

Surgical day care: measurements of the economic payoff

ROBERT G. EVANS,* PH D; GEOFFREY C. ROBINSON,† MD, FRCP[C]

A careful and detailed cost analysis that measured all the costs, direct and indirect, generated in the course of an episode of surgical care demonstrated that there are very large savings from the substitution of surgical day care for inpatient care. Surgical day care appears to be an ideal alternative to inpatient care, from the points of view of those who pay for medical care (governments) as well as those who provide it (hospitals and health professionals) and those who receive it (patients). From an economic perspective the potential savings have not been achieved, and present policies provide no incentives to encourage these savings. These problems, together with strategies to encourage cost savings, are discussed.

Une analyse minutieuse et détaillée des coûts, mesurant tous les frais, directs et indirects, encourus lors d'une intervention chirurgicale, a démontré la possibilité de réaliser d'importantes économies en substituant les soins chirurgicaux d'un jour pour les soins normalement donnés aux patients hospitalisés. Les soins chirurgicaux d'un jour semblent être une alternative idéale aux soins pour patients hospitalisés, tant du point de vue de ceux qui paient pour les soins médicaux (les gouvernements) que de ceux qui les donnent (les hôpitaux et les professionnels de la santé) et de ceux qui les reçoivent (les patients). Sur le plan économique il n'y a eu aucune réalisation, et les politiques actuelles n'offrent aucun stimulant pour encourager ces économies. On discute de ces problèmes de même que des stratégies visant à encourager une diminution des coûts.

There has been a dramatic expansion in the performance of surgical procedures on a day care basis. A number of centres in North America now provide this form of care, and the process has been widely documented in the medical literature. Surgical patients are admitted to the hospital on the morning of a scheduled operation, prepared for the operation in a separate surgical day care unit (SDCU) and then moved to the regular operating suite or similar facility. The surgical procedures are carried out under general anesthesia, then the patients are moved to the postanesthesia room. After recovery from anesthesia patients are returned to the SDCU for observation and then discharged home in late afternoon or early evening. The unit is not kept open overnight, so that patients judged insufficiently recovered to be discharged home when the unit is closed for the evening will be admitted to one of the regular inpatient wards.

From the University of British Columbia

*Professor, department of economics

†Professor and head, division of population pediatrics, department of pediatrics

Presented in part at the annual meeting of the Canadian Paediatric Society, Edmonton, June 23-27, 1979

Reprint requests to: Dr. Geoffrey C. Robinson, Division of population pediatrics, Department of pediatrics, University of British Columbia, 250 W 59th Ave., Vancouver, BC V5X 1X2

This form of care provides a significant alternative to traditional inpatient care for both adults and children. The benefits of such care, particularly for children, have long been recognized. The psychologic sequelae of a hospital stay, particularly for very young children, and the risks of infection from a source in the hospital and of other iatrogenic illnesses are greatly reduced. Reflecting a growing appreciation of these benefits, there has been a rapid increase in surgical day care in a number of provinces in Canada. In British Columbia in particular, this form of care is given for approximately one third of all pediatric surgical procedures; in 1978, 89% of all pediatric dental procedures in hospital and 42% of plastic, 41% of urologic, 32% of ear, nose and throat, and 24% of orthopedic procedures were done on a day care basis.

The Children's Hospital in Vancouver has been a leader in providing surgical day care for children. It began developing this capacity in the late 1960s, and in October 1969 it established a nine-bed SDCU.¹ In 1978, 57% of the hospital's surgical caseload (5193 cases) was handled on a day care basis, and by the end of 1978 over 18 000 cases had been dealt with in the SDCU. A controlled trial of outcome and parent attitudes confirmed the safety of the method and its acceptance by the family.² On balance, families expressed a slight preference for surgical day care; no difference was detectable in medical outcomes, but the psychologic sequelae and risks of cross-infection associated with a longer stay in hospital were avoided. We conclude from those findings that surgical day care, when appropriate, is superior to inpatient care.

