

# Survey of Coronary Care Facilities in 50 Massachusetts Hospitals

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**R**EAL GAINS in extending life are anticipated from the resuscitation of cardiac vitality following infarction of the myocardium. Although the long-term gain in survival is yet to be assessed, the reductions in early mortality are significant and, in terms of additional work years, may prove most effective in the younger patient with relatively little permanent myocardial damage.

Correction of cardiac arrest outside the hospital has been shown by Pantridge and Geddes (1) to be practicable through intensive mobile care. McNeilly and Pemberton (2), concluding that cardiac resuscitation is primarily an extra hospital concern, reported that median survival time in fatal coronary episodes was 3 to 5 hours.

Variations in hospital mortality rates may be attributed partially to such factors as delay in gaining admission or to policies governing acceptance or transport of the shocked or poor-risk patient. Such delays, as Mittra (3) has described, mean that most coronary patients come under intensive medical care after the main risk of death has passed. The local hospi-

tal is most likely to receive patients in the early stages of any prognostically poor medical emergency and so frequently experiences infarcted high-risk patients among its emergency admissions.

Studies (4) have indicated that one-third or more of the deaths following myocardial infarction are due to cardiac electrical disturbances or dysrhythmias. The degree of myocardial ischemia does not determine the tendency to develop fatal disturbances in cardiac rhythm. A large proportion of sudden deaths that occur before medical assistance can be obtained follow relatively minor coronary episodes.

Reversal or suppression of electrical disturbances evolved with the description (5) of the effect of closed-chest massage in reviving the arrested heart and with the demonstration (6-8) that arrhythmia could be reversed by the use of external electrical stimulation. The monitoring and resuscitation techniques that were developed led to the specialized coronary care units. The aim of these techniques was to reduce the mortality of cardiac infarction through early recognition and reversal of disturbances in cardiac rhythm. The report (9) to the second Bethesda Conference of the American College of Cardiology, in 1965, revealed that half of the patients in coronary care units who experienced ventricular fibrillation were successfully resuscitated.

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As long-term monitoring of cardiac rhythm has developed, it has become apparent that significant dysrhythmias are found in most coronary patients during the first few days of the attack and that the more serious life-threatening situations are frequently preceded by easily recognized electrocardiographic abnormalities.

### **The Need to be Met**

In Massachusetts, with a population of 5.3 million, approximately 30,000 persons suffer a recognizable coronary occlusion each year. Figures from the *Annual Report of Vital Statistics* for Massachusetts indicate that 14,053 died of this cause in 1968. Examination of death certificates from one area under study indicates that 57.3 percent of coronary deaths occur before hospital admission can be achieved. The remaining deaths represented, before institution of coronary care techniques, almost one-third of the patients admitted alive. A controlled Australian trial (10) has shown that a mortality of 32 percent without special coronary care techniques can be reduced to 19 percent when these techniques are used.

To control the immediate or early cardiac emergency requires the development of mobile resuscitation teams and training of the medical attendant who first reaches the stricken patient. Places of high risk, such as factories employing older workers, could be identified and on-the-spot resuscitation teams developed. With early teamwork, more than 1,000 lives might be saved in Massachusetts each year.

For the present, however, attention is focused on the 6,000 coronary patients who die annually in Massachusetts hospitals. If the experience of the coronary care units can be applied to these patients and if mortality in community hospitals can be reduced to the 20 percent experienced by Smith (11), more than 2,000 additional lives might be saved each year. On the presumption that 30 percent is also the statewide mortality rate for hospitalized coronary patients, each of the 6,000 or more who presently die and the 14,000 or more who survive must be treated by intensive care techniques with an allowance of additional facilities for repeated and suspected coronary episodes. The investment of facilities, equipment, and staff time to accomplish these objectives is formidable.

### **The Community Hospital's Role**

Initial successes in treatment of the patient with an acute coronary attack have been reported from the large well-staffed hospitals, but because sudden coronary episodes occur anywhere without regard to the disposition of medical skills and because the newly infarcted patient is at the maximum risk of death and may poorly withstand the stress of transportation, community hospitals must be involved in early coronary care. Units to provide such care have already been successfully established (12, 13) in some community hospitals.

Establishment of a separate unit, solely for the coronary patient, may not always be realistic in terms of numbers of beds and staffs. The effective elements of care in the most crucial stage of illness are constant monitoring, intensive but tranquil nursing, recognition of premonitory and actual rhythm disturbances, and prompt resuscitation. Regional Medical Programs under Public Law 89-239 could eventually insure that the coronary patient's chances of survival are independent of the nature of the hospital into which he is admitted.

