text books and journals should provide an adequate experience. The number of ECGs required for adequate training may be exceeded in many busy hospitals. If the trainee is required to spend a very substantial portion of his day in reading ECGs for service purposes, over and above his optimal educational requirements, this activity may dilute the value of the program.

b. Vectorcardiography - is available in many programs and is very useful as an educational and investigative tool. Participation is not imperative.

c. HIS Bundle Recording - The same may be said of this valuable new technique.

d. Phonocardiography - The trainee should be provided an opportunity to take and interpret phonocardiograms under proper supervision. This enhances the accuracy of bedside auscultation and enables one to appreciate the graphic records appearing in the literature.

e. Apexcardiography - The trainee should be encouraged to take his own multichannel records combining apex-cardiography with phono- and electrocardiograms. His skill in palpation will be enhanced by this experience.

f. Carotid and venous pulse tracings - The same is true of these graphic recordings. The carotid tracing combined with ECG and phono permits the measurement of systolic time intervals. At the present time an adequate training program should include this technique.

g. Echocardiography - ability to interpret echocardiograms.

h. Interpretation of cardiovascular roentgenograms, and special procedures and techniques used in the study of cardiovascular problems.

i. Interpretation of hemodynamic data obtained in the cardiac catheterization laboratory. Since catheterization is in most centers one of the principal means of establishing complex diagnoses and providing precise physiologic information it is a basic contributer to an effective program. The extent of personal participation by the trainee may vary but a thorough understanding of the data and ability to calculate results is absolutely necessary.

j. Experience in treadmill testing.

(3) Management of various types of heart disease. A broad experience with the major types of heart disease encountered in the United States is required. This elementary statement is included in view of the tendency in some centers for patient

material to be mainly concentrated on a limited spectrum of disease owing to local referral patterns, surgical attractions and therapeutic fads.

a. Coronary heart disease. A thorough understanding of its pathology, risk factors, natural history, prevention, diagnosis by history, physical examination, laboratory (treadmill testing, chemical studies, coronary arteriography) and medical as well as surgical treatment is required. An experience in a well run coronary care unit under good supervision is a sine qua non of a good training program.

b. Hypertensive heart disease. Knowledge of theories regarding pathogenesis, the natural history, pathology and pharmacologic treatment is needed.

c. Congenital heart disease. Embryology, alterations in the circulation at birth, pathology, clinical presentation, laboratory diagnostic methods, surgical treatment, natural history of the principal types of congenital cardiac malformations is necessary. A period of intensive exposure to pediatric cardiology is a valuable optional experience.

d. Rheumatic heart disease. Knowledge of the bacteriologic association, prevention, pathology, complications, altered physiology, medical and surgical treatment

e. Other types of heart disease. Pericardial disease; Cardiac tumors; Syphilis; Cardiomyopathy; Cor pulmonale; Parasitic heart disease; Traumatic heart disease; Psychogenic factors.

f. Management of arrhythmias. This will include monitoring, cardioversion, and pacemaking. The insertion of pacemakers, detection of malfunction and cooperative supervision of ambulatory patients with the help of nurses and surgeons are all necessary aspects of a good program.

g. Pre-op and post-op management of open-heart surgical cases.

Cardiologists' Career Objectives

Table 97 presents the mean number of program graduates with career objectives in types of practice settings. Its importance is found in relating cardiologist

TABLE 97

AVERAGE NUMBER OF TRAINEES IN CARDIOLOGY CAREER AREAS BY PROGRAM LENGTH

Career Plans for Trainees by Category and Program Year	PROGRAM LENGTH	
	Less than 24 Months (N=51)	24 Months or More (N=139)
	$\bar{X}$ Number	$\bar{X}$ Number
Clinical Practice:		
1972-73	1.27	1.87
1971-72	1.17	1.73
Academic Medicine:		
1972-73	0.38	1.36
1971-72	0.31	1.16
Other:		
1972-73	0.04	0.05
1971-72	0.04	0.06
Unknown:		
1972-73	0.04	0.13
1971-72	0.02	0.04

Source: 4

objectives for practice to the objectives which the training directors indicated for their programs. Also, it indicates the probable distribution of newly graduated cardiologists in types of practice arrangements - a fact of significance in manpower planning.

Program Support

Data were sought regarding types of financial support. Only the percentage of programs which obtained support from any of the sources noted was considered reliable. Table 98 presents these statistics.

Training Program Characteristics

Significant differences were noted in the programs which are less than 24 months in duration and those of 24 months or more length.

Table 99 gives the distribution of programs by length and by program categories. From this table it will be apparent why the division at point of 24 months for two types of programs was chosen.

Table 100 is a summary of all response categories used in the portion of the survey instrument which asked about training program hours. Three response possibilities were used in this section:

- o No response;
- o A check, meaning that the training was offered but no estimate of time was provided;
- o Hours recorded, meaning that actual numbers were provided.