There are also significant economic benefits to be derived from surgical day care. The substitution of a half-day stay and 1½ nursing shifts in the SDCU for a 2- to 3-day stay and 3 nursing shifts per day in a regular inpatient ward should lower hospital costs per episode of care. Thus, a series of studies in the early 1970s addressed the question of how one might measure the cost savings derived from the introduction of surgical day care. These attempted to establish by how much the treatment costs at the Children's Hospital were reduced when the patients were cared for in the SDCU rather than an inpatient ward. Previous research on this question had not adequately addressed the issue of cost savings because it tended to rely either on hospital per diem comparisons or on comparison of charges.³ In the case of per diem comparisons, the total hospital budget is divided by the number of inpatient days, and the resulting per diem amount is used as a measure of the cost of providing a day of inpatient care. This is widely recognized to be an inappropriate measure of the costs generated by any particular inpatient because the various components of the hospital budget are too many and diverse and the differences in service intensity on different inpatient

days too great for the per diem calculation to record an individual service profile. Studies in the United States, which have tended to use the hospital charges as an approximation to the costs generated by episodes of care of either type, have also yielded inappropriate measures. It is generally recognized that such charges reflect the economic policies of the hospital rather than the particular costs generated in a treatment setting.⁴⁻⁶ The appropriate method has to permit a comparison of the attributable costs of an entire illness episode when care is given on an inpatient ward versus in the SDCU. In this paper we outline such a method and its results.

Method

We conducted a cost analysis at the Vancouver Children's Hospital, which is located in the Greater Vancouver Regional District, the largest of the 29 hospital regions in British Columbia. It served a population of 1 085 242 in 1976 (45% of the population of the province) and had 556 rated pediatric beds (one third of the beds approved by the Ministry of Health for pediatric patients in the province) in 1977. The Children's Hospital has 82 pediatric beds, including an 8-bed "care-by-parent" ward.

The geography of the province, with the Pacific Ocean to the west, the Rocky Mountains to the east, the Yukon to the north and the United States to the south, minimizes referral out of the province. The main tertiary care services and the faculty of medicine of the University of British Columbia are located in the Greater Vancouver Regional District, in the southwest corner of the province.

Study population

The method employed in this study was to define two sets of medically similar patients (Fig. 1) and thus have a quasi-controlled comparison of the costs of their care in hospital.

The total separations from the hospital in 1975 represented 5204 children; of the 4061 who had undergone a surgical procedure 2169 had received surgical day care and 1892 had been admitted as inpatients. The study nurse, who had participated in the development of the criteria for surgical day care when the unit was first opened, scrutinized the case summary prepared by the Professional Activity Study for each inpatient undergoing an operative procedure and selected the patients whose type of procedure, age and service profile indicated suitability for surgical day care. Among the 1892 surgical inpatients were 460 patients judged to be eligible for surgical day care. The study nurse judged that surgical day care would not have been appropriate for the remaining 1432 patients, and they were accordingly excluded from further consideration in the study. The procedures performed in the SDCU, along with their numbers in 1975, are listed in Table I; for more details see reference 8.

The 460 inpatients judged eligible for surgical day care represented at best "quasi-controls"; an ideal study design might have compared care profiles for

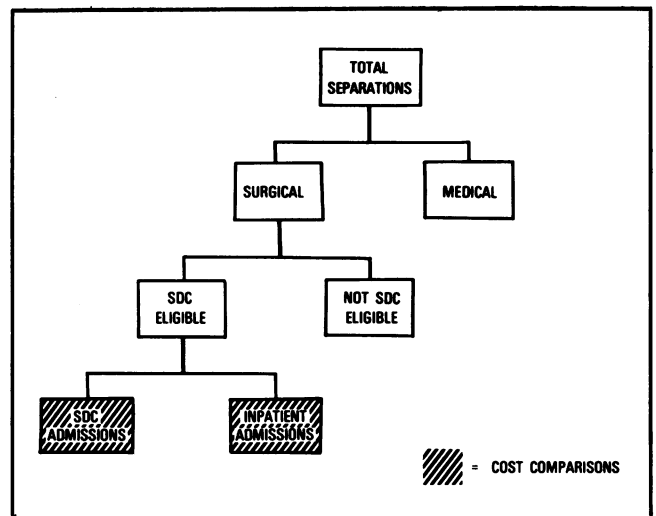


FIG. 1—Derivation of subgroups of patients, based on hospital separations, for comparison of costs of care. SDC = surgical day care.

Table I—H-ICDA* classification of surgical procedures performed in 1975 at the Children's Hospital, Vancouver, on patients in the surgical day care unit (SDCU) or an inpatient ward

