Toward Strategies for Cost Containment in Surgical Patients

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The University of Rochester, Department of Surgery, in response to an experimental community-wide limit on hospital budgets, studied high-cost general surgical patients as a potential source of leverage for containment of hospital costs. It was found that a small number of patients impact significantly on hospital costs. In 1980, 3935 patients at Strong Memorial Hospital (SMH) had at least one contact with a general surgical patient care or intensive care unit; 261 patients (6.6%) had total 1980 charges of more than $20,000 each. They contributed 32% of the total of both general surgical charges and patient days. A subset of 2021 patients was selected to represent more precisely the general surgical patient. The 85 high-cost patients (4.2%) of this subset were chosen for intensive study. These patients generated a significant and disproportionate per cent of total (2021) general surgical charges (26.8%) and hospital days (27.6%). Average total charges were more than 8 times those of the complementary general surgical subset (1936). Nineteen of the 85 patients (22.3%) died in the hospital and 42 patients (49.4%) were dead within 2½ years. Forty patients (of the 85) were then further identified as "complex", based on multiple, usually unrelated, illnesses and multiple annual admissions. Tending to be elderly with poor prognoses, 60% of them had died by April 1983. The major criterion of complexity was the lack of a well-focused medical problem; the cure for one problem simply relinquished primacy to another. A parallel study of hospital ancillary procedures disclosed a similar high-cost pattern. Of approximately 4000 ancillary procedures, 100 (2.5%) had annual charges of $100,000 or over, accounting for two-thirds of total 1980 ancillary charges. Roughly 20% of a single patient's ordered procedures accounted for 80% of the patient's ancillary charges, thus allowing concentrated study of a relatively small number of charges. Means for cost containment may be applied logically to the high-cost patient and particularly toward the complex patient. The complex patient is especially suited for consideration, since it is postulated that these patients are endemic to all general hospitals and to all clinical services. Strategies to be developed should include: 1) a managerial system in which physicians have an incentive to contain costs, 2) an online data system, 3) an accurate, efficient way to identify prospective high-cost and complex patients and, 4) awareness by physicians, patients, and society that less expensive modes of diagnosis and therapy are an appropriate response to rationed health resources.

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A GROWING LITANY about cost containment has pervaded the health care literature for the past decade. Suggestions and efforts to improve the economics of health care have varied. Much of it has been directed to relatively broad issues of reimbursement controls, consumer incentives, and organization design.[1-4] Now there is a growing recognition that attention must and will shift to the technological core of medical care, that is, to clinicians and to the processes of clinical medicine where, especially in hospitals, incentives to contain costs are either weak, non-existent, or even counter-productive. This paper focuses on one such clinical arena in a university hospital, Strong Memorial (S.M.H.), in Rochester, New York.

In Rochester, New York, a Rochester Area Hospitals Experimental Payment (HEP) program has been instituted through the cooperative efforts of the community's nine non-profit hospitals.[5] It has demonstrated that the voluntary hospital system in the greater Rochester area can control the rate of increase in hospital costs and can maintain an efficient high-quality delivery system. Area hospitals are governed by prospective budgets allocated from a fixed community-wide pool created by the major insurers of hospital care, *i.e.*, Blue Cross, Medicare and

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Medicaid. Each hospital is guaranteed certainty of a fixed level of hospital revenues and can share in savings while being responsible for making up its deficits. This broad incentive for cost containment in the community's hospital system has resulted in pressures to exact efficiencies in the more specific clinical services.

In order to assist the community hospitals in identifying productive areas for cost containment, the HEP program has granted a number of research projects directed especially at clinical practice. This project is one of those. Considering the incentive provided by the ambiance of budget constraints, the Department of Surgery is motivated to participate more directly in the search for opportunities to respond to that incentive. An additional motive is the availability of data. One feature of the HEP program is a computerized base of patient-specific utilization data in the participating hospitals. In addition, the Strong Memorial HEP data base has been refined to provide a rich source of patient utilization and billing information. Thus, our study is limited to the Strong Memorial experience.

We have chosen the high cost hospital patient as a potential opportunity to effect efficiencies at the clinical level. Recent literature has suggested that the high-cost hospital inpatient is a point of leverage for cost control and containment.[6,7] Our project intends to add further understanding of this class of patients by specific attention to general surgical patients. In addition, we have applied the principles that guided us in the analysis of high-cost patients to a study of high-cost hospital ancillary services as a means of exploring other potential strategies for containment of costs.

Methods

Strong Memorial—HEP Data Base

This data base is filed and processed in batch mode on an IBM 3032® computer. The base contains detailed patient and billing information about all inpatient discharges in a given year. While this study was in progress, only 1980 data were available. Specifically, the file contains patient demographics (age, sex, ethnic origin), room and ancillary charges, source of reimbursement (Medicare, Medicaid, Blue Cross, other), hospital days, discharge clinical service, discharge disposition, five levels of primary and secondary ICD-9 diagnostic codes, five levels of ICD-9 operating and diagnostic procedure codes, a diagnosis related group (DRG) code, and patient ancillary procedures including the procedure code (charge code), the date the procedure was applied, the charge, and the units delivered. In addition, room charges, ancillary procedure charges, and hospital days are recorded for each patient encounter on a clinical patient care unit (PCU) and intensive care unit (ICU). This data base is managed by a Strong Memorial HEP Data Support Committee, staffed by a full-time data manager and programmer. Every effort has been made to maintain the data base quality.

For this study, computer produced statistics were augmented with manual tabulations when computer and/or programming capabilities were temporarily unaccessible. While we cannot guarantee the complete accuracy of every statistic, we are confident that the results provide a secure base for the conclusions.

Units of Analysis

Literature about inpatient hospitalization often relates to the patient and/or the admission (discharge). The *admission* is a single uninterrupted duration of patient time in the hospital. During a single admission, a patient may be transferred among different geographically identified clinical services or patient care units (PCUs), including ICUs. The *encounter* is an uninterrupted duration of patient time in a given PCU-ICU. Thus, in a given year or more, patients disaggregate into admissions that, in turn, disaggregate into encounters.

Information about clinical service utilization can be misleading if it relates to admissions and not to encounters. Admissions are often linked to clinical services in terms of the patient's status at the time of discharge. Thus, an admission is declared to be "general surgical" if the patient was discharged from a general surgical PCU. This obscures the varied clinical involvement from patient transfers or encounters. For example, the patient discharged from general surgery may have spent most of the hospital stay in a medical PCU. General surgery involvement may have been minor yet be credited with the total admission utilization statistics in a data base.

In this study, we employed three units of analysis—patient, admission, and encounter. The prime unit of analysis is the patient. Patient utilization statistics are aggregated across all of the patients' 1980 Strong Memorial discharges. Thus, a hospitalization consisting of the patient being admitted in 1980 but discharged in 1981 will not be included in the statistics. A flow diagram of the multiple discharges with encounters in several different PCU-ICUs during the course of 1980 illustrates the activity for one high-cost patient (Fig. 1). An elaboration is contained in following sections.

