REPORT TO THE CONGRESS

Study Of Health Facilities Construction Costs B-164031(3)

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

NOV. 20, 1972

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-164031(3)

To the President of the Senate and the
Speaker of the House of Representatives

This is our report on a study of health facilities construction costs undertaken pursuant to section 204 of the Comprehensive Health Manpower Training Act of 1971 (85 Stat. 462). The act directed us to determine the feasibility of reducing the cost of constructing health facilities assisted under the Public Health Service Act, particularly with respect to innovative techniques, new materials, and the possible waiver of unnecessarily costly Federal standards. Our study was broad based and it considered the costs of operating hospitals in addition to initial construction costs. We identified and evaluated ways in which the demand for facilities could be reduced or eliminated.

We have considered the comments of various Federal departments and agencies and private organizations on the matters discussed in this report and have incorporated their formal comments in the appropriate sections.

Copies of this report are being sent to the Director, Office of Management and Budget; the Secretary of Health, Education, and Welfare; and other Federal departments and agencies having cognizance over matters included in our study.

Comptroller General
of the United States

Contents

ABBREVIATIONS

AHA	American Hospital Association
CHAP	Certified Hospital Admission Program
ECF	extended-care facility
FECA	Facilities Engineering and Construction Agency
GAO	General Accounting Office
HEW	Department of Health, Education, and Welfare
HMOs	health maintenance organizations
HSMHA	Health Services and Mental Health Administration
NBS	National Bureau of Standards
VA	Veterans Administration

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

STUDY OF HEALTH FACILITIES CONSTRUCTION COSTS B-164031(3)

D I G E S T

WHY THE REVIEW WAS MADE

This study was made pursuant to section 204 of the Comprehensive Health Manpower Training Act of 1971. The act required the General Accounting Office (GAO) to study the feasibility of reducing the cost of constructing health facilities assisted under the Public Health Service Act, particularly with respect to innovative techniques, new materials, and the possible waiver of unnecessarily costly Federal standards. The act required that GAO submit its report to the Congress on or before November 18, 1972.

The requirement for the study was added while the act was under consideration by the Senate Committee on Labor and Public Welfare because of concern over the high cost of constructing health facilities. Subsequent to passage of the act, the Committee expressed particular interest in having the study concentrate on patient care facilities, primarily hospitals, and consider the costs of operating hospitals in addition to initial construction costs. Interest was also expressed in having GAO identify and evaluate ways in which the demand for facilities could be reduced or eliminated.

FINDINGS AND CONCLUSIONS

Factors impacting on planning and construction process

The success of any construction project depends in large measure on the planning that precedes it. GAO found the following weaknesses and potential opportunities for improvement in the preconstruction planning process.

--Projects often were conceived in a crisis situation with little or no attention given to advance analysis of specific health care needs. (See p. 17.)

--Cost estimates were deficient and alternative sources of funds were not identified early in the planning process. (See pp. 17 and 18.)

--Some projects were delayed by certain Federal review procedures. (See pp. 18 and 19.)

--An opportunity may exist for the reuse of designs, in whole or in part, which would provide the potential to reduce design time and project costs. (See pp. 19 and 20.)

No substantive evidence was found that construction requirements under the Hill-Burton program (the major Federal program providing funds for health facility construction) are increasing construction costs unnecessarily. GAO found, however, that more uniformity is needed between Federal and non-Federal construction requirements. Performance criteria should be developed through research and accumulation of scientific data on construction materials and methods. (See pp. 22 and 23.)

Many agree that the time connected with project delivery can be reduced. This would allow earlier delivery of medical care to a

community and avoid increased project cost due to escalating costs experienced in the construction industry.

Use of the fast-track and total concept approaches is increasing in health facility construction to reduce project delivery time and cost. Fast-track involves the overlapping of programing, design, and construction so that one activity begins before the other is completed. Construction managers or consultant builders provide needed coordination and early involvement of construction expertise. In the total concept approach, a developer may undertake the entire responsibility for a project under one contract with the owner. These approaches have seldom been used on projects assisted under the Hill-Burton program. (See pp. 25 to 36.)

Construction labor and material costs have increased in recent years but labor costs have increased at a higher rate than material costs. Wage rates for construction workers have increased significantly. Contractors claim, and unions deny, that productivity of construction workers has decreased and that restrictive work practices and jurisditional disputes between trade unions add to high construction costs.

Since no reliable objective means exist to measure productivity of building construction, the impact of productivity on health facility construction is not known. Contractor and union officials must both act, however, if rising construction costs are to be stabilized on a voluntary basis. Recent wage and fringe benefit increases being approved by the Construction Industry Stabilization Committee should reduce the rate of increase. Certain Federal requirements--involving minimum wages, safety, and equal employment opportunity--also are affecting or may affect future construction costs. (See pp. 40 to 50.)

Compilation of innovations and life-cycle cost analysis of selected innovations

GAO identified significant innovations which should be considered in health facility construction and renovation. The GAO study used computerized life-cycle cost analyses to evaluate the impact of selected improvement alternatives on hospitals of various sizes. Under this method of analysis, the operating costs of an alternative, as well as its initial investment and future capital costs, were taken into account. (See pp. 57 to 59.)

To demonstrate the impact that certain alternatives would have on initial construction and life-cycle costs, GAO selected a recently opened hospital for detailed study. In the demonstration project, the hospital was redesigned on paper to incorporate the alternative features considered and to give recognition to the impact such items have on costs. The demonstration showed that

--initial construction costs of the redesigned facility would have been as much as 8.6 percent, or $1,544,200, lower than those of the facility that was built and

--life-cycle costs of as much as $10,368,800 could have been saved by incorporating the improvement alternatives into the redesigned hospital. (See pp. 79 to 88.)

GAO found that hospital planners generally do not evaluate on a life-cycle basis alternative construction techniques, materials, designs, and

operating systems. Many hospital administrators and architects, in efforts to curb the rising cost of hospital construction, search for obvious savings in initial construction. This initial savings often precludes later savings in operations and maintenance that exceed the initial cost savings. (See pp. 57 and 58.)

GAO believes that life-cycle cost analysis is essential in the planning and design of all hospital construction projects. Health facility planners also must consider other factors when evaluating hospital system alternatives. These factors vary with the alternative being evaluated and include patient care, environmental considerations, availability of a competent labor force, flexibility to change, and interaction of improvement alternatives with other hospital systems. Hospital management may find that these factors dictate the type of system to be used and override any potential life-cycle cost savings of an alternative system. (See p. 90.)

The results of this study demonstrate that potential exists to achieve significant life-cycle savings in construction and operation of health facilities.

Reducing demand for health facility construction

GAO identified and studied means by which health facility construction could be avoided by either reducing the demand for facilities or increasing the productivity of existing facilities. Means identified and studied were:

Preventive medicine--The present system of health care is not geared toward prevention, and the majority of health resources treat illness and injury only after they occur. GAO believes that unless the medical profession and individuals give more attention to preventing illness and injury, the present health care delivery system may become overburdened and may not be able to meet future health care demands. (See pp. 95 to 97.)

Care in the appropriate facility--Health care authorities generally agree that an estimated 25 percent of the patient population is treated in facilities which are excessive to its needs. GAO found that patients are not being cared for in the appropriate type of facility because of (1) undue emphasis on providing inpatient care in short-term hospitals; (2) inadequate alternative facilities, services, and reimbursement mechanisms, and (3) physician and patient reluctance to use available alternatives. (See pp. 98 to 101.)

Health care delivery systems--Prepaid group practice plans, foundations for medical care, and health maintenance organizations are being used on a limited basis as alternatives to the solo physician, fee-for-service method of health care delivery. Progressive medical practices of these organizations have generally resulted in about a 20-percent reduction in hospital days per 1,000 patients compared with traditional medical practices. A 20-percent reduction in hospital days applied to American Hospital Association-registered short-term hospitals could make as many as 190,000 beds available to meet future needs. (See pp. 102 to 105.)

Utilization reviews--These reviews are concerned with insuring that health care services provided are

necessary, appropriate and of high quality, and such reviews could be used more effectively to reduce lengths of stay in hospitals. GAO found that the lengths of stay for specific types of illnesses varied from area to area and may be unnecessarily prolonged in some areas because of less progressive medical customs and practices. (See pp. 105 and 106.)

Health insurance incentives--The benefit structures of private insurance plans emphasize coverage of hospital care and of physicians' services associated with hospitalization. Many experts recommend an increase in insurance coverage for outpatient and out-of-hospital benefits to eliminate the incentive to use hospital beds. (See pp. 107 to 109.)

Shared services--GAO found that sharing services among hospitals could free existing facilities for other purposes and could be effective in meeting demands for space without construction. Many hospitals, however, have been impeded from establishing shared-service agreements because (1) physicians are reluctant to share hospital medical staff privileges, (2) economic incentives are lacking, (3) hospital medical staffs and administrators want to provide a full range of services, and (4) some communities insist on having such services readily available. (See pp. 109 to 111.)

Regional systems--GAO found authorities consider regional hospital systems to be an effective way of organizing and utilizing scarce medical skills and facilities and of curbing rising costs. Communities, hospital officials, and physicians, however, have resisted the development of such systems because they desire to maintain complete autonomy and to provide each community ready access to health services. (See p. 112.)

Health planning agencies--GAO found that while some planning agencies have been effective, others have been unsuccessful in preventing construction and expansion of unneeded facilities. The inability of planning agencies to prevent unnecessary and costly expansion of facilities and services has been often attributed to the agencies or others lacking the authority to enforce planning agency decisions. (See pp. 112 to 114.)

GAO believes that, in view of the probable continuing high demand for health care services and the increased demand which may result from proposed Government programs, such as national health insurance, greater implementation of the methods cited above could be instrumental in meeting the demand for health facilities and offsetting increased health care costs. (See p. 115.)

RECOMMENDATIONS OR SUGGESTIONS

GAO recommends that the Secretary of HEW (1) compile and publish information on the essential factors to be considered in project planning, (2) explore the feasibility of reusing hospital designs, (3) adopt a common set of construction requirements for HEW-administered programs, (4) develop and disseminate a scientific base of knowledge on construction requirements, and (5) require that the fast-track and total concept approaches be considered for health facility projects assisted under the Public Health Service Act. (See pp. 20, 23, 24, and 37.)

GAO recommends also that HEW establish the capacity to provide life-cycle cost data to health facility planners and require that applicants for Federal funding justify the use of construction techniques, materials, designs, and operating systems which differ from those recommended by HEW. GAO recommends further that, until such time as HEW establishes the capacity to provide life-cycle cost data to health facility planners, HEW should encourage planners to consider the information presented in this report, along with local operating conditions and costs, in identifying the alternatives for life-cycle analysis that are likely to be the most appropriate for inclusion in the facility. (See p. 91.)

GAO recommends that the Secretary of HEW solicit the cooperation of other governmental agencies, private health organizations, and medical professionals and assume leadership in an effort to (1) place greater emphasis on preventive medicine practices, (2) more appropriately use various types of health care facilities, (3) employ more effective utilization review techniques, (4) change health insurance incentives that emphasize inpatient care, (5) share more hospital services, and (6) increase the capabilities of areawide health planning agencies. (See pp. 115 and 116.)

AGENCY ACTIONS AND UNRESOLVED ISSUES

HEW, five other Federal agencies, and 17 private organizations were requested to review and comment on all or parts of this report. For the most part, the agencies and organizations indicated general concurrence with our report. Prior to receipt of formal comments, a meeting was held with each group to obtain suggestions for improving the report. In those instances in which the groups wished to stress a particular point or in which agreements could not be reached, the agencies and organizations were requested to include their views in their formal comments on the report. Comments in the formal replies are included in the pertinent sections of this report. (See pp. 21, 37 to 39, 50 to 56, and 92.) The list of agencies and organizations and the formal comments received are included in appendixes I to XXI.

MATTERS FOR CONSIDERATION BY THE CONGRESS

Some health care providers have changed traditional health care demand and utilization patterns, decreasing the need to construct acute care and other types of health facilities. The economic benefits emanating from these changes and the means by which such changes have been effected, as discussed in this report, may be of particular interest to the Congress in considering legislative health care proposals, such as those providing for the reorganization of the existing health care delivery system and for programs for national health insurance. (See p. 116.)

CHAPTER 1

INTRODUCTION

On November 18, 1971, the Comprehensive Health Manpower Training Act of 1971 became law (85 Stat. 462). Section 204 of the act provides:

> "The Comptroller General shall conduct a study of health facilities construction costs. Such study shall include consideration of the feasibility of reducing the cost of constructing health facilities constructed with assistance provided under the Public Health Service Act, particularly with respect to innovative techniques, new materials, and the possible waiver of unnecessarily costly Federal standards. The study shall be completed, and a report shall be submitted to the Congress, within one year after the date of enactment of this Act."

The requirement for the study was added while the act was under consideration by the Senate Committee on Labor and Public Welfare because of concern over the high cost of constructing health facilities. Subsequent to passage of the act, the committee expressed particular interest in having the study concentrate on patient care facilities--primarily hospitals--and in considering hospitals' operating costs in addition to initial construction costs. Interest was also expressed in having our study identify and evaluate ways in which the demand for facilities could be reduced or eliminated.

SCOPE OF STUDY

To comply with the act, the General Accounting Office undertook a broad-scale study of the many factors affecting health facilities construction costs. The study included an examination into facility planning processes, construction approaches and concepts, construction standards, and construction labor and materials and whether construction requirements could be reduced through better use of, or reduction in, the demand for existing facilities.

Initial costs of constructing a facility, although substantial, are relatively insignificant compared to the cost of operating a facility over its useful life; therefore we gave special consideration to the impact that design and construction decisions have on the operation and maintenance costs over the life of a facility. We identified, through an extensive state-of-the-art survey, significant innovations in design, construction, and operation of a facility which should be considered whenever construction of a new facility or extensive renovation or expansion of an existing facility is proposed. With the assistance of a consulting firm, we developed computerized life-cycle models to quantify the benefits or disadvantages of each of the significant innovations. We used the life-cycle cost models to determine the savings in terms of initial construction costs and operating costs.

To demonstrate the impact innovations would have on initial construction and operating costs, we incorporated into a recently built hospital, in an analytical model, certain of the significant innovations. Certain parts of the reference facility had to be redesigned to incorporate certain of the innovations and to recognize the impact such items had on costs.

In addition to the factors impacting directly on construction costs, many significant factors impact indirectly on costs. We considered the various means by which planners can meet institutional requirements for space without constructing new facilities or expanding or renovating existing facilities. We examined such areas as whether health care is being provided in the appropriate type of facility, whether health insurance incentives should be changed, and whether preventive medicine programs would result in less inpatient care. We also examined the possibility of reducing the demand for facilities by sharing services, providing specialized care on a regional basis only, and utilizing areawide planning.

During our study we examined numerous other studies and pertinent literature; used questionnaires extensively; and held discussions with, and obtained data from, numerous organizations and firms which are directly or indirectly involved in health facility construction. We visited health

facilities, organizations, and firms in 29 States and the District of Columbia. Following are the types and numbers of organizations contacted during our study.

Type of organization	Number
Health planning agencies	180
Hospitals	123
Building associations or contractors	118
Architects	106
Manufacturers and trade associations	45
Hospital or management consultants	27
Building trade councils or trade unions	26
Governmental departments or agencies	23
National health care organizations	16
Health care delivery organizations	8
Other	12

This report summarizes the results of our study. Pertinent details are contained in supporting enclosures as follows:

Enclosure	Content
A	Planning, construction requirements, construction approaches, and construction labor and material
B	Compilation of innovations and life-cycle analysis of selected health facility innovations
C	Preventive medicine, use of appropriate facilities, delivery systems, utilization reviews, insurance incentives, shared services, regional systems, and planning agencies

We requested that the Department of Health, Education, and Welfare (HEW), five other Federal agencies, and 17 private organizations review and comment on our report. For the most part, the agencies and organizations indicated general concurrence with our report. Prior to receipt of formal comments, a meeting was held with each group to

obtain suggestions for improving the report. In those instances in which the groups wished to stress a particular point or in which agreements could not be reached, we requested the agencies and organizations to include their views in their formal comments on this report. Comments in the formal replies are included in the pertinent sections of this report. The list of agencies and organizations and the formal comments received are included in appendixes I to XXI.

TOTAL HEALTH CARE COSTS

In recent years, the amount of funds expended for health care in the United States has substantially increased. The following statistics, compiled by the Office of Research and Statistics, Social Security Administration, show the increases in total health care expenditures since 1950.

	Fiscal year		
	1950	1960	1971
National health expenditures (billions)	$12	$26	$75
Percent of gross national product for health	4.6%	5.2%	7.4%
Health expenditures per capita	$78	$142	$358

Much of this increase can be attributed to new Federal programs, such as Medicare and Medicaid, which were initiated in mid-1966. A substantial portion of this increase is due to the faster rate of escalation of medical-care prices than of all other items in the Consumer Price Index. For example, from 1967 through 1971, the prices for all items in the Index increased about 21 percent, while total medical-care prices increased more than 28 percent, largely due to an increase of over 60 percent in hospital daily service charges. (See exhibit A.)

Average hospital expenses per patient-day in community hospitals increased from $16 in 1950 to about $32 in 1960 and to over $92 in 1971. Most of this increase has been attributed to increases in wage rates in medical and related fields. Other reasons for the rise in hospital operating costs include increases in the number of hospital employees per patient, improvements in medical technology which require more expensive equipment as well as more highly skilled labor,

and increases in the number of hospital services prescribed by physicians due to the threat of malpractice suits.

CONSTRUCTION COSTS OF HEALTH FACILITIES

Expenditures for health facility construction have risen from $1.1 billion in 1960 to $3.5 billion in 1971, when it represented about 5 percent of national health expenditures. By 1980 annual expenditures for health facility construction will approximate $5 billion. The following table shows a breakdown of construction expenditures in 1960 and 1971 by source of funds.

Source of funds	1960	1971
	(billions)	
Federal	$0.3	$0.5
State and local	.3	.5
Private	.5	2.5
	$1.1	$3.5

HEW statistics showed that, in 1970, $18 billion was needed nationally for health facility construction. This represented the cost of constructing about 4,000 new facilities of all types and of modernizing about 10,000 existing facilities.

Costs of constructing buildings rose about 3 percent a year from 1960 through 1967, but during the 4 years ended in December 1971, construction costs escalated at an average of over 10 percent a year. In 1971 the rate of increase averaged approximately 1 percent a month. Generally, the cost of constructing a health facility is greater than the cost of constructing other buildings of comparable size, because construction is more complex and the fixed equipment and electrical and mechanical systems are more sophisticated and require more skilled labor.

The most widely used cost measurements in hospital construction are (1) cost per square foot and (2) cost per bed. These indicators vary widely among hospitals in the same, or different, geographical areas. HEW statistics for 1970 show that cost per square foot ranged from $28 to $78 and the cost per bed ranged from $14,000 to $72,000. For

example, in the Mississippi to Rockies region, cost per square foot ranged from $28 to $60 and cost per bed ranged from $14,000 to $55,000. In the Far West region, square foot cost ranged from $41 to $78 and cost per bed ranged from $29,000 to $72,000. By comparison, nursing home costs also varied, ranging from $26 to $47 per square foot on a national basis.

Many factors influence the cost of constructing health facilities and account for the wide variations in unit cost measures. Among these are type and size of the facility, geographic location, types of materials used, area labor rates, size of departmental areas, services provided, and fixed equipment installed. For example, hospitals providing such specialized or complex treatments as intensive care, radiation, and hemodialysis will normally have a greater cost per square foot and cost per bed than similar hospitals built without these facilities. Hospitals with large outpatient facilities will have a higher cost per bed than similar hospitals providing space primarily for inpatient care.

Authoritative sources have stated that operating costs of many hospitals equal initial construction costs every 1 to 3 years. A primary consideration, therefore, in designing and constructing a health facility is the impact that construction features, including equipment considerations, will have on operating and maintenance costs over the life of the facility as well as on construction costs. The consideration of these various cost elements in total is commonly referred to as "life-cycle costing." In 1970 the cost of operating Federal and non-Federal hospitals amounted to over $25 billion, or about 38 percent of total health care expenditures. This further illustrates the importance of considering life-cycle costs.

FEDERAL PROGRAMS

In recent years the Federal Government has been making expenditures for health facility construction in two ways. The first is through both Federal and federally assisted construction programs, such as the HEW grant programs and the Department of Defense and Veterans Administration (VA) construction programs. The second involves Federal

reimbursement for patient care through such programs as Medicare and Medicaid. As construction costs increase, the latter area becomes important because a portion of the patients' costs eligible for Federal reimbursement relates to the amortization of the investment in facilities. Accordingly, higher construction costs result in higher patient charges and higher Federal reimbursement.

Of the total of $0.5 billion spent by the Federal Government on health facility construction in 1971, about $0.3 billion was provided under the Public Health Service Act, as amended (42 U.S.C. 201). This act, administered by HEW, authorizes various grant, direct loan, and loan guarantee programs for construction and modernization of health care and related facilities. Of these, the Hill-Burton program has been the major Federal program providing funds for health facility construction. Exhibit B gives a synopsis of federally assisted construction programs authorized under the Public Health Service Act, as amended, and appropriated funds for fiscal years 1970 to 1972.

The Hill-Burton program assists States in planning, constructing, moderizing, and equipping health facilities. In fiscal year 1972 about $200 million--almost half of the total construction funds appropriated under the Public Health Service Act--was authorized for the Hill-Burton grant program. Grant assistance is provided for public and private nonprofit facilities, including general and specialty hospitals, outpatient facilities, public health centers, rehabilitation facilities, and long-term care facilities.

The Hill-Burton program was expanded by the Medical Facilities Construction and Modernization Amendments of 1970 (42 U.S.C. 291a), which authorized $1.5 billion in loan guarantees for private, nonprofit facilities and direct loans for construction of public facilities over a 3-year period beginning in fiscal year 1971. Interest subsidies of 3 percent are made on the unpaid balance of the guaranteed loans. The loan programs were authorized because the need for additional construction and modernization of health facilities could not be met solely by the Hill-Burton grant program without creating a heavy burden on the Federal budget. Both programs are expected to stimulate a

substantial increase in construction projects and encourage the use of non-Federal funds.

The Health Care Facilities Service, Health Services and Mental Health Administration (HSMHA), HEW, administers the Hill-Burton program. The Service assists the States in planning, constructing, modernizing, and equipping health facilities through grants, consultations, and guide materials. The primary program objective is to provide modern, well-designed, and appropriately located facilities from which high quality inpatient and outpatient health services can be delivered effectively. The Facilities Engineering and Construction Agency (FECA), HEW, provides architectural and engineering guidance and support for all HEW construction programs, including the Hill-Burton program. FECA is responsible, among other things, for keeping abreast of developments in building technology and encouraging the use of worthwhile innovations on Federal and federally assisted projects. FECA also is responsible for developing standards, criteria, and guides for Federal and federally assisted projects.

Between July 1947, when the Hill-Burton program was initiated, and June 1971, a total of $3.7 billion in Federal funds was spent on constructing and equipping health care facilities. During that time over 70 percent of the funds went for general hospitals. Recently, greater emphasis has been given to providing funds for needed outpatient facilities. Exhibit C shows the types of facilities which were funded under the program through June 1971.

CHAPTER 2

FACTORS IMPACTING ON PLANNING AND CONSTRUCTION PROCESS

This chapter summarizes our study of (1) preconstruction planning, (2) construction requirements, (3) construction approaches, and (4) construction labor and materials. All of these factors are important considerations in bringing a health facility into existence. The long time it takes to bring many health facilities to occupancy status has become increasingly important in recent years due to rising construction costs. These costs rose about 3 percent a year from 1960 through 1967 but, during the 4 years ended December 1971, construction costs escalated at an average of over 10 percent a year. The rate of increase reached a high in 1971, averaging approximately 1 percent a month.

PRECONSTRUCTION PLANNING

According to the American Hospital Association (AHA), planning for the delivery of services to meet community health care needs is a continuous function which should be performed by each hospital. We concentrated our study, however, on those planning functions which occur from the time a need for change is sensed until construction is started. This period of preconstruction planning occupies a significant portion of the total time involved in a construction project. The 23 projects included in our study involved renovations, expansions, and new construction. Preconstruction planning averaged 6-1/2 years per project.

Important decisions made during the preconstruction planning phase include such things as the type, size, and location of the facility; the decision to modernize, expand, or build a new facility if one already exists; the services which will be needed and can be afforded by the hospital; and the arrangement of financing. Also significant changes in the original plan can occur during this period. For the 23 projects included in our study, the estimated cost increased an average of 33 percent over the 6-1/2 year preconstruction planning period. This increase was due to a variety of factors, including expansion of facility and/or

services, inflation, and inaccuracies in original cost estimates.

For purposes of our study, we considered five aspects of preconstruction planning: (1) functional planning, (2) financial planning, (3) State and Federal review processes, and (4) feasibility of reusing existing designs in constructing hospitals.

Functional planning

Functional planning consists of determining (1) the health care needs of the population to be served, (2) the services to be provided to satisfy these needs, (3) the type and size facility to house the services, and (4) the personnel needed and available to staff the facility.

Generally speaking, the success of any construction project depends in large measure on the planning that precedes it. The earlier the need for change is sensed and dealt with, the sooner the services can be provided to the public. Similarly, the better the analysis of health care needs, the more likely that the appropriate services will be provided. Our study showed a need for improvement in both respects. Projects were often conceived in a crisis situation, rather than in an orderly fashion; frequently little or no attention was given to analyzing the specific health care needs before planning the services to be offered and the facility to be constructed. While it is difficult to generalize from the fairly limited coverage of our study, the incidence of these two failings indicated that they are probably fairly common. Therefore we believe that more attention to the continuous analysis of health care needs would do much to improve preconstruction planning.

Two other weaknesses we noted were inadequate coordination between hospitals in the same locale and insufficient consideration given to staffing new facilities. The incidence of these two weaknesses was not great. (See pp. 7 to 16, enc. A, for additional details.)

Financial planning

Financial planning consists of determining monetary needs, defining financial constraints, and obtaining funds.

How well these functions are performed can have a significant impact on project costs and the extent of health care services delivered to the public.

Reliable cost estimates are necessary for defining the amount of funds required and determining project scope, especially when financial limitations are a critical factor. Also, because of the length of time involved in a construction project, inflationary trends must be recognized.

The availability of sufficient funds at the appropriate time is essential to meeting construction deadlines and scope of the project. The availability of funds may be dependent upon arranging for alternate sources which would be available if the primary source fails to respond or is not able to cover increases in the estimated costs.

Our study of the 23 construction projects disclosed weaknesses in financial planning. We found several instances where early cost estimates were inaccurate or incomplete. We found also that sufficient alternate sources of funds frequently were not provided so that when the understated estimates became apparent, they resulted in construction delays and, in some cases, reductions in project scope.

The circumstances of each project may differ and uncontrollable factors often influence the supply of funds, but we believe that many of the problems that arise could be avoided by better cost estimating and by arranging alternate sources of funds early in the planning process. (See pp. 17 to 21, enc. A, for additional details.)

State and Federal reviews

At various times both the State Hill-Burton agency and HEW review health facility construction projects receiving Hill-Burton assistance. Our study showed that, with few exceptions, these reviews did not delay projects significantly.

Since 1966 HEW policy has been that construction bids could not be solicited without first obtaining approval from the Office of the Assistant Secretary, Comptroller. Usually this takes 1 or 2 weeks, but we found that it took 5 to 12 weeks in some cases. The purpose of this policy was to

control the start of projects to minimize concentration of construction in geographic areas and to reduce effects of seasonal variations. It appeared, however, that processing approvals through the HEW Comptroller Office had become perfunctory and was not serving the intended purpose.

After we brought this matter to the attention of HEW officials, the requirement for approval was canceled. (See pp. 21 and 22, enc. A, for additional details.)

Reuse of existing designs

As part of our study we considered the feasibility of reusing existing designs, in part or in total, as a means of accelerating the design and construction of hospitals and of reducing costs. This concept was advanced in our report to the Congress entitled, "Benefits Could Be Realized Through Reuse of Designs For Public Housing Projects " (B-114863, Dec. 2, 1971).

As used in this report, the term "reuse of designs" means the use or adaptation of an existing design when, after thorough analysis of needs, it is determined that part or all of that design will satisfy those needs. Reuse of designs is not intended to mean the development and use of what is often referred to as stock or standard plans which would result in a common facility being repeated many times with little or no regard to an individual hospital's needs.