Procedures	No. of procedures	
	SDCU	Ward
Eye		
Operation on ocular muscles	24	12
Other	24	1
Ears		
Operation on external ear	21	34
Myringotomy	382	3
Other	13	1
Teeth and supporting structures		
Dental extraction	254	27
Surgical removal of tooth	72	90
Filling, artificial crown or root canal therapy	411	15
Other	12	6
Other nose, mouth and pharynx		
Reduction of nasal fracture	14	3
Plastic operation on nose	2	65
Other	68	13
Digestive system		
Hernia	71	0
Other	18	11
Urinary system		
Meatotomy or dilation of urethra	229	30
Other	2	1
Male genital organs		
Circumcision	53	32
Other	5	0
Musculoskeletal system		
Operations on bones, muscles, tendons or fascia	67	43
Reduction of fracture or dislocation	7	7
Manipulation of joint	211	0
Other	4	3
Skin and subcutaneous tissue		
Incision or excision	110	5
Reparative or reconstructive surgery	10	18
Diagnostic and therapeutic procedures		
Cystoscopy	17	12
Application of cast or removal of sutures	29	1
Other	18	15
Other	21	12
Total	2169	460

*Hospital Adaptation of International Classification of Diseases, Adapted.⁷

matched patients, or at least eligible patients randomly assigned to the alternative forms of care. Such an ideal design, however, is impossible if one's objective is to investigate the behaviour of an established system. The experimental activity itself may generate Hawthorne effects among significant decision makers in the system being studied — in this case physicians, who can hardly be "blinded" to where their patients are located. With our approach we had the advantage of observing a delivery system in the field, untampered with, after it had had time to adjust to a new institution.

This must be weighed against the problem of matching revealed in Table I — as shown, for example, by the significantly different proportions of cases of different types managed in the two settings. After 5 years of experience with the SDCU, surgeons at the Children's Hospital no longer admit any patients scheduled for myringotomy or joint manipulation to an inpatient ward. If as a result the patients eligible for surgical day care but admitted to an inpatient ward have in some sense "more severe" conditions than those cared for in the SDCU our cost comparisons will be biased.

But the effect of this bias must be carefully considered. Even if they had more severe conditions the 460 quasi-controls were still judged to be eligible for surgical day care. The ineligible patients had already been excluded. Had these 460 eligible patients been admitted to the SDCU, the costs of their inpatient stay would have been saved. Operating room and post-anesthetic recovery room costs were assumed to be equal in the two groups, and in any case would be unaffected by the location of the patients' care. Thus, the only possible effect of mismatching on the estimates of potential further savings from moving all eligible patients into the SDCU would be the costs of diagnostic services.

On the other hand, the failure to match could result in a significant overstatement of the savings from current SDCU use if the length of stay in hospital of the 460 quasi-controls exceeded what the 2169 SDCU patients would have required had they been inpatients. The "minimal estimate" columns in Table III represent an attempt to allow for this possible bias.

Profile of services received

The next stage was to identify in detail the profile of services received by each child. These profiles were diagnosis-specific; thus, computations were carried out for children with dental diagnoses and for children with each of a set of surgical but nondental diagnoses. The budget of the Children's Hospital was broken

down and its components were allocated to each of the services carried out by the hospital. This provided an estimate of the fully allocated total cost of each type of service provided. The particular units of service that formed the service profiles for each child in the surgical day care and control groups were then costed out. The fully allocated total cost thus embodies not only the direct costs, but also the overhead costs of providing services, and this requires the development of cost sharing or cost allocation rules for each overhead department. The cost per laboratory unit, for example, includes not only the wages and salaries of the laboratory staff and the cost of reagents, but also the cost of cleaning and heating the area used by the laboratory, the cost of providing administrative services to the laboratory, and so on. Similarly, a patient day in the ward, exclusive of diagnostic or therapeutic services, embodies not only the costs of the ward staff, but also the costs of the various indirect and overhead components, such as laundry, housekeeping, plant operation and maintenance, and so on.*

Cost of care

Finally, it is possible to build up a total package cost, or a total cost per episode of care. The number of services of each type received by a particular child are multiplied by the average total cost of each of these types of services, and this gives the total cost per episode for each child. The cost computation counts only the services the child actually received, in contradistinction to the per diem cost, which includes the costs of running services that are not used by children receiving surgical day care or similar inpatient surgical services.

Results

The results of the computation of costs at the Children's Hospital are shown in Table II, where the expected economic savings from surgical day care emerge very strongly. The cost of inpatient care for a typical nondental surgical procedure in 1975 was nearly \$500, compared with just under \$150 for the same type of care provided in the SDCU. These estimates confirm those from a similar study using 1970 data and, in fact, indicate even larger SDCU savings than did the earlier study. In general the SDCU services seemed to save

*Further details of the cost allocation procedure are available from us. Fuller discussion and comparison with other studies are provided elsewhere,^{3,8,9} together with a comprehensive review of the current literature on pediatric surgical day care that places this study in context.³

Table II—Costs of surgical day care and inpatient care in 1975

Diagnosis	Surgical day care		Inpatient care		Savings with surgical day care per episode (\$)
	No. of episodes	Total cost per episode (\$)	No. of episodes	Total cost per episode (\$)	
Nondental	1420	146.01	322	485.45	339.44
Dental	749	124.64	138	463.76	339.12

approximately 70% of the cost of an inpatient episode of care in 1975 but closer to 50% in 1970.^{8,10}

The breakdown of these cost savings is shown in Table III, where, as expected, we find that the bulk of the savings is in the patient care area. The costs of providing inpatient care are relatively large, over \$300 per episode of care, while the costs of providing surgical day care are just over \$50.