Many advantages accrue in having inpatient facilities as close as possible to the population at risk. However, in the community with few physicians and facilities, the most effective service might come from trained mobile emergency crews who could transport the coronary patient under cardiopulmonary control to a distant well-staffed hospital. The position of each of the smallest acute care community hospitals depends on the alternatives for these critically ill patients. In each area there is likely to be a residue of patients for whom further movement would involve risk outweighing the merit of high-quality care. Community health planning must take such factors into account.

### **Situation in Massachusetts**

In 1966 the Massachusetts Heart Association conducted a poll of the 137 acute care general hospitals throughout the Commonwealth. Fifty-six indicated that they operated an intensive or coronary care unit; half were in the Metropolitan Boston area. Of the 30 hospitals outside of Boston, each of which admitted fewer than 100 coronary patients per year, only four claimed to be equipped with intensive care facilities. At

that time these facilities were concentrated in the metropolitan teaching hospitals within a relatively small geographic area, coinciding with the concentration of specialized medical resources of all kinds.

To identify the needs more closely and to standardize the comparisons, we planned to visit all hospitals within a representative region of Massachusetts. In this way the priorities for upgrading the hospitals and their equipment and trained staff could be determined.

### **Survey Method**

In 1968 the contiguous counties of Worcester, Middlesex, and Essex contained 54 acute care hospitals and 2.5 million persons—almost half the population of Massachusetts. The counties cut across Metropolitan Boston, include Worcester, the second largest city in the State, and embrace the northern industrial towns of the Merrimac Valley and those of the central rural area.

At the Massachusetts Department of Public Health we first developed a standard guide to record comparable observations and to determine each hospital's capability of providing intensive coronary care. No clinical judgment was attempted, and insufficient data prevented our determining mortality experiences in relation to hospital techniques.

We obtained information through onsite visits with hospital administrators, nurse supervisors, and chiefs of cardiology or leading physicians. Discussions included the views of the hospital staff about community needs and resources and about regional planning. Information was sought under eight headings:

1. Physical suitability of the room or ward for coronary care
2. Protective environment of the patient
3. Technical preparedness of the apparatus and its availability
4. Supervisory channel for rapid delegation of responsibility
5. Staff of physicians, residents, and nurses immediately and remotely available
6. Training of staff in acute coronary care and resuscitative techniques
7. Set pattern of response throughout the hospital to cardiac emergencies, including radio communication with ambulances and pathway between emergency rooms and coronary care unit
8. Policy on admission of coronary patient

All 54 hospitals in the three counties were asked if they would cooperate in making the survey, and 50 of them did so, fully.

### **Results**

The relationship of the cooperating hospitals' facilities to the population is shown in the chart. Coronary care service areas are represented according to separate coronary care or intensive care and general unspecialized medical facility. Based on the original statewide estimate, this tricounty population of 2.5 million could yield 14,000 coronary cases per year. Of this number, 10,000 persons survive the first few hours and require intensive care, which might save an additional 1,000 or more of the 3,000 who now die in the hospital. The 50 hospitals had 47 beds in coronary care units and 178 in intensive care units. The beds in intensive care units are not always available for coronary care patients. With a 7-day median turnover period, 10 percent occupancy by subsequently rediagnosed patients, and a 20 percent unoccupied reserve, the 10,000 coronary patients per year need in excess of 270 beds. This figure does not include patients who are critically ill with other heart conditions.

Of the 11 hospitals that responded to the 1966 postal questionnaire and claimed to have an established coronary care unit, only six had a unit 2 years later. Conversely, six coronary care units were developed in the hospitals that had responded negatively. There was no evidence that community socioeconomic factors were prime determinants in the development of coronary care or intensive care units. Comparing investment in new hospital coronary care facilities with median family income gave no particular trend.

Seven of the 50 hospitals had either separate coronary care facilities or general intensive care facilities that were suitable in all the main criteria. The space was adequate, and patients were easily observed but were shielded from each other. Sufficient functioning equipment was available, and the staff was trained to respond to cardiac emergencies. These seven hospitals and 20 others with good, if more limited, resources were scattered throughout the three counties. Inclusion of coronary with general in-