Reuse of designs evoked considerable controversy among those with whom we discussed the concept. Many hospital administrators favored it, but most architects and governmental officials opposed it. Officials of a major proprietary chain of hospitals which reuses designs expressed satisfaction with the practice and cited particularly the value of being able to improve upon an existing design.

Actual experience in reusing designs of hospitals is limited, and we were unable to obtain quantifiable data on either the advantages or disadvantages. It is an issue which appears to warrant further consideration. The aspects that need further exploration involve its practical application--such as (1) how to accumulate design information and make it available, (2) how to decide to whom the design

data would be available, (3) how to assure that needs are adequately defined to choose the right design, and (4) whether and how to reimburse the originating architect if his design is reused. (See pp. 23 and 24, enc. A, for additional details.)

Conclusions

Planning for the delivery of health care services involves many considerations and requires critical decisions at various times, each of which may have significant impacts on the success of the project.

We believe our study has demonstrated the need for improvements in several respects: (1) more timely and better analysis of needs in determining the services to be provided, (2) better cost estimating and planning for alternate sources of funding, and (3) consideration of reusing existing hospital designs when those designs satisfy defined needs. We believe that each individual hospital must seek the solution to improved financial planning at the project level. However, we believe the Federal Government can provide significant leadership in the other areas, as specified in the following recommendations.

Recommendations

To help health facility planners avoid some of the deficiencies noted in our study, we recommend that the Secretary, HEW, assisted by the American Institute of Architects and the American Association of Hospital Consultants, compile and publish information on the essential factors to consider in performing the functional planning process, particularly in the needs determination phase of that process, and on the suggested methodology to be used. Determination of needs for individual hospitals should, of course, be coordinated with areawide plans. See page 112 for a discussion of areawide planning.

We also recommend that the Secretary explore the feasibility of reusing designs in hospital construction and, if appropriate, establish the criteria under which designs or elements of designs, could be reused.

Agency and other comments

American Hospital Association

In its formal comments on the reuse of designs, AHA stated that the potential of an economic waste of construction capital and an increase in operating costs through use of an inappropriate design may well outweigh the savings in architectural and design fees. As pointed out in our report, any decision to reuse a design in whole or in part should be made only after the facility needs have been defined and it is determined that an existing design or part of a design could fulfill those needs.

American Institute of Architects

The American Institute of Architects disagreed with the practicability of reusing designs in hospital construction. Several of the Institute's formal comments related to topics in the report which had been modified subsequent to the meeting with the Institute.

In its formal reply the Institute stated that each hospital, whether it is an expansion or renovation of an existing building or new construction, has unique problems which do not lend themselves to standardized designs. They pointed out also that some 15 years ago the Department of Defense attempted to use definitive designs and encountered many problems which were expensive to overcome.

Our study showed that there is considerable disagreement in the health community on the merits of the concept. Actual recent experience on the adaptation of an existing design in whole or in part in recent years has been limited, and any opinion at this time is largely subjective. In many instances the views presented to us during our study reflected the self-interest of the various groups; very little actual data was available to support their opinions.

Because of the lack of quantifiable data on reuse of designs, we believe the concept's potential advantages, which include reductions in design time and design costs, are such that the concept warrants consideration by HEW.

CONSTRUCTION REQUIREMENTS

We could find no substantive evidence upon which to conclude that the Hill-Burton regulations, by themselves, are contributing unnecessarily to construction costs of health facilities. On the contrary, the consensus of architects, hospital administrators, and governmental officials with whom we discussed this matter was that the Hill-Burton regulations constitute reasonable minimum requirements which are generally matched or exceeded by other applicable building codes or by the desires of the owners of the facilities.

We did, however, find a need to develop more uniformity among the various construction requirements--both Federal and non-Federal. We did not find it practicable to quantify the impact of the lack of uniformity among construction requirements. However, it is undoubtedly significant in terms of increased construction costs, delays in construction, and suppression of innovations.

The Federal Government has made substantial progress in developing and applying common requirements of Hill-Burton and Federal Housing Administration. However, fairly significant differences exist between Hill-Burton construction requirements and those Medicare and Medicaid operational requirements which affect construction, even though HEW administers all three programs. HEW recognizes these differences and is making efforts to develop equivalency factors for the differing requirements. Sufficient progress has not yet been made to assess the outcome.

The most pervasive issue disclosed by our study was the multiplicity of Federal and non-Federal codes and regulations which typically become involved with a construction project, often with conflicting and sometimes duplicative requirements. The need for flexible construction requirements has long been recognized by various segments of Government and industry. The solution depends largely on developing performance criteria and testing construction methods and materials to satisfy this criteria. By these means, alternative detail specifications can be included in building codes and regulations. The construction requirements thus should be more flexible and responsive to changing

technology and should encourage, rather than suppress, innovation.

The key to developing performance criteria lies in accumulating scientific data on construction materials and methods. Research seems to be lacking at this time, and that research which is being done is usually conducted by those directly involved in promoting a particular product or service. One notable exception was a recent abortive effort by HEW's FECA and the National Bureau of Standards (NBS). In 1971 FECA and NBS attempted jointly to develop a scientific base of knowledge on fire safety and to promote uniformity among HEW agencies. The attempt failed because of a lack of financial support within HEW. (See pp. 25 to 39, enc. A, for additional details.)

Conclusions

Regarding the differing construction requirements of the Hill-Burton, Medicare, and Medicaid programs, the equivalency factors being developed by HEW may provide a degree of commonality. While establishing equivalency factors for use in evaluating existing facilities may be appropriate, we believe the greater need is to develop one common set of requirements for new construction for all three programs.

As for the multiplicity of conflicting and duplicative codes and regulations, the success of any program to develop and apply standardized, flexible construction requirements requires the efforts of Federal and State Governments and the groups which develop the so-called model building and fire codes. The development and enforcement of building codes is a State responsibility. The various model code groups, in their capacity as a clearing ground for suggested code requirements, are in a position to develop commonly accepted performance criteria. These groups generally find that they are not equipped to perform the research necessary to develop this criteria. Therefore we believe that the Federal Government could provide the leadership necessary to start such a movement, particularly in research.

Recommendations

We recommend that the Secretary, HEW,

--adopt a common set of requirements for new construction under the Hill-Burton, Medicare, and Medicaid programs;

--direct FECA to resume its efforts with NBS toward developing a scientific base of knowledge on fire safety; and

--direct FECA to extend its efforts to other areas involving construction requirements for health facilities; to make the data available to the model code groups, States, and such other organizations as appropriate; and to make revisions when necessary to the Hill-Burton construction requirements, based on the FECA and NBS findings.

CONSTRUCTION APPROACHES

On many hospital projects the time from decision to construct until occupancy has been 6 years or longer. Many authorities involved in health facility projects agree that this time can be reduced. A shorter delivery time (1) allows medical care to be delivered to a community earlier, (2) reduces the chance of hospital obsolescence before occupancy because of the rapid changes which take place in the medical field, and (3) avoids increased project cost due to the escalation in costs experienced in the construction industry.

Many believe the use of a sequential construction approach contributes to lengthening the time for project delivery. This approach, generally referred to as conventional, follows a linear sequence of completing first the total programing of a project, then design, and finally actual construction. Each of these activities, which are common to the creation of any building, usually must be completed before the succeeding one begins. This approach traditionally has been followed in the construction of various kinds of buildings, including hospitals.

Fast-track scheduling and total concept construction are two approaches evolving in health facility construction to reduce project delivery time and cost. They have received only limited use for hospital construction, including federally assisted projects; however, they have been used increasingly in the last few years.

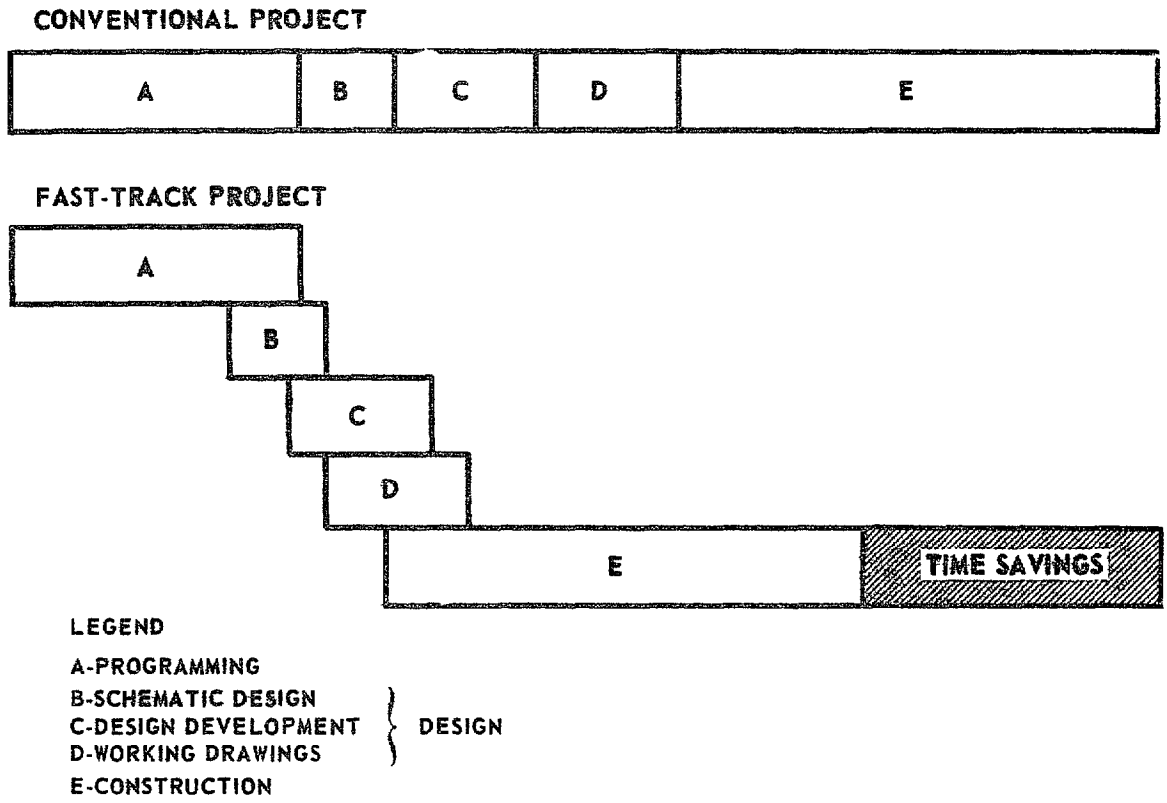
In addition to reducing project delivery time and cost, the fast-track and total concept approaches, unlike the conventional approach, provide construction expertise early in project development. Fast-track scheduling usually necessitates that the project owner employ a construction manager or consultant-builder to coordinate and manage the project; both offer potential savings in addition to those attributable directly to fast-track scheduling. Under the total concept approach, a construction expert is included as part of the organization which undertakes total project development. (See pp. 41 and 42, enc. A, for additional details.)

Fast-track approach

Fast-track scheduling is used to shorten the overall time between the decision to construct a building and its occupancy by starting and completing construction sooner. This is accomplished by overlapping programing, design, and construction so that one begins before the other is completed.

Basically, with fast-track, the design work is separated into "packages," such as foundation, superstructure, and exterior walls. When sufficient programing relating to user requirements and site conditions has been completed to determine the overall building area, configuration, height, and mass and site requirements, design work on the foundation package can be initiated. As soon as foundation design is completed, construction can start while, concurrently, programing of succeeding packages is being completed and design work is proceeding. Once decisions are made which result in construction of a package, they generally cannot be reversed without incurring substantial costs.

Although the length of time to do any one activity may not be shortened, it is generally agreed within the construction industry that overlapping phases, if properly managed, will result in substantial time reductions over the sequential path followed under the conventional approach, as illustrated on the following page.



Fast-track scheduling has been used successfully for many years in industrial and urban commercial construction. Recently its use has spread to construction of educational, health, and government-owned facilities. It has been used for new hospital construction, for additions to existing hospitals, and for renovation projects.

Through reduced project delivery time, escalating construction costs can be avoided and health care can be provided to the community earlier. For example:

--On a recently completed new hospital project with a construction budget of about $3 million, construction began 6 months before completion of design due to fast-track scheduling. The hospital administrator estimated that fast-track scheduling reduced construction costs by $270,000. He added that, because of earlier occupancy, many patients were admitted who would probably have had to wait at least 3 to 4 weeks to enter another hospital.

--With fast-track scheduling, construction began 8 months before completion of design for a hospital project with an estimated construction cost of about $9 million. The architect estimated that costs would have increased about $984,000 had the start of construction waited until design was completed.

--A hospital representative informed us that fast track was chosen for a $19.5 million project to meet the needs for early occupancy and to negate the inflationary trends of the economy. He estimated that, using this approach, project delivery time had been reduced 10 months at a savings of $800,000.

--Officials of a State construction agency advised us that time had been reduced about 20 months through use of fast-track scheduling on a hospital being built at a construction cost of $50 million. Completion is scheduled for early 1973.

Because decisions which result in the construction of a package are generally costly to reverse, fast-track scheduling requires firm and timely decisions from project owners who must forego some of the opportunities for second thoughts which are inherent in conventional design and construction. Further, funding must be available to project owners as construction contracts are awarded; otherwise the projects could be slowed considerably and expected savings could be nullified. Because a project is constructed in phases, a firm cost will not be known until the last phase is placed under contract. This may hinder financing and owners could start work with insufficient funds to complete the facility. However, because a project is designed and constructed in separate packages over a period of time, it is possible, within certain limits, to adjust the design of future packages to the project budget.

The use of fast-track scheduling also requires more than ordinary coordination of design and construction elements to prevent chaos. Some architects believe their fees should be higher for fast-track projects than for conventional projects because of greater effort required on their part. Because fast-track projects are divided into packages, it is apparent that careful coordination and meshing of

elements such as design and construction times, availability and acquisition of materials and labor, and the continuous estimation of cost are critical to project success. Construction managers and consultant-builders provide needed coordination. (See pp. 42 to 48, enc. A, for additional details.)

Construction management

Construction managers are generally considered agents of project owners hired to act as consultants to owners and architects on construction matters during project design; to assist in selecting contractors; and to schedule, coordinate, and direct construction activities. The professional construction manager is paid a fee for his services and essentially does not perform construction work. At least three different types of firms are providing construction management services--general contractors; architect-engineer firms; and cost, schedule, or management consultants.

Construction managers' expertise can achieve monetary savings for project owners without using fast-track scheduling. However, many believe that a primary benefit of using a construction manager is that it allows the use of fast-track scheduling, thereby reducing project delivery time. Many construction managers and others concerned with construction management emphasize that the construction manager, to be effective, must function as a member of a project development team with the project owner and architect and must be hired simultaneously with the project architect. In the conventional approach a construction contractor usually does not become involved in a project until after design has been completed. We found construction management and fast-track scheduling used on various types and sizes of health facilities although there is discussion on the project cost below which their use would be impractical.

One of the hospitals we visited is replacing an existing structure with a 250-bed project expected to cost about $47 million, using fast-track scheduling and construction management. A hospital official advised us that fast-track scheduling has cut about 1 year from the estimated

construction time using the conventional approach and, consequently, the hospital is avoiding a substantial increase in construction cost. In addition the construction manager has produced monetary savings in other ways. For example, the hospital has saved nearly $300,000 because the construction manager found a more economical technique to relocate a sewer line. The hospital has also saved over $400,000 in contracts for construction amounting to $10 million through the construction manager's review of contract proposals. (See pp. 48 to 53, enc. A, for additional details.)

Consultant-builder

Another method of implementing fast-track scheduling involves a general contractor who performs some construction work, acts as a consultant on construction matters during design, and manages overall construction. Some construction managers can also be consultant-builders. One variation in the use of consultant-builders involves the sequential development of a project until preparation of working drawings which overlap construction. Construction contractors work for a fee with the project owner and the architect during design, and, before preparation of working drawings, contractors submit lump-sum bids to construct the entire project. Officials of the firm claiming development of this approach stated that the process allows the construction contract to be awarded from 4 to 10 months earlier than is possible under the conventional approach.

The consultant-builder method is being used to construct a new 275-bed hospital with a construction cost of about $12.5 million. A hospital official informed us that the project was about 75 percent completed and that project delivery time and cost have been reduced by 12 to 14 months and $1.9 million, respectively. The official attributed reduced time and cost to the use of fast-track scheduling and the ability of a good, cohesive, building team to meet time schedules. (See pp. 53 to 55, enc. A, for additional details.)

Total concept approach

Under the total concept approach, a developer may undertake the entire responsibility for planning, programing, designing, financing, constructing, and equipping a hospital under one contract with the owner. This differs from the conventional approach in which the owner usually hires a hospital consultant, an architect, and a general contractor under separate contracts.

The total concept approach is popularly referred to as "turnkey" and, to a lesser extent, "design-construct," and by other terms, depending on the building firm involved and the services offered. Although this approach is not new, its use in hospital construction appears to have evolved in the last few years. We identified six firms that offer this type of service for hospital construction and a relatively small number of hospital projects completed under the approach; however, the use of this approach appears to be increasing. We also found that architects and general contractors have combined to implement the total concept approach on an individual project basis.

Much discussion has concerned the use of the total concept approach on hospitals, especially the larger and more complex ones. Advocates of this method claim significant reductions in project time and costs. Critics claim that quality is sacrificed, which will result in high maintenance and equipment replacement costs. Another issue is whether one firm should be responsible for a project.

How much quality should be built into the project is a basic issue in constructing health facilities. One architect has pointed out that health facilities being constructed today are frequently obsolete before they are completed, due to the rapid changes in medicine. He has stated that when permanent structures are built to last 40 to 50 years, so much money is spent that they must be used even if, because of obsolescence, they require high operating costs. One source indicated that a solution to the problem would be to build hospitals with much shorter lifespans. This could be done regardless of the project delivery approach.

One hospital that we visited was completed recently under the total concept approach at a contract price of about $2.4 million for design and construction. Officials of the hospital told us they followed a stringent financial budget in constructing the facility. The cost using the total concept approach was significantly less than the cost estimate for using the conventional approach, and the hospital included the same types of services and departments as previously planned. One official stated that he believed that the hospital got its money's worth and that the total concept approach would be used again in the event of future expansion.

A study and an inspection report present evaluations of this hospital. Although the study report, prepared by an architectural and a management consultant firm, cited deficiencies, including some pertaining to space and arrangement and expansion capability, it concluded that credit must be given, because adequate health care services appeared to be available and because the project proved that initial economies in hospital construction were possible. Because the total concept approach was used, HEW officials inspected the hospital and concluded in their report that the hospital was of minimal size and that materials used were questionable from a maintenance standpoint.

Total concept firms emphasize the cooperative team approach by directly employing various skills and by working very closely with the owner on every step of the project. Critics claim that the project owner is limited to the experience, knowledge, and ability of the firm he is dealing with and that he generally does not have the benefits of a consultant, architect, and engineer operating as independent professionals. (See pp. 56 to 61, enc. A, for additional details.)

Construction approaches on federally assisted projects

Most hospital projects which have received Federal assistance under the Hill-Burton program have followed the conventional approach. However, the use of the fast-track and total concept approaches is allowed on projects which receive assistance from the program. According to Department

officials, HEW cannot require a project owner to use a specific construction approach.

Firm information on the number of fast-track projects assisted under the Hill-Burton program was not readily available. However, as of June 1, 1972, 26 projects had been approved which included the use of construction management. An HEW official pointed out that not all of these projects include fast-track scheduling.

The Health Care Facilities Service--the HEW agency responsible for administering the Hill-Burton program--has not issued a policy pertaining solely to fast-track scheduling; however, it issued a memorandum on August 6, 1971, giving the proposed interim policy for approving construction management contracts. This policy does not specifically mention fast-track scheduling but does state that no Federal funds will be paid until the final total firm contract price is known for a complete facility. The policy states further that a guaranteed maximum price--which some construction managers give--will not be considered as the final price.

Under the fast-track approach a firm price will not be known until the contract for the final construction phase has been awarded. Although a firm price is required before making payments for a fast-track project, Service officials advised us that funds are set aside for such projects when they receive Federal approval, as is done normally for all projects. The firm price, according to Service officials, is required to avoid spending public funds in financing a project which might not be completed. Thus the requirement is a safeguard to protect the financial interest of the Federal Government. However, it essentially transfers any risk that may be involved in proceeding with a project without a total firm price to the private sources of funding, and it could impede more extensive use of fast-track scheduling on future projects assisted under the Hill-Burton program.

According to a Service official, the guaranteed maximum price is not considered a firm price because actual cost is expected to be less than the guaranteed amount. The official pointed out that the Hill-Burton program would not be able to use these savings for assistance to other projects if they were realized after expiration of the appropriation. This

is because funds approved in each annual appropriation must be obligated within 3 fiscal years, or they must be returned to the Treasury. However, it appears that the reallocation of funds could be handled through administrative adjustment on projects nearing the end of the 3-year cycle. The Service official also informed us that FECA does the actual promotion of construction management.

In 1971 FECA issued an information circular on construction management. The agency promotes its use for projects assisted or built by HEW. FECA does not regard fast-track scheduling as a necessary element of construction management, although it believes a good project development team which includes a construction manager can use fast-track scheduling. An official of FECA advised us that the small number of, and the few States having, construction management projects assisted under the Hill-Burton program are probably a result of the variance in promotion given by HEW regional offices and State offices which administer the Hill-Burton program. He pointed out that FECA does not have the authority to go beyond suggesting to project owners that they consider the use of construction management.

The Service issued a policy memorandum on September 27, 1971, giving requirements for approving projects under the total concept approach. Service officials believe that, although life-cycle costs for projects which use the approach could possibly be high, a place exists in the health facility field for the lower initial cost projects produced under the approach, because many projects have limited construction budgets. As of May 1972 three projects had been approved for construction under the Hill-Burton program using the total concept approach.

FECA has not issued a policy on the total concept approach. (See pp. 62 to 68, enc. A, for additional details.)

Construction approaches on Federal projects

The General Services Administration, VA, and the Army Corps of Engineers have used the fast-track approach on selected projects including hospitals. The General Services Administration recently has taken the general direction of using construction management and fast-track scheduling on

major projects, primarily to achieve earlier project completion. The General Services Administration has hired private construction managers, but VA and the Army Corps of Engineers have provided construction management services themselves.

These agencies have not used the total concept approach for hospital construction and VA and the General Services Administration have not used it extensively for other types of construction. The Corps has employed the approach in one form or another numerous times in the acquisition of guest houses, family housing, bachelor officers' quarters, industrial plant facilities, and an aircraft maintenance hangar. One future project for which the approach will be used requires the construction of barracks, bachelor officers' quarters, and dispensaries at an antiballistic missile site. (See pp. 68 to 72, enc. A, for additional details.)

Conclusions

The fast-track approach, used in conjunction with the construction management or the consultant-builder methods, and the total concept approach offer potential reductions in time and costs in health facility construction. These approaches are too new in their application to health facilities to draw firm conclusions on the extent to which they should be used and the types and sizes of health facilities best suited for each approach.

Fast-track scheduling requires a special and cooperative effort among members of the project development team. Unless each member carries out his responsibilities as part of the team, the full benefits of fast-track scheduling, in terms of money and time, cannot be realized. When considering the use of fast-track scheduling, project owners should bear in mind the role they intend to play in project development and the capability and attitude of other members to be selected for the development team.

Because only a few firms currently offer the total concept approach for hospital construction, competition afforded project owners who decide to use this approach may be limited. Also the important question of costs over the life of a hospital constructed under the total concept approach cannot be evaluated until existing facilities have been in

use for a longer time. Until more experience has been gained with the approach, project owners should consider having an independent consultant, such as an architect or engineer, to advise on design and construction matters when using the total concept approach. This is currently required on projects assisted under the Hill-Burton program.

Under the conventional approach, the general contractor is not brought into the project until the total design has been completed. In complex projects, such as hospitals, there are advantages to hiring a construction expert, such as a construction manager or consultant-builder, early in project development. The best time appears to be at the beginning of project design. Such construction approaches as fast-track scheduling and total concept have the potential for reducing project time and costs over the conventional approach.

Fast-track scheduling, together with construction management or the consultant-builder methods, and total concept construction can be used on projects which are assisted by the Hill-Burton program. Few such projects have used these approaches. The promotion of innovative construction approaches for projects receiving Hill-Burton assistance apparently varies with each Federal and State office connected with the program, and Federal offices suggest rather than require that these approaches be considered on individual projects.

Finally, neither the Health Care Facilities Service nor FECA of HEW makes the final decision on the best approach to be used on a federally assisted project. The conventional, fast-track, or total concept approach may be used by project owners as long as the projects meet the minimum requirements of the Hill-Burton program. Although the fast-track and total concept approaches may not apply to the construction of all health facilities, they have provided an economical alternative to conventional project delivery for some projects. Therefore the use of these alternate approaches should not be dismissed without reasonable consideration on an individual project basis.

Recommendation

We recommend that the Secretary of HEW require the Director, Health Care Facilities Service, in cooperation with the Director, FECA, to issue policy guidance (1) setting forth the advantages and disadvantages of using the fast-track and total concept approaches on different types and sizes of health facilities and (2) requiring that the fast-track and total concept approaches, along with the conventional approach, be considered on all health facility projects assisted under the Public Health Service Act.

Agency and other comments

American Institute of Architects

In a letter of October 17, 1972, the American Institute of Architects took issue with our recommendation that HEW require the consideration of the fast-track and total concept approaches on all health facility projects assisted under the Public Health Service Act. The Institute stated that this would be tantamount to promoting the use of the concepts rather than giving them simple consideration and that these alternate approaches should not be considered as applicable to all health facility projects. We agree that these approaches may not apply to all health facility projects and have emphasized this point in our conclusions. Because they offer potential savings, however, we believe these approaches should be considered as alternatives to the conventional approach on an individual project basis.

The Institute stated that our report did not properly note that planning services regarding hospital design, construction, and operation are not accommodated with "package builders." We agree that proper planning is critical to the success of constructing a health facility. The report states that total concept firms may undertake planning for a project or use a hospital consultant's report, when available. Total concept firms emphasize that they work closely with project owners on every step of the project in which they are involved. While it is true that independent professionals may not be involved in all health facility projects, Hill-Burton regulations require that an independent consultant, such as an architect or engineer, be hired to advise on design and construction matters when using the total concept approach.

In general, the remaining comments from the Institute emphasize matters pertaining to the two major issues involving the total concept approach, as discussed in the report. The first issue involves quality versus time and money savings, and the Institute's views closely parallel the critics' opinions presented in the report. Life-cycle costs of hospitals constructed under this approach, as pointed out in the report, cannot be evaluated until existing facilities have been used for a longer time.

The second issue concerns the appropriateness of placing responsibility in one firm for the planning, design, and construction of a project. The Institute stated that the most difficult problem to eliminate from the total concept approach is the inherent conflict of interest present in a system in which the contractor establishes both what is to be built and the basis for building it. The Institute continued that no way to eliminate this problem exists other than the independent professional system, in which the professional being asked for advice has no financial interest in the project, nor is his fiduciary client-owner relationship being compromised by establishment of an architect-client relationship with the general contractor constructing the facility. Because the architect-general contractor relationship places the architect in the position of working for and receiving compensation from the contractor, and not the project owner, we do not see how this significantly differs from the Institute's basic objection to the total concept approach; namely, the lack of independent professionals protecting the interests of owners.

Veterans Administration

VA expressed general agreement with this report. VA stated, however, that Office of Management and Budget Circular A-11 prevents full use of the fast-track approach for direct Federal construction. VA explained that the circular requires that project requests for construction provide for full financing of complete construction costs and that modification of this requirement would be needed to permit partial funding of projects if fast-track scheduling were warranted.

American Hospital Association

In its formal comments the American Hospital Association stated that our report did not emphasize the construction management method to the extent that it may well deserve. In our report construction management is discussed in conjunction with fast-track scheduling. The advantages of construction management are discussed along with the policies of various Federal agencies regarding the use of this method. Specifically, the report points out that FECA is actively promoting the use of construction management on health facilities construction projects.

CONSTRUCTION LABOR AND MATERIALS

The rising cost of construction labor is one of the primary factors contributing to the increase in construction costs. Although the costs of construction materials have risen, particularly since 1967, such costs have increased much slower than construction labor costs. (See p. 73, enc. A, for additional details.)

Construction labor

Although many factors affect the cost of construction labor, increases in wages for construction workers have contributed significantly to the increasing cost of construction labor. The majority of construction industry representatives claim, and the unions generally deny, that productivity of construction workers has decreased and that this decline, combined with restrictive work practices and jurisdictional disputes between trade unions, has contributed to the high cost of construction. Restrictive work practices and jurisdictional disputes have detrimental impacts on productivity. Union representatives generally point out that costs are increased because contractors mismanage work.