The average stay for nondental surgical procedures, 3.79 days, appears rather long; in 1970 the corresponding stay was about 2.7 days.¹⁰ The increase in stay could indicate that the inpatients were sicker in 1975 or were otherwise less well matched with the SDCU patients than in 1970. The SDCU was opened in October 1969, and the surgeons' admitting patterns did not immediately shift to the extent reflected in Table I. Alternatively, the difference in stay may reflect the behaviour of the admitting physicians. As the use of the SDCU has increased and the numbers of children eligible for surgical day care but admitted to inpatient wards has decreased, the remaining quasi-control inpatients have increasingly been patients of relatively conservative surgeons. Because of the matching of patients by study staff and the observed behaviour of the surgeons, we believe that the lengthening of inpatient stay reflects the surgeons' behaviour. In any case, from Table III it is relatively easy to compute what the savings would have been if the inpatient stay had not been as long as 3.79 days.

There is also a significant difference in the costs per episode of laboratory, radiologic and other diagnostic procedures. This could be interpreted as indicating that the matching of patients was inadequate and that the inpatients were in some sense sicker than the SDCU patients. We think that this is not the case and that the difference reflects a tendency for patients who are in hospital longer to be subject to more diagnostic procedures. In other words, one cannot perform diagnostic procedures on patients who are not there, but the longer a patient occupies a bed the more likelihood there is that some kind of procedure will be carried out. This seems to be the interpretation for similar findings elsewhere in the literature.¹¹⁻¹³

The difference in administrative overhead is derived from the other components, as it is simply a constant

percentage mark-up on the costs of the other components of care. However, the latter already embody the allocated costs of all the forms of overhead that could be specifically attributed.

Our interpretation of the differences in service patterns reported in Table III may, of course, be in error. Accordingly, we added to the actual estimates of costs per inpatient episode of care an additional "minimal" estimate derived by reducing the average stay per episode from 3.79 to its 1970 value, 2.7 days, and substituting the units and cost of the diagnostic procedures undergone by the SDCU patients. The cost advantage of the SDCU remained very large, a saving of nearly 60% of the costs per episode, compared with the 70% derived from the actual estimates.

The impact of these savings is comparatively large. If we multiply the savings per episode of care by the number of episodes in the SDCU in 1975, the estimate of total savings is nearly three quarters of a million dollars: $(1420 \times \$339.44) + (749 \times \$339.12) = \$736\,055.68$.⁸ The total budget of the Children's Hospital in 1975 was just over \$4 million. The implication, then, is that had the SDCU not been available and had the same volume of care been provided through the inpatient wards, the budget would have to have been three quarters of a million dollars larger. The potential savings are not fully realized, however, since there is still a sizeable group of children who are eligible for surgical day care and are being treated on the inpatient wards. If all of these could be treated in the SDCU a further \$150 000 could be saved: $(332 \times \$339.44) + (138 \times \$339.12) = \$156\,098.24$.⁸

Discussion

The institution of surgical day care at the Children's Hospital in Vancouver has represented a happy coincidence of both improved quality of patient care (medical outcome unchanged, but psychologic effects and risk of infection reduced and parent acceptability increased) and significant reductions in economic costs. These are the types of developments that should be pleasing to physicians, economists and governments. The story is, of course, too good to be true, and it is necessary to introduce two major qualifications to these estimates. First, the reduction in costs of in-

Table III—Services and costs per nondental episode of care⁸

Service	Surgical day care		Inpatient care			
	Units*	Cost (\$)	Actual estimate		Minimal estimate	
			Units*	Cost (\$)	Units*	Cost (\$)
Patient care area	1.0	53.60	3.79	329.82	2.7	234.96
Radiologic	0.015	0.87	0.25	14.37	0.015	0.87
Laboratory and other diagnostic	16.195	5.82	30.63	11.75	16.195	5.82
Operating room and postanesthetic recovery room	1.0	66.88	1.0	66.88	1.0	66.88
Administrative overhead	—	18.84	—	62.63	—	45.71
Total		146.01		485.45		354.24

*Work units are the countable output of direct service departments and patient care areas, such as the number of hospital days of care and the number of roentgenograms made.

patient care is not proportionate to the reduction in use of inpatient care, as admissions have been redirected to the SDCU; such cost reductions will take a considerable time to be fully realized. Second, it is by no means assured that the use of inpatient care will fall as admissions are redirected to the SDCU. The increased availability of inpatient beds may lead to an increase in admissions, so that the total caseload is increased.