Charges Versus Costs

As with many studies of hospital utilization, we are confined to using patient charges or billings as the convenient surrogate measure of cost. Charges are an accurate measure of the cost to reimbursing agencies. But for specific patients or procedures, charges are an in-

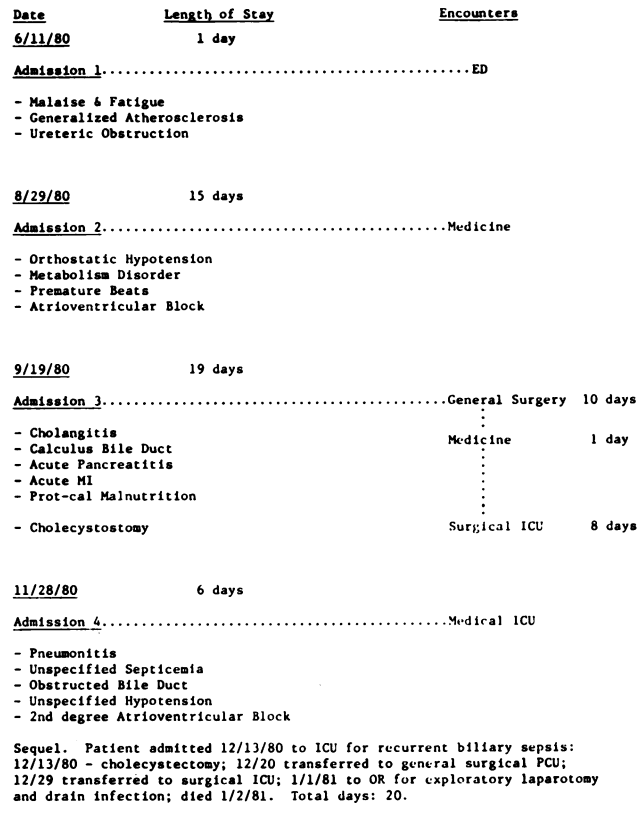

FIG. 1. Flow diagram for a typical high-cost patient having multiple admissions and encounters. Patient: male, age—78 years, total charges in 1980—$25,500, intensity—$621 per day for 41 days.

accurate measure of actual hospital resources consumed. For example, in judging the "savings" in cost by the reduction or elimination of services to a high-cost patient, one must evaluate the value of the resources that are "marginally" or actually escaped. They would be much lower than the charges escaped because of the short-term fixed nature of hospital resources. However, in the comparison of different classes of patients, charges provide a useful relative measure of the resources used.

There are two major components of the patient's charge. The first is the per diem room rate for the PCU or ICU. Except for the ICU differential rate, the charge is basically the same per day for all patients. Therefore, the room charges do not differentiate the per patient intensity of services provided by the patient care units. Charges for high-cost patients may be conservative if we assume that they are more intensive users of PCU labor and supplies than low-cost patients. The second component is direct charges for ancillary services. These do measure the intensity of ancillary service usage by individual patient. Our results indicate that on the average, 50% of the general surgical patient's charges consist of room charges that tend to dampen the true variability in the daily patient utilization of PCU-ICU resources.

S.M.H. General Surgical Patients

The 1980 S.M.H.-HEP data base contains information about 21,820 inpatients, excluding newborns. These patients generated 24,320 discharges, 236,000 hospital days, and $82 million inpatient charges. From this file, 3935 patients were identified as having at least one encounter with one or more of the five general surgical patient care units including the general surgical ICU. These were defined initially as general surgical patients. It is important to keep in mind that these patients were likely to have had encounters with other clinical services during 1980 either within single or among multiple admissions. And, unless otherwise noted, their utilization statistics include all services.

This population of general surgical patients was divided into two mutually exclusive subsets. The first subset included those patients who were discharged from the general surgery clinical service at least once in 1980. They were identified in the data base by a code that recognizes a clinical service as opposed to a geographically determined PCU code. The complementary subset includes those patients who, while experiencing general surgical PCU encounters, were discharged from other clinical services, primarily medicine and surgical subspecialties. The first and second groups numbered 2021 and 1914, respectively. This division resulted in "purifying" the general surgical content of the study population. The subpopulation of 1914 included almost all of the high-cost open-heart, neurosurgical, orthopedic, rehabilitation, and other surgical subspecialty patients. They appeared in the initial population of 3935 because of one or more encounters with a general surgical PCU-ICU during their hospitalization. Since the subset of 2021 is more representative of the general surgical patient, it was used to select the high cost patients for more intensive study.

High Cost General Surgical Patients

The definition of "high cost" is arbitrary. In our study, we chose annual charges of $20,000 and above per patient as the criterion. Two hundred sixty-one patients from the 3935 population each had total 1980 S.M.H. inpatient charges of over $20,000 (the lowest being just over $20,000).

The two subsets of patients, 2021 and 1914, each yielded subpopulations of high-cost patients. Figure 2 diagrams the relationships between the various subpop-

ulations. The group of 2021 general surgical patients, chosen on the basis of clinical discharges, contained 85 high-cost patients. They are the basis for a more intensive study described subsequently.

The "85" High Cost Patients

The population of 2021 general surgical patients yielded 85 patients with annual S.M.H. charges of over $20,000 each. This group excluded high-cost open-heart, neurosurgical, orthopedic, rehabilitation, and other subspecialty patients, except for several patients who had other general surgical problems resulting in discharges from general surgical services.

The detailed utilization data extracted from the data base were supplemented with information taken from each patient's record. The record was given a comprehensive review as a basis for providing further patient classification. Each record was examined in detail by one of the physicians or the nurse clinician. Information for years other than 1980 was also obtained to provide a broader perspective for assessment of these high-cost patients.

Complex patients. Each patient was classified as being complex or non-complex. Complexity was defined as follows: that patient presented with multiple co-morbidities as judged by the reviewers and by the number of unique ICD-9 diagnostic codes assigned overall to the patient's admissions in 1980. In these patients, no one problem was deemed to be the major cause for repeated hospitalizations. The coexisting several diseases or problems were quasi-independent. This was reflected by the judgment that the cure of one problem would have had little effect on the remaining problems, so that the patient had a "chronic" set of residual problems. There was an experience or expectation of repeated admissions and multiple encounters among different clinical services and long hospital stays. Prognosis was not good in a significant per cent of the patients.

Prognosis and surgical intervention. Each of the 85 patients was subjected to an evaluation by three surgeons to determine a prognosis for future living status and the relative benefits from surgical intervention. The prognosis scale was based on the estimation of the patient's likelihood of resuming his/her role in society as a potential contributor: poor, guarded, or good. The dominant surgical intervention in 1980 was categorized as justified, questionable, or not justified. This was done under the assumed situation of highly visible and severe budgetary constraints. In addition, the dominant surgical interventions were classified as curative or palliative.