It is important to refer back to this table in assessing the statistics regarding hours of training because these statistics are calculated from the hours recorded only.

Table 101 provides summary statistics for hours of training by both types of programs. Figures 2, 3 and 4 present comparable data graphically.

It is well to observe that the average program of less than 24 months duration had approximately 70 required training hours per week. The longer programs had approximately 55 required hours of training per week. Assuming that a 70 hour week is normal for a trainee, those in the two-year programs have about 15 hours each week for program electives. Only required hours have been presented in tables and figures; one can only assume that sufficient resources exist within training programs to accommodate trainee interests in program electives which might demand more time in any of the topical areas presented.

TABLE 98

CARDIOVASCULAR TRAINING PROGRAM FISCAL SUPPORT SOURCES: PERCENT OF PROGRAMS INDICATING SOURCES

Fiscal Support Sources	Cardiovascular Training Programs
	% Yes
Training Grants and Fellowships	
Federal Government Agency	
NHLI	26.8
Other NIH	13.2
Other	21.6
Non-Federal Government Agency	13.2
Non-Government Agency	
American Heart Association	11.6
Local Heart Association	24.2
Foundation	15.3
Other	16.8
Research Grants	
Federal Government Agency	
NHLI	23.2
Other NIH	13.2
Other	15.3
Non-Federal Government Agency	10.0
Non-Government Agency	
American Heart Association	13.2
Local Heart Association	22.6
Foundation	14.7
Other	21.0
Own Institution	56.8

Source: 4

TABLE 99

CARDIOVASCULAR TRAINING PROGRAM USUAL MONTHS OF TRAINING:
PERCENTAGE DISTRIBUTION FOR THREE TYPES OF TRAINING INSTITUTIONS[1]

Usual Months of Training	Type I Hospitals		Type II Hospitals		Type III Hospitals		All Hospitals	
	N	%	N	%	N	%	N	%
12 Months	26	52.0	15	16.5	2	4.1	43	22.6
18 Months	1	2.0	7	7.7	0	0.0	8	4.2
24 Months	22	44.0	68	74.7	46	93.9	136	71.6
30 Months	0	0.0	1	1.1	1	2.0	2	1.1
36 Months	1	2.0	0	0.0	0	0.0	1	0.5
TOTAL	50	100.0	91	100.0	49	100.0	190	100.0

[1] Training institutions categorized based on number of internal medicine residencies: Type I = 1 to 15; Type II = 16 to 41; Type III = 42 and over. Usual months provided by the institution.

Source: 4

TABLE 100

CARDIOVASCULAR TRAINING PROGRAM SUBJECT AREAS AND EXPERIENCES: ITEM BY ITEM RESPONSE PERCENTAGE DISTRIBUTION FOR PARTICIPATING INSTITUTIONS BY PROGRAM LENGTH

Cardiovascular Training Program Subject Areas and Experiences	PROGRAM LENGTH											
	Less than 24 Months (N=51)						24 Months or More (N=139)					
	No Response		Check Only		Hours Recorded		No Response		Check Only		Hours Recorded	
	N	%	N	%	N	%	N	%	N	%	N	%
Experience in Clinical Care, Research and Teaching												
Cardiac patient care: pediatric	21	41.2	9	17.6	21	41.2	69	49.6	28	20.1	42	30.2
Cardiac patient care: medical	5	9.8	13	25.5	33	64.7	17	12.2	40	28.8	82	59.0
Cardiac patient care: surgical	24	47.1	11	21.6	16	31.4	41	29.5	27	19.4	71	51.1
Cardiovascular research: basic	37	72.5	10	19.6	4	7.8	71	51.1	39	28.1	29	20.9
Cardiovascular research: clinical	16	31.4	12	23.5	23	45.1	25	18.0	46	33.1	68	48.9
Teaching: clinical	7	13.7	13	25.5	31	60.8	19	13.7	37	26.6	83	59.7
Teaching: didactic	11	21.6	12	23.5	28	54.9	28	20.1	42	30.2	69	49.6
Laboratory Diagnostic Techniques												
Electrocardiography	2	3.9	14	27.5	35	68.6	14	10.1	39	28.1	86	61.9
Phonocardiography	4	7.8	15	29.4	32	62.7	15	10.8	37	26.6	87	62.6
Echocardiography	26	51.0	7	13.7	18	35.3	57	41.0	25	18.0	57	41.0
Exercise tolerance testing	5	9.8	15	29.4	31	60.8	22	15.8	38	27.3	79	56.8
Vectorcardiography	10	19.6	17	33.3	24	47.1	36	25.9	32	23.0	71	51.1
Angiography: cardiac	11	21.6	16	31.4	24	47.1	15	10.8	43	30.9	81	58.3
Angiography: coronary	14	27.5	14	27.5	23	45.1	19	13.7	43	30.9	77	55.4
Angiography: peripheral	34	66.7	8	15.7	9	17.6	90	64.7	17	12.2	32	23.0
Cardiac catheterization	12	23.5	14	27.5	25	49.0	13	9.4	38	27.3	88	66.3
Pacemaker insertion	6	11.8	15	29.4	30	58.8	16	11.5	41	29.5	82	59.0
Pacemaker follow-up	6	11.8	15	29.4	30	58.8	24	17.3	43	30.9	72	51.8
Swan-Ganz right heart catheterization	20	39.2	16	31.4	15	29.4	30	21.6	45	32.4	64	46.0
Laboratory and Classroom Instruction for Trainees												
CV anatomy	22	43.1	12	23.5	17	33.3	62	44.6	27	19.4	50	36.0
CV physiology	17	33.3	13	25.5	21	41.2	40	28.8	31	22.3	68	48.9
CV biochemistry	28	54.9	9	17.6	14	27.5	77	55.4	22	15.8	40	28.8
CV pathology	20	39.2	10	19.6	21	41.2	45	32.4	27	19.4	67	48.2
CV epidemiology	34	66.7	8	15.7	9	17.6	93	66.9	17	12.2	29	20.9
CV pharmacology	20	39.2	11	21.6	20	39.2	62	44.6	24	17.3	53	38.1
CV radiology	21	41.2	10	19.6	20	39.2	50	36.0	29	20.9	60	43.2
Pulmonary physiology	22	43.1	11	21.6	18	35.3	71	51.1	28	20.1	40	28.8
Hypertensive renal disease	24	47.1	10	19.6	17	33.3	72	51.8	26	18.7	41	29.5
Peripheral vascular disease	30	58.8	9	17.6	12	23.5	93	66.9	18	12.9	28	20.1
Cerebral vascular disease	33	64.7	8	15.7	10	19.6	101	72.7	17	12.2	21	15.1
Biostatistics	46	90.2	4	7.8	1	2.0	103	74.1	13	9.4	23	16.5
Bioengineering	44	86.3	3	5.9	4	7.8	103	74.1	14	10.1	22	15.8

