Electrocardiogram Abnormalities in Primary Care Patients

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All electrocardiograms (ECGs) from a primary care setting during a one-year period were analyzed. A total of 370 ECG tracings were recorded during 2.1 percent of patient visits. Of these tracings 62.4 percent were interpreted as normal. Only 15 different ECG diagnoses were needed to interpret 96.5 percent of the ECG tracings (97.2 percent of total diagnoses). These data can facilitate design of ECG curricula for family medicine training programs.

Electrocardiography is an integral component of the family physician's diagnostic armamentarium. Sixty-six percent of American family physicians report electrocardiogram (ECG) capability in their own offices.[1] Training in ECG interpretation, therefore, is an important task for family practice training programs.

The field of electrocardiography is extensive and complex, and even cardiologists have difficulty mastering all of its intricacies. A curriculum in electrocardiography designed for family physicians must be selective and should be based on the frequency of ECG disorders encountered in ambulatory patients in primary care settings. Using a group of test items from ECG tracings on ambulatory patients, Pinkerton and associates[2] demonstrated deficiencies in ECG interpretation skills in both family practice and internal medicine trainees. The frequency with which those test item abnormalities occurred in their patient population, however, was not given. To define the prevalence of ECG abnormalities in ambulatory patients, all ECGs from a primary care practice over a one-year period were analyzed.

Methods

The medical staff of the Coram Health Center, operated by the Suffolk County Health Department and affiliated with the State University of New York at Stony Brook University Hospital, is composed of the following number of full-time equivalent health providers: 1.5 family physicians, 0.5 internists, 1.0 pediatricians, and 2.5 nurse practitioners.

During 1981 all ECG tracings recorded on patients visiting the center were analyzed using diag-

Table 1. Distribution of Patients by Age and Sex

	ECG Tracings (% of Total)	Patients (% of Total)
Age (yr)		
0-1	0	5.6
1-5	2.4	22.2
6-14	7.2	15.3
15-20	1.1	11.1
21-34	9.8	20.8
35-44	8.8	6.9
45-64	29.0	9.7
65 and over	41.8	8.3
Sex		
Male	37.6	38.3
Female	62.4	61.7

nostic criteria previously published.[3] The age and sex distribution of the patient population and total patient visits for the year were obtained from a computer file maintained by the Suffolk County Health Department.

Results

In 1981, 6,011 patients made 17,218 visits to the Coram Health Center. Three hundred seventy ECG tracings (2.1 percent of visits) were recorded in 352 patients. These data are comparable to those derived from a study of US family physicians in which 2.3 percent of 39,247 patient visits included an ECG.[1] Table 1 compares the age and sex of patients receiving ECG at the health center with those characteristics of the entire patient population. More tracings were recorded in women, but in a ratio similar to that found in the visiting patient population. Older patients received ECG out of proportion to their representation in the patient population.

A total of 462 ECG diagnoses were made on the 370 tracings. The rank order of the most common

diagnoses was established (Table 2). Less common abnormalities, accounting for 2.8 percent of diagnoses, were noted in 3.5 percent of ECG recordings and included incomplete right bundle branch block (4), atrial flutter (2), isolated prolonged QT interval (2), and sinus arrest, wandering atrial pacemaker, premature junctional contraction, ventricular aneurysm, and Lown-Ganong-Levine syndrome (1 each). Of the 370 tracings 62.4 percent were normal, similar to data reported from a British family practice (53.5 percent).[4]

Discussion

The distribution of ECG diagnoses will vary with both the demographic and morbidity characteristics of the patient population. Normal ECGs can be expected in more than 90 percent of persons undergoing routine health screening,[5] but will be infrequent in hospitalized cardiac patients. If, however, more than one half of ambulatory practice tracings are normal, family physicians require a precise knowledge of the range of normal and its variants. The age structure of family practice is such that this knowledge must include ECG in the young, in particular the evolution of precordial lead R/S ratios and T wave changes,[6,7] as well as those changes that occur with aging.[8,9] It can be difficult, however, to distinguish ECG findings associated with aging from those due to cardiac disease that has not yet become clinically manifest.[10]

In addition to the normal ECG, family physicians need to know the diagnostic criteria of abnormalities listed in Table 2, with some attention directed to those that occur less frequently. Only 15 diagnostic entities were required to interpret over 95 percent of ECGs on ambulatory patients from this primary care setting.

These data can be used to construct an ECG curriculum appropriate for family physicians and trainees. Family practice is a broad-based specialty whose practitioners share skills and knowledge with those of several other disciplines. It is important, therefore, to define carefully a core curriculum based on the realities of family practice. Failure to do so can result in training inappropriate for the needs of its graduates. Since

Table 2. Distribution of Electrocardiogram Diagnoses (total diagnoses = 462, total ECGs = 370)

Diagnoses	No.	Percentage of Total
Normal*	231	50.0
Abnormal ST-T wave	55	11.9
Myocardial infarct, age uncertain	33	7.1
Premature ventricular beats	21	4.5
Premature atrial beats	19	4.1
Left anterior fascicular block	17	3.7
Low voltage	13	2.8
Atrial fibrillation	11	2.4
First-degree atrioventricular block	11	2.4
Left ventricular hypertrophy	11	2.4
Bifascicular block	7	1.5
Left atrial enlargement	6	1.3
Left bundle branch block	5	1.1
Right atrial enlargement	5	1.1
Right bundle branch block	4	0.9
Other diagnoses	13	2.8

*Includes sinus bradycardia, sinus tachycardia, and sinus arrhythmia

Additional studies in different ambulatory populations are therefore needed.

This study did not address the issue of ECG interpretation in hospitalized patients, although almost 20 percent of family physicians' patient contacts occur in that setting.[1] Most hospitals, however, maintain an ECG interpretation service, and there is less need for family physicians to interpret independently ECGs on those patients.

The ECG is a readily available, relatively inexpensive, noninvasive cardiac examination widely used by family physicians. Knowledge of a modest number of diagnostic entities can result in interpretation of most ECGs encountered in daily practice. Emphasizing a well-defined and limited number of ECG diagnoses may improve the performance of graduating family practice residents.

family physicians refer 5 percent or less of their patients to other specialists,[11,12] a goal to acquire skills and knowledge that permit independent care of 95 percent of patients seems reasonable. For ECG interpretation of ambulatory patients, data from this study indicate that mastery of 15 ECG entities would permit interpretation of more than 95 percent of tracings. Other entities need only be identified as abnormal and the precise diagnosis made by an ECG referral service.

These data, however, must be interpreted with caution, in that the patient population studied contained more patients in the pediatric age range and fewer geriatric patients as compared with an average family practice.[1] ECG in populations with different age, sex, and morbidity characteristics could yield a different spectrum of abnormalities.

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