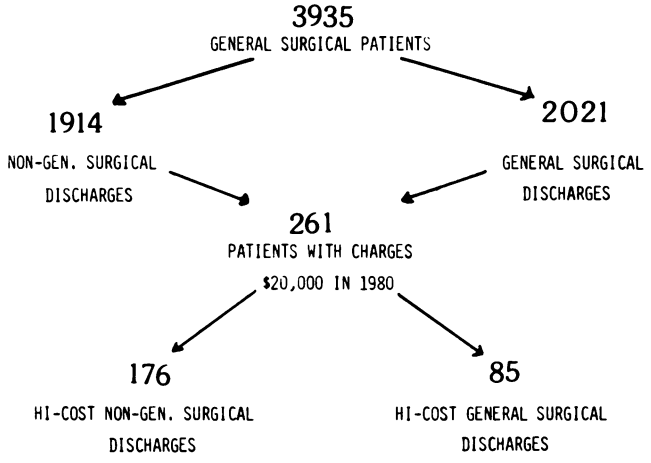

FIG. 2. Relationship between subpopulations of general surgical patients.

The 85 high-cost patients were categorized further as to their dominant medical problem on admission (vascular disease, gastrointestinal disorders, cancer, renal disease, psychiatric disorders, or other) and according to their major operation by systems (vascular, gastrointestinal, urinary, musculoskeletal, integumentary, or respiratory).

Complications among the 85 high-cost patients. To categorize more fully high-cost general surgical patients, a classification was devised based on preoperative state and postoperative course. Each patient was given an A/B designator as follows:

A. Preoperative condition.

A1) simple surgical problem;

A2) simple surgical problem with other medical diseases;

A3) complex surgical problem;

A4) complex surgical and other medical problems.

B. Postoperative course.

B1) uncomplicated postoperative course;

B2) no surgical complications but ongoing medical problems were responsible for continuing hospital care;

B3) postoperative surgical complication;

B4) postoperative medical complication;

B5) both medical and surgical complications.

Ancillary Procedures

Part of our investigation was a study of ancillary procedures and charges for the hospital in total and by patient. S.M.H. maintains a hard copy file of annual ancillary charges for each of the hospital's approximately 4000 individual procedures (charge codes). The file contains the procedure identification number, the total annual

TABLE 1. *General Surgical Component of Total Inpatient Hospitalization 21,820 1980 SMH Patients (100%)*

	3935 General Surgery (18%)	17,885 All Other Services (82%)
Total charges	32.7%	67.3%
Hospital days	26.7%	73.3%
Admissions	22.1%	77.9%
ICU charges	44.3%	55.7%
Ancillary charges	39.0%	61.0%
Charges per patient	$6824	$3083
Charges per day	$426	$319

charges for that procedure, classified by inpatient, outpatient, and emergency department, and the units sold. This detail is also aggregated by service department. The 1980 file was used to identify high-cost ancillary procedures.

At the patient level, the HEP data base contains every ancillary procedure charged to a patient. The profile of ancillary procedure utilization for a small sample of patients was studied to determine the existence and nature of high-cost procedures in individual patients.

Results

S.M.H. General Surgical Patients

From the 21,820 patients (excluding newborns) served by S.M.H. in 1980, 3935 patients (18%) were identified as having at least one encounter with a general surgical patient care or intensive care unit. Table 1 presents some utilization data for these patients compared to those who had no contact with general surgery. Note that the data for both groups includes the patients' total 1980 S.M.H. activity across all of their admissions.

These general surgical patients accounted for just under one-third of the hospital's total patient charges and almost 27% of the hospital days. They were significant users of the hospital's ICU and ancillary services, accounting for over 44% of the former and just under 40% of the latter. The average per patient charge was more than double the average charge for the non-general surgical population. Their $426 average charge per day was $100 per day higher than the non-surgical patients.

TABLE 2. *Clinical Service Utilization of General Surgical Patients 3935 General Surgical Patients*

Clinical Service	% Charges
General surgery ICU	28.5
General surgery PCU	40.2
Medicine ICU	2.7
Medicine PCU	10.4
All other services	18.2

TABLE 3. *Utilization by the 261 High-Cost General Surgical Patients*

100%	3935	General surgery patients
6.6%	261	Patients with charges > $20,000
32%		Total hospital charges
32%		Total hospital days
54%		Charges for just general surgical days
40%		All ICU days
30%		Ancillary charges

Table 2 presents the clinical service utilization of the 3935 general surgical patients in terms of annual charges. Over two-thirds of their total 1980 charges were for patient days spent in general surgery PCUs or ICU. Thirteen per cent of the charges were for encounters in medicine PCUs and ICU. For the average patient encountering general surgery at least once in the year, just over 40% of the charges for general surgery went for PCUs and 28% to the ICU.

High-Cost General Surgical Patients

Table 3 details some utilization statistics for the 26 high-cost patients as a percentage of the population of 3935. While accounting for only 6.6% of the patients, they generated almost one-third of the charges and hospital days. They consumed 40% of the ICU days and 30% of the ancillary charges for the 3935 patients. Fifty-four per cent of the charges for general surgical days were credited to these patients.

Characteristics of the "85" High-Cost Patients

Table 4 lists utilization statistics for the 85 high-cost patients compared to the remainder of those patients in the population of 2021 and to the total population.

The 85 patients constituted 4.2% of the 2021 patients but generated a significant and disproportionate per cent of the total charges (26.8%) and hospital days (22.6%). Their hospital days per patient were over 6.5 times longer than that for a patient in the complementary set. The average total charge per patient was over eight times larger for the high-cost patient than the complementary one. Ancillary charges as, a percent of total charges, were about the same for both groups.

Nineteen (22.3%) of the 85 patients died while in Strong Memorial Hospital in 1980. By May 1, 1983, a total of 42 (49.4%) of the 85 patients had died, 36 patients are known to be living, and seven patients were lost to follow-up.

TABLE 4. *1980 Inpatient Activity for 85 High-Cost Patients and the Complementary Set of 1936 Patients Taken from the Population of 2021 Patients*

	85 High Cost	Others	Total Population
Number of patients	85	1936	2021
Number of admissions	209	2513	2722
Admissions per patient	2.46	1.30	1.35
Number of hospital days	6106	20,892	26,998
Hospital days per patient	71.8	10.8	13.4
Total charges	$2,953,580	$8,068,070	$11,021,650
Charges per patient	$34,750	$4167	$5454
Ancillary charges	$1,519,570	$3,991,720	$5,511,290
Ancillary charges as per cent of total	52.1	49.5	50.6
Average charges per day	$483	$386	$408

The primary source of reimbursement for the 85 high-cost patients in 1980 was: Medicare (63.5%), Medicaid (20.0%), Blue Cross (9.4%), and others (7.1%).

The average age was 64 years and the age distribution was as follows:

Years	Per cent
0–19	2.35
20–44	15.29
45–54	12.94
55–64	25.88
65–69	12.95
70–74	10.59
75–79	11.76
80–84	5.88
85–89	2.35
	100.00

Table 5 details the clinical PCU-ICU activity for the 85 patients.

Complex patients. Forty of the 85 high-cost patients were classified as "complex" using the criteria described in Methods based primarily on the judgments rendered by the three surgeons. Table 6 compares these complex patients with the complementary 45 non-complex from the population of 85.

Prognosis and Justification for Surgical Intervention. Tables 7 and 8 show assessment of the 85 patients by the three surgeons in regard to prognosis and justification of surgical intervention.