Source: 4

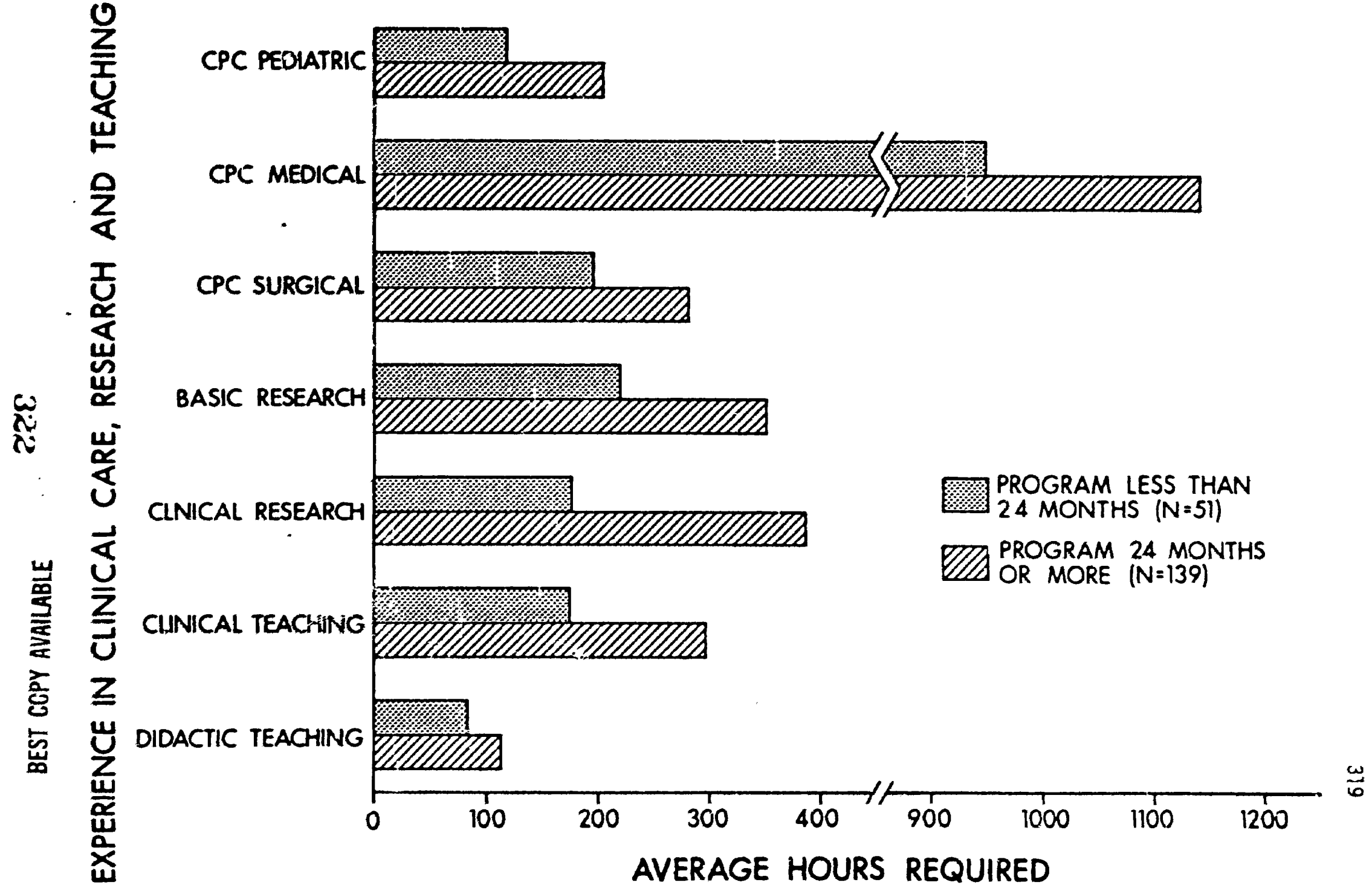
TABLE 101

CARDIOVASCULAR TRAINING PROGRAM SUBJECT AREAS AND EXPERIENCES: AVERAGE HOURS AND PERCENT OF TOTAL IN SUBJECT AREAS BY USUAL MONTHS FOR TOTAL PROGRAM

Cardiovascular Training Program Subject Areas and Experiences	Less than 24 Months (N=51)		24 Months or More (N=139)	
	$\bar{X}$ Hours	%	$\bar{X}$ Hours	%
A. Clinical Care, Research and Teaching				
Patient Care - Medical	947.4	26.1	1140.2	21.8
Patient Care - Other	311.4	8.6	488.1	9.3
Research - Basic and Clinical	398.6	10.9	734.7	14.1
Teaching - Clinical and Didactic	254.7	7.0	409.5	7.8