Although many construction industry representatives expressed strong viewpoints on the reasons for increased construction costs, we experienced considerable difficulty in obtaining documentation for statements made during our interviews, including data to support estimates of costly management or union practices or savings which might be realized.

Several other items have or may have an impact on construction costs. Open-shop contractors claim that the requirements of the Davis-Bacon Act have increased the cost of construction labor. Federal requirements related to job safety and equal employment opportunity may increase such costs in the future. The availability of construction workers, particularly in skilled trades, may also have an impact on future costs of construction labor.

Wage increases

From 1960 through 1971 the average hourly earnings for contract construction workers increased about 86 percent, while the average hourly earnings for all production and nonsupervisory workers increased about 64 percent. Department of Labor statistics show that the average annual increase in union hourly wage rates and fringe benefits for the six trades predominantly employed in hospital construction ranged from 10.1 percent to 11.3 percent for each trade during the 4 years ended July 1971.

More skilled work is required for hospital construction than for construction of Federal office buildings and schools because of the complex equipment and sophisticated systems used in hospitals. Therefore the cost of construction labor for hospitals is higher than labor costs for these buildings and probably is higher than for other types of buildings.

Both construction industry and union representatives must act if wages are to be stabilized voluntarily. Labor unions generally have been well organized and have bargained for what appeared to be best for their members. This usually has meant higher wages and increased fringe benefits. Unions can and do strike when agreements cannot be reached. When contractors fight strikes, they have been pressed by project owners to settle quickly to complete construction. Any increases in wages agreed to by contractors are generally passed on as increased costs to owners on future projects.

Before the implementation of wage and price stabilization guidelines on November 14, 1971, the President, because of concern over spiraling wages in the construction industry, established the Construction Industry Stabilization Committee on March 29, 1971, to review and approve collectively bargained wage and salary increases in the construction industry. The Pay Board delegated authority to the Committee to administer regulations for collective-bargaining agreements in the construction industry.

As of August 17, 1972, the Committee had approved 1,340 cases[1] for the six trades predominantly employed in hospital construction. The Committee provided the following data.

Trade	Total cases	Average annual increases: Negotiated prior to November 14, 1971	Average annual increases: Negotiated on or after November 14, 1971
Bricklayers	240	8.8%	5.3%
Carpenters	234	10.9	5.5
Electricians	409	8.5	6.0
Plumbers	232	10.1	5.0
Sheet-metal workers	75	11.6	4.1
Laborers	150	11.5	5.6
Total	1,340		

On the basis of the above data, the average annual increases for approved agreements negotiated on or after November 14, 1971, are substantially lower than the approved increases for agreements negotiated before that date. (See pp. 75 to 78, enc. A, for additional details.)

Costly management and labor practices

We asked both contractor and union representatives to comment on practices which increased construction costs--in particular, hospital construction costs--unnecessarily. The views obtained during our interviews generally reflected the self-interests of the various groups. Following are the results of our study on (1) productivity, (2) restrictive work practices, and (3) jurisdictional disputes.

Productivity--Presently, no reliable means of measuring productivity exist in the construction industry and productivity statistics on building construction are virtually nonexistent. The majority of contractors we interviewed believes that productivity has decreased in recent years.

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[1]A case may include more than one collective-bargaining agreement.

Reasons given by contractors for decreased productivity include apathy on the part of workers, deterioration of pride and quality of workmanship, increased featherbedding,[1] jurisdictional disputes, absence of incentives for better workers to produce more than poor workers, time lost from absenteeism and prolonged rest breaks, and later starting times and earlier cleanup by workers at the end of the day.

Some union representatives said that productivity had increased, but others felt that if productivity had declined in the construction field, it was no different than in other fields. Some pointed out that contractors could fire the unproductive worker and that contractors frequently mismanaged projects by (1) not having equipment ready when needed, (2) requiring workers to report to the office before proceeding to the construction site, and (3) overstaffing projects. (See pp. 79 and 80, enc. A, for additional details.)

Restrictive work practices--Many union contractors told us that restrictive work practices were causing increased construction costs. Many of these practices stem from work rules in union agreements. Union representatives pointed out that contractors acknowledge these work rules when they sign the agreements. In contrast, open-shop contractors told us that they did not have significant problems with restrictive work practices.

Many examples were cited of practices considered costly and unnecessary by contractors. One contractor was required by union agreement to hire a full-time operator on each of three daily shifts to man an automatic sump pump on a construction project. Wages paid to these operators while the project was under construction amounted to $143,000. The project was completed over 2 years ago, and according to the contractor the same pump continues in use in the building without an operator.

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[1]Practices or work rules which limit the amount of work to be done in a given period, including payment for unneeded workers, unnecessary tasks, work not performed, or job duplication.

A union representative stated that operating engineers, such as sump pump operators, were needed in most cases and that any exception to the rule should be worked out between the contractor and the respective trade union. Another union representative said that the use of sump pump operators is sound, as evidenced by the union agreements negotiated with contractors.

Another contractor stated that a union agreement required an operator for an automatic elevator during construction. This practice, which the contractor considered unnecessary, added $20,000 to the cost of the building. Other examples given by contractors and the comments of union officials are discussed on pages 80 to 83 of enclosure A.

Jurisdictional disputes--Jurisdictional disputes occur when more than one building trade claims the right to do a particular job. Union officials claim that jurisdictional disputes are due to mismanagement of work by contractors. Contractors stated that these disputes have increased construction costs but that, because the disputes are between two or more trade unions, they are caught in the middle. Examples of jurisdictional disputes given by contractors and comments by union officials are discussed on pages 83 and 84 of enclosure A.

Federal requirements

We inquired into the cost impact of requirements for minimum wages and for those involving job safety and equal employment opportunity. Although we inquired primarily into the economic aspects of Federal requirements, we recognize that the basic purpose and future benefits of each requirement may be far more important than the costs involved.

Requirements for minimum wages--The Davis-Bacon Act of 1931, as amended (40 U.S.C. 276a), requires the payment of minimum wages to laborers and mechanics (skilled workers) employed under Federal contracts in excess of $2,000 for construction of public buildings and public works. It provides that the minimum wages be based on wages determined by the Secretary of Labor to prevail for the corresponding classes of workers employed on similar projects in the "*** city, town, village, or other civil subdivision of

the State in which the work is to be performed.***" The primary purpose of the act was to protect communities from the depressing influence of lower wage rates at which workmen might be hired elsewhere and brought into communities to perform construction work. Legislation enacted subsequent to the Davis-Bacon Act extended minimum wage coverage to contracts for construction of federally assisted projects, including those under the Hill-Burton program.

On July 14, 1971, we issued to the Congress summary report B-146842, entitled, "Need for Improved Administration of the Davis-Bacon Act Noted Over a Decade of General Accounting Office Reviews." The report pointed out that, because the Department of Labor made improper minimum wage rate determinations, construction costs increased by 5 to 15 percent on selected projects. The Department agreed with the basic recommendation in the report, took action on those recommendations, and made other changes in policies and procedures to improve wage determinations.

During our present study we did not evaluate wage determinations made by the Department of Labor but concentrated on obtaining the views of construction industry and union representatives as to whether there were cost differences, due to requirements of the Davis-Bacon Act, in construction of Federal or federally assisted projects, as opposed to construction of privately funded projects. Open-shop contractors told us that the requirements of the Davis-Bacon Act have increased the cost of Federal and federally assisted projects significantly. Union contractors believed there was little difference in costs because wage rate and classification requirements under the act were virtually the same as union requirements. Union representatives generally did not comment on the cost impact of the act, but some said that it had properly enabled the union contractors to compete for Federal construction work.

In the Southeastern United States, for example, union contractors generally agreed that in metropolitan areas the wage rates required under the Davis-Bacon Act were usually the local union rates. Open-shop contractors stated that they were discouraged from bidding on Federal and federally assisted projects because, due to Davis-Bacon requirements, they had to pay higher wages than they normally paid in the

area. Also, they expressed concern over restrictive worker classifications which required them to pay different wage rates for each different type of work performed. In nonmetropolitan areas contractors said that the wage rates assigned under Davis-Bacon requirements are usually much higher than the minimum wage rates prevailing in the area and that assigned rates were based on union wage rates of the metropolitan area nearest the construction project. (See pp. 85 to 88, enc. A, for additional details.)

Requirements involving job safety--In 1969 and 1970 the President signed into law two acts which provide, in general, for the Secretary of Labor to set safety and health standards for businesses, including the construction industry, involved in interstate commerce. Federal standards implementing the acts were issued in 1971.

Because of the relatively short time that the Federal safety standards had been in effect, contractors could give only rough estimates of the effect they would have on costs. Estimates of increased construction costs ranged from less than 1 percent to approximately 30 percent. The wide variation in estimates appears to be due to such factors as the safety level maintained by the contractor in the past; whether the contractor owns equipment which will require extensive modification; and the familiarity with safety legislation. Union officials stated they will support contractors in their efforts to maintain a safe job site. (See pp. 89 and 90, enc. A, for additional details.)

Requirements for equal employment opportunity--All construction contracts involving Federal funds must contain equal employment provisions. These requirements do not appear to be affecting construction costs significantly, but future costs may be increased because of difficulties in recruiting qualified minority workers in some areas, especially in the more highly skilled trades. (See p. 91, enc. A, for additional details.)

Availability of skilled labor

According to a Department of Labor study, construction manpower requirements for skilled workers will increase from about 1.9 million in 1970 to 2.5 million in 1980, on an

annual average basis. The Department forecasts an increase of as many as 100,000 job openings a year for skilled construction trades during this period.

In areas where we held discussions, construction industry and union representatives stated that, although labor shortages existed during the period of high construction activity several years ago, shortages were not currently a significant problem. This is evidenced by the average unemployment rate of 10.4 percent during 1971 for the construction industry.

Studies point out and contractors stated that, because of the cyclical and seasonal nature of construction work, labor shortages have existed at one time or another in nearly every area of the country. Trades identified as being in short supply included carpenters, bricklayers, electricians, plumbers, sheet-metal workers, and roofers. Labor shortages can increase construction costs due to delays in construction, scheduling of overtime work, and/or payments of higher wages necessary to attract qualified workers.

One of the ways that construction journeymen receive their training is through an apprenticeship program which generally lasts 3 to 5 years. Some contractors think this training period is too long for some crafts, and they believe it can be reduced. Also contractors told us that the number of apprentices on a project could be increased with no adverse effect on construction quality or costs, but union officials said that increasing the number of apprentices would reduce productivity and increase construction costs. (See pp. 91 to 94, enc. A, for additional details.)

Construction materials

From 1960 through 1967 prices for construction materials were relatively stable, increasing at a rate which averaged less than 1 percent annually. However, during the 4-year period ended December 1971, material prices rose at an average rate of almost 4 percent a year. Our research and many discussions with construction industry representatives and material suppliers showed that the costs of construction materials have been primarily affected by (1) increases in wages paid to production workers, (2) increases in freight rates, (3) domestic supply and demand considerations, and (4) level of foreign trade for certain materials. (See pp. 95 to 99, enc. A, for additional details.)

Prefabricated materials

The use of prefabricated materials in hospital construction has been limited because hospitals generally are individually designed and building codes and union agreements in some areas prevent their use. Contractors' views have varied on the effect the use of prefabricated materials has on construction costs. Many have stated that savings may be realized through reductions in construction time and onsite labor costs. Others have considered the cost of these materials to be high and overall construction and life-cycle cost savings from their use to be negligible. In our view, prefabricated materials have been used insufficiently in hospital construction to assess whether significant savings may be realized. (See pp. 100 to 102, enc. A, for additional details.)

Conclusions

Many factors have contributed to the increase in labor and materials costs of health facilities construction. The factors contributing to the increase in costs of these facilities are also intrinsically related to the overall construction industry.

Wage increases for both onsite construction labor and production workers in material industries have had a significant impact on construction costs in recent years. The costs of hospital construction appear to be affected more by wage

increases than by costs of other building construction because of the higher percentage of skilled construction workers required on hospital projects. Actions must be taken by both construction industry and union representatives if wages are to be stabilized on a voluntary basis. It appears that recent wage and fringe benefit increases being approved by the Construction Industry Stabilization Committee should reduce the rate of increase.

Costly labor and management practices being followed on construction projects contribute to high construction costs. Certain contractor and trade union practices, as well as jurisdictional disputes between trade unions, may be affecting productivity and increasing costs. Finding practical solutions to the many problems involved will be a difficult task. Until contractor and union officials join to eliminate costly practices and to hold down costs, construction costs will continue to increase.

The implementation of the Davis-Bacon Act has increased the costs of some Federal and federally assisted construction projects, and requirements involving job safety and equal employment opportunity may increase costs in the future. Estimates of the cost increases, or potential increases, associated with these requirements vary widely. However, each of these Federal requirements has been established for a specific purpose and the costs involved, both past and future, should be evaluated with this in mind.

Although significant labor shortages did not exist in areas covered by our study, they have existed in the past; future requirements, particularly for skilled workers, are expected to be much higher than present manpower levels. Manpower availability can affect the cost of health facility construction because these projects must compete with other construction projects for required skills.

Finally, the costs of construction labor, as evidenced by the increases in average hourly earnings and wage rates for construction workers, have increased at a much higher rate than the costs of construction materials. Therefore areas involving the costs of construction labor afford the best opportunities for reducing the rising costs of health facility construction. The use of prefabricated materials

may offer savings through the use of less costly, offsite labor, but these materials have not been used sufficiently in hospital construction to assess their impact on construction costs. Also the individual designs of most hospitals, building code requirements in some areas, and provisions in union agreements may prevent the future use of prefabricated materials on a large scale.

Agency and other comments

Department of Labor

In commenting on our draft report, the Department of Labor, by letter dated October 5, 1972, stated that the report presented "an adequate description of the cost situation in construction from the standpoint of the Department of Labor." The Department attached the following statement on productivity to its reply and requested that it be included in our final report.

> "Although there are no reliable measures of productivity change in the construction industry, certain events in recent months may result in an improvement in the productivity situation in 1972 and beyond. The level of strikes in the construction industry declined significantly between 1970 and 1971. Strikes over economic issues (contract terminations) dropped from 424 to 233 over the period. Average duration of these strikes also fell from 42 calendar days in 1970, to 30 days in 1971. In the first half of 1972, the level of strikes over economic issues remained at about the same level as in 1971, while the average duration fell slightly. Man-days lost because of jurisdictional disagreements among unions also fell significantly between 1970 and 1971. Declines in strikes in the industry reflect improved relationships and greater stability among the parties which could lead to productivity improvements in the years ahead.
>
> "Several other important events argue for improved productivity in the industry. The National Constructors Association and Building and

Construction Trades Department (AFL-CIO) signed a historic national Work Rules Agreement in April 1971. Agreements in several local areas have endorsed this agreement or used it as a model for local agreements. Moreover, the CISC has disapproved costly new work rules in various agreements where offsetting cost savings were not evident. Finally, the National Commission on Productivity and the Construction Industry Collective Bargaining Commission--both tripartite agencies with labor, management, and public representatives--are actively engaged in developing approaches to raise labor and management productivity in the construction industry. These efforts should also begin to pay off in the near future."

The Department of Labor letter also requested that the following statement regarding the administration of the Davis-Bacon Act be included in our final report.

"*** the Department of Labor agreed with the basic recommendations contained in the GAO 1971 report concerning the administration of the Davis-Bacon Act. Action has been taken on these recommendations and other changes have been made in policies and procedures. Of particular interest is the change in policy with respect to wage determinations issued for Government assisted residential construction. In late 1970 a decision was made to treat residential and commercial construction separately in making wage surveys and issuing wage determinations. The change now fully effective, was necessary because our studies showed that commercial construction wage rates generally do not prevail in residential construction. More importantly, the Department of Labor has decentralized to Regional Offices the functions of gathering and analyzing wage data for project wage determinations. The field staff of the Employment Standards Administration (over 900 Compliance Officers) has subsequently conducted hundreds of on-site wage surveys. Compliance Officers assigned to conduct such surveys have extensive knowledge of local wage practices and the wage surveys are conducted by direct

contact with builders, associations, labor organizations, and local contracting agency officials. This has greatly expedited the issuance of accurate wage determinations.

"Another important change has been to publish general or area wage determinations in the Federal Register. This permits any interested party to see what has been done and to ask for review if he feels that the published wage rates are not those prevailing in the particular area. The Department of Labor plans to increase the number of general or area wage determinations as rapidly as is practicable."

Building and Construction Trades Department, AFL-CIO

The President, Building and Construction Trades Department, AFL-CIO, by letter dated October 11, 1972, raised objections to much of the information discussed in the draft report related to construction labor. Before the receipt of formal comments, we met with representatives of AFL-CIO to obtain their comments on the report and discuss any suggestions they had for improving it. The representatives of AFL-CIO disagreed with most of the information included in the report and it became clear that AFL-CIO's objections to the report could not be resolved unless the report was revised substantially as a result of the meeting disregarding much of the information obtained from contractors and union representatives during our study.

The AFL-CIO formal reply reiterated many of the objections discussed during the meeting. Certain of the objections dealt with the study approach, techniques used, and the professionalism applied during the study. We believe that these matters are adequately discussed in the report and our discussion of AFL-CIO's comments has been limited to those matters which deal with the technical information presented in the report.

AFL-CIO listed four "fundamental deficiencies" relative to the technical information in the report. The first implied that costs should not be referred to as high, increased,

or increasing, without assigning a standard for comparison or a time frame, when appropriate. The impact of the issues discussed in the report was characterized in these terms on the basis of statistical data and information obtained from studies, contractors, and union representatives. For example, wages have increased because they can be measured over a period of time by using available data on wage rates and average hourly earnings. (See pp. 75 to 78 of enc. A.)

Second, AFL-CIO stated that we equated increases in the hourly wage rates of construction workers with increases in construction labor costs without knowing the actual labor costs involved in the construction of health facilities. As stated in the report and emphasized in our conclusions, many factors have contributed to the increase in the cost of construction labor. Wage increases certainly had a significant impact on construction labor costs, regardless of the type of building constructed. For example, the average annual increase in hourly earnings for contract construction workers (see p. 76 of enc. A) was 9.8 percent during the 4 years ended December 1971. Although it may not be possible to precisely equate this increase to building costs, the fact that building construction costs increased by about 10 percent during the same period cannot be ignored. Data on wage and fringe benefits increases for the six trades predominantly employed in hospital construction are shown on pages 77 and 78 of enclosure A.

AFL-CIO cited a Department of Labor study published in 1971, "Labor and Material Requirements for Hospital and Nursing Home Construction," which reported that, because of decreasing man-hour requirements per hundred square feet of construction from 1960 to 1966, productivity had increased 7 percent.

During our study we reviewed the Department of Labor study in some detail. While the study includes a substantial amount of useful information, we noted several matters relating to the computation of man-hour requirements which made the data questionable for inclusion in our report or as a measurement of productivity. First, the data in the study is old; man-hour requirements for hospital projects constructed in 1959 and 1960 were compared with man-hour requirements for hospital projects constructed in 1965 and

1966, a period before the large increase in construction costs. Second, the 1959-60 data was based on 32 new hospital projects and 14 projects involving hospital additions while the 1965-66 data was based on 26 new hospital projects and 35 projects involving additions. The differences in types of projects could provide the answer for changes in man-hour requirements. Further, the Department of Labor cited many reasons for the changes in man-hour requirements, including shifts in the relative importance of hospitals of different sizes, types, and locations and in materials used, as well as changes in productivity due to technological and related improvements.

In a paper which discussed the study, prepared for the September 14, 1972, Conference on the Measurement of Productivity in the Construction Industry, Department of Labor officials pointed out that they had experienced considerable difficulty in matching projects' characteristics over two time periods. Because of the difficulty in providing matches for entire structures, the paper concluded that another approach was necessary.

AFL-CIO stated also that the Department of Labor study showed that "on-site labor wages rose only 1.4 percent over a six-year period from 28.2 percent of construction costs to 29.6 percent of construction costs ***." The data presented in the study appears to have been somewhat misinterpreted by AFL-CIO. As used in the study, the 28.2 percent (based on 1959-60 data) and the 29.6 percent (based on 1965-66 data) represent a 1.4 percent increase in the percentage of hospital construction costs attributable to onsite labor wages. With regard to increased wages, the study stated that during the 6-year period, average hourly wages rose 22 percent and not 1.4 percent as stated by AFL-CIO.

Although it is universally recognized that there are no reliable means of measuring productivity in the construction industry, the letter from AFL-CIO infers that we should use a figure released by the Price Commission that productivity in contract construction--nonresidential (except highways and sewers)--increased by 1.5 percent annually from 1958 to 1967. The percentage cited, along with other rates for numerous standard industrial classifications, was printed in the Federal Register (vol. 37, No. 86,

May 3, 1972) as an amendment to regulations of the Price Commission. The purpose of this amendment is

> "*** to provide, in the case of manufacturers and construction contractors only, a formula for the calculation necessary to determine these productivity gains in cases involving price increases based in whole or in part on actual increases in allowable labor costs."

Although the Price Commission uses the 1.5 percent as an average annual rate of productivity gain to reduce labor costs when they are used as the basis for a price increase, we do not believe any totally reliable figure exists to measure productivity change in the construction industry.

Third, AFL-CIO stated that we did not properly correlate differences between health facility construction and other building construction or give full consideration to the more sophisticated requirements of hospitals. Our overall report discusses the many aspects of health facility construction. Specifically, in the area of construction labor, page 76 of enclosure A shows that more skilled workers are required for hospital construction than for other buildings because of complex equipment and sophisticated systems used in hospital construction. Also, as pointed out in the report, construction industry representatives assured us that the issues associated with the increase in labor costs are the same for health facility construction as for general building construction. These issues pertain to wage increases, productivity, restrictive work rules, jurisdictional disputes, availability of skilled workers, and the Federal requirements pertaining to construction labor discussed in the report.

Fourth, AFL-CIO pointed out that we should have considered wages and salaries of architects and engineers, technical and administrative personnel, and supervisors in our discussion of labor costs. In our study we concentrated on those items which have the most significant impact on the cost of constructing a health facility. The previously cited Department of Labor study showed that 80 percent of hospital construction costs are for onsite wages and materials based on hospital projects constructed in 1965 and 1966.

Further, the AFL-CIO's comments included several statements regarding the Davis-Bacon Act. They stated that an estimated 60 percent of the minimum wage determinations of the Department of Labor involve rural, nonunion areas, and they give illustrations of Davis-Bacon wage determinations for selected trades in these areas. Although it is not clear what the information presented is intended to convey, these comments imply that in rural, nonunion areas, all rates in these wage determinations are similarly low and that the rates in the wage determinations in these areas are usually not union rates.

We found five of six wage-rate determinations available for the locations cited in the AFL-CIO letter which contain the same trades with rates identical to those illustrated in the letter. Each of the rates cited in the letter was a nonunion rate. Two of the rates were part of wage determinations pertaining to highway construction. All three rates pertaining to building construction were included in wage determinations which contained other trades whose rates were union rates--some substantially higher than the illustrations presented. For example, in the illustration of the bricklayers' hourly rate of $3 in Pineville, Kentucky, the wage determination for building construction contains 26 wage rates for various trades. Fifteen of the wage rates were union rates and ranged from $4.35 to $7.95 for the various trades. Although the letter states that the illustrated rates are for rural, nonunion areas, this example shows that union rates are used in rural, nonunion areas when the Department of Labor assigns them as being the prevailing rates for the area.

The letter from AFL-CIO further states that we did not evaluate the administration of the Davis-Bacon Act or wage determinations made by the Department of Labor during our study. As pointed out on page 56, we issued to the Congress a summary report entitled, "Need for Improved Administration of the Davis-Bacon Act Noted Over a Decade of General Accounting Office Reviews" (B-146842, July 14, 1971). In view of changes made by the Department of Labor on the basis of our recommendations, we did not review the administration of the act in this study because new policies and procedures were not in effect for a sufficient time.

CHAPTER 3

COMPILATION OF INNOVATIONS IN HOSPITALS AND LIFE-CYCLE COST ANALYSIS OF SELECTED INNOVATIONS

This portion of our study was directed toward (1) identifying significant innovations which should be considered whenever construction of a new hospital or an extensive renovation or expansion of an existing facility is proposed, (2) evaluating the impact which certain innovations would have on initial construction costs and on operating costs over the life of facilities, and (3) demonstrating the impact of the selected innovations in a recently built health facility (reference hospital). "Innovations" are defined as alternatives to traditional construction techniques, materials, designs, and hospital operations.

The cumulative operating costs of a hospital usually equal or exceed the initial construction costs in 1 to 3 years. Because most hospitals have estimated lives of 20 years or more, the significance of this relationship is apparent. For this reason, we not only examined ways of reducing initial costs but also considered the feasibility of reducing operating costs during the life of the hospital, even though initial construction costs may be increased.

Although various Government agencies have funded numerous studies on hospital construction, design, and operation, we found that no central repository of state-of-the-art data exists on innovative construction techniques, materials, designs, or operating systems to use in life-cycle cost analysis. For this reason, we undertook an extensive state-of-the-art review to compile a list of innovations having the potential to reduce either construction costs or life-cycle operating costs.

In our contacts with architect-engineers, hospital consultants, and hospital administrators, we found a general lack of quantitative evaluation of alternative construction techniques, materials, designs, and operating systems. Many hospital administrators and architects, in efforts to curb the rising cost of hospital construction, search for obvious initial construction savings. These initial savings

could preclude greater savings in operations and maintenance. A recent HEW publication pointed out that

> "*** it may be worth spending an extra 40 percent for initial construction to save 10 percent in operating costs. It would be false economy to reduce construction costs if it would increase operating costs."

We used computerized life-cycle cost analysis during our study to measure the impact of selected alternatives on hospitals of various size. Under this method of analysis, the operating costs of an alternative as well as its initial investment and future capital costs were taken into account. Because the life-cycle alternative may be affected by inflation and discount rates used or by the expected lifespan of the system, alternatives were analyzed for sensitivity at (1) inflation rates ranging from 2.5 percent to 7.5 percent, (2) discount rates varying from 5 percent to 10 percent, and (3) lifespans of 10, 20, and 30 years. To illustrate the results of the life-cycle analyses in this report, we used an inflation rate of 2.5 percent and a discount rate of 7.5 percent. A lifespan of 20 years was used unless otherwise specified.

Because of the technical nature of the computerized life-cycle analysis, we contracted with Westinghouse Electric Corporation, Health Systems, Pittsburgh, Pennsylvania, to be responsible for developing the analytical process for life-cycle costs. Westinghouse also was given the responsibility to demonstrate the effect of using the innovations in a reference facility. Westinghouse subcontracted with RTKL, Inc., Baltimore, Maryland, an architectural and urban planning firm, and MDA, Arlington, Virginia, a construction cost consulting firm, to assist in certain aspects of its work.

Our life-cycle analyses presented in this report represent general relationships of a combination of geographic and operating distinctions and should not be considered as representative of any one health care facility. The life-cycle data should be considered only as a guide for health facility planners in identifying the most appropriate alternatives suited for the facility, considering both local

cost and operating data. Hospital management may find that factors other than quantifiable cost considerations dictate the type of system to be used and may override any potential life-cycle savings of an alternative system.

To demonstrate the impact that certain alternatives would have on initial construction and life-cycle operating costs for a specific facility, considering geographic and operating distinctions, we selected for detailed study a recently opened facility which was constructed with assistance provided by the Hill-Burton program. Westinghouse and its subcontractors were given primary responsibility for this demonstration, which required the redesign of the reference hospital to incorporate the alternative features considered and to give recognition to the impact such items have on costs.

The following alternatives were analyzed for life-cycle effects during the study.

Construction and materials:
- --Interstitial space/long span construction.
- --Alternative construction materials.[1]
- --Flooring materials.

Design:
- --Computer assisted layouts.[1]
- --All private patient rooms.
- --Variations in hospital functional design.[1]

Operations:
- --Dietary.
- --Pharmacy.
- --Material handling.
- --Waste disposal.
- --Laundry.
- --Clinical laboratory.
- --Radiology.
- --Outpatient surgery.[1]

Planning:
- --Improved planning techniques.[1]
- --Fast-track scheduling.[1]

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[1]Analyzed for reference hospital only.

CONSTRUCTION AND MATERIALS

We identified several alternative construction techniques and materials which have significant impacts on initial construction costs and have potentials to increase hospital flexibility and reduce operating costs. On the basis of our discussions with architects and hospital administrators, we selected several of the alternatives for further review.