Complications among the 85 high-cost patients. The patients fell into three main groups in the classification

TABLE 5. *A Clinical Utilization Profile of 85 High-Cost General Surgical Patients*

Clinical Service by Encounters	% Charges	% Days
All general surgery PCU and ICU	74.8	69.1
General surgery ICU	37.7	15.6
General surgery PCU (exc. ICU)	37.1	53.5
All medicine PCU and ICU	16.1	18.1
Medicine PCU (exc. ICU)	11.9	16.2
All ICU	43.6	19.0
All other services (exc. surgery, and medicine)	9.1	12.7

TABLE 6. *Utilization by Complex and Non-Complex High-Cost Patients*

	Complex	Non-Complex
Number of patients	40	45
Admissions per patient	2.9	2.1
Encounters per patient	6.0	3.5
Hospital days per patient	80	65
Charges per patient	$36,990	$32,760
ICU days per patient	11.7	15.4
ICD-9 DX codes per patient	9.4	5.3
Terminal 5/1/83	60%	40%
Average age (years)	64	57
"Not likely" prognosis	75%	55%

matrix based on an evaluation of the pre- and postoperative state. Thirty patients before operation had a simple surgical problem associated with other medical diseases and developed both medical and surgical complications after operation (A2-B5 group). An additional fifteen patients had a similar preoperative state, but their postoperative complications were confined to problems associated with their medical illness (A2-B2).

The third group of any size was composed of six patients who had complicated medical and surgical problems before operation and developed both medical and surgical complications after operation (A4-B5).

These three groups accounted for 60% of the 85 high-cost patients, with the remaining patients scattered, ap-

TABLE 7. *Prognosis in the 85 High-Cost Patients*

Prognosis	% of Patients
Poor	64
Guarded	24
Good	12

TABLE 8. *Justification of Surgical Intervention*

Surgery not justified	19%
Surgery possibly not justified	14%
Surgery definitely justified	67%

TABLE 9. *Preoperative Status Compared with Postoperative Complications among High-Cost Patients*

Preoperative State		Postoperative Course: Uncomplicated B1	Ongoing Medical Problems B2	Surgical Complications B3	Medical Complications B4	Surgical and Medical Complications B5
Simple surgical problem	A1	1	3	3	2	1
Plus medical problem(s)	A2	—	15	2	4	30
Complex surgical problem	A3	4	—	4	1	3
Complex medical problem(s)	A4	—	3	1	1	6

One patient did not have an operation.

parently in a random manner, throughout the preoperative matrix (Table 9). The postoperative course is summarized in Table 10.

Diagnostic classifications and operative procedures. The patients were classified according to their type of disease. All patients easily fell into one of six problem categories (Table 11). There were 13 patients in the renal category by virtue of either a kidney transplant or surgery for dialysis access. These patients tended to be younger, less likely to have surgical complications, and had an average cost of $36,793 per patient. There were nine renal transplants as well as eighteen access procedures in this group.

Most of the 30 patients classified in the vascular group underwent a major vascular bypass procedure, *e.g.*, femoral-popliteal bypass graft or elective repair of an abdominal aneurysm. Interestingly, there were no ruptured aortic aneurysms in this group. There were 40 major operations in this group. The total cost per patient was $30,625.

The remaining patients, broadly classified as general surgery patients, were more hetereogenous. Nevertheless, one-half of these patients required treatment of either cancer or intestinal obstruction. There was an average charge of $37,447 per patient in this broader group of patients. The postoperative complications in this group were not as likely to be responsible for a significant portion of the high cost as compared to the patients with vascular disease. This group, however, did have complications more frequently than those with renal disease.

The 85 high cost patients involved 114 different ICD-9 operative codes across 134 admissions. The distribution of admissions by aggregated operative codes or systems is shown in Table 12.

TABLE 10. *Summary of Postoperative Courses in the 85 High-Cost Patients*

Uncomplicated	5
With ongoing medical problems without surgical complications	21
With surgical complications only	10
With medical complications only	8
With both medical and surgical complications	40

One patient did not have an operation.

TABLE 11. *Dominant Problem for the 85 High-Cost General Surgical Patients*

Vascular	30
GI	15
Cancer	14
Renal	13
Psychiatric	4
Other	9
Total	85

High Cost Ancillary Procedures

Ancillary procedures (x-rays, laboratory tests, drugs, special therapy procedures and services) are produced by 45 ancillary service departments in S.M.H. In 1980, the total charges for these services was over 42% of the hospital's budget. There are over 4000 cataloged individual ancillary procedures, called "charge codes," and produced by these service departments. In 1980, 70 of the codes (approximately 2%) had annual charges of $100,000 or more. In the aggregate, these 70 codes accounted for almost two-thirds of the total annual hospital ancillary charges.

Table 13 lists the 20 ancillary procedures having the highest 1980 charges. In the aggregate, they accounted for 50% of the total 1981 S.M.H. ancillary charges. This heavily skewed distribution of ancillary usage reflects the fact that hospital patients receive a common battery of ancillary services. Then there is a large number of services that are specific to each admission and applied in relatively small doses, that is, the hospital is a heavy user of standard procedures and a light user of many special and possibly high technology procedures.

The Patient and Ancillary Procedures

Twelve admissions for nine patients, with charges exceeding $5000, were selected at random and analyzed for

detailed ancillary usage. The average number of procedures or codes charged per admission was 243. The maximum number was 591 and the minimum was 68. Twenty per cent of the procedure codes charged to the patient accounted for an average of 73% of the total ancillary charges to the patient (range, 55.6–81.1).

Discussion

Background

Many factors have been identified as participants in the progressive increased proportion of our national wealth consumed by medical care, a trend that has been growing over the past half century.[8] The public has developed unrealistically high expectations of medicine, reflected in part by greater use of hospitals.[9] Stimulated by social pressures, as well as by more effective therapeutic interventions, there is an increased tendency to use hospitals for an aggressive approach to the care of many chronic diseases.[6,7] By 1981, there were ICUs in 95% of all acute care United States hospitals.[9] Also, there is a greater reliance on the hospitals to participate in the dying process. Hospitals, lacking cost control incentives, have been powerless or at least unwilling to stem this tide.[9] Although the unwarranted use of the plethora of laboratory tests and procedures currently available constitute a significant influence on the rising costs of health care, this is one area in which a limited control of expenses has been achieved.[10]

It is the development of new technologies with large capital costs, however, that have attracted public attention as culprits in the escalation of the costs of medical care. A schizophrenic attitude is clearly portrayed by the demand for universal access to the new high technology for diagnostic and therapeutic procedures, coupled with expressed concerns and projected programs to restrict utilization of these resources. It is becoming increasingly apparent that a disproportionate investment in medical care is being provided to a small number of patients and that, all too often, these patients do not benefit from the resources that are used in their care.[9,11–15]

Within an ambiance of "capped" hospital budgets and fixed reimbursement rates, physicians will be required to determine where leverage can be applied to affect cost savings and improve efficiency. Obviously, this will not be an easy task, because it will require substantial changes in attitudes plus increased knowledge and understanding about the quality and microeconomics of medical care. Attendant moral and ethical considerations must also be addressed. This challenge must be assumed by all segments of society—patients, families, governments, *etc.*, as well as by the medical professionals.