Response of costs to reduced use of inpatient care

It is not true in general that hospital expenditures vary in proportion to patient load. An old (but unsubstantiated) hospital rule of thumb says that an empty bed costs 80% as much as a full bed; if so, then inpatient costs would fall by only 20% of any decrease in use. This is too simplistic, however, because the expenditure response actually depends on the period considered. A fall in number of inpatients should have an immediate effect on the costs of raw food and drug ingredients, though these are only a small part of the total budget. Over a longer period, however, ward staffing patterns can be adjusted to achieve further cost reductions. If the drop is large enough and persists long enough, whole wards can be closed. Finally, over a period long enough to adjust the total bed capacity available to a regional population, one can save the capital costs of space and equipment as well. (Either because the population grows and the bed capacity does not, or because the population does not grow, some obsolete beds need not be replaced.) It is this long-run savings in total operating and capital costs that we have calculated.

One could analyse the short-run savings associated with reductions in the use of inpatient care and increases in the use of surgical day care, and indeed this has been done. As expected, it indicated that there are significant savings in the short term from surgical day care but that these are much smaller than the total cost savings in the long run. The numbers are not reported here because they are extremely sensitive to the assumptions one makes about the behavioural responses of the hospital. In particular, they depend on the extent to which the hospital adjusts its staffing

when bed use falls. It is, of course, possible for a hospital administration not to adjust its staffing at all when this happens, in which case there will be no savings whatever. If the hospital does adjust its staff in a relatively flexible manner, however, about three quarters of the savings we have estimated will be available within the period over which that staff is adjusted.

Response of use of inpatient care to surgical day care

As important as the short-term adjustment of costs in the hospital is the extent to which surgical day care actually substitutes for inpatient care. The estimates of potential savings we have reported are long-run savings and assume that the inpatient load of the hospital falls by an amount equal to the increase in the surgical day care load. Every SDCU patient would otherwise have been an inpatient. On the other hand, it is conceivable that the development of surgical day care facilities merely made admission of inpatients easier and led to an increase in overall rates of separation. If this happened, clearly no cost savings would be generated and the total costs of care would rise as the use of the SDCU increased. Fig. 2 indicates that this may very well be what happened at the Children's Hospital. The rate of inpatient surgical care remained relatively stable from 1966 to 1978; the dramatic increase in the use of surgical day care during the late 1960s and early and late 1970s was merely superimposed on the existing inpatient load. Thus, the total budget of the Children's Hospital was clearly not reduced by the creation of the SDCU unless one believes that in the absence of the SDCU the inpatient facilities would otherwise have had to be expanded. If that were the case, one might then argue that indeed the total costs of such an expansion, including not only the costs of new staff but also the new capital costs, had been averted by the establishment of the SDCU.

It is impossible, however, to evaluate the impact of surgical day care at the level of a single hospital. One must observe whether the increase in surgical activity at the Children's Hospital reflects an increase in the region as a whole or merely a shift of activity from other hospitals in the region to the Children's. It is therefore necessary to review data from the regional hospital district to observe whether the impact of surgical day care has been to transfer patients from inpatient care (i.e., to substitute for inpatient care) or whether it has been to stimulate an increase in the total quantity of surgery being performed (i.e., to generate new business).

In this context it must be emphasized that we are assuming stability of pediatric surgical rates except for any impact of the availability of surgical day care. We recognize that numerous other factors might be influencing the surgical rates over the period studied. Measuring the net impact of the availability of surgical day care against this possibly shifting background requires a quite different (and major) research effort; we are currently attempting this. Any inferences drawn from utilization data under the *ceteris paribus* assumption (i.e., other things being equal) can only be impressionistic and tentative.