Construction

Interstitial space/long span construction

"Interstitial space" is a space between floors that is large enough to contain all major electrical and mechanical equipment and of sufficient height to allow maintenance personnel to service equipment and related utilities. The space has the potential to increase a hospital's flexibility and reduce maintenance costs by providing better access to equipment and to utilities without disturbing operations. Long-span construction allows a long span, generally over 50 feet, between support columns and is best suited for use with interstitial space. The use of long-span construction makes it possible to achieve a high level of adaptability and flexibility because many columns and fixed partitions can be eliminated, providing a large, clear, open floor space. Our life-cycle cost analysis showed that, although interstitial space with long-span construction increases initial construction costs, it has the potential to provide cost savings in maintenance, modification, and future rearrangement.

Construction and life-cycle cost comparisons were developed for test facility configurations in three interstitial space/long span alternatives and six different hospital sizes. The following table illustrates the life-cycle analysis of three alternative applications of interstitial space/long span construction for a 250-bed facility. Because of the lack of data, certain assumptions were used in the analysis to illustrate a methodology for evaluating interstitial space. The analysis is based on a 20-year facility life, assuming (1) alterations which would cost $122,000 and $31,500 annually in a conventional facility, (2) savings of 20 and 50 percent in making alterations, and (3) annual savings of 5 percent in maintenance.

	Initial construction cost increase	Life-cycle Savings			
		50 percent savings in making changes	Interstitial space justified	20 percent savings in making changes	Interstitial space justified
Over diagnostic/treatment zone only					
Annual alteration costs of $122,000	$ 346,700	$952,200	yes	$468,800	yes
Annual alteration costs of $31,500	346,700	354,600	yes	229,800	no
Between alternate floors					
Annual alteration costs of $122,000	538,400	952,200	yes	468,800	no
Annual alteration costs of $31,500	538,400	354,600	no	229,800	no
Over all floors					
Annual alteration costs of $122,000	1,076,000	952,200	no	468,800	no
Annual alteration costs of $31,500	1,076,000	354,600	no	229,800	no

Other construction techniques

Various other construction techniques, such as modular construction and systems building approach, were identified in our study as having potential for savings in construction and labor costs. These techniques are designed to improve a hospital's degree of adaptability and either have not been used extensively in hospital construction or are in various stages of research and development. (See pp. 27 to 31, enc. B, for additional details.)

Materials

The use of alternative construction materials--concrete or steel--was evaluated in the redesign of the reference hospital. We also analyzed interior finishing materials--floor coverings, partitions, and mobile components--which impact on operating costs. Because much of the attention in the past several years has focused on the use of carpeting in the hospital environment, we made a life-cycle analysis of the use of carpet versus other floor coverings.

Floor coverings

Our life-cycle analysis of floor coverings showed that the most influential cost factors were material, installation, and routine maintenance. The analysis showed that, over a 20-year lifespan, vinyl asbestos tile had the lowest life-cycle costs among the floor covering materials analyzed.

The following table shows the results of our life-cycle analysis of flooring materials.

Floor Coverings

Total Life-cycle Costs

(1,000 sq. ft.)

Floor covering	Cost
Vinyl asbestos	$2,350
Vinyl	2,800
Terrazzo	3,300
Carpeting	3,400
Terrazzo tile	4,300

Carpeting ranked low in the analysis due to its relatively high initial cost, but other considerations--acoustics, safety, and appearance--could make carpeting an appropriate selection.

(See pp. 33 to 38, enc. B, for additional details.)

Interior partitions and mobile components

Our study of interior partitions and mobile components--furniture, equipment, and service modules--showed that available alternative systems can provide added flexibility because future changes can be made at less cost and less disruption. Although the systems have higher initial costs, they can be cost justified, depending on the amount of flexibility required or the amount of change anticipated. (See pp. 38 to 41, enc. B, for additional details.)

Heating, ventilating, and air conditioning

A hospital's heating, ventilating, and air-conditioning system is a significant part of its total construction and operating costs. Our consultant advised us that the current process for planning and designing heating, ventilating, and air-conditioning systems may lead to oversized systems, and it suggested an alternative method of sizing systems. We also found that a total energy system, whereby the hospital's energy needs are produced by a hospital-owned and operated generating plant, significantly reduces operating costs in some hospitals. (See pp. 43 to 48, enc. B, for additional details.)

HOSPITAL DESIGN

On the basis of our compilation and evaluation of health facility innovations, we selected for evaluation hospital designs and design techniques which had the potential of improving patient care while reducing operating costs.

Nursing unit design

A "nursing unit" is an area containing patient rooms, equipment and supply facilities, and a nurses' station. We found many variations in the configuration of nursing units. Because some nursing unit designs may increase personnel efficiency and promote patient welfare, we examined various design alternatives, including single corridor, double corridor, circular, triangular, and spoke designs. Some of these designs, while more costly initially, have the potential to provide improved patient care and to reduce operating costs. (See pp. 49 to 56, enc. B, for additional details.)

No-nursing-station concept

Another concept in nursing unit design is one in which the centralized nursing station is eliminated. The no-nursing-station concept decentralizes many nursing duties and transfers nonnursing administrative duties to nonnursing personnel. A study performed by an engineering firm for a hospital consulting firm that advocates the concept reported a significant nursing staff reduction at one hospital using the no-nursing-station concept. The study showed that, although nonnursing personnel increased, the same quality of patient care had been provided with a 14 percent reduction in nursing and related staff. (See pp. 57 to 58, enc. B, for additional details.)

Combined surgical and delivery suites

The rationale of combining the surgical and delivery suites is to avoid duplication in constructing, equipping, and staffing separate suites. Increased staffing efficiency is the principal operating cost saving attributed to the combination of the surgical and delivery suites. Nursing personnel are cross trained in both functions, and assignments are determined by workload rather than by nursing

specialty. Although it has not been used extensively in hospitals, this concept appears to offer the potential to reduce initial construction and operating costs. (See pp. 59 to 60, enc. B, for additional details.)

Computer assisted layouts

Computer assisted layouts enable hospital designers to evaluate a much larger range of physical arrangements of various departments than would normally be possible by manual manipulation of layouts. The purpose of a layout scheme is to physically arrange, in close proximity to each other, functionally related departments. This technique was used in evaluating the design of the reference facility. (See pp. 61 to 62, enc. B, for additional details.)

Private rooms

A growing trend in hospitals is to construct private rooms for patient care in place of multibed rooms (semi-private rooms and wards). The Secretary of HEW advised us that State Hill-Burton agencies had been urged to encourage the construction of private rooms. He stated that private rooms have a substantial impact for the Hill-Burton program, since hospitals with high percentages of private rooms can function at higher occupancy rates, and it is necessary to provide fewer beds to handle the same patient population.

Our study showed several benefits have been attributed to having all private rooms. These include increased occupancy rates, reduced operation and maintenance costs, more privacy for patients, and flexibility. The primary disadvantages attributed to having all private rooms are increased initial construction costs and the fact that most insurance programs will not cover the total charge for a private room. Our life-cycle analysis showed that the additional construction cost premium of all private rooms can be justified if the hospital has a large number of transfers and the cost of transfers is high. (See pp. 63 to 68, enc. B, for additional details.)

HOSPITAL OPERATIONS

On the basis of our compilation and evaluation of alternative operating systems, we selected for further evaluation several alternatives that appeared to offer the greatest potential to reduce initial construction or life-cycle operating costs.

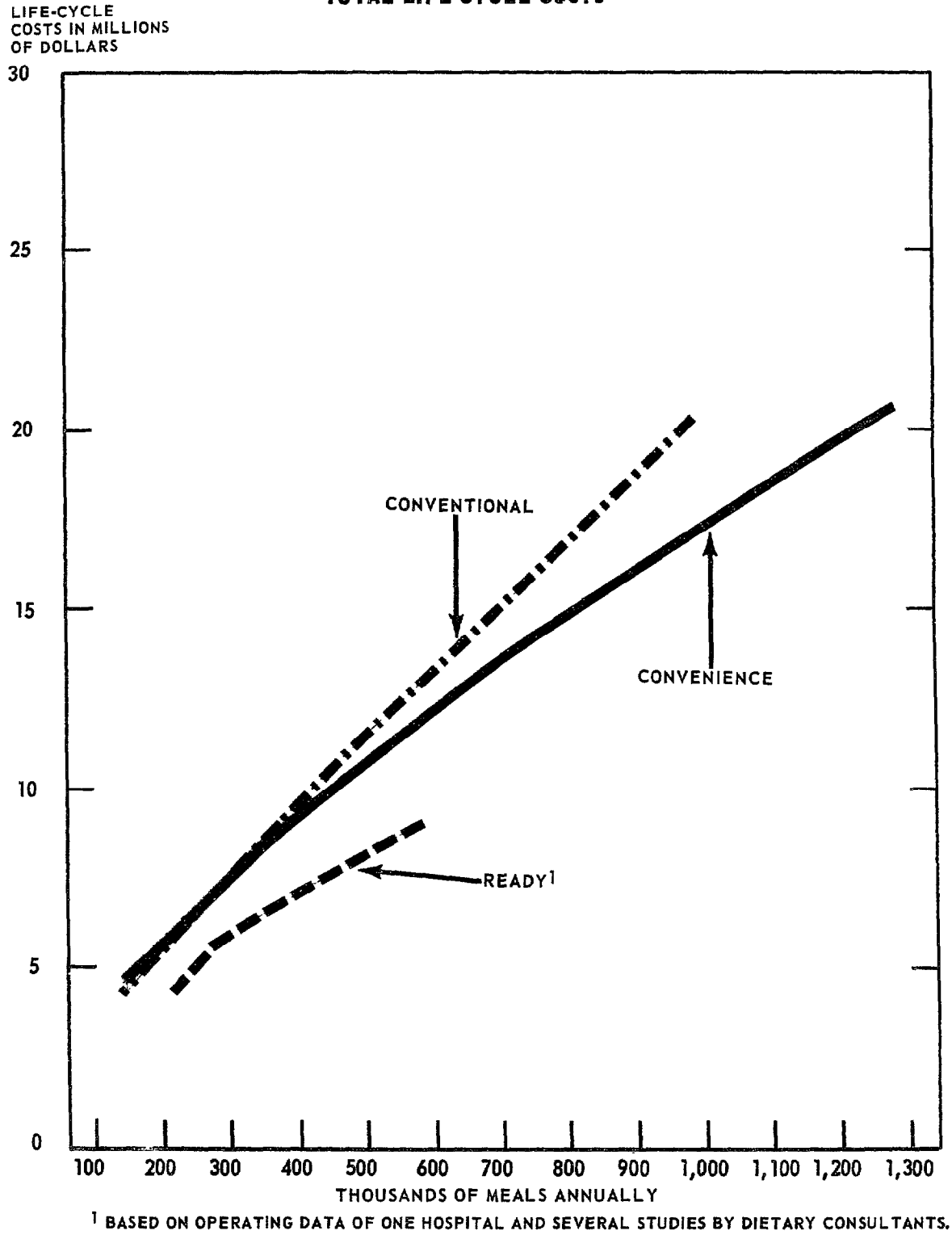
Dietary

Our study of dietary operations showed that two innovative alternatives, convenience food systems and ready food systems, differ significantly from conventional dietary systems and have the potential to reduce dietary costs without diminishing food quality. In convenience food systems hospitals purchase prepared, precooked, and refrigerated or frozen food from wholesale distributors. When needed, the food is reheated and served. In ready food systems, the hospital prepares its own convenience foods. Raw food is purchased in bulk quantities and prepared, portioned, quick frozen, and stored (usually several weeks' supply) by hospital dietary personnel. When needed the food is reheated and served. In a conventional system raw food is purchased, prepared in the hospital kitchen, transported directly to the patients or cafeteria, and served.

Our comparative analysis of the life-cycle costs for the three systems showed that, although initial capital investment costs of ready food systems are significantly greater than either the conventional or convenience food systems, they offer a potential for greater reduction in life-cycle operating costs than do the other two systems, particularly in larger health care facilities. While convenience food systems may be the least expensive in initial capital investment costs, the life-cycle operating costs of convenience food systems may exceed that of conventional systems in a smaller health care facility.

The graph on page 67 represents the results of our life-cycle analysis of all cost elements of convenience, conventional, and ready food systems over various ranges of total meals served.

DIETARY
TOTAL LIFE-CYCLE COSTS



[1] BASED ON OPERATING DATA OF ONE HOSPITAL AND SEVERAL STUDIES BY DIETARY CONSULTANTS.

In addition to quantifiable cost considerations, other factors must be taken into account in evaluating dietary alternatives. These include, but are not limited to, such things as the availability of labor, availability of food suppliers, quality of food supplied, flexibility to change, and availability of adequate manufacturer maintenance of equipment. (See pp. 69 to 83, enc. B, for additional details.)

Pharmacy

The hospital pharmacy department is part of a total medication distribution system which includes ordering and receiving medications at the hospital, filling physician medication orders, administering medications to patients, and recording results of medication therapy. In a conventional system, the responsibility of the pharmacy department relates primarily to procuring medications from outside the hospital and distributing them to patient floors. Our review of hospital pharmacy literature published during the past several years and discussions with experts in the field disclosed that conventional medication distribution systems resulted in a significant degree of medication errors, staff inefficiency, and medication loss.

Our study of technological advancements in medication distribution systems showed that an alternative distribution system, referred to as the unit dose system, has the potential to overcome some of the deficiencies of conventional systems. The distinguishing feature of unit dose systems is that the pharmacy department personnel are responsible for keeping records associated with dispensing and controlling medications, interpreting physicians' orders, maintaining patients' medication records, providing unit dose packages of medications at the time medications are to be administered, and, in certain instances, administering medications to patients. A unit dose package contains the exact dose of medication, such as one tablet or one capsule, ordered by the patient's physician to be administered at a specific time.

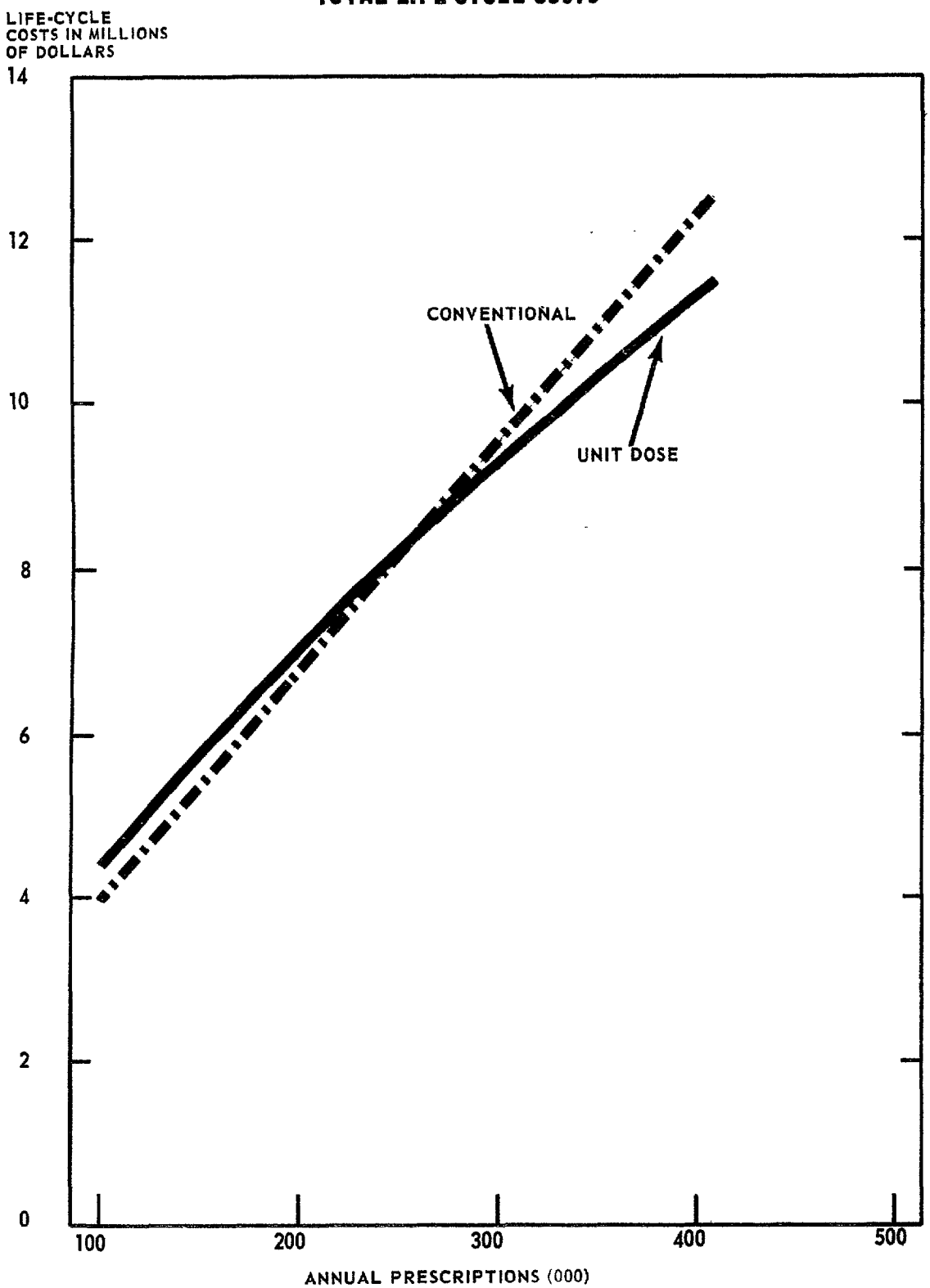
Our comparative analysis of the life-cycle costs for conventional and unit dose distribution systems showed that unit dose distribution systems have lower life-cycle costs

than conventional distribution systems at higher annual prescription ranges. The life-cycle savings are largely attributed to a reduction in nursing time for administering medications. Nurses may actually use the savings in nursing time to provide more nursing care to patients or the savings may be converted to reduced labor costs for the hospital.

The graph on page 70 shows the results of our comparative analysis of all cost elements of unit dose and conventional medication distribution systems over various ranges of annual prescriptions.

In addition to quantifiable cost considerations, several other criteria must be considered in evaluating medication distribution system alternatives, including such things as medication errors and medication losses. Also each medication distribution system alternative must be assessed for its potential to improve patient care through a closer professional relationship between pharmacists and physicians and more nursing time for patient care. (See pp. 85 to 101, enc. B, for additional details.)

PHARMACY
TOTAL LIFE-CYCLE COSTS



Material handling

Hospitals have two basic transportation needs: (1) moving bulk materials and supplies, including food, linen, medical supplies and equipment, medication, and waste, and (2) moving nonbulk items, including medical records, pharmacy stat (emergency) orders, laboratory specimens, X-rays, and the transportation of patient discharge records, to the business office.

For our study we evaluated only the movement of bulk materials and supplies, and we classified material handling systems into three categories.

1. Manual. Materials and supplies are hand carried or transported in manually pushed carts.

2. Semiautomated. Part of the materials and supplies are transported automatically and the remainder are handled manually. Included are self-propelled carriers, conveyors, and pneumatic tubes.

3. Automated. All materials and supplies are transported automatically except for dispatching. Included are monorails and battery-powered carts.

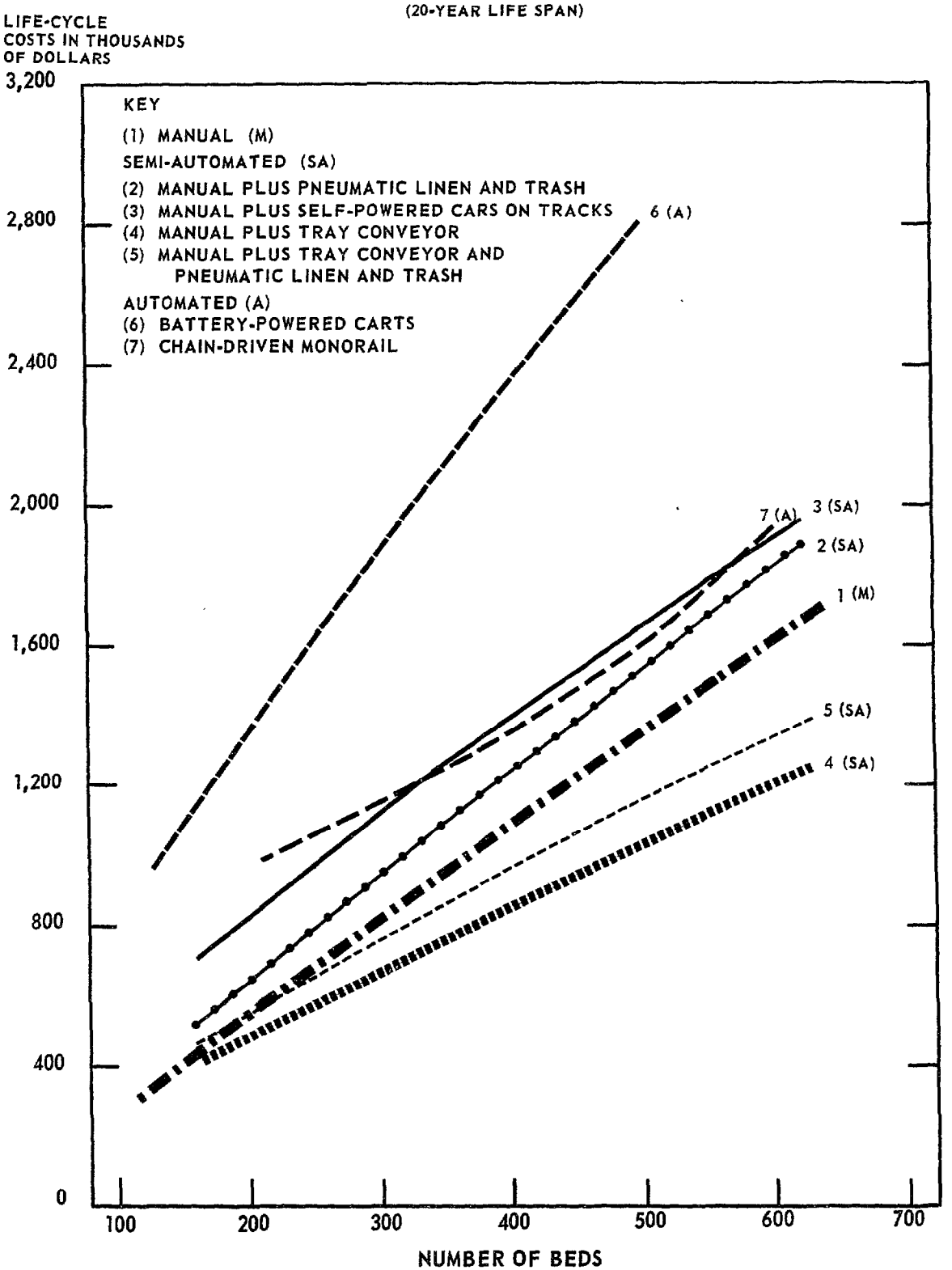
Our comparative analysis of life-cycle costs showed that initial capital investment costs of the semiautomated and automated systems analyzed were significantly greater than manual systems. However, two of the four semiautomated systems analyzed offered a potential for reduced life-cycle costs. The other two semiautomated systems and the two totally automated systems analyzed had higher life-cycle costs than totally manual systems.

The graph on page 73 shows the results of our comparative analysis of all cost elements of material handling systems over a range of hospital sizes.

Because some of the automated and semiautomated systems are capable of handling the demands of nonbulk items, conclusions should not be reached that other semiautomated or automated systems are not cost justifiable in some instances.

The configuration of the facility and the type of operating system alternatives selected for the various departments are critical factors in selecting a material handling system. Therefore separately analyzing material handling alternatives, using the specific facility configuration, needs, and conditions, is particularly important before deciding whether to automate any or all of the material handling functions. (See pp. 103 to 125, enc. B, for additional details.)

MATERIAL HANDLING
TOTAL LIFE-CYCLE COSTS
(20-YEAR LIFE SPAN)



Waste disposal

Our study of hospital waste disposal systems showed that five alternative systems have been developed. We selected for life-cycle analyses the following four alternative waste disposal systems. The fifth alternative, the small incinerator method, was not considered because of its overriding disadvantages relating to air pollution.

1. Unprocessed. Loose solid waste is removed without processing.

2. Shredding (processed). Solid waste materials are reduced to small particle size by cutters, choppers, and hammers.

3. Compacting (processed). The size and volume of solid waste is reduced by crushing.

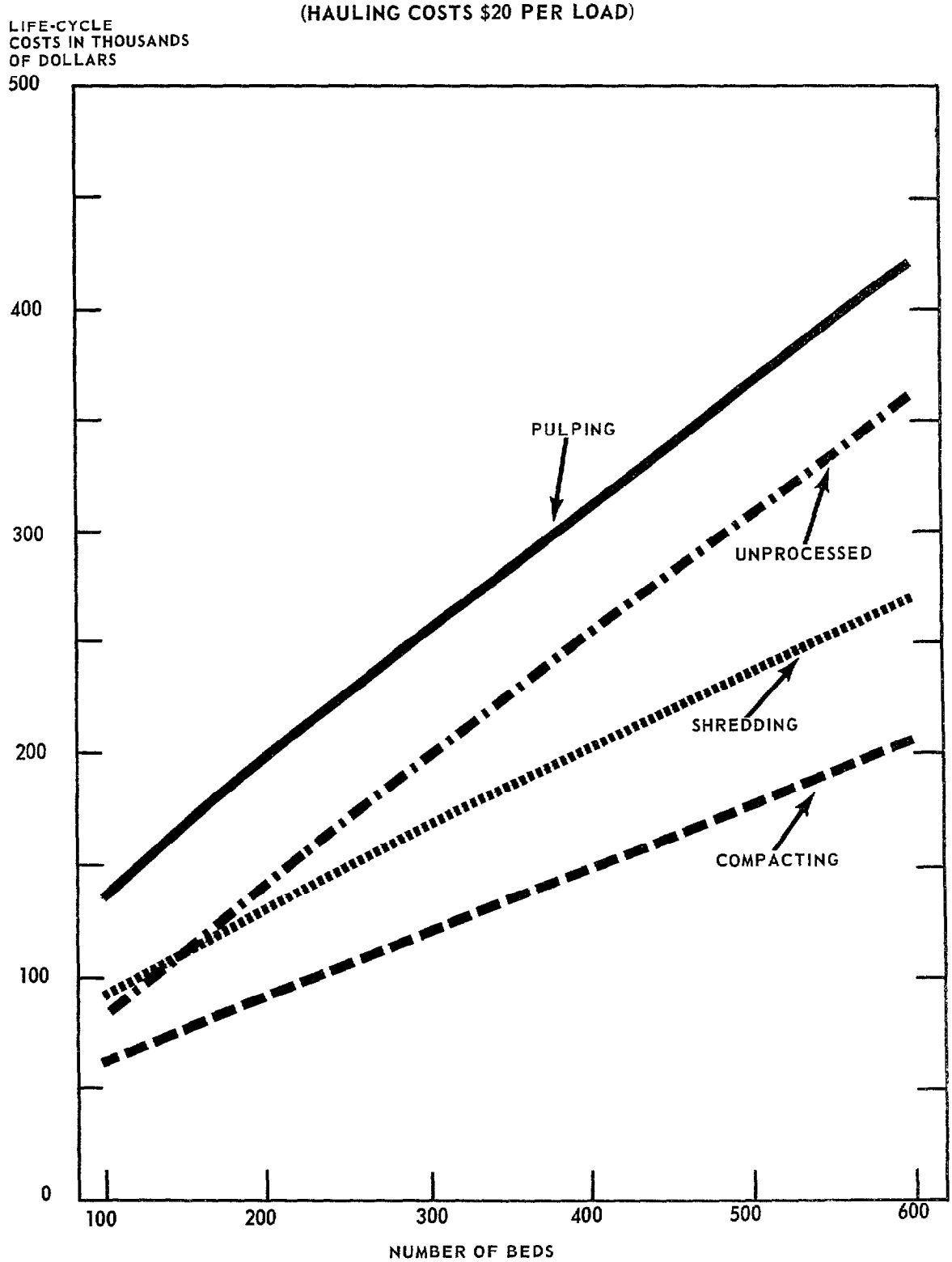
4. Pulping (processed). The size of waste materials is reduced by chopping in a water bath, resulting in a slurry of waste material.