Subtotal	1912.1	52.7	2772.5	53.0
B. Laboratory Diagnostic Techniques				
Cardiac Catheterization and Angiography	676.7	18.6	973.5	18.6
Electrocardiogram	336.9	9.3	330.7	6.3
Non-Invasive Testing (PCG, Echo, Exercise Test, VCG)	295.4	8.1	451.3	8.6
Pacemaker	114.5	3.2	154.4	3.0
Swan-Ganz Catheterization	26.7	0.7	58.7	1.1
Subtotal	1450.2	39.9	1968.6	37.6
C. Formal Instruction for Trainees				
Subtotal	268.4	7.4	494.4	9.4
TOTAL	3630.7	100.0	5235.5	100.0

Source: 4

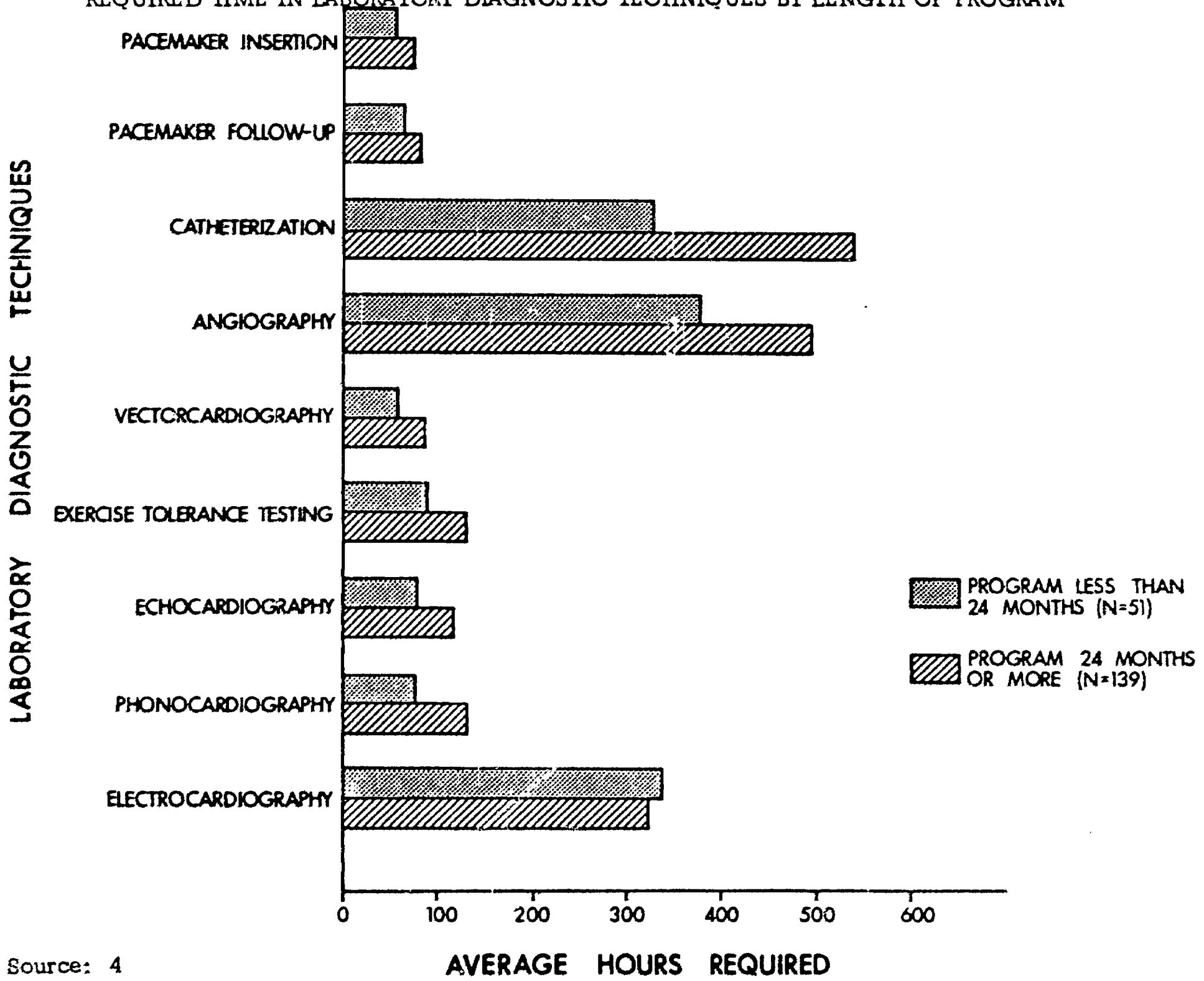
FIGURE 2
REQUIRED HOURS IN CLINICAL CARE, RESEARCH AND TEACHING BY PROGRAM LENGTH