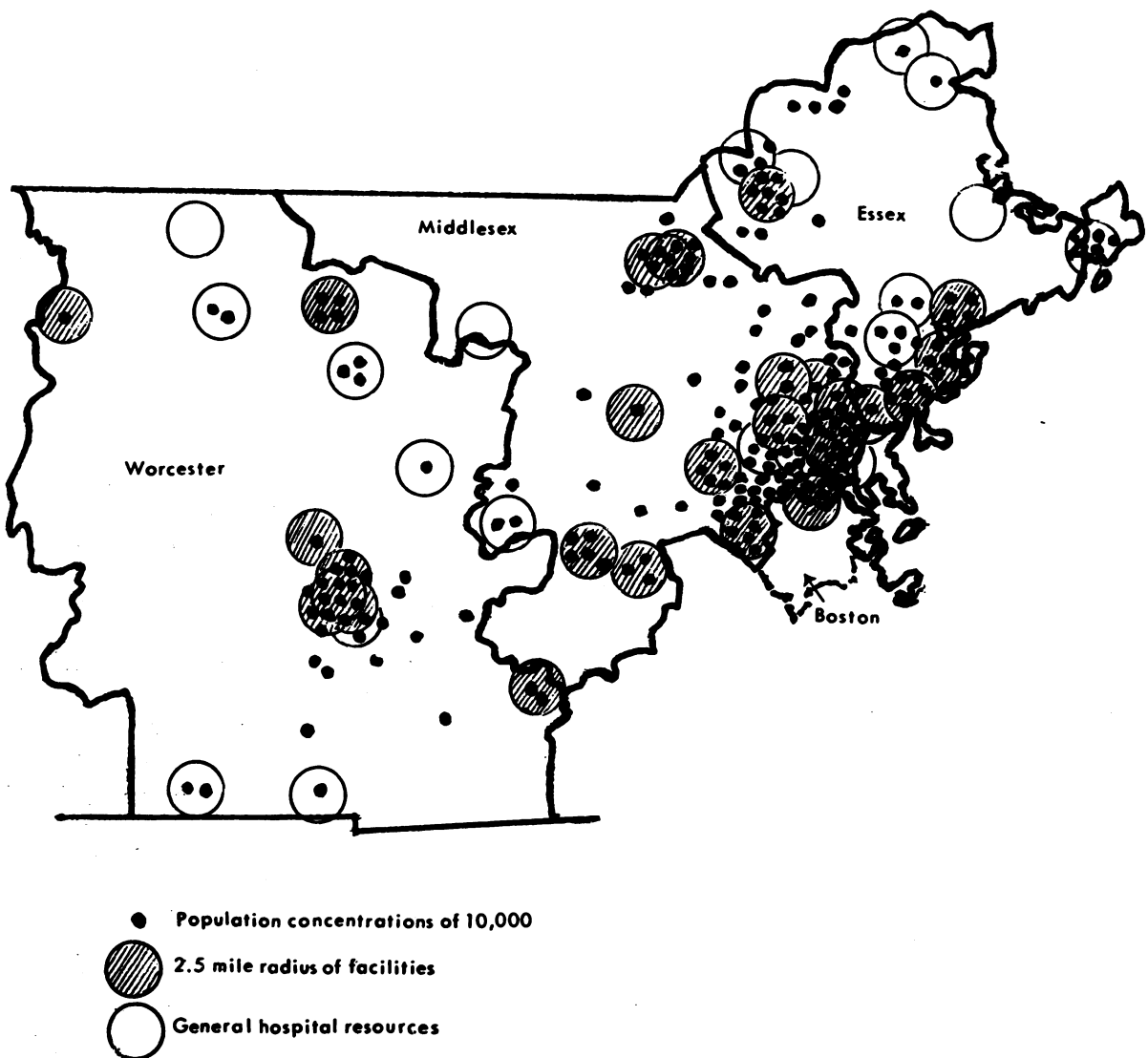
tensive care does not always reflect the size of the hospital (table 1).

Some of the more specific criteria used in assessing functional ability in each of the hospitals over and above the basic equipment required for the acutely ill coronary patient are shown in table 2. All 50 hospitals had considered the needs of their coronary patients. Each had purchased an electrocardiogram, a defibrillator, and an external pacemaker, and each had established a procedure for responding to acute cardiac emergencies. Thirty-six hospitals received prior warning from ambulances

bringing coronary suspects. Forty-five hospitals were equipped with an emergency crash cart and a drug cart, had rapid communication from the distressed patient to the staff, and had installed bedside suction and oxygen outlets. Thirty-one hospitals possessed central monitoring oscilloscopes linked to simultaneous bedside or mobile systems, and at all times most hospitals either observed their monitoring apparatus or used a warning bell.