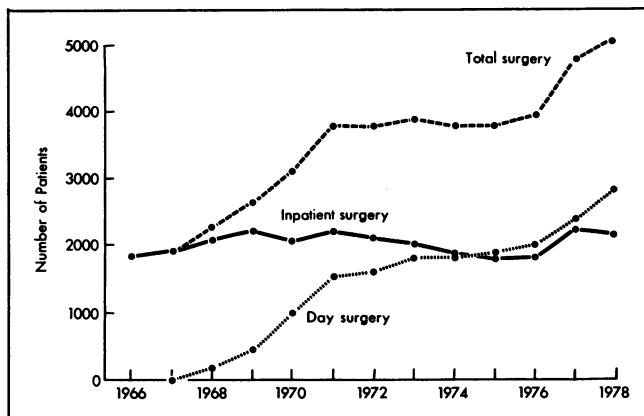


FIG. 2—Numbers of surgical procedures (total, inpatient and day care) at the Children's Hospital, Vancouver, in patients aged 14 years or less.

Fig. 3 displays the trend over time in the number of separations after pediatric operative procedures in the Greater Vancouver Regional District. (Since the pediatric population was relatively stable over the period studied we did not convert these numbers into rates per 1000 population. The district receives a number of referrals from other regions in the province; these were excluded from the calculations.) It appears that most of the region-wide increase in surgical day care has been due to the increase at the Children's Hospital; the regional rates of inpatient surgery have dropped markedly. These data suggest that the development of the SDCU at the Children's Hospital has resulted in a large transfer of surgical activity from the other hospitals in the district to the Children's Hospital. Most of the effect appears to be due to a reduction in inpatient pediatric surgery in the region occasioned by the increase in surgical day care at the Children's Hospital.

This interpretation, however, is incomplete because the drop in inpatient pediatric surgery in the region is clearly much larger than can be accounted for by the increase in surgical day care. The drop is largely due to the decrease of more than two thirds over the decade in the rate of performance of tonsillectomy and adenoidectomy (codes 21.1, 21.2 and 21.3 of the International Classification of Diseases, Adapted¹⁴). This decrease cannot be attributed to the increase in surgical day care because the operation is one that has been judged inappropriate for surgical day care in almost all the hospitals providing this form of care. However, this consensus, at the time the Children's Hospital SDCU was opened, seems to have been based on opinion rather than specific information about outcomes, and by 1978 several British Columbia hospitals were performing significant numbers of these procedures on a surgical day care basis with no ill effects. This suggests that the original consensus may be revised, and if so the SDCU workload could be significantly increased.

On the assumption that changes in the rate of performance of tonsillectomy and adenoidectomy are wholly independent of the introduction of surgical day care facilities we restricted our focus in Fig. 4 to numbers of all pediatric surgical procedures and those performed on an inpatient basis, excluding tonsillectomy and adenoidectomy. For this residual total the decline in inpatient care from 1967 to 1978 is much less marked. During the period 1967-71, when surgical day care was most rapidly introduced, there was an almost commensurate increase in the performance of all pediatric surgical procedures, but the performance of inpatient surgical procedures, excluding tonsillectomy, was virtually unchanged. If, for want of other evidence, we assume that other factors affecting surgical rates were unchanged during this period, we must infer that the main impact of surgical day care in the late 1960s and early 1970s was to expand the total volume of surgical activity. The small reductions in inpatient surgery, excluding tonsillectomy and adenoidectomy, suggest some but relatively little substitution of surgical day care for inpatient care over this period.

(The periods are too long for these trends to be explained by waiting list adjustments.)

From 1971 to 1976 the *ceteris paribus* assumption becomes untenable, as a steady decline is observed in all pediatric surgery, excluding tonsillectomy and adenoidectomy. The increase in surgical day care is very small in this period, but if we assume that the variation in other factors is fully captured in the total curve in Fig. 4, then it would follow that the increase in surgical day care represents substitution for inpatient care. The larger increases in surgical day care since 1976 are associated with both further reductions in inpatient surgery and an increase in all pediatric surgery, which suggests a combination of substitution for inpatient surgery and generation of "new business".

It is clear that more research is needed before firm conclusions can be drawn about the impact of surgical day care on the rates of all pediatric surgery and that performed on an inpatient basis. The evidence here is at best suggestive. What it suggests is that surgical day care resulted in an increase in total surgical workload rather than a shift from inpatient to ambulatory care, and hence that the potential savings from surgical day care in the late 1960s and early 1970s were dissipated. More recent data can be interpreted more optimistically, although the numbers are still small.

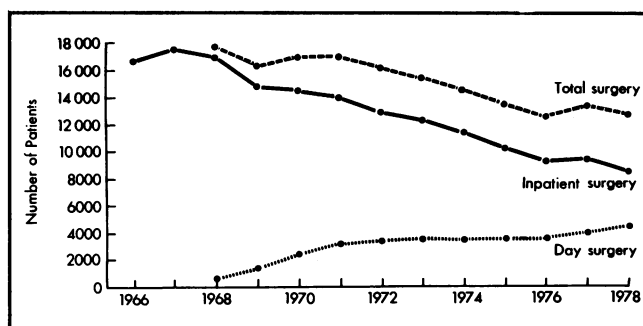


FIG. 3—Numbers of surgical procedures (total, inpatient and day care) at hospitals in the Greater Vancouver Regional District in patients aged 14 years or less living in the district.