Source: 4

FIGURE 3

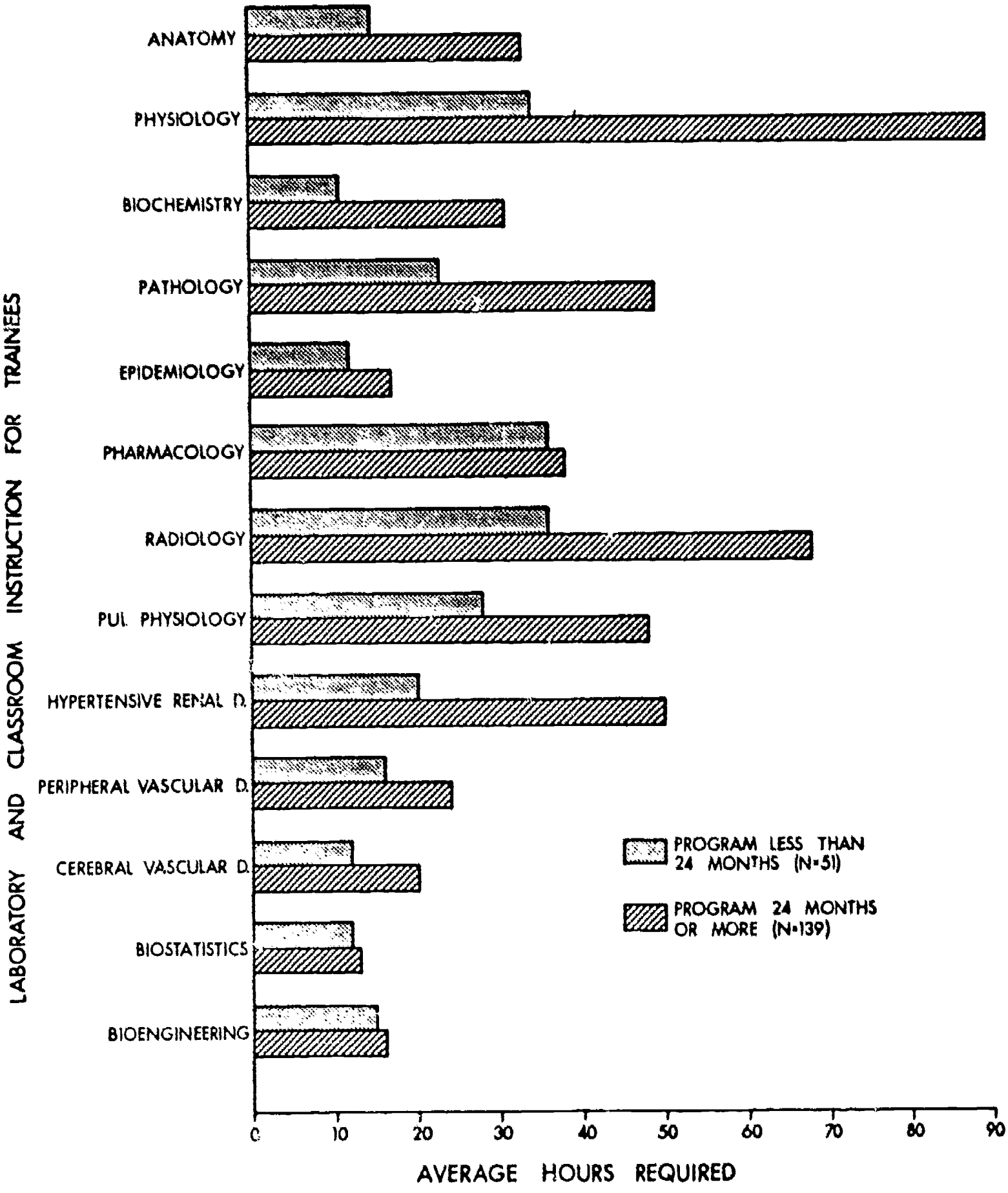
REQUIRED TIME IN LABORATORY DIAGNOSTIC TECHNIQUES BY LENGTH OF PROGRAM



Source: 4

FIGURE 4

REQUIRED TIME IN LABORATORY AND CLASSROOM INSTRUCTION
BY PROGRAM LENGTH



Source: 4

MANPOWER PROJECTIONS

Factors considered in preparing the manpower estimates for cardiologists in active practice at year-end 1973 are discussed in Chapter Two, pages 78 through 80. Those related to projections of need from year-end 1971 through year-end 1976 are discussed in detail in Chapter Seven.

Manpower Needs for Year-End 1976

The active cardiologist manpower estimate of 10,691 at year-end 1971 must be adjusted to reflect (1) population growth rate estimates, (2) known and projected graduates from cardiovascular disease training programs and (3) death and retirement rates associated with physician age groups.

Population growth of 1 percent per year is a current planning assumption. The probable graduates each year from cardiovascular training programs were obtained from program directors through the Cardiovascular Training Programs Survey. The factors associated with physician deaths and retirement were calculated from data abstracted from Blumberg's study[1]. A final factor which entered the equation was the possible expansion to training programs as indicated by training program directors.

Tables 102 and 103 provide statistics regarding changes in the cardiologist population for the time period 1972 through 1976 and 1977 through 1981 respectively.

Manpower to Achieve a Ratio of 6.0 per 100,000 Population

Chapter Seven presents a summary table for the effects on each of the census divisions if an objective of 6.0 per 100,000 population within five years is adopted. Table 104 indicates the numbers within the Primary Cardiologist and Secondary Cardiologist groups needed by geographic area to achieve this ratio.

Manpower at Year-End 1973