Our comparative analysis of the life-cycle costs for alternative waste disposal systems showed that initial equipment costs for shredding, pulping, and compacting systems are greater than for systems of disposing of solid waste without processing. Depending on hauling and dumping costs, however, life-cycle costs of the alternative systems may be less than unprocessed systems.

The graph on page 75 shows the results of our comparative analysis of all cost elements of waste disposal systems over various ranges of hospital bed sizes.

In addition to quantifiable cost considerations, several other criteria must be considered in evaluating waste disposal systems. Hospital management may find that a more sanitary environment, noise reductions, and reduced air and water pollution may be the overriding considerations in selecting a waste disposal system. (See pp. 127 to 143, enc. B, for additional details.)

WASTE DISPOSAL
TOTAL LIFE-CYCLE COSTS
(HAULING COSTS $20 PER LOAD)



Laundry

A hospital laundry system must provide an attractive, germ-free, and adequate supply of all linen items to hospital departments when needed.

Our study showed that hospital laundry service can be provided under four alternative systems.

1. Inhouse. Laundry services are performed in an inhouse laundry staffed by hospital personnel.

2. Contracted. Hospital-owned linens are laundered by a commercial laundry.

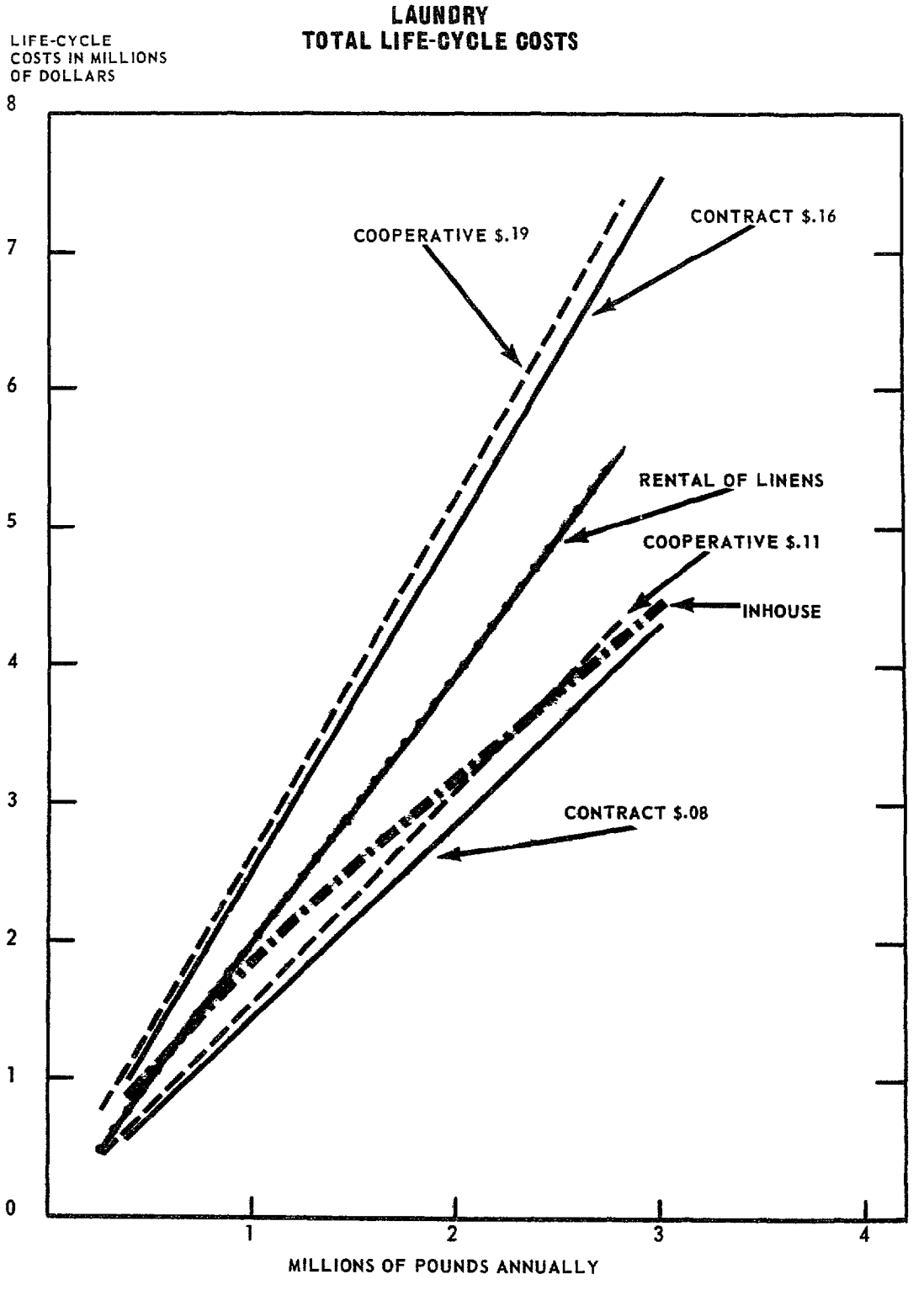
3. Rental of linens. All linens and laundry services are provided by a commercial laundry.

4. Cooperative. A laundry service is owned and operated by a group of hospitals.

The decision of which of the four alternatives is the most cost effective must be determined for each facility primarily on the basis of the cost per pound for laundry services. Operating costs varied widely for the hospitals in our study which used cooperative and contract laundry systems. We found that hospitals with contract systems were charged between 8 and 16 cents per pound of processed laundry and hospitals with cooperative systems were charged between 11 and 19 cents per pound. Therefore for these systems we performed separate life-cycle cost analyses for each of these operating cost ranges. The operating costs for hospitals we visited which had rental of linen laundry systems varied only between 12 and 13 cents per pound of processed laundry. Because of the small variance in rental costs, separate life-cycle cost analyses were not performed for each of these operating costs.

Our life-cycle analysis of all cost elements of the alternative laundry systems showed that initial costs for inhouse laundry systems are greater than for the alternative laundry systems. Depending upon costs per pound charged by commercial and cooperative firms, however, life-cycle costs of an inhouse laundry system may be more or

less than the alternative systems. The graph below shows the results of our comparative analysis of all cost elements.



In addition to quantifiable cost considerations, several other factors must be considered in evaluating laundry systems. These factors include the availability of a commercial or cooperative laundry facility which can provide prompt, dependable service and which can handle the required workload. (See pp. 145 to 153, enc. B, for additional details.)

Clinical laboratory

The hospital clinical laboratory is responsible for performing tests on body fluids and tissues and submitting results to the requesting physician. Our consultant formulated general guidelines for estimating the amount and type of personnel, space, and equipment needed in the chemistry and hematology sections of the clinical laboratory. (See pp. 155 to 160, enc. B, for additional details.)

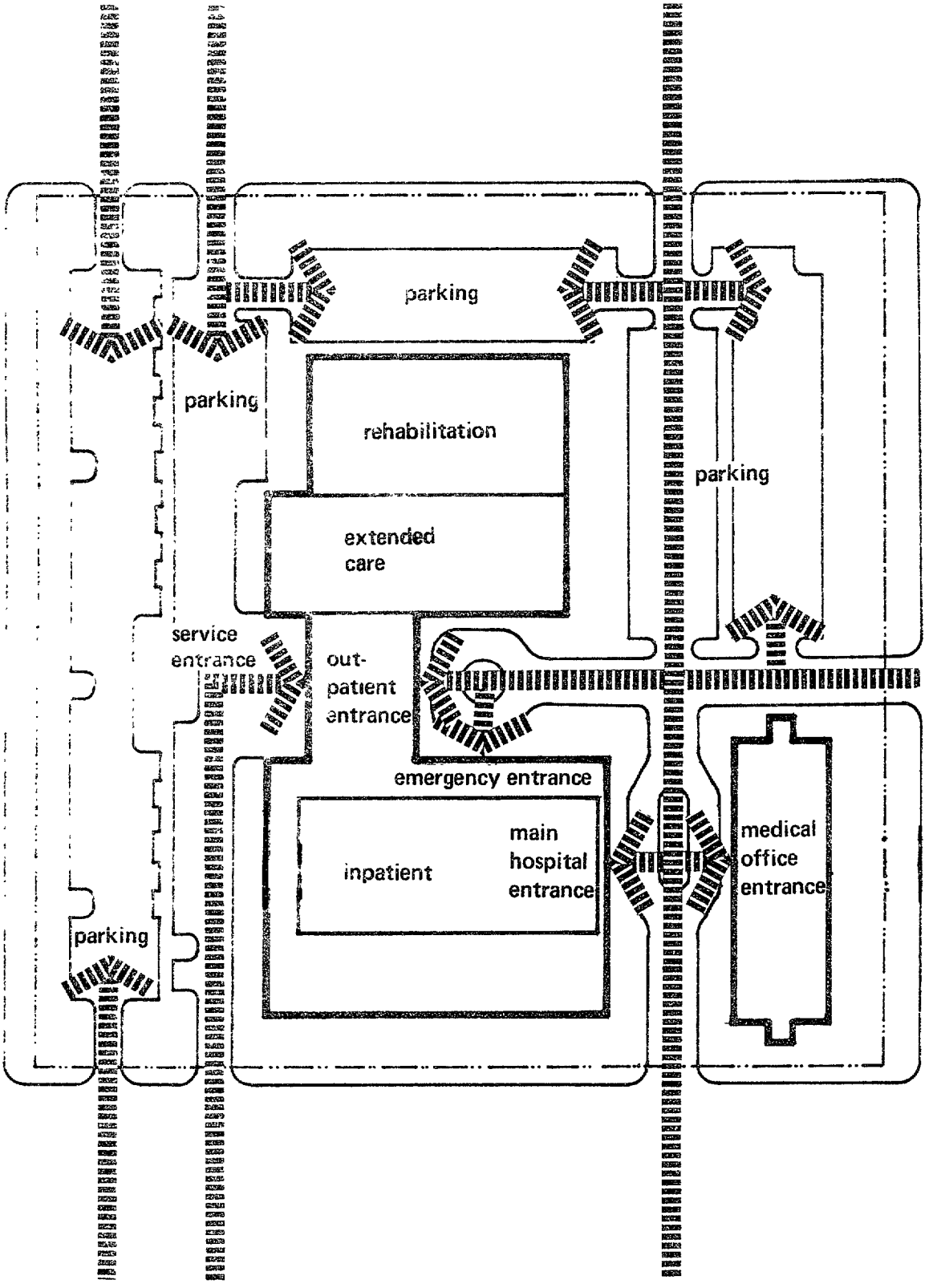
APPLICATION OF SELECTED INNOVATIONS TO A RECENTLY CONSTRUCTED HEALTH CARE FACILITY

We selected a recently opened hospital (reference hospital), constructed with assistance provided under the Public Health Service Act, to demonstrate the effect that certain innovations would have on initial construction and life-cycle operating costs. The primary objective of the demonstration was to synthesize a near optimal health care facility (improved hospital) incorporating selected innovations into the reference hospital and demonstrating the effect of each innovation on initial and life-cycle costs. Westinghouse and its subcontractors were given primary responsibility for this demonstration. The results of the analysis are summarized below and explained in more detail in chapter 5 of enclosure B. The complete Westinghouse report is included as an appendix to enclosure B.

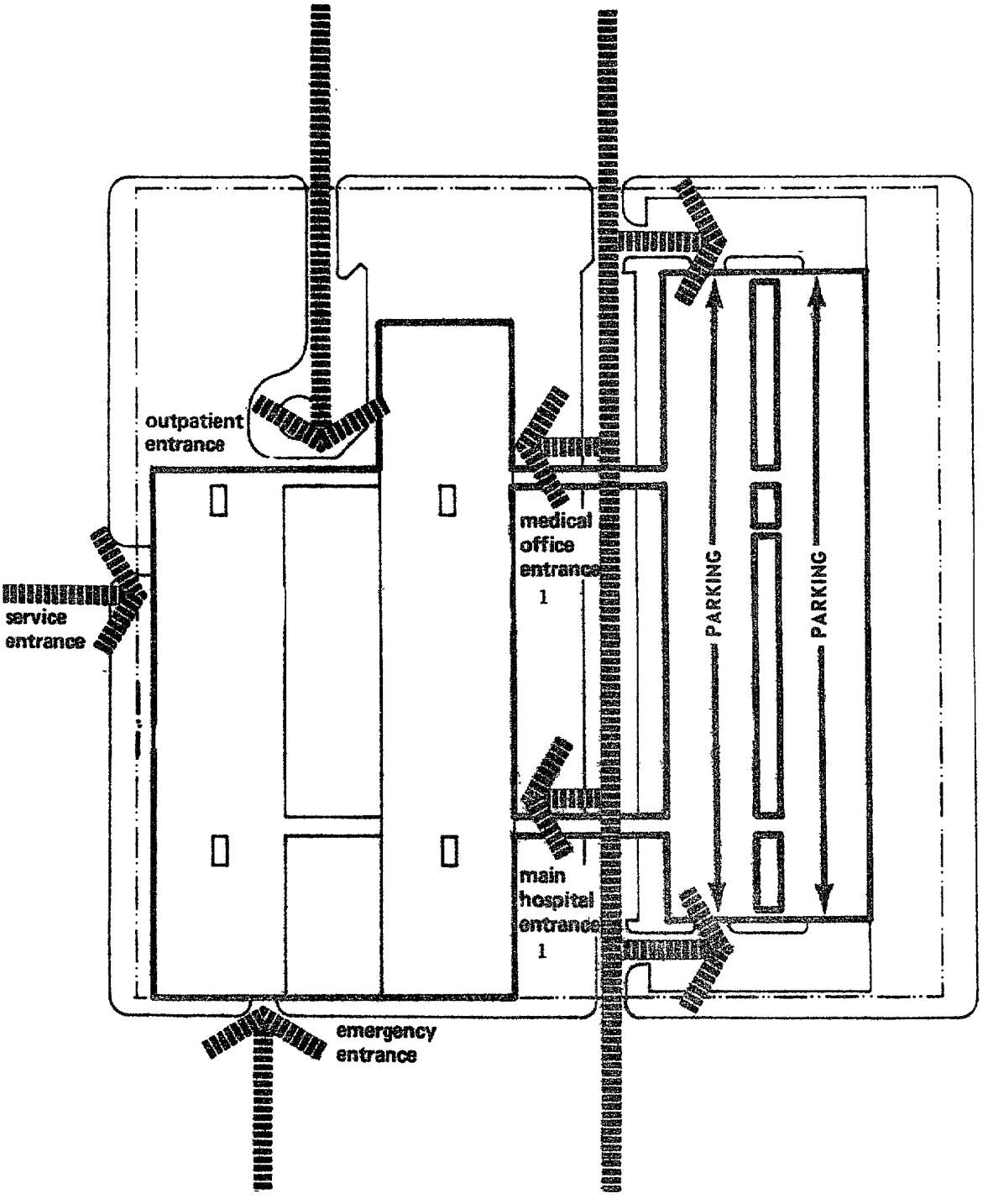
Westinghouse, using the planning criteria of the reference hospital as a base, applied the latest planning, construction, operating systems, and life-cycle analysis techniques to determine how initial construction costs and life-cycle costs could be reduced. For purposes of the analysis, a 25-year lifespan was selected. The analysis was performed using various inflation and discount rates. The savings in initial and life-cycle costs discussed below were computed using an inflation rate of 2-1/2 percent and a discount rate of 7-1/2 percent, except for savings relating to the construction alternatives which were computed using an inflation rate of 6 percent.

Our consultants decided, with our concurrence, to exclude funding and financial constraints, which can affect hospital construction, in the improved hospital. The consultant decided on a major redesign of the reference hospital to optimize functional efficiency. Basically all of the functions previously housed in four separate buildings were incorporated into one building. The reference facility originally considered a similar functional design which was rejected because of the uncertainty of Federal financial support, thus resulting in a more costly facility. The existing hospital site plan and the improved hospital site plan are shown on pages 80 and 81.

REFERENCE HOSPITAL SITE PLAN



IMPROVED HOSPITAL SITE PLAN



[1] Rehabilitation and extended care facilities may be entered through the medical office and main hospital entrances.

SYSTEMS ANALYZED

As a result of the redesign and incorporation of the selected alternatives, the initial hospital construction cost of the improved hospital was as much as 8.6 percent, or $1,544,200, lower than that of the reference hospital. Incorporation of the selected alternatives, however, resulted in an increase in equipment cost of $29,900 and a net reduction of $1,514,300 in the initial costs of construction and equipment. The incorporation of the improvement alternatives into the improved hospital with interstitial space over the diagnostic/treatment area resulted in a total life-cycle savings of as much as $10,368,800.

The systems currently in use at the reference hospital, the systems considered, and the systems selected for the improved hospital are discussed below. The schedule on page 86 summarizes the results of these comparisons.

The results reflect the maximum savings estimated by Westinghouse and do not necessarily agree with the results of the preceding general life-cycle analyses because the general analyses (1) represent average hospital costs which include a combination of geographic and operating distinctions and (2) do not consider the interactions of improvement alternatives with other systems analyzed.

Dietary

The dietary system in use at the reference hospital was a conventional system. This system and three alternative dietary systems--ready foods, total use of convenience foods, and convenience foods plus abbreviated kitchen--were evaluated. On the basis of the life-cycle cost analysis, a total convenience food system was chosen for the improved hospital.

Pharmacy

The pharmacy system in use at the reference hospital was a mechanical dispensing system. This system and two alternative pharmacy systems--the ward stock prescription system and the unit dose system--were evaluated. On the basis of the results of the life-cycle analysis, the recommended pharmacy system for the improved hospital was the unit dose system.

Waste disposal

The reference hospital's system of waste removal was pulping. This system and four alternative waste disposal systems--unprocessed, compacting, shredding, and high intensity incineration--were evaluated. On the basis of the life-cycle analysis, the recommended alternative for the improved hospital was the compacting system.

Radiology

The radiology units at the reference hospital were powered separately. The cost effectiveness of powering two radiology rooms with one generator and set of controls was evaluated. On the basis of the life-cycle analysis, the technique of powering two radiology rooms with one generator was recommended in the improved hospital.

Laundry

An inhouse laundry system was used at the reference hospital. This system and three alternative laundry systems--contract, rental, and shared services (cooperative)--were evaluated. On the basis of the life-cycle cost analysis, the inhouse laundry method was recommended for the improved hospital.

Material handling

The reference hospital's material handling system was basically a manual system, although automation was used to some extent in the pharmacy, central services, and laundry departments. The manual and five alternative systems--manual with exchange carts, manual with automated dumbwaiters, manual with pneumatic handling of soiled linen and trash, manual with pneumatic handling of soiled linen and trash and dumbwaiter, and a chain driven monorail--were evaluated. The manual system with pneumatic handling of soiled linen and trash was recommended, on the basis of the life-cycle analysis, for the improved hospital.

Clinical laboratory

The clinical laboratory at the reference hospital was a highly automated department. The present equipment is the

best available for the reference hospital's diagnostic and operation workload. The laboratory staff should be reduced, according to the analysis, by one full-time laboratory technician for a total of 14 full-time equivalent personnel in the two sections of the laboratory analyzed. These 14 personnel should be able to handle a greater workload than was currently being handled by the 15 personnel in the reference hospital.

Outpatient surgery

The reference hospital performs come-and-go surgery similar to that performed in a physician's office. The study considered whether greater use could be made of outpatient surgery. A review of the type of surgical procedures being performed on an inpatient basis showed that a substantial number of such procedures could be done on an outpatient basis. According to the life-cycle analysis, the use of outpatient surgery in the improved hospital is recommended whenever possible.

Floor covering

The reference hospital uses six different types of floor covering. Five alternative floor coverings--sheet vinyl, vinyl-asbestos tile, carpeting, ceramic tile, and terrazzo--were evaluated. Vinyl-asbestos tile was recommended, on the basis of the life-cycle analysis, as the primary flooring material for the improved hospital.

Construction

The reference hospital as designed and constructed included four separate buildings--an acute hospital (259 beds); an extended care unit (128 beds); a rehabilitation unit (38 beds); and a doctors' office building--using a combination of concrete and steel framing.

Our consultants designed a structural system for the improved hospital similar to that in the reference hospital, using conventional steel framing. A preliminary evaluation of a concrete structural system showed that this system was more expensive and offered no greater flexibility than steel construction.

Once the facility was redesigned, interstitial space/long span construction was evaluated over three levels--diagnostic/treatment zone only, between alternate floors, and over every floor. The analysis showed that interstitial space/long span construction over the diagnostic/treatment zone was cost effective and was recommended for the improved hospital.

Comparison of Improvement Alternatives
Reference and Improved Hospitals

Subsystem	Initial facility cost	Initial facility cost savings	Initial equipment cost	Initial equipment cost savings	Total investment initially	Initial investment savings	25-year life-cycle cost	Life-cycle savings
Operations:								
Dietary		$ 206,600		$ 16,800		$ 223,400		$ 5,540,000
Reference	$ 736,200		$209,200		$ 945,400		$23,130,000	
Improved	529,600		192,400		722,000		17,590,000	
Pharmacy		-7,600		78,100		70,500		1,060,000
Reference	135,200		94,100		229,300		9,100,000	
Improved	142,800		16,000		158,800		8,040,000	
Waste disposal		1,000		48,000		49,000		152,000
Reference	1,700		62,000		63,700		456,000	
Improved	700		14,000		14,700		304,000	
Radiology				18,000		18,000		52,200
Reference			150,000		150,000		414,500	
Improved			132,000		132,000		362,300	
Laundry		-		-		-		-
Reference	315,000		170,000		485,000		3,305,000	
Improved	315,000		170,000		485,000		3,305,000	
Material handling		-6,400		-191,000		-197,400		104,000
Reference	36,500		107,000		143,500		1,209,000	
Improved	42,900		298,000		340,900		1,105,000	
Clinical laboratory		-		-		-		174,800
Reference	439,300		167,500		606,800		3,441,000	
Improved	439,300		167,500		606,800		3,266,200	
Outpatient surgery								93,900
Reference							93,900	
Improved							-	
Subtotal		193,600		-30,100		163,500		7,176,900
Reference	1,663,900		959,800		2,623,700		41,149,400	
Improved	1,470,300		989,900		2,460,200		33,972,500	
Materials:								
Flooring		203,600		200		203,800		150,100
Reference	368,000		1,400		396,400		1,064,200	
Improved	164,400		1,200		165,600		914,100	
Subtotal		397,200		-29,900		367,300		7,327,000
Reference	2,031,900		961,200		2,993,100		42,213,600	
Improved	1,634,700		991,100		2,625,800		34,886,600	
Construction:								
Reference	17,900,000	1,147,000		-	17,900,000	1,147,000	28,867,600	3,041,800
Improved[a]	16,753,000			-	16,753,000		25,825,800	
Total savings		$1,544,200		$ -29,900		$1,514,300		$10,368,800

[a] Includes $1,201,000 for interstitial space over diagnostic/treatment area.

OTHER EVALUATIONS

Westinghouse also evaluated, in addition to the systems discussed above, the use of computer assisted layouts, all private rooms, improved planning, and fast-track scheduling. These improvement alternatives were not included in computing the total initial investment or life-cycle savings of the reference and improved hospitals, as shown on page 86.

Computer assisted layouts

Computer assisted layouts were used to assist the consultants in modeling an improved hospital with a functionally efficient layout based upon actual hospital flows. Computer assisted layouts were used to perform functional efficiency analyses of both the reference and improved hospitals' layouts to:

--Measure the functional efficiency of the reference hospital as a base line for comparison.

--Determine the improvement in functional efficiency which would result from the improved configuration.

The computer-assisted layout analysis resulted in an 8 percent improvement in functional efficiency over the reference hospital. The 8 percent improvement resulted primarily from the following.

--A more efficient vertical circulation system.

--The integration of medical offices and nursing units.

--The integration of acute care, extended care, and rehabilitation nursing units.

--Reduced distances between functional zones.

All private rooms

The use of all private patient rooms could not be cost justified. The cost of constructing all private rooms was about $2 million greater than the conventional mix. Life-cycle cost savings resulting from a reduction in patient

transfers were about $1 million and therefore could not justify this additional cost.

Improved planning

The potential savings that could be realized if improved planning concepts were applied to the reference facility were also evaluated. The use of demand projections, demographic analysis, and better scheduling of patients indicated that the number of beds could have been reduced and still would have fulfilled the hospital's mission.

Fast-track scheduling

Fast-track scheduling of design and construction and use of interstitial space would have permitted the hospital to open 15 months earlier. The earlier project completion would have decreased initial construction costs by $240,000.

OBSERVATIONS, CONCLUSIONS, AND RECOMMENDATIONS

Observations

We noted that, although HEW recognized the importance of life-cycle operating costs, existing Hill-Burton regulations do not require applicants for grant funding to perform life-cycle cost analyses. Generally, existing regulations pertaining to the physical plant relate only to such items as the competitive selection of a contractor and of building and equipment standards. The effect of not requiring life-cycle cost analyses may be the construction of less economical health care facilities than could be constructed if adequate life-cycle information were available.

The health profession has been concerned recently with the need for a central repository of information which would enable hospital administrators, consultants, planners, and architects to consider the life-cycle operating costs of alternative construction techniques, materials, designs, and operating systems. A recently completed study sponsored by the American Institute of Architects recommended the establishment of an independent research-oriented organization whose primary purpose would be developing and promoting research toward improved facility environments for all health activities. Among the areas proposed for study were numerous hospital areas having life-cycle cost implications, including material handling, laundry systems, and interstitial space.

A recently initiated study sponsored by the Facilities Engineering and Construction Agency, HEW, also involves an evaluation of the health facilities building process. The objectives of the study are to investigate and evaluate the existing process for acquiring health facilities, including life-cycle costing, and to recommend changes or new processes. HEW has deferred certain work on the life-cycle phase of its study, pending receipt of our report, to take maximum advantage of the information contained in it.

Conclusions

We believe that the results of our study demonstrate that potential exists to achieve significant life-cycle savings in construction of health facilities and that life-cycle cost analysis is essential in the planning and design of all hospital construction projects. Health facility planners also must consider many other factors when evaluating hospital system alternatives. These factors vary with the alternative being evaluated but may include such things as patient care, environmental considerations, availability of a competent labor force, flexibility to change, and interactions of improvement alternatives with other hospital systems. Hospital management may find that these factors dictate the type of system to be used and override any potential life-cycle savings of an alternative system.

Because of the impact reduced life-cycle costs could have on the cost of health care, we believe that it would be appropriate for HEW to establish a base of life-cycle data for use by all health facility planners. We believe that a central repository of life-cycle operating data on innovative construction techniques and materials in health care facility construction, design, and operation should be established within FECA, HEW. This agency was established to consolidate architectural/engineering guidance and support for all HEW construction programs, both federally assisted and direct Federal.

We believe this repository should contain the appropriate life-cycle data to (1) apprise health facility planners of the latest developments in construction techniques, materials, designs, and operating systems and (2) provide a data base which could be useful to health facility planners in making decisions on available alternatives.

We believe that such data should be made available to health facility planners early in the planning stages of a health care facility and that planners should be provided general life-cycle cost data which shows the alternative systems that are likely to be best suited for the proposed health facility size range and geographic location.

We believe that health facilities applying for funding under the Public Health Service Act should be required to justify the selection of any construction techniques, materials, designs, and operating systems which differ from those identified by FECA as having potential to reduce life-cycle operating costs.

Recommendations

We recommend that the Secretary of HEW establish within FECA the capacity to:

1. Establish a state-of-the-art data base on innovative construction techniques, materials, designs, and operating systems.

2. Develop the methodology for life-cycle cost analyses, including data collection methods and techniques.

3. Establish and maintain a central repository of life-cycle data which would show health care facility planners, by the proposed health care facility size and geographic location, the innovations which have a potential to reduce life-cycle operating costs.

We recommend further that health care facilities applying for funding under the Public Health Service Act be required to justify the use of construction techniques, materials, designs, and operating systems which differ from those identified by FECA as having a potential to provide significantly lower life-cycle costs.

We recommend also that, until HEW establishes a central repository of life-cycle operating data, HEW should encourage health facility planners to consider the information presented in this report, along with local operating conditions and costs, in identifying the alternatives for life-cycle analyses that are likely to be the most appropriate for inclusion in the facility.

Agency and other comments

The American Institute of Architects said that a life-cycle data base is an excellent concept and that it would be a major contribution to the important decisionmaking required during the planning and design phases of a health care facility. They expressed concern, however, that the requirement to justify departures from the data base would reduce the potential of broadening the base, thus impairing its usefulness.