The widespread availability of technical resources was not matched by trained staffs. Only 15 of the hospitals had a cardiologist in charge

**Population, coronary or intensive care facilities, and general hospital facilities of eastern Massachusetts, 1968**



**Table 1. Size of hospital, site of coronary care, and special training of nurses at 50 hospitals in Massachusetts, 1968**

Size of hospital by number of beds	Number of hospitals	Type of care unit for coronary patients			Coronary training for nurses	
		General medical	General intensive	Special coronary	None	All types
75 or less	10	7	3	0	7	3
76-125	17	5	11	1	4	13
126-225	11	1	6	4	1	10
226 or more	12	0	6	6	0	12
<b>Total</b>	<b>50</b>	<b>13</b>	<b>26</b>	<b>11</b>	<b>12</b>	<b>38</b>

of coronary care procedures and policies, and 18 did not have access at all times to a physician. Resident physicians were available for coronary patients in 13 hospitals, while in 19 others a physician was available on call. The situation was a little less acute for nursing though 15 of the hospitals had only one registered or practical nurse available at any one time for coronary patients; still more hospitals were unable to deal with simultaneous medical emergencies. Despite slim coverage, none of the 50 hospitals had entered into a regional or cooperative arrangement with nearby or larger hospital units for the care of coronary patients. Many hospitals were selective in coronary and intensive care; in fact, almost half of the specialized

units did not accept every coronary emergency patient. Table 2 shows that despite the long critical hours of waiting the relatives of acutely ill patients feel obliged to share, only seven of the 50 hospitals provided a separate nearby waiting room.

No common policy was found on the use of nursing staff for acute coronary procedures. Twenty-two of the 50 hospitals either had an internal course of 32 hours or more or sent at least one nurse to a university-based course in coronary care, and 16 hospitals provided some less organized training experience. Twenty-six of the hospitals, including five whose nurses had received no formal training, allowed nurses to defibrillate arrhythmic patients. Table 3 demonstrates the relationship between nursing responsibilities during a coronary crisis and nurse training and the availability of physicians. Some hospital inservice training programs could scarcely catch up to the turnover in their nursing staff.

**Table 2. Size of hospital and specific coronary care facilities available at 50 hospitals in Massachusetts, 1968**

Hospital assets in coronary care	Number of beds			
	75 or less	76-125	126-225	226 or more
Number of hospitals	10	17	11	12
Patient protection from environmental stress		4	3	5
Separate rooms for each acutely ill patient		3	3	1
Good bed access and 120 square feet minimum space		3	3	4
Resuscitation apparatus for each bed		3	2	3
Central monitoring station for each oscilloscope	3	10	7	11
Medical resident or physician on call		11	10	11
Waiting room facilities for relatives	1	3	2	1

### Discussion

No general standard of basic care was followed by the hospitals for the acutely ill coronary patient. In some new hospital units patients could clearly observe each other's stresses and emergencies or could anxiously watch their oscilloscopes. Each hospital, however, was concerned with the need to conserve unnecessary deaths from coronary attacks. Activity was largely determined by the initiative and availability of the local cardiologists or internists at each hospital. In some hospitals the staffs were training local policemen and firemen in

resuscitative methods; in others equipment was unused for lack of trained personnel.

Training of staff had low priority compared with purchasing of new equipment and designing of new facilities. However, considering that the whole concept of acute coronary care procedures and of the specialized coronary care unit is a relatively recent one, great progress has been made. Some hospitals have already made considerable investments in new or adapted buildings and in staff training. Whether specialized physical units for coronary care should or should not be developed in every community hospital, regardless of alternative resources, is a matter for regional health planning. If the hospitals' involvement in community emergencies is to be met by tighter coordination with highly trained mobile emergency teams, more planning will be needed to avoid technical duplication, especially in urban areas. The hospital's ability to respond to the needs of coronary patients forms part of its general preparedness to apply cardio-pulmonary-anesthesia skills to medical and traumatic emergencies. For this service the first priority is staff training and reinforcement through simulated exercises.

The medical staffs of hospitals, especially in rural areas, expressed growing anxiety about the future supply of physicians. Encouraged by circumstances to disengage from patient contact and to concentrate his skills in larger medical centers, the physician may lose the initiative in dealing with sudden disasters. Monitoring equipment emphasizes the need for staff to deal with foreseeable or reversible emergencies rather than with terminal events. Apart from teaching hospitals or those with a resident anesthesiologist, it appears to be impractical to assign physicians the responsibility for attending to cardiac emergencies. Few community hospitals had medical residents and, unless specifically assigned to cardiology, they were not usually trained to deal with or available for cardiac emergencies.

The need for intensive training of nurses in acute coronary care procedures is confirmed by this survey. Units having 270 beds for coronary care require at least 540 fully trained registered or practical nurses each year and, if staff turn-

**Table 3. Nursing responsibility for coronary care and training and availability of physicians at 50 hospitals in Massachusetts, 1968**

Staff coverage	Nurses defibrillate	Nurses do not defibrillate	Total
No nurse training-----	5	7	12
Nurses trained in coronary care-----	21	17	38
Physician constantly available-----	17	15	32
No constant coverage by a physician-----	9	9	18

over is rapid, the same number of nurse trainees. Whether a nurse is able to assume the disciplines of resuscitation and monitoring of the acute coronary patient is beyond the scope of this paper. The essential consideration is the number of skilled staff needed now.