Using the data contained in Table 102, as well as known graduates from training programs as indicated in Table 94, gives an estimate of approximately 11,768 cardiologists at year-end 1973. The assumption here is that the graduates of two program years (1971-72 and 1972-73) will be in active practice and that the loss rates (described above) will apply.

[1] Blumberg, Mark S., Trends and Projections of Physicians in the United States 1967-2002. Carnegie Commission on Higher Education, 1971.

TABLE 102

CARDIOLOGISTS ACTIVE ON DECEMBER 31, 1971:
PROPORTION OF CARDIOLOGISTS ACTIVE IN 1972
AND ACTIVE THROUGH 1976

Age Groups	Number in Group[1]	Proportion Living[2]	Number Living	Proportion Active[2]	Total Active	Net Losses
25-29	76	.9964	76	.996	75	1
30-34	982	.9875	970	.995	965	17
35-39	1689	.9835	1661	.994	1651	38
40-44	1630	.9687	1579	.992	1566	64
45-49	1604	.9457	1517	.990	1501	103
50-54	1311	.9411	1234	.988	1219	92
55-59	1039	.9111	947	.979	927	112
60-64	986	.8676	855	.953	814	172
65-69	597	.8152	487	.878	427	170
70-74	344	.7175	247	.789	194	150
75 +	215	.5039	108	.662	71	144
Total	10473		9681		9410	1063

[1] 218 with no age data = 2.0 percent
[2] "Trends and Projections of Physicians in the United States 1967-2002," Mark S. Blumberg, Carnegie Commission on Higher Education, 1971.

TABLE 103

CARDIOLOGISTS ACTIVE ON DECEMBER 31, 1971:
PROPORTION OF CARDIOLOGISTS ACTIVE IN 1977
AND ACTIVE THROUGH 1981

Age Groups	Number in Group[1]	Proportion Living[2]	Number Living	Proportion Active[2]	Total Active	Net Losses
25-29	-0-	-0-	-0-	-0-	-0-	-0-
30-34	75	.9875	74	.995	74	-0-
35-39	965	.9835	949	.994	943	22
40-44	1651	.9687	1599	.992	1586	65
45-49	1566	.9457	1481	.990	1466	100
50-54	1501	.9411	1413	.988	1396	105
55-59	1219	.9111	1111	.979	1088	108
60-64	927	.8676	804	.953	766	161
65-69	814	.8152	664	.878	583	231
70-74	427	.7175	306	.789	241	186
75+	265	.5039	134	.662	89	176
Total	9410		8535		8232	1154

[1] 218 with no age data = 2.0 percent
[2] "Trends and Projections of Physicians in the United States 1967-2002," Mark S. Blumberg, Carnegie Commission on Higher Education, 1971.