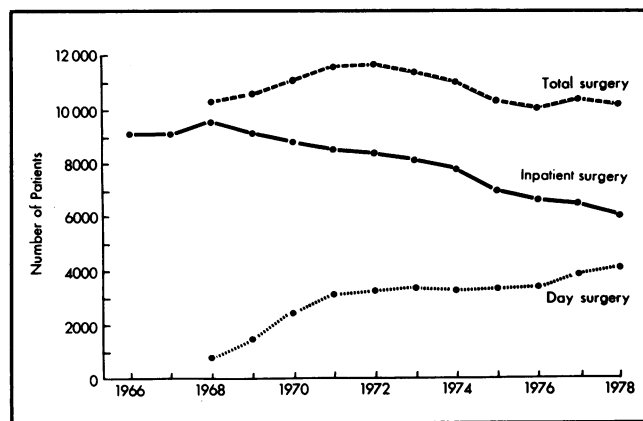


FIG. 4—Number of surgical procedures (total, inpatient and day care), excluding tonsillectomy and adenoidectomy, at hospitals in the Greater Vancouver Regional District in patients aged 14 years or less living in the district.

Relative costs to families and attending physicians

A third qualification might be made to these estimates, in that we restricted our measurement of costs of care to the costs generated in the hospital. Some might argue, and we felt at an early stage of the study, that a complete accounting of total costs to society, or "to whomsoever accruing", would require analysis of the relative costs of inpatient versus day care for the family and for the attending physician due to early discharge and changes in visit patterns respectively. We now believe, however, that such extension of the net of cost-gathering and analysis is neither necessary nor appropriate.

Costs generated in the family might be monetary or nonmonetary. If all family members are employed, care of a patient discharged early may involve loss of work, time and income, or payments for babysitting. Travel costs may differ for parents of inpatients and day care patients, because of the different numbers of hospital visits. Such costs are in principle measurable by survey. On the other hand, additional costs in time and effort for family members not employed outside the home might be significant as well. Some analysts have tried to measure these costs by attaching market wages to hours spent on different activities in the home; others regard the problem as "essentially insoluble".¹⁵

Fortunately, however, it appears that the issue can be bypassed by a "revealed preference" argument. Each family participating in the SDCU had a free choice of SDCU or inpatient care, with no significant difference in associated out-of-pocket charges. Families choosing SDCU care for their children were thus indicating that the benefits to them of SDCU care relative to inpatient care were at least equal to and presumably in general greater than any additional time or money costs borne by them. Thus the net impact of SDCU (benefits less costs) on families was positive (at least *ex ante*) or they would not have made such a choice, and the earlier study showed that, indeed, families using the SDCU preferred such care.² In disregarding costs borne by the family, then, we are disregarding an equal or larger benefit, and the savings at the level of the hospital from the use of the SDCU will understate the total social benefits.

As for the impact of inpatient versus day care on the costs of physicians' services, it is certainly true that if, for example, physicians made additional home

visits to patients discharged early these costs would offset some hospital savings. But there is no evidence that such additional visits occur. In the earlier study it was found that postoperative nursing visits could be discontinued:² parents reported them as unnecessary. In general it appears that as long as the scheduling of operations for surgical day care patients can be integrated with that for inpatients so that the surgeons do not have idle time, the work pattern per patient of the surgeons will be unaffected by the form of care.

Savings for whom? The administrator's dilemma

The difficulty of achieving very large potential savings is illustrated in Table IV. This table indicates that what is conventionally described as hospital costs is, in fact, a concept that in other forms of economic activity would be described as hospital industry sales. Hospital costs from the point of view of a society or a provincial government are equal to the sales of the hospital industry to the rest of society or to the provincial government, and since these are equal one cannot change one without affecting the other. Hospital costs can be defined as the product of costs per patient treated times the number of patients treated. Similarly, hospital sales can be broken into the average income per hospital employee times the number of hospital employees plus the costs of some minor items (raw materials, drugs, food, power etc.). But since costs must equal sales, it follows that the product of costs per patient times number of patients must equal the product of average income per employee times number of employees. Thus, one cannot influence costs without influencing incomes generated in the industry. If one adopts a procedure such as surgical day care that reduces the costs per patient treated and the number of patients does not increase, which is what is implied by the substitution of surgical day care for inpatient care, it follows that either the average income per hospital employee must shrink, which is understandably unpopular among hospital employees, or the number of hospital employees must fall. On the other hand, if one can respond to a drop in the costs per patient treated by an increase in the total volume of patients treated these unpleasant effects on incomes in the hospital sector can be avoided.