In the contiguous counties of Worcester, Middlesex, and Essex, the data indicated that at least 1,000 lives might be saved each year if all coronary patients admitted alive into hospitals could be treated with intensive care techniques. Hospitals as community resources have gone a long way in providing the basic physical facilities to care for coronary patients. Effective use of their facilities may depend on the development of regional training programs so that an essential contribution can be made toward preventing unnecessary deaths from coronary attack.

### Summary

Intensive care techniques that favorably affect survival after a coronary episode have been developed in hospitals. The Massachusetts Department of Public Health designed a standard guide to determine the ability of a hospital to monitor and nurse acutely ill coronary patients and especially to combat early electrical failures. This guide was applied to 50 acute care community hospitals serving a 2.5 million population from which more than 10,000 admissions of acutely ill but live persons with coronary attacks might be expected each year. With 270 beds fully equipped for coronary patients and with 540 trained nurses, 1,000 of the 3,000 pa-

tients presently dying following hospital admission might be saved.

Actually, 225 beds for coronary or intensive care already were available along with basic monitoring and resuscitation apparatus in each hospital, but only seven of the 50 hospitals had units satisfying most of the criteria for acute coronary care. The most frequent deficiencies were in staff trained to use the equipment. In the 37 hospitals with no medical residents, particular responsibility devolved upon the registered or practical nurses, many of whom had little or no training in resuscitative techniques. Nurse training was deemed the immediate priority if community hospitals are to participate fully in reducing early coronary mortality.

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#### Tearsheet Requests

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# Occupational and Physical Therapists in Community Health

The Community Health Service, Division of Health Resources, Health Services and Mental Health Administration, Public Health Service, conducted two workshops dealing with community and health manpower planning for physical and occupational therapy. As a result of these workshops, a dynamic concept emerged of the participation of the occupational therapist and physical therapist in community health planning.

The first, "Workshop on Community Health Services and Health Manpower Planning for State Occupational Therapy and Physical Therapy Consultants," was held in College Park, Md., November 10-15, 1968. It included 40 occupational and physical therapists. Participants were from all areas of community health from the five Public Health Service regions east of the Mississippi River. The objective of this group was to lay the groundwork for defining the role and function of the physical and occupational therapist in community and health manpower planning. Thus, the participants concluded that both the occupational therapist and physical therapist will contribute to community health from both personal and professional aspects, through administration, consultation, education, and training.

Built on the work of the first group, a second workshop, "Workshop on Community and Health Manpower Planning for State Physical and Occupational Therapy Consultants, Western States," was held in Denver, Colo., September 21-26, 1969. This group included occupational and physical therapists representing the four Public Health Service regions west of the Mississippi River.

The 38 participants in this workshop adopted and approved the following statement:

As part of the health care system, the professions of occupational therapy and physical therapy are dedicated to the achievement of a high quality of total health care for the entire population. This concept includes the protection of wellness, the identification of suboptimal health and the delivery

of appropriate services. These professions are committed to the unique application of their knowledge and experience to society's efforts to solve health problems.

Occupational therapists and physical therapists possess evaluative and decision-making skills to serve the community. It is the responsibility of every therapist in these professions to act as consultant in order to promote and implement this concept.

Inherent in the practice of these professions are the following:

*Advocacy planning*—aggressive planning for constructive action on behalf of the people deprived of their right to occupational therapy and physical therapy services. Advocacy includes interaction and negotiation with policy- and decision-making bodies.

*Management*—Administration, conservation, and deployment of available resources of manpower, money, materials, and facilities.

*Development*—Enhancing and modernizing the philosophies, the education, skills and collaborative problemsolving abilities of physical therapy, occupational therapy, and related fields. This includes skills and knowledge of social systems, information systems, data gathering procedures, and other innovative techniques.

Maximum achievement in the above areas will be attained through the following actions: assess community needs, establish priorities, plan programs, implement plans, evaluate program effectiveness, educate through contributing to and receiving from the academic community.

Effective community health care planning and services can occur only to the degree that occupational therapists and physical therapists are involved in and committed to these concepts.

At the conclusion of the western workshop, the participants recommended that an organization of occupational therapists and physical therapists be established in community health. A four-member committee (two from each workshop) was chosen to plan and implement the formation of this organization.

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