TABLE 104

CARDIOLOGISTS BY PRIMARY AND SECONDARY SPECIALTY BY CENSUS DIVISION
NEEDED TO ACHIEVE NATIONAL AVERAGES OF 6.0 PER 100,000 POPULATION
(POPULATION AT DECEMBER 31, 1971: 206 MILLION)

Census Division	Primary				Secondary				Total		
	Has		Needs		Has		Needs		Has		Number Needed
	N	Ratio	N	Ratio	N	Ratio	N	Ratio	N	Ratio	
New England 11,841,633	462	3.9			371	3.1			833	7.0	
Middle Atlantic 37,199,040	1570	4.2			1428	3.8			2998	8.0	
South Atlantic 30,671,337	919	3.0	62	0.2	854	2.8			1773	5.8	62
East-South Central 12,803,470	163	1.3	244	1.9	155	1.2	205	1.6	318	2.5	449
West-South Central 19,320,560	379	2.0	232	1.2	304	1.6	232	1.2	683	3.6	464
East-North Central 40,252,476	796	2.0	483	1.2	742	1.8	403	1.0	1538	3.8	886
West-North Central 16,319,187	273	1.7	245	1.5	284	1.7	180	1.1	557	3.4	425
Mountain 8,281,562	199	2.4	66	0.8	138	1.7	91	1.1	337	4.1	157
Pacific 26,522,631	827	3.1	26	0.1	696	2.6	53	0.2	1523	5.7	79
Caribbean	65				38						
Military	8				20						
Number Needed			1358				1164				2522

Cardiologists Certified by the Subspecialty Board in Cardiovascular Disease

The Initial Cardiology Survey identified 9.6 percent with Certification in Cardiovascular Disease, whereas the final cardiology survey (Cardiologists' Training Questionnaire) indicated a percentage of 15.0 with this certification.

The differences in the two estimates are largely explained by recognizing that (1) the first survey in 1971 included active cardiologists regardless of the amount of time that they had been active and (2) the second survey in 1973 went to a population which had not had new personnel added to it for two years and had experienced losses related to retirement and death. In essence, the two populations were not identical in all respects. Analysis of whether or not there are differences, and what the actual number of certified cardiologists might be must consider the following:

- The cardiologist population must be adjusted to year-end 1973 - including both new cardiologists and population losses - yielding a new active total of 11,768.

- Subspecialty Board Certification actions added 203 to the total certified in December, 1971. The 982 known certified would thus increase to 1,185.

The percentage of cardiologists who are Subspecialty Board Certified in Cardiovascular Disease is 10.1 with the adjustments just described. A difference between a percentage of 9.6 and 10.1 is considered neglible and quite possibly is attributable to the reliability of data sources entering into those estimates. The conclusion is that there has been little change in this percentage and that the data presented throughout the report regarding this level of certification can be used with conficence.

Number of Cardiologists Board Certified in Internal Medicine at Year-End 1973

This is more difficult to estimate because of many unknowns regarding actual certifications for cardiologists as opposed to the total who are certified in this specialty. However, certain assumptions can be made to assist in an estimate:

- Approximately 30 percent of the physicians Certified in Internal Medicine can be classified as either Primary Cardiologists or Secondary Cardiologists.

- About 5,000 physicians were certified in Internal Medicine in 1971 and 1972. Cardiologists (30 percent of internists) might account for as many as 1,500 of these Internal Medicine Certifications.

- About 3,850 Internal Medicine Certifications were granted in

1972. Cardiologists could account for 1,155 of these.

- The year-end 1971 cardiologist population had 10,691 members with 5,626 (52.6 percent) certified in Internal Medicine.

- The year-end 1973 cardiologist population could have as many as 6,900 (58.8 percent) Internal Medicine Certified.

- If we assumed that none of the 1971 certified was included in the records used to describe the year-end 1971 population, then as many as 7,100 (60.5 percent) might be Internal Medicine Certified.

This analysis leads to the conclusion that the most likely percentage who will be Board Certified in Internal Medicine at year end 1973 is 60 percent. This represents an increase of about 3 percent per year over the two year time period.

Regarding the responses to the Cardiologist Training Questionnaire, the conclusion is that here, too, the respondents "over-interpreted" and reported board eligible status as well as board certified. Specifically, the over-reporting of 66.0 percent compared to 60.0 percent introduces an error of 6.0 percent to the collective total.