TABLE 12. *Classification of Admissions by Class of Operation*

System	Number of Admissions
G.I.	62
Vascular	40
Urological	14
Musculoskeletal	9
Integument	5
Central nervous system	3
Respiratory	1

Accepting this imperative, the attention by physicians largely has been centered on control of intensive care units, since these segments of the hospital operations so clearly generate high costs. It is estimated that approximately 20% of total hospital charges are consumed by ICU care.[16] It is noteworthy that students of ICU activity almost uniformly acknowledge the failure of this type of care to promote improved survival or quality of life for many of the patients who are routinely admitted to these units.[9,16–18] As currently constituted and operated, the ICU service has been considered to be one of the least-efficient users of medical resources.[16] A relatively large proportion admitted to a medical ICU are simply for the reassurance of the physician or for non-critical monitoring.[9,11,12] Different cost problems are encountered in the surgical ICU patients. Cullen[14] found that 54% of primarily postoperative critically ill patients on an ICU died within a month and only 12% were fully recovered within

TABLE 13. *Twenty Highest Cost Ancillary Procedures—S.M.H.—1981*

Ancillary	1981 Charges $ in Millions	Per cent of Total Ancillary Charges
OR rentals	5.08	12.10
Blood gas	2.48	6.05
Pharmacy IV additives	2.01	4.90
Chem profile	1.56	3.80
Anes hosp support	1.44	3.51
Stat test charges	1.02	2.49
Blood smear/WBC diff	0.83	2.02
Post anesthesia	0.66	1.61
X-ray—portable	0.63	1.54
Electrocardiogram	0.60	1.46
Delivery room rentals	0.51	1.24
Blood cell profile	0.49	1.20
Compatibility T cross	0.47	1.15
Pharmacy—hyperalimen	0.46	1.12
X-ray—PA lat chest	0.43	1.05
Red blood cells	0.42	1.02
Gyn room rentals	0.41	1.00
Solutions	0.41	1.00
Psych activities fees	0.40	0.98
X-ray chest—single view	0.40	0.98
Totals	20.70	50.22

the year. Civetta[19] concluded from his study of surgical intensive care units that the costs generated by prolonged use of this type of facility were inversely related to the probability of survival.

In response to these observations, Mulley in Boston and Knause in Washington have undertaken the task of prospectively identifying those patients who do not need or will not benefit from ICU care.[9,13] The anticipated moral and ethical concerns engendered by these inquiries have become less onerous by the reaffirmation of those investigators of the two basic goals of an ICU as a service to provide close monitoring of stable non-critically ill patients in anticipation of a sudden need for life support, and as a resource to reverse acute physiologic abnormalities to buy time until definitive therapy of the underlying problem can take effect.[9,13,17] The criticism is growing that use of the ICU is an unwarranted expense when it serves as a place to prolong the dying process.[9,11-13,17]

Another and less well-studied approach to the cost of hospital care by physicians involves attention to the groups of patients who consume a disproportionate share of the hospital resources. Recent literature has suggested that these high-cost inpatients provide a logical point of leverage for cost containment.[6,7,20] This rationale is imbedded in the more general principle that in many human activities, a small number of the actors contribute (account) for a major and disproportionate share of the action. This principle was first articulated at the end of the last century by the Italian economist, Vilfredo Pareto,[21] who studied the skewed distributions of family income. A small number of families received the major share of total income. During the earlier part of this century, the principle received managerial attention. For example, the differential control of material inventories was based on the relative importance of the small numbers of items that contribute to most of an inventory investment. The recognition and use of this principle in health management is relatively recent.[20] Morrow[22] studied the maldistribution of health manpower and facilities in terms of Pareto's law. Densen[23] studied high-cost *versus* low-cost utilizers in a medical care plan in 1959. In a more general setting, two important works discuss the high-cost patient issue in the context of inpatient hospitalization consistent with the Pareto principle. In 1976, Schroeder et al.[6] provided a clinical description of high-cost patients in a 17 acute-care hospital system. A corresponding study, also in 1976, reported by Zook and Moore,[7] found in six contrasting hospital populations that 13% of patients consumed one-half of the total resources. Their high-cost patients were characterized by potentially harmful personal habits such as drinking, smoking, and obesity, by a greater frequency of unexpected complications during therapy and by repeated hospitalization for the same disease. One-third of the high-cost patients had an incurable or degenerative illness with a substantial degree of impairment.[7] Forty-seven per cent of the adult high-cost patients studied by Schroeder had a chronic medical condition, particularly heart disease or a malignancy, and they had been receiving therapy for some time. Approximately only 16% of the high-cost patients had acute, unexpected medical problems, usually trauma. One-seventh of these patients died while in the hospital, and it is probable that an appreciable additional number died shortly after discharge in nursing homes or at home. These results are strong testimony in support of the growing concern about a disproportionate allocation of resources for dying patients in comparison with other high-cost patients.[6]

Readily characterized surgical high-cost problems and procedures, such as coronary artery bypass, renal transplantation, hip replacement, and trauma associated with neurologic or orthopedic problems have attracted widespread attention. But these highly specialized readily characterized problems did not constitute a large proportion of Schroeder's group of high-cost patients.

It is probable that attention to control of these patients in the hospitals where this type of surgery constitutes a higher proportion of the total surgical activity will result in an effective containment of costs. On a national scope, however, drawing on Schroeder's findings, it is questionable whether this type of high surgical technology will have a significant impact on containment of costs due to the relative infrequency with which these procedures are performed in most of the nation's hospitals.

In our study, these patients with high costs and readily definable surgical problems were largely excluded by the methods used to select our population for study. Our goal was to determine whether or not a core of high-cost patients existed in the community of patients ordinarily classified as general surgical and probably representative of most acute care hospitals across the country. Despite the method of selection, a few of the recognized high-cost patients became included in our series because for one reason or another, they were discharged from the hospital from a general surgical service.

Patient Selection

Characterization of the high-cost general surgical patient. In our efforts to identify "general surgical" patients, we were confronted with the problem of matching definitions with a data base containing information about patients, admissions, and encounters. Both multiple ad-

missions and encounters contribute to the difficulty in establishing a population of homogeneous general surgery patients.

The 85 high-cost patients represent a subpopulation and not a statistical sample. Thus, our results cannot be extrapolated to a large and underlying population. The alternative would have been to select a cross-sectional sample from a population, such as the total general surgical group of 3935 patients, and thereby have a basis for comparing high-cost to low-cost patients, as well as permitting some estimations of broad population parameters. But we were less interested in characterizing a population than in identifying high-cost patient management issues.

Regardless of the size of a study group, the problem of heterogeneity and further subclassification is universally present in studies of hospital patients. The 85 patients were an interesting group to investigate. Their common dimension of high cost did not preclude variation in demographics, admission and encounter utilization, medical problems, and surgical procedures (Table 4).