We believe that a life-cycle data base would be useful in promoting innovation by making health facility planners aware of the improvement alternatives which offer the greatest potential to reduce life-cycle costs. Proper implementation of the data base would include maintaining current information on innovative construction techniques, materials, designs, and operating systems. A proposal to HEW for health facility construction funds which includes an innovation not in the data base should be justified on a life-cycle basis by the applicant and evaluated by HEW for inclusion in the data base.

CHAPTER 4

MEANS BY WHICH CONSTRUCTION COSTS COULD BE REDUCED BY REDUCING DEMAND FOR HEALTH FACILITIES

This part of the study involved identifying and studying means by which health facility construction could be avoided either by reducing the demand for health care facilities or by increasing the productivity of existing facilities. We primarily studied matters affecting the need to construct acute care hospitals. We also considered matters affecting demand for nonacute facilities, such as skilled nursing homes, particularly shifting emphasis from acute hospitals to other types of health care facilities. Means selected for study were:

--Preventive medicine programs for the prevention or early detection of illness or injuries.

--Treatment of patients in the most appropriate, least costly facilities to avoid misuse of expensive facilities.

--Alternative medical care delivery systems that result in less use of hospitals.

--Utilization review programs to insure that admissions and lengths of stay are held to the minimum and are dictated by medical necessity.

--Insurance benefit structures and other provisions that affect hospital use.

--Sharing of hospital services to free existing underused facilities for other purposes.

--Regional hospital systems that attempt to use existing facilities more efficiently.

In addition we inquired into the role and success of local and areawide health planning agencies in insuring that the construction of health facilities was consistent with community needs.

For each means studied we attempted to (1) assess its gross impact on demand or productivity, (2) identify problems inhibiting its application, (3) provide examples of institutions that have successfully overcome these problems, and (4) make recommendations which, if implemented, should reduce the need for construction of health facilities by changing existing demand patterns or operating practices. We did not make a cost effectiveness analysis for each means studied.

The level of demand for health care facilities discussed in this study pertains mainly to patterns of recent use. However, future demand may increase significantly if pending legislative proposals involving health care, such as those providing for programs of national health insurance, are enacted. In this event, because costs to construct and operate health facilities are rising, the importance of finding ways to more efficiently use existing facilities and reduce demand for additional facilities would take on added significance.

We sought to measure the effect on construction demand in terms of admissions, lengths of stay, and occupancy rates as related to bed requirements. We did not adjust our estimates of reductions in bed requirements attributable to each means studied to account for reductions caused by related means. For example, alternative medical care delivery systems emphasize preventive medicine and utilization review; we did not attempt to adjust the decrease in demand attributable to delivery systems for the overlapping decreases attributable to these means.

In assessing each means' potential, problems, and successful examples, we researched the medical literature in detail and contacted numerous representatives of hospitals and other types of health facilities; national health organizations, such as the American Hospital Association (AHA) and the American Medical Association (AMA); Federal, State, and local government agencies; local and areawide health planning agencies; medical care delivery organizations; health insurance organizations; labor union welfare funds; and health research organizations. We performed numerous analyses of health statistical data provided to us or tabulated from the records of the organizations providing us with assistance.

PREVENTIVE MEDICINE

The strategy of preventive medicine is to preclude illness or injury, to intervene as early as possible to alter its course, and to halt or delay its passage to a more critical stage. It is difficult to obtain acceptance from the general public for many preventive measures, even though some programs have been widely publicized, have achieved dramatic results in many cases, and have what appears to be considerable potential for further reducing illness and injury and the resultant demands placed on health care services and facilities.

The present system of health care is not geared toward prevention, and the vast bulk of its personnel, services,and facilities are there to treat illness and injury after it occurs. The emphasis on curative treatment is indicated by health care expenditures, medical education, insurance incentives, and socioeconomic conditions which tend not to encourage preventive care.

Prevention has been emphasized, and has been quite successful in the fight against communicable disease, but it has been less successful in controlling chronic illness and injuries. Polio and tuberculosis are outstanding examples of successes achieved in preventing and treating communicable diseases; hospitalization in tuberculosis hospitals has decreased dramatically. Hospital infections exemplify the communicable diseases not yet effectively controlled. These infections increase the average length of stay of those affected by an estimated 2 to 4 days, amounting to 1.8 million to 3.6 million extra days of hospital care annually--the equivalent of about 5,000 to 10,000 hospital beds.

Heart disease, stroke, and cancer are major chronic diseases, accounting for more than 27 percent of the use of all general hospital beds. In 1970 victims of these diseases spent about 72 million days in hospitals, utilizing nearly 200,000 beds. The life-styles of individuals have a major impact on the risk of contracting these diseases. Notwithstanding efforts by the medical profession, health organizations, and the Government, many individuals continue to engage in practices, such as smoking and overeating, which are detrimental to their health.

Wiser and greater use of techniques to detect diseases or abnormal conditions early also would reduce the length or incidence of hospitalization. For example, if more women took the PAP test annually to permit early detection of cancer of the uterus, the treatment time and, more importantly, the death rate from uterine cancer could be greatly reduced.

Accidents continue to have a significant impact on health services and facilities. Over 2 million people are hospitalized annually for injuries, requiring an equivalent of 6,000 beds. By more responsible individual action, many of these injuries could be avoided. For example, the incidence of automobile accidents, which continues to rise, now accounts for a majority of the accidental deaths; the use of alcoholic beverages is involved in half of the fatal accidents; surveys show that only a minority of the automobile-riding public properly uses seat belts, shoulder harnesses, and head restraints.

The importance of preventive efforts gaining greater attention and acceptance than they have in the past takes on increasing significance as more individuals are either provided access to or strive to obtain adequate health care. Unless such attention and acceptance is forthcoming, the present delivery system, which emphasizes treatment and not prevention, probably will become overburdened and will not be able to meet these demands.

Most preventive measures require an acceptance by individuals to be effective, and it is therefore highly important that more persons obtain a specific understanding of and utilize measures designed to prevent disease and injury. It is equally important that the private and public agencies involved in promoting health and safety continue their efforts to educate and persuade the public to adopt better health practices. We believe that the primary preventive measures for controlling heart disease and stroke, outlined on pages 12 and 13 of enclosure C of our report and recommended by the Inter-Society Commission for Heart Disease Resources, are the types of actions which are needed to increase the effectiveness of preventive medicine programs.

Hospitals also need to make a concerted effort to prevent extended patient stays caused by infections contracted while hospitalized. Expanded health insurance coverage for preventive care would provide persons a greater incentive to use these services. (See pp. 97 to 112, enc. C, for additional details on health insurance incentives and pp. 3 to 24, enc. C, for additional details on preventive medicine.)

CARE IN THE APPROPRIATE FACILITY

There is a consensus among health care authorities that an estimated 25 percent of the patient population is treated in facilities excessive to their needs. This is due to the health care system being oriented toward treating the acute phase of illness rather than offering a complete spectrum of health care by providing available alternatives to acute care, financing the alternatives, and educating physicians and patients in the acceptance of alternatives.

An HEW cost effectiveness analysis, completed in 1968, projected that a better matching of hospital patient needs with facilities' services could result in 81.7 million short-term general hospital days being transferred to alternative health facilities. This would have resulted in savings of about $3 billion in 1970 health system operating costs. The analysis also concluded that a reduction by 1 day in lengths of stay could save 28 million short-term hospital days, or the equivalent of about 96,000 beds.

The cost of building, equipping, and maintaining a modern hospital has become so great that it is no longer economical to use an acute hospital for convalescent care, treatment of chronic illness, or custodial care. Each community and health facility is responsible for developing a comprehensive and balanced range of services and facilities accessible to all. The hospital, the extended care facility (ECF), the skilled nursing home, the individual patient's home, and ambulatory outpatient facilities constitute important facilities in the continuum of patient care in a community. Appropriateness of medical care depends on using the right facility for the right patient at the right time.

The economic importance of patients being provided care in the appropriate facility is evident by comparing the costs of constructing and operating the various types of facilities. For example, the cost to construct a general acute hospital bed ranges between $14,000 and $72,000, depending upon size, complexity of service, and location; a recent national study showed the average cost per bed was about $50,000. The cost of a nursing home bed has been estimated to be about $25,000. In 1970 the average expense per patient day was $81 in an

acute general hospital, $24 in an extended care facility, and even less in a nursing home or in the patient's home.

We found that home care programs have grown slowly and that health authorities consider long-term care programs to be a neglected and underdeveloped program area. An HEW cost effectiveness analysis highlighted the importance of these programs gaining greater prominence and use. HEW reported that in 1970 about 5.8 million hospital days, equivalent to about 20,000 beds, could have been saved through effective home care programs and about 17 percent of the acute short-term general hospital patient days could have been handled in various long-term care facilities. This would have saved about 37 million patient days of acute care, which we estimated would reduce the need for about 126,000 acute beds.

Appropriate use of ambulatory care facilities, when personal health care services not requiring an overnight stay are rendered, also results in more efficient use of inpatient facilities and thereby reduces the need for these facilities. For example, patients receiving care in neighborhood health centers are less frequently admitted to hospitals than persons not using the centers. Performance of preadmission laboratory tests in outpatient departments has reduced hospital inpatient stays by 1 to 2 days. Surgical procedures performed in ambulatory surgical centers also have saved 1 to 2 patient days; one hospital projected annual savings of 18,000 acute beds nationally as a result of its experience with the ambulatory surgical facility. Our analysis tended to confirm this estimate. Available information indicates that these techniques or facilities are greatly underused.

The extent of the use of alternatives to acute care has been restricted for numerous reasons, but important among these has been the lack of insurance coverage. A report of the National Advisory Commission on Health Manpower disclosed that health insurance coverage is generally limited to those expenses incurred by a patient when he is hospitalized. This has encouraged the use of a hospital in situations where outpatient care would be just as appropriate. Lack of adequate health insurance coverage also seems to be a primary factor retarding acceptance of home care programs.

Complex Medicare regulations governing the extended care benefits, lack of understanding of Medicare's limited nature, and the tendency to view it as a general nursing home benefit have resulted in large numbers of claims being denied retroactively. Such denials discourage the use of ECFs. Also Medicare does not cover care in a free-standing ambulatory surgical facility, apparently because it does not qualify as a health provider as defined by law. However, the Congress passed legislation in October 1972 allowing HEW to study such facilities and, if warranted, to determine the best method of reimbursing such facilities under Medicare.

The use of neighborhood health care centers to provide health care has been limited because they have been largely restricted to the poor within a specified geographic area. Hospitals and physicians have generally resisted implementing ambulatory surgical and preadmission testing concepts, even though some hospitals and physicians have successfully applied these concepts. The resistance, in part, appears to be simply related to a reluctance to change from old to new methods of care. Other factors inhibiting the use of these concepts include (1) hospitals with low inpatient occupancy rates resisting ambulatory, medical, and surgical services, (2) physicians being concerned about the currency of preadmission tests and hospitals being reluctant to accept tests from outside sources, and (3) some physicians not being oriented to the use of ambulatory surgical facilities and others expressing concern over greater malpractice risks when using these facilities.

A serious shortage of quality facilities has hindered greater use of long-term care facilities. For example, the Public Health Service estimated as of January 1969 that about 175,000 long-term care beds needed to be added to the national inventory and that 40 percent of the Nation's non-Federal long-term care facilities, including skilled nursing homes, needed modernizing. Health care authorities believe that licensure and enforcement of minimum standards for licensure are needed to control and upgrade the quality of facilities. Also physicians often lack knowledge about the availability of facilities and services.

In summary, health care programs should be concerned about the quality, availability, accessibility, adequacy, effectiveness, and economic use of the health care services. Many people are not being cared for in appropriate types of facilities because of undue emphasis on acute inpatient care, inadequate alternative facilities, services and reimbursement mechanisms, and physician and patient reluctance to make use of available alternatives. Because of these circumstances, medical care costs are considerably greater than they would be if the various types of health facilities were appropriately used. (See pp. 25 to 73, enc. C, for additional details.)

HEALTH CARE DELIVERY SYSTEMS

Medical care delivery systems emphasizing control, coordination, and systematic continuity of care have evolved from the traditional solo physician, fee-for-service method of delivery and are being used on a limited basis. These systems include prepaid group practice plans, foundations for medical care, and health maintenance organizations. These organizations generally use at least 20 percent fewer hospital days per 1,000 patients than the traditional delivery system. A 20-percent reduction in the need for existing beds for the American Hospital Association-registered short-term hospitals would mean 190,000 beds would be available to meet future bed needs. A national study of construction costs reported that the average cost per bed in the patient care area in February 1971 was about $15,000. At $15,000 per patient bed area, use of 190,000 beds to meet future bed needs would make the expenditure of $2.85 billion unnecessary. It is unlikely that all 190,000 beds could be available because of facilities distribution problems and the improbability of providing these alternative medical care delivery systems to the entire population. However, this gross estimate does point out that wider use of delivery systems other than the traditional system may offer significant savings.

Although striking technological advances have been made under our present pluralistic medical care delivery system, the system has been criticized for lack of control and coordination. The majority of physicians conduct solo fee-for-service practices, and their level of compensation is directly related to the amount of services provided. Hospitals are generally independent of each other, independent of other service providers, and free of any central control. Virtually no economic competition exists among hospitals, and the investment risk has been reduced by the insurance reimbursement method which, in general, insures recovery of reasonable costs.

Some of these problems have been effectively overcome by prepaid group practices. This is a medical care delivery system which accepts responsibility for the organization, financing, and delivery of health care services for a fixed per capita sum for each subscriber. Physicians are

generally compensated by a means other than fee-for-service. The medical group has an economic incentive to deliver the most appropriate and least costly services.

We estimated that early in 1972, 27 operational community prepaid group plans were serving a membership of 3.4 million. At the end of 1968, 101 employer-employee-union group practice plans were serving a membership of 1.6 million and 11 private prepaid group medical clinics were serving about 150,000.

Various studies have shown that prepaid group practice members compared with traditional insurance plan members (1) have substantially lower hospital use rates, generally at least 20 percent less, (2) have lower surgery rates, and (3) compare favorably on other measures of health care.

In the past, prepaid group practice organizers have had to overcome (1) attempts by organized medicine to freeze out the plans on the basis that the plans did not provide free choice of physicians and (2) restrictive State laws governing the control or form of organizations offering medical care. Successful antitrust suits against county medical societies and a change in policy by the AMA to support the right of the individual to choose between alternative systems of medical care have lessened resistance by organized medicine. Federal law has been enacted to bypass State restrictions for insurers and reinsurers involved in the Federal Employees Health Benefits programs.

Another alternative for the delivery of medical care is the foundation for medical care. Foundations have been described as incorporating some of the attractive features of prepaid group practice with those of private medical practice. Foundations are based on (1) the member-patient's free choice of physicians and hospitals, (2) the fee-for-service concept, and (3) the local control of overuse and underuse of facilities and services through peer review. The functions of various foundations differ to some degree. Most foundations establish broad insurance standards of coverage which emphasize out-of-hospital care and other low-cost options. Cooperating health insurance carriers offer policies to the public covering the prescribed benefits. The participating doctors agree to accept reimbursement

from the insurers not exceeding specified maximums for each type of service. The foundations police the claims by using peer review. Some foundations, however, recommend, rather than require, broad insurance benefits. Others are primarily involved in developing peer review mechanisms for Government programs and do not sponsor commercial prepaid health insurance nor determine practitioners' fee schedules.

In February 1972, there were 46 foundations in 19 States, and 32 medical societies in 22 States were in the process of forming foundations or had expressed interest in forming them. The rapid growth in the number of foundations has been largely caused by (1) the growing concern of physician groups that solo, fee-for-service medicine is threatened and (2) the introduction of Federal legislation which would mandate implementation of peer review organizations for Federal programs.

An innovative peer review utilization control program being used by an increasing number of foundations is the Certified Hospital Admission Program (CHAP). CHAP provides for preadmission certification for a specific number of days on the basis of the admitting diagnosis and for length-of-stay monitoring. The certified length of stay is adjusted on the basis of medical necessity. Three foundations using CHAP programs have reported decreases in hospital utilization equivalent to 220 hospital beds. One foundation has reported decreases of 26 and 27 percent in hospital utilization rates under two programs.

To obtain further benefits of prepaid group practice and foundation medical care delivery systems, the Government has provided financial assistance to private and public health groups to establish health maintenance organizations (HMOs). HMOs insure the delivery of comprehensive health services for a prenegotiated fixed periodic payment. In fiscal year 1971 HEW awarded 53 grants totaling about $4.4 million and 14 contracts totaling about $2.2 million for HMO planning and development. In fiscal year 1972 HEW awarded 92 grants and contracts totaling about $15 million for HMO planning and development.

AHA, in August 1971, proposed a major reorganization of the medical care delivery system which would not only

try to take advantage of the economies of prepaid group practice but also increase the Federal participation in financing such a system and provide for a strong regulatory framework. It was proposed to the 92d Congress and was introduced as House Bill 14140. The reorganization would provide for a system of health care corporations. AMA has not supported AHA's proposal but favors instead a private medical and health insurance system, a pluralistic delivery system free from centralized controls and regulations, and a voluntary approach to health care planning at the community level. (See pp. 75 to 90, enc. C, for additional details.)

UTILIZATION REVIEW

Utilization review is a segment of the all-inclusive term "peer review" and is concerned with insuring that services provided are necessary, appropriate, and of high quality. Utilization review today is widely used and is helping to optimize the utilization of hospitals and other health facilities. It has been most successfully applied by prepaid group practice plans and foundations for medical care and has contributed toward their record of using generally at least 20 percent fewer hospital days per 1,000 patients than other medical delivery systems.

Under the Medicare program hospitals are required to establish committees to review for Medicare patients the medical necessity of admissions, durations of stay, and professional services rendered. Of the Nation's approximately 7,600 hospitals, 6,716 were participating in the Medicare program as of March 31, 1972. In our report to the Congress entitled, "Improved Controls Needed over Extent of Care Provided by Hospitals and Other Facilities to Medicare Patients" (B-164031(4), July 30, 1971), we reported that utilization reviews served a useful purpose and helped to reduce unnecessary costs. We also reported many cases of noncompliance with the Medicare law and regulations pertaining to utilization review.

In our study we learned that foundations for medical care have been especially effective in developing techniques to insure that admissions and continued hospitalization are medically necessary. One technique involves comparing lengths of stay for patients treated for the same

illness. Recently the Social Security Administration developed a similar program applicable to Medicare patients with the hope that this program, called Medicare Analysis of Days of Care, would assist hospital committees to assess and improve their utilization review practices.

Patient length of stay is an important factor considered in conducting a utilization review. We noted that patients' lengths of stay for specific types of treatment vary from area to area, and there are indications that lengths of stay may be unnecessarily long in some areas because of less progressive medical customs and practices.

Accordingly, if not justifiable for sound medical reasons, the longer patient lengths of stay in those areas are resulting in higher medical costs and are contributing to the inefficient use of expensive facilities. (See pp. 91 to 96, enc. C, for additional details.)

HEALTH INSURANCE INCENTIVES

The benefit structure of private health insurance today emphasizes coverage of hospital care and of physicians' services associated with hospitalization. Although coverage of services not requiring hospitalization has increased substantially over the years, it is still much less extensive in terms of both the number of people with some coverage and the proportion of charges met by insurance. Other health insurance considerations affecting the use of hospitals include the benefit structure of Government programs, the extent of insurance coverage, cost sharing provisions, and overinsurance.

Many health authorities recommend the increased coverage of outpatient and out-of-hospital benefits to eliminate the incentive to use hospital inpatient beds. Their position is that in many instances patients use inpatient hospital services when they could use outpatient or out-of-hospital services because these other services are not covered. The late executive president of AHA stated that for such reasons as the insurance incentive to use hospitals, as many as 20 percent of expensive beds were often occupied by people who did not really need them. Studies to test the effect of additional insurance benefits on the use of inpatient hospital beds, however, have been very limited and inconclusive.

Insurance coverage of outpatient and out-of-hospital services has been increasing over the years as people become more cost conscious and seek additional coverage. The increased cost of even minor medical procedures and the push by labor unions for additional health benefits have been important motivating factors in the increased coverage. Notwithstanding this trend, a large number of people still lack this coverage because they cannot afford it or are hesitant to spend more money on health insurance although their out-of-pocket costs might be reduced. A representative of the Health Insurance Association of America informed us that the insurance purchaser decides what coverage is to be provided; if he wants additional coverage and is willing to pay for it, the benefits will be offered by the insurers. A Social Security Administration research report concluded that one reason for the lack of demand for additional coverage is that the general public is not fully aware of its health insurance needs.

Generally the benefit structures of Government-sponsored Medicare and Medicaid programs provide inpatient, outpatient, and out-of-hospital benefits. A possible feature favoring inpatient care is the Medicare requirement that a beneficiary, to be eligible for extended care facility and home care benefits, must have been a patient in a participating hospital for at least 3 successive days. According to HEW, extended care under Medicare is restricted because of statutory limitations on the level of care which is covered and the statutory requirement of a 3-day stay in an acute hospital before admission to an extended care facility. A Social Security Administration analysis of a sample of Medicare claims concluded that there is no evidence of general abuse of inpatient stays in order to qualify patients for ECF benefits. The Congress passed legislation in October 1972 allowing HEW to experiment with bypassing or modifying this requirement.

Medicare does not provide for payment for preventive medicine services. Medicare payments are authorized only for the diagnosis or treatment of illness or injury. Routine physical examinations, immunizations, and diagnostic tests not justified by patient symptoms are not covered.

Studies have shown that those who are insured use hospitals more than those who are uninsured and those with greater insurance coverage use hospitals more than those with lesser coverage. This experience points out the probable increase in demand which will result from future Government programs such as national health insurance.

The insurance industry has adopted practices designed to curb unnecessary use of health services and to prevent a person participating in more than one insurance program from making a profit on an illness. The first practice involves the use of deductible and coinsurance provisions, but studies on the effectiveness of this practice in curbing abuses are inconclusive. The effect of the second practice is better understood, and the likelihood of a person profiting from an illness has decreased as insurance companies have developed procedures for coordinating benefits payable under group policies. Companies have had less success, however, in coordinating benefits on individual policies.

One type of policy that can lead to overinsurance is the individual policy that provides fixed benefits per day or week of hospital confinement. Such policies can encourage prolongation of hospital stays, as they pay only when a patient is hospitalized and pay regardless of coverage under other private insurance or Medicare. (See pp. 97 to 111, enc. C, for additional details.)

SHARED SERVICES

The sharing of services among hospitals can free existing facilities for other purposes and is, therefore, an effective means by which demands for additional space can be met without constructing new facilities. By sharing services, existing resources also can be used more efficiently, and the average cost of patient care should decrease.

Standard hospital services that have been successfully shared and offer the most potential for additional sharing are obstetric, pediatric, and emergency services. More specialized services that can be similarly categorized are those involving open-heart surgery, radiation therapy, and renal dialysis. Of nonclinical services, laundry service shows the greatest potential for sharing from the standpoint of making space available for other purposes.

The potential for sharing obstetric services is accentuated by declining birth rates and shorter lengths of stay for newborns. Statistics compiled by the National Health Panel Survey show that, since 1963, births in hospitals generally have maintained a downward trend and, by the close of 1971, births had declined 11.9 percent. Lengths of stay in 1970 and 1971 for obstetrical patients were 4.2 days compared to 4.4 days in 1963.

In 1971 an average of only about 40 percent of the newborn beds were occupied, or 36,021 of the total of 89,420 beds. Assuming that the number of obstetric beds closely approximates the number of newborn beds and allowing for an occupancy rate of 70 percent, which some health planners consider to be a practical standard, a total of 51,459 obstetric beds instead of 89,420 beds were needed. This means that about 38,000 obstetric beds were underused in 1971. Labor and delivery rooms, of course, also were greatly underused during this period.

Probably all 38,000 beds would not have been available for other purposes because of unequal geographic distribution, but the above estimates highlight the importance of sharing obstetric services and using this space to meet demands for additional space. At an estimated construction cost of $15,000 per patient bed area, the 38,000 obstetric beds represent about $570 million in capital outlays.

The potential for sharing pediatric service and utilizing that space to provide other medical care is also significant. The Public Health Service estimated that in 1965 there were about 8,700 pediatric beds and, although more recent national data was unavailable, other current relevant statistics indicate use of pediatric services remains low. For example, the population under age 5, the single largest users of pediatric beds, decreased by 15 percent from 1960 to 1970. Planning agencies also have reported that, gauging by occupancy standards applicable in 1970 and 1971, hospital pediatric facilities are greatly underutilized.

Sharing hospital emergency services has been somewhat obscured by using these departments for treating nonemergency patients and by legislation in some States prohibiting hospitals from closing this service. One State is considering legislation to permit hospitals experiencing fewer than 5,000 emergency visits a year to close this service and share the facilities of other hospitals.

Using this standard to estimate the national potential for sharing, our analyses showed that of 6,200 hospitals reporting emergency visits in the 1970 AHA annual survey, 3,744 had less than 5,000 visits per year and these hospitals accounted for only 12.8 percent of the total emergency visits reported by all 6,200 hospitals.

The following statistics show the potential for sharing other services. Of the 416 hospitals equipped to perform open-heart procedures in 1969, 97 percent used these facilities less than four times a week, which is below the standard of four-to-six procedures a week set by the Inter-Society Commission for Heart Disease Resources. A 1971 AHA survey found 544 hospitals sharing laundry facilities and another 724 interested in sharing facilities.

Many hospitals have shared one or more of the above services, but others have not been able to overcome problems which have impeded establishing shared service agreements. These include reluctance of physicians to share hospital medical staff privileges, lack of economic incentives, desire of each hospital medical staff and administrator to provide and control a full range of medical services and facilities, and community pressures to have such services readily accessible.

Various actions being advocated by health authorities to increase the incidence of sharing services include (1) promoting and regulating services by areawide planning agencies, (2) setting and enforcing standards to eliminate or penalize submarginal service operations, (3) providing financial assistance to cover costs to effect sharing, and (4) developing regional hospital systems. (See pp. 113 to 124, enc. C, for additional details.)

REGIONAL SYSTEMS

Regional health care systems are a means of systematically organizing and managing all medical skills and facilities in specified geographic areas to enable the public, within the limits of available resources and without wasteful duplication of those resources, to obtain the quantity and quality of medical care needed. Authorities consider regional hospital systems to be an effective way of organizing and using scarce medical skills and facilities and of curbing rising costs, but communities, hospital officials, and physicans usually have resisted the development of such systems. Their resistance has been due in part to a desire to maintain autonomy in operations and to provide communities served with ready access to health services.

Because each hospital has largely gone its own way in development and operation, a complex, fragmented pattern of hospitals has evolved. Each hospital pursues its own objectives and tends to concentrate on the productive processes, rather than the distributive processes. This often results in duplicative effort because each hospital strives to meet all the needs of its patients, rather than all the hospitals in the community striving to collectively meet community needs. The existing system and emphasis would change considerably if a 1971 AHA proposal is implemented which calls for establishing a new nationwide system for delivering health services. (See p. 89.)

Other systems of organizing and using medical skills and facilities presently existing include branch or satellite hospital operations, multiple hospital units under single management, and vertically integrated systems in which centrally managed health facilities provide different types or levels of care. Although few, these systems have produced, or have the potential to produce, efficiencies of operation and economies in capital and operating costs, and they have made medical care available to persons to whom it otherwise may not have been readily accessible. (See pp. 125 to 132, enc. C, for additional details.)

HEALTH PLANNING AGENCIES

Local and areawide health planning agencies have an important role in the process of regulating health facility

construction and the expansion of services proposed by health institutions and others. Planning agencies have been instrumental in stopping proposals to expand health facilities and services beyond community needs and have reported to us that they were instrumental in preventing the wasteful expenditure of hundreds of millions of dollars in capital and operating costs. However, they also have reported that their efforts sometimes have proved unsuccessful and that large sums of money have been spent unnecessarily.

The inability of planning agencies to prevent the unnecessary expansion of health facilities and services is often attributed to a lack of authority on their part, or on the part of others, to control these activities and to the fact that their span of authority does not always extend to all types of health facilities. Information provided us by planning agencies throughout the country strongly indicates that additional authority is needed to prevent the continued establishment of unneeded health facilities and services.

AHA and other health authorities are urging the adoption of stronger controls, such as certificate of need legislation which 20 States recently have enacted. The HEW Task Force on Medicaid and Related Programs also recommended that all agencies involved in the financing of operating or capital costs of health care seek the counsel of planning agencies. Agencies cited included banks, savings and loan companies, and such nonfiscal groups as the American Institute of Architects. AMA supports areawide planning but advocates a voluntary approach to planning and voluntary acceptance and use of planning recommendations.