Effect of the increased Certification in Internal Medicine study conclusions will fortunately be quite minor. This is because when the analysis was limited to Primary Cardiologists, no important differences were found in any instances where board certification was a factor. Only Cardiovascular Disease Certification was found to have an important effect on activities; and the analyses regarding proportions who have this certification status concluded with no important changes in percentages certified.

NEEDS FOR THE FUTURE

There are many factors which should enter into a comprehensive manpower projection equation. Some are relatively simple to postulate; others are beyond the scope of this study. Projections made for this report were limited to ratios of manpower to population.

Factors which should be taken into account include the following:

- Is there evidence to support the hypothesis that selected cardiovascular disease conditions are correlated with culturally produced factors, i.e., population density, environmental stresses and/or environmental pollution? If the answer is yes, then wherever such conditions can be isolated, the manpower-need projection should take these factors into account.

- It is known that most cardiac disease conditions increase in incidence with the age of the individual(s). Differential population age composition, where known, should be recognized in the needs equation.

- It is known that certain cardiovascular disease conditions occur with greater frequency among males than females and within specific age groups. Sex and age factors should be taken into account if there is evidence of differential rates in specific geographical areas.

- Unmet needs for cardiovascular disease care can be estimated from analysis of those which are actually met. Voluminous data of this type were obtained through the Professional Diary study. Assuming it is possible to postulate a percentage of unmet needs based on those which have been and are being met, one can estimate the incremental increase in qualified cardiologists which would be required to meet all needs. The most difficult parameter in this estimate is the one which indicates "these are the things which cardiologist type one, cardiologist type two, etc., should do..."

- Inequalities in ratios of both Primary and Secondary Cardiologists to population can be measured; and, based on the assumption that a particular ratio is minimum, the requirement to bring all areas of the country up to a standard can be computed. This technique has been used in this report.

- Demand for new and/or increased numbers of cardiologists will have a direct impact on the numbers who are required for (1) basic research and (2) teaching new cardiologists. The survey addressed to training institutions gives data regarding training directors perceptions of (1) current unfilled needs and (2) additional staff required to be responsive to anticipated demands. The current filled needs-estimates are probably not debatable and thus should enter the needs equation as stated. The future needs, however, represent training directors assessments of the volume which they will be asked to assume in the near future and, hence, are likely colored by their perception of demand rather than actual need. Such future prediction should not be totally ignored; rather, they should be considered as one element of many which enter the qualitative judgment regarding manpower needs. This was done in this report.

- Changing the access patterns for health care through such techniques as national health insurance will have a profound effect on manpower; no longer will it be a question of can

the individual obtain the economic resources to elicit and receive his needed care. The research aspects of this study did not look into possible effects of such a change.

- Changing the method of payment to the physician (as well as the demands on his time) would have a significant effect on what was actually done. This study did not look into alternative health service delivery modalities. However, it is known that in systems such as are found in New Zealand, England and Scandinavia, ratios of physicians to population are quite different from those in the United States.

- Effective time to cardiology for each of the types of cardiologist identified in this study could easily be calculated by using the proportions identified through the Initial Cardiology Survey and further refined in the Cardiology Professional Diary study. Such ratios or proportions could utilize the proportion of total time in selected activities as well as the focus of that time on specific types of activity. In patient care, for example, the profile of patient problems seen and treated could be part of the time-activity analysis. This was not done for this report because of funding limitations.

- Changing national health objectives could have a major impact on manpower. The estimates of need which have been made by the project staff have been based on providing an equitable distribution of today's type of cardiovascular disease care, by making the numbers of trained cardiologist required to achieve this equality available. For example, if "major attacks" on cardiovascular disease prevention and/or isolation of all early stage hypertension cases were a goal, then the numbers of cardiologists postulated to achieve national equality in ratios to population might not be enough. The "state of the art" in cardiovascular disease care potential has not been taken into account in DRME's work but should, in our opinion, enter into the future plans for both acquisition of and location of cardiologists of each specialty and practice type.

- Changing the approach to health care services delivery could alter the numbers required and the training which is given to the cardiologists who would be members of the alternative delivery systems. Greater efficiency and service effectiveness through alternative delivery modes is possible. This study did not make an in-depth analysis of either existing delivery systems within the United States or known or postulated delivery

modes from other areas. A fruitful analysis in this area, now that a very extensive statistical data base regarding the principal facets of cardiovascular care has been created, would be a productive next step.

SUMMARY AND RECOMMENDATIONS

An extensive and comprehensive study of adult cardiologists has been completed. As voluminous as this report has been, it has selected only those data deemed most important in meeting the Advisory Committee's responsibilities. The most pertinent point to make is that once these data have been analysed by responsible organizations and individuals, the value of looking deeper in any one of the study's data files will become known. Other analyses are possible and may well be desirable. Through communication to the senior authors of this report and to the NHLI, the practicality of such analyses may be determined. Obviously, further analyses would involve time, money and people and would therefore be done only if the NHLI or other funding source chose to sponsor them.

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