High-Cost Patients

The data presented in Table 3 confirms the observations of others that a small number of patients are users of an extraordinarily high percentage of a hospital's resources, as measured by patient charges.[6,7]

The 85 "pure" high-cost general surgical patients, in spite of small numbers, still accounted for a large aggregate total charge ($3 million or 3.6% of the total 1980 S.M.H. charges). Their average annual per patient charge was almost $35,000, as compared to $4000 for the remaining patients in the population of 2021 (Table 4). They had prolonged periods of hospitalization, an average of 72 days compared to only 11 days for the complementary set. The complementary set of 1936 patients (2021 − 85) also included patients with charges ranging from $5000 to $19,999, high-cost by many standards. Three-fourths of the 85 patients' charges were related to general surgery PCUs-ICU. Interestingly, the charges were divided evenly between the PCU and ICU activity (Table 5). They were extensive users of combined (surgical plus medical) ICU facilities (43.6% of charges).

Medical surgical characteristics. Ninety-four per cent of the patients had some type of postoperative complication (Tables 9 and 10). It is difficult to assess precisely the extent to which the postoperative complications contributed to the exceptionally high cost of these patients. This issue, of course, is of paramount interest, since it bears directly on the question regarding the justification for performing surgery in these patients. Undoubtedly, the frequent association of a serious medical disorder contributed to the high incidence of postoperative surgical complications in this group, which, in turn, significantly influenced time spent in the hospital (39/85, 46%) (Table 9). Although surgical complications per se do not usually lead to this degree of high cost, 11 patients in this group (13%) had a significant postoperative surgical complication without relation to a pre-existing medical problem (Table 9). This is in keeping with the observations of others that attention to surgical misadventures may prove to be an important strategy toward reduction of hospital costs.[7,24,25]

In an effort to gain further characterization of the high-cost patients, they were assessed in regard to the prognosis for their return to a useful life. As might be expected, considerable discussion centered on a functional understanding of this criterion which, of necessity, was arbitrary without quantitative boundaries. But we felt that some indication of the judgment of prognosis by the physicians thoroughly familiar with the patient's medical history would help toward a better characterization of this group of patients. There proved to be a surprisingly good consensus after the functional guidelines of "useful life" became better delineated (Table 7). No attempt was made to supplement this judgement with a reliability study.

Similar difficulty was encountered in assessing whether or not the significant operative intervention was justified (Table 8). Our judgments were made under the hypothetical constraint that resources were absolutely limited and that a choice would have to be made between performing the operation that was done on the patient or saving the resources involved for other patients with more promising prognoses. Thus, the judgments of prognosis had a direct bearing on the judgments of justification for surgical intervention. Perhaps reflecting our background and, indeed, the tradition of surgery, we estimated that two-thirds of the patients had a justifiable surgical procedure even under the hypothetical strict constraint of resources and despite an estimate of guarded or poor prognosis in 88% of these patients (Tables 7 and 8). Granted a positive or negative bias for making retrospective judgments and the fact that we had only a hypothetically imposed constraint which could foster wishful thinking, our behavior in this assessment, nevertheless, may be indicative of the difficulties physicians and society in general will encounter as they are forced to readjust their concepts about the allocation of medical care in a time of limited resources.

The complex patient. Among the 85 high-cost patients, we identified a group of 40 patients who were arbitrarily termed "complex," as judged by a number of criteria. We originally hypothesized that these patients would

present a special problem of management and opportunity for cost containment. The probable general presence of this type of patient in most hospitals, the characteristic ambiguity of the patient's problem(s), and the lack of a focused diagnostic classification would seem to make this group of patients of special interest.

Our investigation showed, however, that the 40 high-cost "complex" patients were not significantly different in their use of hospital services than the complementary set of non-complex patients (Table 6). Nor were they significantly different in the proportion of patients classified as "poor prognosis" or "not-justified surgical intervention." Both groups had a large percentage of terminal patients and both groups raised the underlying and difficult question about the justification for medical or surgical intervention.

This group is important not because it offers a clear-cut strategy toward containment of costs, but due to its hitherto lack of identification as a major contributor to a large expenditure of hospital resources. The patients in this group can be identified verbally as possessing the following characteristics: they are usually aging patients who have more than one disease process, often degenerative, which contributes to their illness. The problems are quasi-independent, but in the aggregate, they are responsible for multiple hospital admissions with many different encounters and a prolonged, although not necessarily, intensive period of hospitalization. Adverse socioeconomic factors delay their placement from the hospital, and their overall prognosis for resuming any kind of comfortable or useful life is not encouraging. Unlike the other sizable groups of high-cost patients (cardiovascular, renal, and oncologic) these patients do not have a clearly focused major medical or surgical problem. They manifest a syndrome of chronicity with numerous and, all too often, disconnected therapeutic attacks on isolated problems with little consideration of an integrated approach to patient care.

In general, regardless of our identification of this special class of high-cost patients, we still do not know very much about them. There is no particular reason to expect them to be confined to general surgery. Indeed, it is highly probable that this prototype of "complex" patient exists throughout the hospital. Our classification of the "complex" patient was retrospective and based on a relatively costly and time-consuming analysis of patient records. This raises the question of how one can prognosticate the potential or evolving high-cost complex patient on a real time basis. A step toward clinical awareness of these patients is that they are likely to be complex at the time of admission since, by definition, they tend to have chronic illnesses. Another step is to make patient-related medical, social, and economic information available at all times rather than as inaccessible, fragmented data or even nonexistent data in the patient record.

Diagnosis Related Groups

Diagnosis Related Groups (DRGs) are standardized patient admission classes based on primary diagnosis, secondary diagnosis, primary surgical procedure, age, and the presence or absence of psychiatric service. They were developed at Yale University and have received widespread recognition and some use as a basis for reimbursement.[26] Current proposals to change hospital reimbursement mechanisms include prospective payments for each patient admission rather than by hospital day, especially for Medicare patients. Payments would be based on a standard charge for DRGs. Since DRGs relate to patient admissions, high-cost patients with multiple admissions would be classified variably unless the admissions were for identical medical problems. The risk to financial solvency that will be imposed on a hospital by high-cost patients if reimbursement is based on the DRG classification is exemplified by the following calculations based on our study.

Sixty-eight of the 85 high-cost patients had multiple admissions in 1980. Of these, 60% had a different DRG for each admission. In the remaining multiple admission cases, about one-third of the admissions per patient had common DRGs.

An important question is how do actual patient charges compare with the average charge for the high-cost patient admissions. Table 14 shows the results of five different samplings of admissions and the comparison of actual charges and average charges for the DRGs in question. The average charge in each sample is the average actual charge for all S.M.H. admissions in 1980 having that DRG.

The first four samples are from the population of 85 high-cost patients and the last is a sample of low-cost patients from the population of 2021. First, there were 28 single-admission patients among the 85 high-cost patients. None of these admissions had actual charges less than the average, and the ratio of total actual charges to the total of the average charge was 4.3. Both results are expected, since the single admissions are unusually costly and may be typical of "outliers." But these patients would cost 4.3 times more than the hospital would be reimbursed under a system based on average DRG charges.