In October 1972 the Congress passed legislation authorizing HEW to withhold or reduce under Medicare, Medicaid, and Maternal and Child Health programs certain reimbursement amounts to providers of services and HMOs for depreciation and interest and, in the case of proprietary providers, a return on equity capital related to capital expenditures that are determined to be inconsistent with State or local health facility plans. Such capital expenditures include those (1) for plans and equipment which exceed $100,000, (2) which change the bed capacity of the institution, or (3) which substantially change the services provided by the institution.

Other important problems diminishing the planning agencies' role in regulating health facility construction include:

--Identifying facility needs. Less than 50 percent of the 163 health planning agencies responding to our inquiries about health facility needs provided data showing that they had knowledge of 1972 needs for various types of inpatient, extended, and ambulatory care facilities and beds.

--Preparing areawide health facility plans. Only about 20 percent of 128 planning agencies responding to our inquiries about areawide health facility master plans said that need assessments were set out in a master plan.

Because of limited financial and personnel resources, it is questionable whether many areawide health planning agencies presently possess the capability to perform these and other important functions, especially considering that their planning responsibilities encompass all facets of the health system and not just facilities. (See pp. 133 to 154, enc. C, for additional details.)

CONCLUSIONS

Our study showed that the demand for hospitals and, to a lesser extent, other health care facilities could be reduced and that, by more efficiently using existing facilities, millions of dollars in construction costs would not need to be spent. These results are attainable by (1) placing greater emphasis on preventive medicine practices, (2) making more appropriate use of various types of health care facilities, (3) increasing the use of more efficient and economical medical care delivery systems, (4) using more effective utilization review techniques, (5) changing health insurance incentives that emphasize inpatient care, (6) sharing more hospital services, (7) organizing more efficient and economical health care systems, and (8) strengthening the role and increasing the capabilities of areawide health planning agencies.

RECOMMENDATIONS

In view of the probable continuing high demand for health care services and the increased demand which may result from proposed Government programs such as national health insurance, implementation of the changes cited above could be instrumental in offsetting a surge in demand for hospital facilities and increased construction and medical care costs. Responsibility for implementing these changes rests with many governmental agencies, private health organizations, and medical personnel. Accordingly, we recommend that the Secretary of HEW seek their cooperation and take the leadership in the following areas.

--Placing more emphasis on preventive medicine and public health, giving particular emphasis to education for health professionals and paraprofessionals and to further reduction of the incidence of hospital-contracted infections.

--Developing for use by physicians, hospitals, and patients and their families specific current information about the availability of alternative health care services and facilities and the types of care provided by them.

--Publicizing (1) the kinds of care that can be obtained other than as a hospital inpatient and (2) the effect the use of different types of facilities would have on reducing medical costs and insurance premiums.

--Studying the geographic variations in lengths of stay for those types of diagnoses, such as normal delivery of newborns, whose variances are less explicable for medical reasons and more likely to be attributable to physician customs and traditions followed in different localities, and, as applicable and consistent with good medical practice, encouraging physicians, through utilization review committees, to adopt those practices which will result in reducing patient lengths of stay.

--Working with local and areawide health planners to establish minimum standards of use for obstetric and pediatric services with a view toward eliminating

unnecessary duplication of those services and to encourage public and private third-party payors not to reimburse hospitals that consistently fail to adhere to such standards.

--Working with local and areawide health planners to reorganize emergency services in communities served by two or more hospitals to eliminate duplicative facilities and services excessive to the needs of communities.

--Assessing the financial and personnel resources of areawide health planning agencies and taking appropriate actions, as necessary, to assist the agencies to increase these resources, particularly to improve their capability to determine health services and facility needs and develop and promote plans to fulfill those needs.

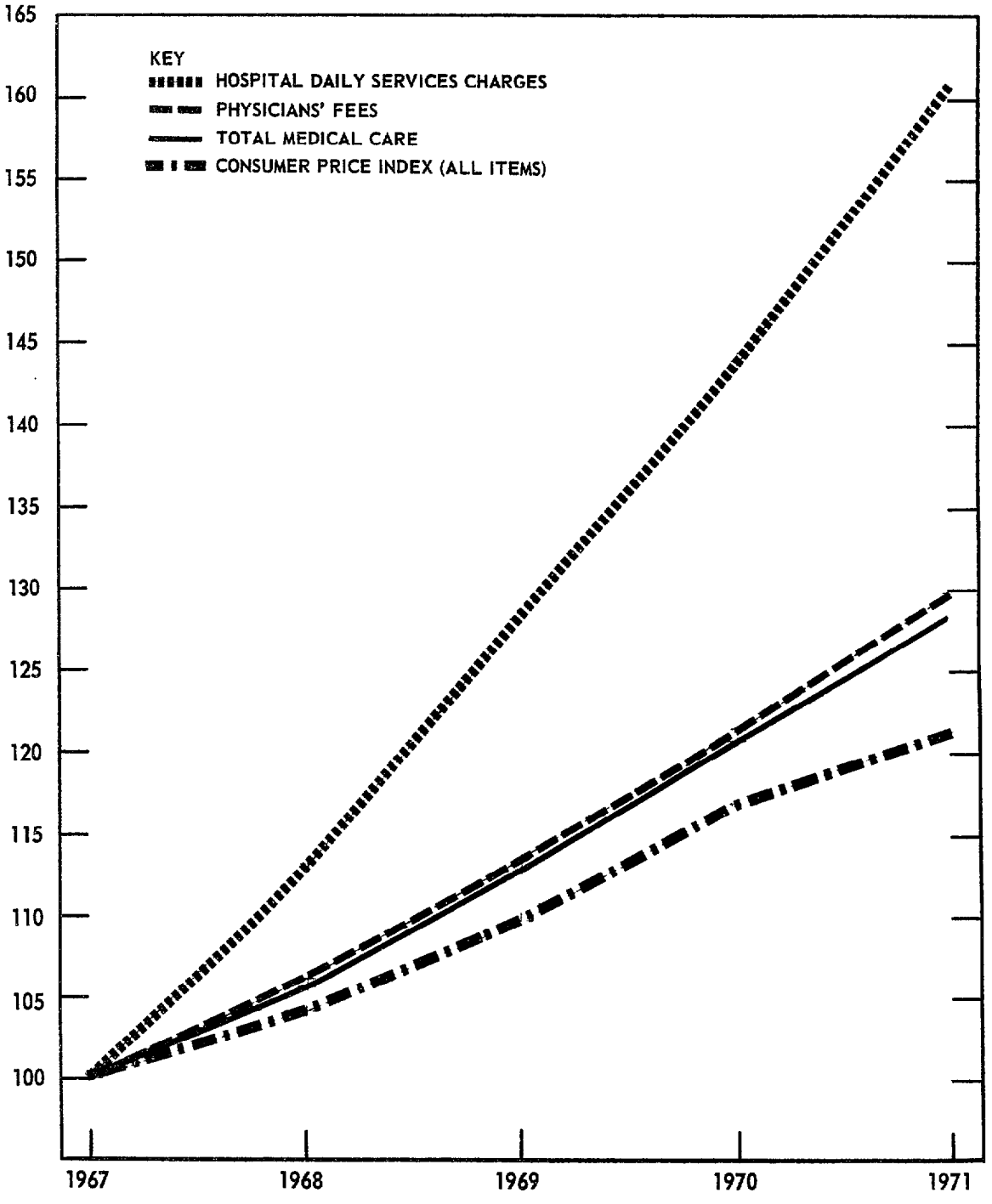
MATTERS FOR CONSIDERATION BY THE CONGRESS

Some health care providers have changed traditional health care demand and utilization patterns, decreasing the need to construct acute care and other types of health facilities. The economic benefits emanating from these changes and the means by which such changes have been effected, as discussed in this report, may be of particular interest to the Congress in its consideration of legislative health care proposals, such as those providing for the reorganization of the existing health care delivery system and for programs of national health insurance.

EXHIBITS

COMPARISON OF INCREASES IN MEDICAL CARE PRICES AND ALL ITEMS CONSUMER PRICE INDEX, 1967-1971

INDEX 1967=100; ANNUAL AVERAGES



SOURCE: DEPARTMENT OF LABOR, BUREAU OF LABOR STATISTICS

EXHIBIT B

FEDERALLY ASSISTED CONSTRUCTION PROGRAMS

FOR HEALTH FACILITIES AUTHORIZED BY

THE PUBLIC HEALTH SERVICE ACT, AS AMENDED

Program	Purpose	Agency	Appropriated amounts		
			Fiscal year 1970	Fiscal year 1971	Fiscal year 1972
			(millions)		
Grants for Construction of Health Care Facilities (Hill-Burton)	Constructing and modernizing hospitals and other health facilities. Grant assistance is provided to public and private nonprofit hospitals, public health centers, long-term care facilities, outpatient facilities, and rehabilitation facilities.	Health Services and Mental Health Administration, HEW.	$172.2	$172.2	$197.2
Loan Guarantees with Interest Subsidies (Hill-Burton)	Guaranteeing loans to private, nonprofit agencies for constructing and/or modernizing health care facilities. Subsidies are made to reduce the net effective interest rate by 3 percent paid for private, nonprofit facilities.	do.	Not Funded	5.0	20.3
Direct Loans Program (Hill-Burton)	Making direct loans with 3 percent interest subsidies for constructing and/or modernizing publicly owned health facilities.	do.	do.	Not Funded	30.0
Grants for Regional Medical Programs	Constructing facilities for regional medical programs of research, training, and demonstration activities.	do.	do.	5.0	Not Funded
Grants for Health Services Research, Development, and Demonstration	Constructing experimentally designed health facilities.	do.	do.	Not Funded	do.
Grants for Construction of Health Education Facilities--Health Professions	Constructing and modernizing teaching facilities for the training of physicians, pharmacists, optometrists, podiatrists, veterinarians, dentists, and professional public health personnel.	National Institutes of Health, HEW.	118.1	131.6	142.4
Grants for Construction of Health Education Facilities--Nursing Schools	Constructing and modernizing training facilities for nurses.	do.	8.0	9.5	19.5
Grants for Construction of Teaching Facilities--Allied Health Professions Personnel	Constructing new, replacing, or rehabilitating existing facilities for training of personnel in professions related to health care.	do.	Not Funded	Not Funded	Not Funded
Grants for Construction of Medical Library Facilities	Constructing new, renovating, and expanding medical library facilities.	do.	do.	do.	do.
Grants for Construction of Health Research Facilities	Constructing new and replacing old facilities for national research programs in the health field.	do.	do.	do.	do.
Total			$298.3	$323.3	$409.4

EXHIBIT C

TYPES OF FACILITIES FUNDED UNDER THE HILL-BURTON PROGRAM JULY 1947 to JUNE 1971

Description	Total grants (millions)	Total grants (percent)
General hospitals	$2,635	71
Long-term care (units of hospitals, nursing homes, and chronic disease hospitals)	523	14
Outpatient	204	6
Other (specialty hospitals, rehabilitation facilities, public health centers, etc.)	356	9
Total	$3,718	100

APPENDIXES

AGENCIES AND ORGANIZATIONS THAT REVIEWED AND

COMMENTED ON THE REPORT OR SECTIONS THEREOF

Agency or organization	Reviewed			Comments in appendix
	Report chapter	Enclosures	Topics	
Department of Health, Education, and Welfare	All	All	All	II
Veterans Administration	All	All	All	III
Department of Defense	All	All	All	No formal comments
Department of Labor	2	A	Construction labor and materials	IV
General Services Administration	2	A	Construction approaches	V
Department of Commerce, National Bureau of Standards	2	A	Construction requirements	VI
American Hospital Association	All	All	All	VII
American Institute of Architects	All	All	All	VIII
American Association of Hospital Consultants	All	All	All	IX
American Medical Association	4	C	All	X
Blue Cross Association	4	C	All	XI
Construction Industry Stabilization Committee	2	A	Construction labor and materials	No formal comments
Associated Builders and Contractors, Inc.	2	A	Construction approaches and construction labor and materials	XII
Associated General Contractors of America	2	A	do.	XIII
Building and Construction Trades Department of the AFL-CIO	2	A	Construction labor and materials	XIV
Health Insurance Association of America	4	C	All	XV
American Insurance Association	2	A	Construction requirements	XVI
International Conference of Building Officials	2	A	do.	XVII
Building Officials and Code Administrators International	2	A	do.	No formal comments
Southern Building Code Congress	2	A	do.	XVIII
National Fire Protection Association	2	A	do.	XIX
Reference hospital	3	Appendix to enclosure B	Reference hospital	XX
Architects for Reference hospital	3	Appendix to enclosure B	do.	XXI

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

OCT 6 1972

Mr. Dean K. Crowther
Deputy Director, Manpower
and Welfare Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Crowther:

This will confirm for your records that Department representatives were afforded an opportunity to review the GAO draft report entitled "Study of Health Facility Construction Costs."

It is my understanding that in a meeting with GAO staff, Department representatives indicated general concurrence with the report findings. However, certain changes were suggested with respect to the thrust of the recommendations which I understand will be reflected in the final version of the report.

The opportunity to review and comment on this report in draft form is most appreciated. Your office should be commended for a very thorough and thoughtful analysis of a most difficult and complex area.

Sincerely yours,

James B. Cardwell
Assistant Secretary, Comptroller

VETERANS ADMINISTRATION
OFFICE OF THE ADMINISTRATOR OF VETERANS AFFAIRS
WASHINGTON, D.C. 20420

OCTOBER 11 1972

Mr. Frank M. Mikus
Assistant Director, Manpower
and Welfare Division
U. S. General Accounting Office
Room 137, Lafayette Building
811 Vermont Avenue, N. W.
Washington, D. C. 20420

Dear Mr. Mikus:

The Veterans Administration has reviewed the General Accounting Office study of the costs of constructing health facilities assisted under the Public Health Service Act. A conference of General Accounting Office and Veterans Administration representatives was held on September 28, 1972, for discussion of comments and suggestions on the draft report. Minutes from this conference are attached.

We are in general agreement with the study conclusions and recommendations. However, we have some reservations about their application in all cases, especially as they might affect other federal agencies. One recommendation requires that fast-track and total concept approaches to construction be considered in all federally assisted health facility projects. From our discussion with General Accounting Office representatives, it was mutually concluded that this was intended to apply only to facilities constructed under the Public Health Services Act. We suggest, therefore, that the recommendations be modified to reflect this clearly.

As you will note in the minutes, we also discussed the matter of Office of Management and Budget Circular A-11. The provision of A-11 prevents full utilization of fast-track construction by government agencies. This circular requires that project requests for construction provide for full financing

Mr. Frank M. Mikus
Assistant Director, Manpower
and Welfare Division
U. S. General Accounting Office

of complete construction costs. Modification of this requirement would be needed to permit partial funding of projects if fast-track construction is warranted.

Sincerely,

FRED B. RHODES
Deputy Administrator

Att.

U.S. DEPARTMENT OF LABOR
OFFICE OF THE ASSISTANT SECRETARY FOR ADMINISTRATION
WASHINGTON, D.C. 20210

October 5, 1972

Mr. George D. Peck
Assistant Director
Manpower and Welfare Division
United States General
Accounting Office
Washington, D. C. 20548

Dear Mr. Peck:

We have reviewed the appropriate sections of the draft GAO Report on Construction Costs of Health Facilities, and met several times with Messrs. Martin and Walsh, and others of your agency in order to resolve differences. We believe that the modifications we have agreed to greatly improve the accuracy of the report and results in an adequate description of the cost situation in construction from the standpoint of the Department of Labor.

We have enclosed, for your information, a paper detailing some changes. We appreciate the opportunity to have assisted you by reviewing this important document.

Sincerely,

Edward J. McVeigh

Edward J. McVeigh
Associate Assistant Secretary
for Administration

Enclosure

UNITED STATES OF AMERICA
GENERAL SERVICES ADMINISTRATION

Public Buildings Service
Washington, DC 20405

OCT 3 1972

Mr. J. K. Fasick
Director, Logistic and
Communications Division
United States General
Accounting Office
Washington, DC 20548

Dear Mr. Fasick:

It was a pleasure meeting with your representatives, Mr. James Walsh and Mr. Anthony Assia and discussing with them the study of the cost of constructing health facilities under the Public Health Service Act. We reviewed that part of the study made available to us, which pertains to the use of innovative construction techniques. Material in this part of the study relating to GSA is considered to be generally accurate and representative of our experience in this area to date.

The members on our review team were:

T. L. Peyton, Jr. - Acting Assistant Commissioner for Construction Management
T. L. Dunn - Director, Contract Systems Division
C. C. Law - Director, Professional Services Division
F. R. Desiderio - Chief, Professional Services Contracts Branch
W. J. Oughton - Assistant Chief, Professional Services Contracts Branch
W. J. Gregg - Acting Director, Financial Management Division

Thank you for the opportunity of reviewing the report and we welcome any further information regarding your progress in the use of Construction Management in the health facilities program.

Sincerely,

John F. Galvin

Acting Commissioner
Public Buildings Service

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington, D.C. 20234

OCT 20 1972

Mr. James D. Martin
Task Force on Health Facilities Construction
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Martin:

We have reviewed the GAO Draft Report on Health Facilities Construction and find no problems with the contents or the recommendations. It should be noted that we have only reviewed that portion of the report which you furnished us (Pages 25-28, 41-61, and 144-146), which deals with the construction requirements. Our comments likewise address only the construction requirements and are not intended to reflect any opinion on the organization or management of the respective agencies noted in the report.

Your report has clearly identified the multiplicity of conflicting and duplicate codes and regulations and recognized that the power to develop and enforce building codes is a State responsibility. It was also noted that the private groups that are in a position to develop commonly accepted performance criteria generally find that they are not equipped to perform the research necessary to develop this criteria. We concur with your conclusions that "the Federal Government could provide the leadership necessary to start such a movement, particularly in the areas of research."

We appreciate the opportunity to comment on the subject report and are prepared to meet further with your staff as required.

Sincerely,

LAWRENCE M. KUSHNER
Acting Director

APPENDIX VII

American Hospital Association
840 NORTH LAKE SHORE DRIVE · CHICAGO, ILLINOIS 60611
TELEPHONE 312 645 9400 / CABLE ADDRESS AMHOSP

October 25, 1972

Mr. James D. Martin
United States Government
Accounting Office
Room 6844
441 G Street N.W.
Washington, D.C. 20548

Dear Mr. Martin

The American Hospital Association is pleased to have been given the opportunity of reviewing the draft report, "Study of Health Facilities Construction Costs", and the added opportunity of meeting with you and the staff involved in its preparation for the purposes of commenting on it.

First, the reactions of our staff people meeting with your representatives were highly complimentary of the magnitude of the work which you have undertaken and of the depth of the analysis.

With respect to some specific comments, it was noted that your draft report did not touch upon the question of priorities with respect to specific recommendations but left that question to the judgment of others. Perhaps some indication of priorities would be helpful to the Congress or the Administration in any implementation of your recommendations.

A second specific relates to the concept of construction management. While the draft report does mention the concept, it has not been given the emphasis which our staff feel it may well deserve.

Lastly, with respect to the recommendation concerning the re-use of existing hospital designs, our staff expressed a reluctance to give that concept as much emphasis as the report indicates. The potential of an economic waste of construction capital and an increase in operating cost through use of an inappropriate design may well outweigh the savings in architectural and design fees.

Mr. Martin/2 10/25/72

With respect to Enclosure C of your draft report, many of the areas covered are those which this Association has encouraged and attempted to implement for several years. Outpatient care, home care, transfer of hospital patients to extended care and convalescent care facilities, utilization and peer review, shared services, planning agencies, broadening of health insurance coverages to include other than acute hospital care, are elements of better and less expensive health care which we have long espoused. In this regard, you may be interested in our Quality Assurance Program. This has just been released within the last month or so. Mr. Sale, of our Division of Hospital Medical Staffs, with whom you met with respect to the section on Utilization Review, has given you a copy.

While we have no specific comments with respect to Enclosure C, the draft report points out at some length the potential of savings resulting from a shared laundry service but makes only a casual reference to the deterrent in Section 501 (e) of the Internal Revenue Code which forces hospitals into other channels to achieve this cost-saving result with respect to laundries - channels which have threatened those institutions with anti-trust action and make adequate financing most difficult.

All in all, the draft report appears to us to be thorough and comprehensive, with the potential, assuming implementation of its recommendations, of reducing hospital construction costs.

Sincerely yours

John E. Sullivan
Assistant Treasurer

sg

THE AMERICAN INSTITUTE OF ARCHITECTS

October 17, 1972

Mr. James D. Martin
Assistant Director, Man-Power & Welfare Division
United States General Accounting Office
Washington, D. C. 20548

Dear Mr. Martin:

The American Institute of Architects and the Committee on Architecture for Health appreciate being given the opportunity to comment and review the draft report on the Study of Health Facilities prior to it being forwarded to Congress. The report is generally in agreement with AIA thinking and positions in several important areas of mutual concern. Among these are the standardizing of codes and regulations, the importance of gathering and updating data on initial versus continuing costs of owning a building; the necessity of comprehensive long range planning, and the elimination or at least minimizing of the restrictions imposed or encouraged by present policies governing federal funding programs for Health Facilities Construction.

There are two areas in the report where the AIA must take issue with the recommendations made by the GAO; 1) the recommendation that HEW encourage the reuse of designs and 2) that HEW require the consideration of the total concept approach and fast track design-construction on all federal assisted Health Facilities Projects.

Reuse of Design

1) With regard to the reuse of existing designs, the GAO report states "The concept appears sound and the benefits seem obvious," but no supporting data is supplied either in the report itself or in the enclosures to prove this statement. In fact, the data supplied suggest just the opposite conclusion, that the reuse of designs is a false economy in terms of life cycle costs. A large portion of hospital design problems involve renovation and expansion of existing buildings. These are unique problems which do not lend them-

1785 MASSACHUSETTS AVENUE, N.W. • WASHINGTON, D. C. 20036 • (202) 265-3113

selves to standardized design solutions. The GAO report states that HEW statistics show that on a national basis in 1970, about 4,000 new facilities of all types were constructed and about 10,000 existing facilities were modernized. With respect to new construction, it was the experience of the Department of Defense some 15 years ago during their period of utilizing "definitive" designs, that the previous design seldom responded to the particular needs of specific situations. During the time this hospital construction program was operative, many problems were encountered and overcome at considerable expense in trying to site adapt earlier designs on different topography and in various climates. The result of this DOD experience indicates that the reuse of building plans for health care facilities is not economically justified.

The GAO report itself contradicts the concept of the reuse of plans when it states in the report that planning for the delivery of health care services involves many considerations requiring critical decisions at various points in time. These decisions are influenced in turn by the interaction between various program requirements and staff, budget, and time constraints, of the particular project. The design process itself is essentially an intergrating of similar elements and occurs throughout the program, conceptual design and construction document phases. It cannot be properly done at only one stage. The GAO recognizes in its report the fact that life cycle costs vary with different geographical and operating restraints and through interactions of various alternatives in the design, which is a contradiction of the reasons usually advanced for the reuse of plans.

The inevitable conclusion is that there are no stock or standard plans for health care facilities, each facility will be unique to the extent that site constraints, local zoning, vehicular access and neighborhood requirements are taken into consideration in the initial project. Each facility will also vary in the amount of space and emphasis placed on specialized facilities derived from its location in the metropolitan area in relation to other existing and planned health facilities.

Total Concept

2) The report, in describing the "total concept approach," defines it as a "single developer undertaking the responsibility for planning, programming designing, financing, constructing and equiping a hospital under one financial transaction with the owner." While indicating that there are other means where-

by architects and general contractors have combined on individual projects on a turn-key basis, the discussion is primarily directed at the single developer offering total concept services - the "package builder." The report recognizes the importance of continued planning for hospital design, construction and operation as an important element of successful projects. However, the report fails to note that these planning services, which are required prior to the formulation of the specific building project and include substantial expenditures of time and professional fees, are not accommodated with package builders. Construction quality, instead of the requirement of professional services and the possibility of conflict of interest, is singled out as the primary emphasis in this report. The error in this approach is that items which are difficult to evaluate, such as the value of adequate planning for proposed facilities, is over looked and this is where the greatest economics may be effected. The major disadvantages of the "total concept" approach is the problem of controlling the quality of the finished product. The report states that the owner is purchasing a facility of known size and apparent capability for a fixed price, which is sometimes true, but the choice of construction materials, costs covering maintenance, operation and replacement costs over the life cycle of the facility make the initial costs only one minor item of consideration.

Experience in the health facility field indicates that the construction cost of the facility is exceeded by its operation and maintenance cost in no more than 3 years. Knowing this, it is short sighted to make initial construction costs, including professional fees necessary to do this work, the most important consideration when constructing a health facility. It can be shown that initial savings most often have the long range effect of precluding attainable savings in operation and maintenance costs over the life of a facility. The most difficult problem to eliminate from the total concept approach is the inherent conflict of interest present in a system where the contractor establishes both what is to be built and the basis for building it.

There is no way to eliminate this problem other than the independent professional system, where the professional being asked for advice has no financial interest in the project, nor is his fiduciary client-owner relationship being compromised by establishment of an architect-client relationship with the general contractor constructing the facility. Once the arrangement is established, the owner must be aware that he is not "receiving" professional services but, like it or not, is on the other side of the two party contract and at the mercy of the general contractor.

The recommendation to HEW by GAO that the total concept approach be considered on all federally assisted health facilities projects, because of the relationship between the funding of projects and the competitive aspects of these funding programs, would be tantamount to promoting the use of the concepts rather than simple consideration of the concept. This same recommendation with respect to the fast track design and construction approach, in addition to conflicting with present Hill-Burton construction guidelines for allocation of federal funds, presents a concept which is not applicable to all projects in the guise of a cure all.

From time to time, variations of the total concept approach and/or fast track design and construction would be the most desirable method of completing a project, but this is a complicated issue and heavily dependent upon the judgment of the professional involved in the project in conjunction with the owners requirements. Whether it would be the best choice for a particular project, should not be foreclosed by a mandate to HEW that they require a certain approach on all of their projects, but rather should be among the feasible alternatives allowed.

Cost Data Bank

3) The recommendation that HEW establish a data bank of life cycle costs is an excellent concept and would be most helpful to the client, his professional and HEW in evaluating various design proposals. The requirement that applicants for funding under the Public Health Services Act justify their departure from the then existing HEW data bank, is going to reduce the potential of broadening of the data bank and impair its usefulness for comparative purposes. The original purpose of the information, as a toool to assist in making decisions in design and selection of materials will be forgotten and what began as a guideline will become a requirement. The data bank is not an end in itself, but rather a means to an end, better control over building costs. Any requirement that limits the application and broadening of the data bank detracts from its real purpose.

The AIA would be pleased to have the opportunity to participate in the formation of an information retrival system with HEW. We believe this would be a major contribution to the important decision making required during the planning and design phases of a health care facility.

Sincerely,

William L. Slayton

William Slayton, Hon. AIA
Executive Vice President

AMERICAN ASSOCIATION OF HOSPITAL CONSULTANTS
1700 K Street N.W. at Connecticut Avenue
WASHINGTON, D. C. 20006 202/785-3434

October 10, 1972

Dear Mr. Martin:

As agreed on Friday, October 6, 1972, at the conclusion of our meeting, I am forwarding a couple documents which should prove valuable in defining "Functional Planning".

We were certainly appreciative of the opportunity afforded us to review and comment on your Study of Health Facilities Construction Costs.

You and your associates are to be commended on a superb study and the manner in which it was performed, as well as, the conclusions reached.

If, in the future, you find we may be of assistance, please do not hesitate to call upon our Association as it would be our pleasure to assist you in any way possible.

Sincerely,

Vaughan A. Smith
Executive Vice President

Mr. James D. Martin
Assistant Director
U.S. General Accounting Office
441 G Street, N. W.
Washington, D. C. 20548

VAS:wc
enclosures

AMERICAN MEDICAL ASSOCIATION

535 NORTH DEARBORN STREET • CHICAGO ILLINOIS 60610 • PHONE (312) 527-1500 • TWX 910 221 0300

DIVISION OF
MEDICAL PRACTICE

October 9, 1972

Mr. James D. Martin, Assistant Director
Manpower and Welfare Division
United States General Accounting Office
Washington, D. C. 20548

Dear Mr. Martin:

Appropriate members of our staff have consulted on two occasions with Messrs. David Hanna, Patrick Dolan, and Peter Larson of your Chicago Regional Office concerning the GAO "Study of Health Facilities Construction Costs." The most recent meeting was last Tuesday. October 3. In the interim we received copies of several sections of the GAO draft report, including:

Preventive Medicine
Care in the Appropriate Facility
Health Care Delivery Systems
Utilization Review
Health Insurance Incentives
Shared Services
Regional Systems
Health Planning Agencies

These sections were carefully reviewed by our staff and were the subject of discussion at the October 3 meeting, in some instances involving a line by line review of the draft. The AMA participants in the meeting were gratified by the attitude demonstrated by Mr. Hanna and his associates and their obvious desire to incorporate the objective suggestions and comments developed from our review. We hope that the final report will reflect these suggestions, particularly where references are made to AMA positions or statements on various issues.