In the remaining studies, these single-admission patients were excluded from each sample because of their bias. The second sample consists of 40 randomly selected admissions from the population of 85 high-cost general sur-

TABLE 14. *Comparison of Actual Patient Charge to the DRG Average Charge for Selected Admissions*

Sample	Per cent of Admissions in which Actual Patient Charges was Less than DRG Average*	Ratio of Total Sample Charges to the Total Sample Average Charges for the DRG in the Sample
1. Twenty-eight high-cost patients with single admissions in 1980†	0	4.3
2. Fourty high-cost patient admissions selected randomly	22.5	2.1
3. Eighty-four high-cost patient admissions—DRG average greater than $5000	30.0	2.4
4. Fifty-six high-cost patient admission—DRG average less than $5000	26.8	2.9
5. Fifty-four low-cost patient admissions selected randomly‡	74.0	0.7

* The average DRG charge is over all 1980 Strong Memorial Admissions for the DRG.

† All high cost patients are from the set of 85.

‡ Low cost patients are from the population of 2021.

gical patients. In 23% of these admissions, the actual charge was less than the DRG average, but the ratio of totals was above 2.0. Third, a sample of 84 admissions with high-average DRG charges was selected. In 30% of these admissions, the actual charge was less than the DRG average, but the ratio of the total was 2.4. Fourth, a sample of admissions with low average DRG charges was selected. Almost 27% of the admissions had actual charges less than the average, but the ratio was almost 3.0. Finally, a sample of admissions from 54 low-cost patients was selected from the population of 2021. In 74% of these admissions, the actual charge was less than the average, while the ratio was less than 1.0 or 0.7.

Under pressures to reduce costs through the application of this type of prospective payment, one would anticipate a strong incentive to monitor the care and cost of high-cost patients. They are very likely to generate charges that fall above the average, assuming the average to be the standard for payment and, therefore, to contribute to the risk of deficit operations. What forms this monitoring will take and its ramifications for selection and care of patients is, of course, central to our concern for the management of high-cost patients.

The Patient and Ancillary Procedures

This study of ancillary service utilization, both at the hospital and patient levels, produced the unanticipated result that so few charge codes accounted for such a larger percentage of the total charges. At the hospital level, this fact provides a leverage for cost control. The question of "how" is as important as "why" these services are delivered. On the other hand, the large inventory of low-usage procedures raises the issue of the cost of maintaining the inventory that includes the skills and facilities necessary to deliver the product. The fact that we are a teaching institution argues for the maintenance of these low-usage high-technology ancillaries, but a true appreciation of their costs may be lacking.

Just as with the total ancillary usage, the individual patient's utilization of ancillary procedures follows the Pareto principle. In subsequent analyses of high-cost patient ancillary charges, we applied this principle and analyzed only the code charges that accounted for 80% of the patient's ancillary charges. Thus, we preserved the detail that truly indicates if and where profligate use of ancillary services are present, while introducing some economy in dealing with the immense volume of information.

Strategies for Cost Containment

Organization and data system. In spite of our research and that which preceded ours, we are unable to suggest a specific strategy that will abate unequivocally the costs at the point where they are generated clinically. It is increasingly apparent, however, that the need exists to identify organizational structures that will promote cost containment and efficient use of hospital resources by physicians. A system of program management or cost centers is an example of one such organizational structure. Physicians are central to this managerial system. They have the traditional delegation of authority and responsibility to manage a clinical program, but within a fixed budgetary constraint. The incentives are to participate in any savings accruing from more efficient operation of the program or receive penalties for a deficit operation. Being at financial risk, the physician-manager is encouraged to exercise ingenuity toward saving resources. In order for this system to work, the manager must have a system of data and information to support real-time decision making. He must also possess a body of clinical knowledge with an understanding of costs and how they enter into decision making. A central problem for the physician-manager will be to determine where in the clinical setting there is leverage to exert exact control over direct costs of hospital inpatient care.

There is no uncertainty about the significance of high-cost patients' contributions to total hospital charges and costs. (The charges for our small number of very high-cost patients was just under $3 million which was over 3.5% of S.M.H. charges in 1980). Ten per cent of all S.M.H. patients in 1980 accounted for 50% of S.M.H. charges, a ratio that agrees with other investigators.[7] But the search for cost control leverage among these patients is a complex venture, fraught with uncertainties and often frustrations.

First, we must recognize that "cost containment" is a loose term. The fundamental problem is to reduce the rate at which hospital costs are rising and also to promote a more beneficial reallocation of scarce hospital resources. It is the latter approach, that may prove to be more viable in the case of high-cost opportunities. The reduction in services (hospitalizations, days, or ancillaries) for a few high-cost inpatients may have a small short-term effect on total hospital costs. While it may be possible to reallocate more effectively the fixed resources (professional time and ancillary services) that would otherwise be used on these patients, it is difficult to document the occurrence of these other opportunities.

Second, attempts to classify more rationally high-cost patients must continue. The ease with which this can be done depends on the format of hospital data bases. The accumulation of inpatient utilization by clinically related geographic area, or by encounter, yields information that is otherwise masked by data limited to admissions. Our study of encounters made it clear that general surgical patients are not homogeneous in terms of clinical intervention and responsibility. The high-cost patients particularly were users of multiple hospital clinical services, both within and among multiple admissions. For one patient, general surgery may have been the exclusive intervener and source of responsibility for the patient's welfare. For another patient, general surgical intervention may be minor and transitory. It is noteworthy that only 19 of the 85 high-cost patients had a single or multiple encounter solely with general surgery. For the others, about 40% of the encounters were for other non-general surgical PCU-ICU.

Third, the difficulty in identifying patients in the group for whom a poor prognosis is sufficiently well documented to justify withholding therapy has been well described by investigators who are involved actively in developing appropriate criteria for withholding admission to ICUs.[9,13,27] For surgeons, the task may be somewhat easier because it is similar to a risk-benefit consideration that is inherent in the decision process about all operative procedures. A significant proportion of research by surgeons traditionally has been devoted to an objective assessment of the appropriateness of operations. For instance, the study by DeWeese and Rob[28] on long-term follow-up of autogenous venous femoropopliteal bypass is an example of the type of careful critical analysis that surgeons have pursued traditionally to assist in risk/management decisions about surgical procedures. Now the factor of cost is being added to this decision process. This issue of restricting the application of recognized and valuable high-technology procedures due to constraint on resources already has been faced in Great Britain, where renal dialysis is not offered to patients beyond a certain age.

The economists and policymakers are beginning to urge physicians to "consider the possibility of contributing more by doing less."[2] Finding alternative courses of therapy for the high-cost complex patients that were identified in our study probably will not lead, as noted, to a substantial reduction in use of beds, but will likely reduce the intensity of care and surgical intervention with a corresponding savings in expenditure of resources. The moral and practical issues in such decisions and a challenge to face them were stated admirably by James Maloney[29] in his Presidential Address to the American Surgical Association in 1981.

Part of the problem is that we still do not understand the nature of high-cost patients, who they are, and why they exist. Then, the potential for cost containment must be viewed from a time horizon. In the short term, more immediate results may be gained from the analysis and control of ancillary services. In the long term, the central issue is the prevention of conditions that lead to ultimate high-cost hospitalization; Zook and Moore[7] found adverse life styles were more frequent in high-cost than in low-cost patients. But dealing with issues of preventibility precludes more immediate successes in cost containment. In the intermediate horizon, the central question is the ratio of cost to benefits for diagnostic and therapeutic procedures, especially for complex patients with doubtful prognoses and outcomes. There is also the question of possible lack of continuity of care for these patients. High-cost general surgical patients experienced more than twice as many admissions and encounters per year as low-cost patients. The analysis of patient records suggests that a single and well-defined patient agent is lacking. The task for this agent would be to guide the decision process to obviate expensive, prolonged, and possibly ineffective medical inpatient care.

Conclusions

The imperative for containing the rise of hospital costs and monitoring the allocation of hospital resources is undebatable. Increasingly, pressures will be exerted on

physicians to factor economic considerations in their clinical decision making. How precisely this will be done is an open question. We offer these caveats.

First, changes in hospital organizations will require the development of policies and incentives (rules of the game). As managers with fiscal responsibilities, clinicians will be motivated to consider the economic consequences of their decisions. Physicians and other professionals as resourceful individuals will respond in many ways, some unanticipated and innovative. But these individuals will need to gain knowledge about the manner in which economic variables interact with the traditional and technical clinical variables. And, they will need timely and relevant information that will help guide their decisions.

Second, one point of leverage for potential cost containment is the high-cost hospital inpatient. It is quite evident that this patient constitutes a relatively small group of patients and yet makes a significant impact on total hospital charges and costs. It is tempting to conclude that important savings may come about by the more prudent use of ancillary services for these patients. But we feel that, while this may be true and should be pursued as a strategy, the potential benefits are relatively small. A more significant leverage will come about by questioning the extent of medical and surgical interventions for the high-cost patients.

Third, within the general surgical population, we have identified, albeit incompletely, a particular set of high-cost patients to which we have assigned the designation, "the complex patient." This group cannot be distinguished by a well-focused disease problem or a surgical intervention such as patients subjected to open-heart surgery, kidney transplantation, or trauma. They are what we have referred to historically and loosely as the chronic degenerative "dwindler." They probably exist to a significant degree in every community acute care hospital, and they probably are not confined to general surgical services. Because of the ambiguity surrounding their illnesses and possible socio-economic contributions to their overall distress, continuity of care may be lacking and decision making about medical and surgical intervention may be desultory.

Fourth, both complex and non-complex patients are candidates for more highly organized decision making about surgical-medical intervention. The evaluation directed to withhold expensive interventions will require pluralistic decision making among physician, patient, family, and other interested parties. There is a national awakening about this issue. We can hope that a more viable organization will replace recent highly publicized interventions by the courts in decisions about these matters. It is improbable, however, that a workable organization will become evident without the active participation of informed physicians.

Fifth, a popular contention is that clinicians are profligate users of ancillary services, since they are not at risk for the costs. We suspect that in regard to high-cost patients, particularly complex ones, there may be some justification for this concern. Our investigation of the ancillary service utilization indicates that a detailed analysis of item by item is necessary to ferret out such inefficiencies. However, an important economy in such an analysis can be gained by limiting the analysis to the roughly 20% of the items that account for 80% of the patient's ancillary charges. A method needs to be developed that provides data for this assessment in a timely and usable manner.

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Discussion

DR. WILLIAM G. ANLYAN (Durham, North Carolina): There is no single button to push for cost containment. Last week in our own institution, Dr. Wallace, the Chief Executive Officer of our hospital, and his staff presented to our Trustees a budget for the year starting next July with no increase in charges, at the same time giving our employees a 6% increase in wages. Again, this was not accomplished by a single button. This was done by zero-based budgeting of every cost center in the hospital, looking at efficiencies in every nook and cranny, and with the total support of the chiefs of service.

Teaching hospitals are inefficient. Some inefficiencies are built into the fabric by our education and research mission. Other inefficiencies can be reduced. For instance, the capital investments in high technology, operating rooms, radiology suites, function 40 to 50 hrs a week. No airline could survive the competition using its equipment that sparingly.

Regarding the point made by Dr. Drucker that a small number of patients generate a disproportionately high percentage of costs—this is true for all age groups. In our University Student Health Service, 20% of the students generate 80% of the costs.

Finally, a word about DRGs. As never before, the system will strain physician/hospital relationships. It is of paramount importance that physician chiefs of service function as part of the corporate board of the teaching hospital. They must help generate the ten commandments—the tablets are too heavy for one Moses to carry them—and not leave the matter to lay administrators; otherwise, chaos will reign.

Speaking of lay administrators and cost containment, such a person recently in Washington, looking at computer printouts of Medicare payments, noted that half of the cost of Medicare nationally was by persons who went on to live less than 1 year. He raised the question of eliminating that care, but he never told us how to recognize when a patient has entered his last year.

DR. RICHARD H. EGDAHL (Boston, Massachusetts): Many programs have been undertaken over the past several years, designed to manage health costs, including sharpening the indications for surgical procedures, shortening hospital lengths of stay and reducing the volume of diagnostic tests, doing surgical procedures on an ambulatory basis whenever possible, and training an appropriate number of surgical specialists for the community's needs. Many of the basic papers on these subjects have been presented at meetings of the Association.

Dr. Drucker and his co-workers have provided important new information concerning high-cost surgical patients in hospitals, and, as you have heard, complex rationing choices are raised by his data. Bill Anlyan's discussion points up the difficulty of those decisions, especially if this country is serious about health costs containment.

But even if we succeed in decreasing the need for expensive hospitalization for these patients, we have a residual basic problem which we have been facing in particularly severe form this year in Massachusetts. It is that hospital cost containment of a real sort can only occur at the expense of shrinkage of the health care system, including hospital jobs and beds. We have 3,000 less hospital employees in Massachusetts than we had last year, as a result of Chapter 372.

This kind of cost containment will be associated with a greatly decreased capacity to start new programs, including the development and dissemination of advances in technology. Ambulatory surgery is currently being pushed as a cost management device, but Great Britain has found that the opening of ambulatory surgical units, although it has the potentially useful result of decreasing surgical queues for common elective surgical conditions, is always associated with a greater total expense to the surgical district in which the facility is based, because of the elasticity of demand.

Therefore, if the goal is to keep the percentage of the GNP under 6% for health, as has been achieved in England, there can be no widespread use of this logical cost-saving device—ambulatory surgery—without shrinkage of an aging and underfunded hospital system. Considering the public pressure for ready access to a complete range of hospital and health services, including new technology that could be useful in diagnosis and treatment, one realizes the problems that health cost containment programs face.

It appears that many of our smokestack industries will never rise again, to the extent that existed in the past, with resultant permanent loss of jobs in those industries. The same thing will happen in the hospital industry, if health costs are to be truly contained.

We have found, for example, that under Chapter 372 we can cut out some lab tests, that aren't essential, but we've got to lay off lab workers to save any real amount of money. And that's very difficult, and decreases flexibility and emergency potential.

It will be very interesting to see if shrinkage occurs in a hospital system that appears to be delivering a product that is increasing in complexity, perceived desirability, and cost at a rate that exceeds that of general inflation.

DR. JOSEPH M. CIVETTA (Miami, Florida): Dr. Drucker correctly delineates a complex problem that defies a simple solution. A multifaceted entity cannot be resolved using a single focus for analysis. Society cries for, simultaneously, diametrically opposed ends. Everything must be done for the individual, and we must control costs by identifying the mean, or average. This can only result in a mean so-