We are aware that additional consultations are scheduled to be held with other interested organizations and that you have a

mid-November deadline for submission of the report to the Congress. If time does permit, however, and you wish us to do so, we will be pleased to review promptly and comment upon any portions of the final draft.

Sincerely yours,

John A. Rowland

JAR/ajm
cc: Mr. David A. Hanna
Mr. Bernard P. Harrison

BERNARD TRESNOWSKI
Senior Vice President
Government Programs

BLUE CROSS ASSOCIATION

840 NORTH LAKE SHORE DRIVE • CHICAGO, ILLINOIS 60611 • (312) 329-6029

October 11, 1972

Mr. James D. Martin
Assistant Director
Manpower and Welfare Division
United States General Accounting Office
Washington, D. C. 20548

Dear Mr. Martin:

Following receipt of your recent letter concerning the study of the Costs of Constructing Health Facilities, we met on October 4th with members of your staff. We very much appreciate the opportunity to review this study and wish to compliment your staff on the extensive amount of effort in bringing together under Chapter IV the substantial amount of useful data and information.

At our meeting on October 4, 1972, we reviewed our reactions to Chapter IV and Enclosure C on two levels. We offered factual information as it relates to the activities of Blue Cross with specific reference to coverage of alternatives to acute care and the extent of Blue Cross efforts to accelerate the development of prepaid group practice and alternative delivery systems. We also provided information on Blue Cross efforts in the areas of peer and utilization review; our position on coinsurance and deductible provisions; and, our work to make health care planning an effective tool.

APPENDIX XI

On a secondary level, we urged that the recommendations focus primarily on the need for indepth research into an analysis of the topic with emphasis on the short and long run implications of the various alternative actions when analyzed on a cost effective basis.

We also urged that the recommendation be rank ordered on a cost effectiveness basis with our suggestion that priority be given to strengthening the planning mechanism by effectively relating it to the payment for health care benefits.

Again, we want to thank you for the opportunity to examine this material and discuss our reactions with your staff.

Very truly yours,

Bernard R. Tresnowski

BRT:vm

associated builders and contractors, inc.

P.O. BOX 698 GLEN BURNIE, MARYLAND 21061 TELEPHONE Area Code 301 - 760-6060

October 4, 1972

Mr. James Martin,
Assistant Director
General Accounting Office
General Accounting Office Building
441 G Street
Washington, D.C. 20548

Dear Mr. Martin:

On behalf of the Associated Builders and Contractors, let me express my appreciation to you for the opportunity to examine the draft report of the "Study of Health Facilities Construction Costs."

The report is certainly thorough and treats many controversial elements in what I conceive to be an impartial manner. It will certainly serve as a good basis for Congressional decision-making.

As for specific comments, I have gone over these in detail with Mr. James Walsh, and I am sure my comments will be subject to review for any possible changes in the draft.

Sincerely yours,

John P. Trimmer,
Executive Vice President

JPT:jh

APPENDIX XIII

THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA

1957 E STREET, N W · WASHINGTON, D C 20006 · EXECUTIVE 3-2040

JAMES D McCLARY *President* | SAUL HOROWITZ, JR., *Vice President* | WILLIAM E. DUNN, *Exec Vice President*
NELLO L TEER, JR. *Sr Vice President* | W. E. NAUMANN, *Treasurer* | JAMES M SPROUSE, *Executive Director*

September 20, 1972

Mr. James D. Martin
Assistant Director
Manpower and Welfare Division
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Martin:

Re: Draft of Report to Congress, "Study of Health Facilities Construction Cost"

We have reviewed those segments of the subject draft which deal with innovative construction approaches and increases in construction labor and material costs and find that they accurately reflect conditions and procedures in the industry today. In general, we found no significant omission or mistatement in those sections of the report which we reviewed.

Thank you for giving us an opportunity to review the draft of the report.

Sincerely yours,

Campbell L. Reed

CAMPBELL L. REED
Director
Building Division

CLR/vf

Building and Construction Trades Department
AMERICAN FEDERATION OF LABOR — CONGRESS OF INDUSTRIAL ORGANIZATIONS
815 SIXTEENTH ST., N.W., Suite 603 • WASHINGTON, D.C. 20006
(202) District 7-1461

October 11, 1972

James D. Martin
Assistant Director
Manpower & Welfare Division
U. S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Martin:

By letter dated September 11, 1972, you forwarded to me certain sections of the Comptroller General's proposed report to the Congress, required by Section 204 of the Comprehensive Health Manpower Training Act of 1971, entitled "Study of Health Facilities Construction Costs." Specifically, you forwarded Chapter 1 ("Introduction") and Chapter 5 of Enclosure A to the Report ("Construction Labor and Materials"). While neither the Department nor any of its affiliated International and National Unions had been consulted by members of your staff at any time during the preparation of this Report, your letter requested us to review and comment on the sections enclosed and asked that a meeting be held with members of your staff. As you know, a meeting was held with you and members of your staff on September 29, 1972.

Although we think it would have been preferable, and more helpful to the authors of the Report, to have contacted the Building and Construction Department and its affiliated Unions while the material was being collected, we appreciate the opportunity to have met with you and your staff and to submit our views at this time.

Comments Concerning Sections of Report Dealing with Health Facilities Construction Costs.

We view, with great concern, the lack of professional quality inherent in these sections of the Report, and, therefore,

fail to see how they properly can be given credence by a reader, particularly one with the immense responsibilities of the Congress of the United States. For the most part, these sections of the Report are neither quantitative nor qualitative in nature, and the apparent methodology used in compiling these sections is incompatible with normal research practices and techniques that yield credible data capable of withstanding critical evaluation. These sections border on what might be appropriately termed an opinion poll rather than the kind of fact finding "study" obviously anticipated by Congress' charge in Section 204 of the 1971 Act. Certainly the product is inconsistent with the data gathering techniques employed by such government statistical collecting agencies as the Bureau of Labor Statistics, Census Bureau, etc. At the outset of Chapter 5, the sources are identified as a review of "many studies" and interviews of "officials of over 100 building contractors and associations and over 25 building trade councils or trade unions in generally the same geographical areas." "In addition" it is stated, "we held discussions with architects, suppliers of construction materials, and officials of Federal and State agencies. Work was concentrated in four States with some additional work in four other States and the District of Columbia."

There is a failure to analyze, in the Report, any of these referred to studies, or to even mention them by name except for an article published in the February 1972 issue of the "Engineering News - Record" which article is as similarly lacking in documentation as the Report itself. There <u>are</u> relevant studies which have been issued during the past several years which would seem to have required treatment in the Report but which, for all that appears, are not even known to its authors. What clearly surfaces is a virtually total reliance for any purported factual statements in the Report on the opinions expressed in the interviews of the referred to contractor and local union representatives from several States. Not only is the identity of the representatives and their organizations withheld, but there is not even a revelation concerning the pertinent nature of their activities and interests so that their opinions, which form the basis of these sections of the Report, can be considered in proper context. The quantitative and geographical scope of the sample used, is itself, completely inadequate. The methodology used in obtaining their opinions is not explained. Were any actual on the job observations made? Did

the GAO follow a standardized questionnaire? More basic still is the fact that no further documentation is provided to substantiate the conclusory opinions of those interviewed. Where opposing views were expressed among contractors, and between contractor and union personnel, was any effort made to ascertain which view was most accurate? At our meeting with GAO staff, it was stated by the authors that there was no data to support such opinions.

At various places in these sections of the Report, concessions related to this methodological inadequacy are made. Thus, for example, at page 106, it is stated, "Many expressed strong viewpoints on the reasons for increased construction costs but we experienced considerable difficulty in obtaining documentation for statements made during our interviews, including data to support estimates of costly practices or savings which might be realized." Again (at p. 112), "In most cases, we encountered a general lack of data to support statements on the cost impact of practices considered to be unnecessary;" (at p. 114), "Although we have no basis for evaluating the accuracy of this estimate, . . .;" (at p. 126), "Estimates of increased construction costs [resulting from Federal safety standards] ranged from less than 1 percent to approximately 30 percent."

If the pertinent sections of the Report had been properly tailored with a view toward the basic inadequacies in methodology and documentation therein, we would be less insistent in pointing them out. But the real danger in this kind of a product is that, perhaps because of the effort spent by GAO staff in conducting the interviews or because of a felt need to offer the Congress a result-oriented submission, the Report makes the quantum leap from guestimate to conclusion. Indeed, the grossly misleading and deductively backward process is used of attempting to lend credibility to purported findings by repeated recitations of conclusions -- conclusions unsupported by reliable data, and, in most cases, by any data at all. Indeed, conclusions attaching to the various subjects explored in these sections of the Report can be found in no less than five places, including twice in the most skeletal section of all -- Chapter 1 ("Introduction", pp. 45 and 48).

At least four other fundamental deficiencies in these sections of the Report are evident. First, throughout these sections, various

adjectival descriptions of costs are employed indiscriminately, revealing a lack of a clear, conceptual understanding as to what is being analyzed. Costs are referred to as "high", "increased", "increasing", "costly" without the assignment of a standard for comparison, where appropriate, or of a time frame, where appropriate.

Second, in both the Introduction (pp. 45, 57, Ex. C) and in Chapter 5 (pp. 104-105, Ex. C), GAO would equate increases in the hourly wage rate of construction workers with increases in construction labor costs. This relationship has not been demonstrated. It would be necessary to know actual labor costs involved in the construction of health facilities. A study released by the Bureau of Labor Statistics in 1971 ("Labor and Material Requirements for Hospital and Nursing Home Construction" - Bulletin 1691) which, incidentally demonstrated that, as a contributing factor, on-site labor wages rose only 1.4 percent over a six-year period from 28.2 percent of construction costs to 29.6 percent of construction costs, showed that man-hours per hundred square feet actually declined from 544 in 1960 to 507 in 1966, indicating an increase in productivity of more than 7 percent over the period. Unless productivity and the decreasing man-hour requirements are computed for health facilities construction, the statement made in the GAO Report, at p. 45 ("Introduction") and, again at p. 104 (Chapter 5), regarding hourly wage rates, is meaningless. When these factors are coupled with the recognition -- casually made at the bottom of p. 104 -- concerning the requirement for more highly skilled (and, therefore, more highly paid) workers on health facilities construction than on other building construction, the meaninglessness of the purported GAO equation between hourly wages and costs is compounded.

Third, the casual recognition referred to above and the seeming inability to properly correlate it with other subject matters in these sections of the Report, including the Davis-Bacon Act, is extremely important. GAO should have made sure that staff members were knowledgeable concerning the techniques required in health facilities construction, and should have included an analysis of the difference between such construction and other building construction. As a result of this failure, appropriate, if any, weight to this significant factor has been ignored. Hospital construction requires customized construction techniques

for reasons apparent to the workers on the job, but evidently not obvious to those who examine costs from afar. All hospital rooms are necessarily equipped with special provisions such as oxygen, electrical outlets for hybrid equipment, nurses' call systems, and special plumbing in each room because of the infirmities of those who will use it. Hospitals are particularly sensitive to safety and emergency systems which are not necessities in office buildings and schools. Every hospital needs an emergency generating system capable of providing the electrical needs that could arise as a result of a power shutdown. Every operating room must have a sophisticated ground-fault system to prevent the possibility of electric shock to those performing surgery. Operating rooms may have oxygen and other volatile gases used at any time during surgery, so it is absolutely necessary that all fixtures and equipment installed should not contribute to the spread of these gases or support their combustion; operating rooms must, therefore, be sealed off from other portions of the hospital and in the case of an electrical installation, for example, it means that all conduit passing through the operating rooms must have seals installed both upon entering and leaving the room. It also means that all conduit must be of the threaded hard-walled type. These are just a few of the examples which require consideration and analysis in any study dealing with health facilities construction costs.

Fourth, there is a complete absence in the sections dealing with construction labor costs of a discussion dealing with the wages and salaries of architects and engineers, technical and administrative personnel and supervisors. It would appear to us that if one was attempting to arrive at the "labor costs" of a particular product, he would necessarily have to concern himself with all pertinent cost factors involved. In addition, at least in the sections forwarded to us by your letter, no concern is given to other health facilities construction costs such as site costs, the cost of financing, or profits. At this time, we do not know whether other sections of this Report treat these pertinent cost items.

Perhaps some of the many deficiencies in these sections of the Report can be illustrated by reference to the discussion concerning Productivity.

Having begun its report on "Construction Labor and Materials" with the premise that the costs of health facilities construction labor are "high" and are "rising", the GAO no less than five times in the Introductory Chapter and Chapter 5 concludes that a primary cause for this purported phenomenon is "decrease in productivity of construction workers". Indeed, all five conclusory statements are made prior to any discussion at all on the subject of productivity. The last such statement appears in the first full paragraph on p. 112 of Chapter 5. The discussion on productivity then begins, with the following statement: "Presently there are no reliable means of measuring productivity in the construction industry, and productivity statistics on building construction are virtually nonexistent." We agree wholeheartedly with the quoted qualification, and would suggest the existence of an inconsistency between it and the five conclusory statements appearing at prior places in the Report. We think it appropriate that the Report goes on to indicate to Congress that a cooperative effort among construction industry representatives, labor, and government officials is currently being made to develop construction industry productivity measurements. Some discussion concerning what has already taken place with respect to this endeavor, and the extent of participation by organized labor, at the highest levels, would also have been pertinent.

Moreover, to the extent that existing studies may be said to reveal a trend regarding productivity in health facilities construction, the aforementioned study by the Bureau of Labor Statistics (Bulletin 1691) did produce measures indicative of productivity growth. This study, however, is not even mentioned in the GAO Report. Along with this is the figure for Contract Construction - Nonresidential (except highways and sewers) released a few months ago by the Price Commission from unpublished BLS data of a 1.5 percent annual rate of increase in productivity from 1958-1967. This too is not mentioned. It is surprising that no reference is made in the Report to the limited credible information which is available.

Having already alleged a decrease in construction worker productivity as a primary cause of high construction costs and in the admitted absence of any reliable means of measuring construction

productivity or of established statistics on building construction, the Report goes on to try and substantiate its allegation through a series of opinion polls taken among individual contractors. Though it states that even the contractors were divided in their opinions as to the trends in worker productivity and "were able to furnish little or no data on past or present trends showing productivity rates," the Report goes on to use isolated opinions to substantiate its original premise following closely the pattern set forth in the above-mentioned "Engineering News - Record" article. According to the GAO Report, the contractor estimates of the decrease in productivity were "based on their knowledge and experience" which, needless to say, encompasses many complications in view of the complexities associated with productivity measures especially in the construction industry. And one might ask, since, according to GAO, the opinions of the contractors themselves were divided, whether those who estimated increases in productivity used the same "knowledge and experience" to arrive at their conclusions? From all that appears, the GAO, in its interviews, did not even attempt to ascertain the nature or degree of such contractor "knowledge and experience" or the documented bases upon which contractor opinions were rendered. Clearly, the statement beginning at p. 111 of the Report, that "the views obtained during our interviews generally reflected the self-interests of the various groups", would apply to these opinions on productivity as well as to the opinions obtained on the other subjects treated. This was confirmed by GAO at our meeting.

The GAO Report does not stop here. Rather, notwithstanding all of the limitations referred to above, the Report then purports to assign a quantitative figure for the range of the decreases expressed in this unknown sampling of contractors. It might be noted in passing that no quantitative figure is assigned to those contractors who stated that, in their opinion, productivity had increased. But the main point, of course, is that because of the serious limitations referred to above, a report dealing with a matter of the importance of productivity cannot professionally justify the making of any conclusions about this subject, not to say, the repeated reliance on such conclusions as a major theme of the Report.

The discussion of the Davis-Bacon Act is at least as superficial and misguided. There appears to be less than a full understanding by GAO as to what the Davis-Bacon Act is all about. This Act does not set wage rates. It merely requires that government contractors pay the prevailing minimum wage rate which is the result of either collective bargaining or individual employment contracts. Davis-Bacon rates are determined on the basis of the prevailing wage principal which is not a "preferential" arrangement for the Building and Construction Industry worker. See, for example, the Federal Comparability Act and the McNamara - O'Hara Service Contract Act. The Davis-Bacon Act prescribes prevailing wage rates, not union rates (unless they happen to be prevailing). It has been estimated that 60 percent of the minimum wage determinations of the Department of Labor involve rural-non-union areas. Illustrations of recent Davis-Bacon rates in such areas are: Arkansas (Statewide), Ironworkers, $2.86; Florida (City of Everglades), Cement Masons, heavy construction, $1.75; Iowa (Emmetsburg), Electricians, $2.00; Kentucky (Pineville), Bricklayers, $3.00; South Carolina (Clarendon County), Laborers, $1.60; Virginia (Coeburn), Painters, $2.50. A review of Department of Labor files would show many other similar illustrations. Yet, this part of the GAO Report is typical in its aversion to the use of more primary and credible source material, when it states: "During our recent study, we did not evaluate the administration of the Act or wage determinations made by the Department of Labor...."

We hardly consider it pertinent or useful that the GAO Report points out that certain contractors who pay less that the prevailing rate, and who would prefer to use a less skilled work force than that required on health facilities construction projects, find that application of the Davis-Bacon Act would require them to increase their payrolls. But one might recall, when the Davis-Bacon Act was being considered and passed in 1931 by a coalition of democrats and republicans, conservatives and liberals, that one example cited by Congressman Bacon to illustrate the need for the Act involved the Veterans' Hospital in New York. The contractor from a low-wage area brought workmen with him and established a "construction camp" of questionable adequacy, and paid less than the local rates. According to Congressman Bacon the purpose of the bill ". . . is simply to give local labor and the local con-

tractors a fair opportunity to participate in this building program." And, completely aside from the important policies underlying the Davis-Bacon and other prevailing wage statutes, and also aside from matters of productivity and other construction costs, it just doesn't follow that payment by a contractor of lower hourly wage rates to a certain group of workers will lead to lower labor costs on health facilities construction projects.

Conclusion

Fundamental inadequacies in methodology and documentation prevent those sections of the Report dealing with health facilities construction costs from being of assistance to the Congress.

In the short time provided to us, it has been impossible for us to delve deeply into the matters contained in the charge of Congress in Section 204 of the Act. But the comments above go to basic deficiencies in those sections of the GAO Report which are obvious even from a first reading. We appreciate the opportunity afforded us by GAO to review and comment upon these sections of the Report prior to their release and we hope that our response will be viewed in the same constructive sense. Naturally, if congressional hearings are conducted on this subject, we expect to have the opportunity to present information of a more detailed nature which will be of assistance to the Congress.

Sincerely,

Frank Bonadio

Frank Bonadio, President

FB:daw

APPENDIX XV

HEALTH INSURANCE ASSOCIATION OF AMERICA

CHICAGO NEW YORK WASHINGTON

LESLIE P. HEMRY, *President*

HEALTH INSURANCE COUNCIL
Louis A. Orsini, Director

New York Office
750 Third Avenue
New York, New York 10017

September 29, 1972

Mr. James D. Martin
Assistant Director
Manpower & Welfare Division
United States General
Accounting Office
Washington, D.C. 20548

Dear Mr. Martin:

I certainly appreciate the opportunity to review your draft of the costs of constructing health facilities.

The document represents a meaningful contribution to the health care field. The content of the study being most appropriate.

I have discussed our review with Mr. Larson of the Chicago Regional Office who most graciously accepted my few comments.

Sincerely,

Eugene H. O'Reilly
Associate Director

EHOR/md

AMERICAN INSURANCE ASSOCIATION
85 JOHN STREET
NEW YORK, N Y 10038
(212) 433-4400

September 13, 1972

Mr. James D. Martin,
Assistant Director
United States General Accounting Office
Manpower and Welfare Div.
Washington, D.C. 20548

Dear Mr. Martin:

This is in reply to your letter of September 11 requesting our comments and suggestions on the section of your report on health care facilities concerned with construction requirements.

We have reviewed the drafts submitted and have nothing to add. The report is well prepared.

Very truly yours,

John L. Jablonsky
Assistant Vice President
Engineering & Safety Service

JLJ:ml

APPENDIX XVII

International Conference of Building Officials

5360 SOUTH WORKMAN MILL ROAD • WHITTIER CALIFORNIA 90601 • (213) 699-0541

October 5, 1972

James D. Martin
Assistant Director
Manpower and Welfare Division
United States General Accounting
Office
Washington, D. C. 20548

Dear Mr. Martin:

As I indicated to Mr. Gutknecht in a recent telephone call, I felt your draft report to the Congress of the United States on the Study of Health Facilities and Construction Costs was pretty much on the mark. There are a few things that you may wish to consider that might help to clarify our position and perhaps lead to a more cooperative effort among the various regulatory agencies who are called upon to pass judgment on the suitability of design and construction of these kinds of facilities.

The Model Code Agencies all produce model codes that regulate the various kinds of facilities with which you report is concerned. The Uniform Building Code dates from 1927, the Basic Code from 1950, and the Southern Code from 1946.

All of these codes, since their inception, have been kept current by annual review. New editions are issued periodically which incorporate changes based upon results of open hearings in which the various segments of industry and government can be represented and can put forth their ideas and recommendations. A great deal of additional uniformity could be obtained if some of the federal agencies, such as HEW, FHA, and the Hill-Burton people, were to become more intimately involved

in the Code changes processes of the model codes. This would, hopefully, help to eliminate the overlap and duplication that spins off from the syndromes that you have emphasized on Page 52 of the draft. The habit of adoption by reference of a proliferation of standards and codes containing both mandatory and permissive language leads to a very fractured enforcement picture. The philosophy that two pounds of safety are better than one pound without determining the appropriate level of safety further confuses the matter. I think you have summarized very clearly the problems that exist. Your example on Page 58 vividly illustrates the problem.

On Page 53, you have summarized some data which appears to have been taken from the Douglas Commission Report. In interpreting this data, I would like to point out that the category "Out Dated Model National Codes" may be misleading. A number of communities may be primarily suburban and with housing as principal construction. Accordingly, changes to codes may not be as significant as for a community with a greater mixture of construction types. I think some important and accurate data can be gathered from a report entitled "Use of Fire Limits in the United States" by Milton Applefield of the U. S. Forestry Service. In compilation of data with respect to fire limits, Mr. Applefield gathered very significant information on the adoption of model codes and local influences throughout the United States. He had responses from 2090 cities, based upon contacting all of the 2,115 cities in the United States with more than 10,000 population. He breaks down the statistics by population size and by regions throughout the country and I think paints a meaningful picture on the extent of influence of model codes. I am enclosing copies of typical tables from his report.

I think that the model codes would benefit by a greater participation of federal agencies in their code changes processes. And, I think the Federal Agencies would benefit by working within established lines of communications among local governments.

We feel that the legislation pending with respect to the National Institute of Building Sciences will help to fill the gap that exists in basic research on building construction problems. We think this is a proper role for the federal government to play and certainly is an activity in which industry is not generally engaged.

Again, our compliments on your draft.

Yours very truly,

INTERNATIONAL CONFERENCE
OF BUILDING OFFICIALS

James E. Bihr
Managing Director

JEB:ks

cc: Mr. Gutknecht

Southern Building Code Congress
1116 - Brown Marx Building
Birmingham, Alabama 35203

October 4, 1972

Mr. Kenneth Edmonson
United States General Accounting Office
Manpower and Welfare Division
Washington, D. C. 20548

Dear Mr. Edmonson:

Sorry to be so late in reply to the drafts presented to this office concerning the study of construction costs in health care facilities.

Both Mr. Vasvary, Executive Director of the Southern Building Code Congress, and myself have had the opportunity to review the documents.

We would agree with the conclusions that are drawn on Pages 27 and 28, and now the three model code groups, International Conference of Building Officials, Building Officials and Code Administrators, Inc., and the Southern Building Code Congress, have formed one "umbrella" organization, which is known as the Council of American Building Officials, it is felt that this organization would give every consideration to the data that would be forthcoming from the combined efforts of FECA and the National Bureau of Standards.

We wish you every success in this venture and if we can be of further assistance, please feel free to contact us.

Very truly yours,

R. E. Sullivan
Technical Director

RES:kh

APPENDIX XIX

NATIONAL FIRE PROTECTION ASSOCIATION
INTERNATIONAL

September 20, 1972

Mr. James D. Martin
Assistant Director
United States General Accounting Office
Manpower and Welfare Division
Washington, DC 20548

Dear Mr. Martin:

Thank you very much for giving me an opportunity to comment on the draft report to the Congress on the Study of Health Facilities Construction Costs. I am pleased to give you my personal comments but I hasten to point out that I am not in a position to speak for the National Fire Protection Association. Actually, my comments are relatively mild.

Throughout the report reference is made to "performance requirements" and the inference is that there needs to be research done before those performance requirements can be written. My opinion is that the performance requirements can be written but the criteria to comply with those requirements need research in many areas. This probably is a matter of semantics but I admit that the report confused me on this point.

On page 46 of Enclosure A there is a paragraph which cites estimates of the cost of installation of automatic sprinkler systems ranging from $1.00 to $4.00. These estimates are quite a bit higher than the averages we have been receiving in this office. Costs submitted to us by sprinkler companies indicate a cost range between 50¢ and $1.00 per square foot. In that same paragraph there is a statement that the Medicare and Medicaid requirements for automatic sprinklers in all areas are not being enforced. While I agree that the enforcement of the Code requirements on this matter has been delayed, I am quite sure the requirements are being enforced now.

On page 48, Subitem (3), there is the expression used: "One hour flame resistant walls." In our parlance this would be stated: "Walls having a one hour fire resistance rating." In addition, floors and ceilings are not tested separately. They are tested as a composite so that the one hour rating would be for a floor-ceiling assembly.

Very truly yours,

Richard E. Stevens
Director of Engineering Services

RES:ss

[See GAO note.]

September Twenty-fifth
Nineteen Hundred Seventy-two

Mr. James D. Martin
Assistant Director
Manpower and Welfare Division
United States General Accounting Office
Washington, D.C. 20548

Dear Jim:

Your time and that of Bob Tice's was appreciated by all of us involved in the Westinghouse Health Systems study of [reference hospital].

The conclusions reached, we are basically in accord with. If we had the opportunity to do it again, many of the suggestions would be used for the new hospital.

From the present study we have adopted the recommendation regarding pharmacy--unit dose system. This will phase in with our development of a computerized Medical Information System and interphase with our computerized business office system.

If you are interested in doing a further study after our computerized Medical Information System is in, we would welcome that effort.

On behalf of myself and our people involved in this study may I say, "Thanks for the opportunity, and it was a pleasure working with you and all the others involved in this study."

Best regards.

Cordially yours,

[See GAO note.]

GAO note: Comment by administrator of reference hospital.

[See GAO note.]

September 19, 1972

Mr. James D. Martin
Task Force On Health
Facilities Construction
U. S. General Accounting Office
441 G Street, N.W.
Washington, D. C. 20548

Dear Mr. Martin:

We are very pleased to have had the opportunity to discuss with you and Mr. Tice the section of the report you are preparing for Congress, related to improved hospital design and construction.

Having been architects for the [reference hospital] during most of its recent development, we believe tnat we are in a position to evaluate this section in terms of the improvements hypothetically possible assuming removal of physical, funding and phasing constraints, and assuming also the state-of-the-art improvements offered in that analysis.

It is our judgment that the design approach based on these assumptions has validity, and that the justification offered in that section is applicable and prudent. As a whole, that section represents a thoughtful and considered approach to the issues of improvement and warrants serious consideration.

It was a pleasure to meet with you to discuss both these general conclusions, as well as the detail of the section, and we will be interested in the report which you will submit to the Congress.

Sincerely,

[See GAO note.]

GAO note: Comments by architects of reference hospital.

Copies of this report are available from the U. S. General Accounting Office, Room 6417, 441 G Street, N W., Washington, D.C., 20548.

Copies are provided without charge to Members of Congress, congressional committee staff members, Government officials, members of the press, college libraries, faculty members and students. The price to the general public is $5.00 a copy. Orders should be accompanied by cash or check.