It is readily apparent that neither those who work in the hospitals nor those who admit patients to them have any economic incentive to control hospital costs and thereby ensure that the potential savings are achieved. The hospital staff have, in fact, an active disincentive to encourage the use of surgical day care as a substitute for inpatient care since hospital costs can be saved only through decreasing the hospital staff. Administrators of a hospital who open and expand an SDCU will save money for the provincial government if they correspondingly shrink their inpatient wards, but they will save this money by firing staff or by allowing staff to shrink over time, and this is unlikely to make them popular. Physicians are indifferent (economically) to whether a patient is admitted for inpatient care or surgical day care.

Table IV—The hospital budget through the looking glass

Hospital costs (\$)	Hospital sales (\$)
Costs per patient treated	Average income per employee
X	X
Number of patients	Number of employees (plus minor items)

↑ These two must be equal ↑

Corresponding to this absence of an economic incentive or this disincentive for the key decision makers in the health care system to achieve such savings is an observed lack of savings. The conversion of surgical day care facilities from a substitute for inpatient beds to an addition to existing inpatient services is thus economically advantageous to hospitals and their staffs, who thus preserve jobs, and to physicians, who are then able to do a larger volume of work. This conversion is distressing if one regards (as we do) surgical day care as an innovation that improves the quality but lowers the cost of current levels of care. If, on the other hand, one takes the view that more surgery is always better for the community, then one might regard the add-on expense as a small price to pay for the opportunity to increase these benefits in the face of government restrictions on hospital capacity and budgets. We think it difficult to sustain the view that the community benefits from general increases in the performance of pediatric surgery, but even if it were true this view would make it impossible to advocate surgical day care as a cost-reducing strategy.

Implications

Are there other ways to organize the delivery of hospital services so that the very large potential savings from surgical day care can materialize? Is there any way in which the hospital system as a whole can avoid these kinds of disincentives?

There seem to be two main approaches to such questions. Since the existing budget policy faced by hospitals and by physicians tends to discourage the realization of potential savings, then either one must impose regulatory bodies to modify the decisions made by hospitals and physicians, or one must change the incentive structures in which these decision makers carry out their activities. If neither of these is done, then clearly savings will never emerge. The regulatory approach might be achieved by the creation of a regional board that would be responsible for rationing access to existing hospital space. Thus, when an SDCU was opened one might begin to discourage inpatient admissions in proportion to the increase in surgical day care admissions, perhaps by simply identifying particular physicians who have expanded their volume of admissions for inpatient and day surgery and feeding them information on the nature of their use patterns. A system of peer review could be developed that required these physicians to justify their requests for access to inpatient space.

The alternative approach would be to shift incentive patterns. For hospitals, for example, one might say that when an SDCU was opened a reduction would follow in the number of regional inpatient beds per 1000 population, but that the cuts would not take place in the hospital that introduced the SDCU. In other words, one would attempt to generate a degree of interinstitutional competition similar to that expected in the private sector. For physicians one might attempt to build into the fee schedule a reimbursement for the average hospital costs of treating a particular surgical condition and then require physicians to pay from this

the actual costs of each hospital episode. Thus, physicians who chose to use the SDCU would be fully reimbursed or even over-reimbursed for that choice, whereas physicians who chose to use inpatient care would find themselves paying part of the cost directly.

These suggestions have a number of weaknesses and are relatively easy to criticize. The point they raise, however, is that the existing delivery system seems incapable of realizing the potential savings from an innovation such as surgical day care. It is presumably incapable of realizing the savings from other types of innovation as well. If physicians are to play a significant role in the planning of health care for the future, and it is hard to see how a satisfactory health care system can be maintained and developed without such input, they will have to consider with some care the lessons that have emerged from the apparent failure of an innovation that, while in principle enormously promising both economically and medically, appears to have fallen far short of the economic promise.

References

1. DAVENPORT HT, SHAH CP, ROBINSON GC: Day surgery for children. *Can Med Assoc J* 105: 498, 1971
2. SHAH CP, ROBINSON GC, KINNIS C, et al: Day care surgery for children: a controlled study of medical complications and parental attitudes. *Med Care* 10: 437, 1972
3. EVANS RG: Other experiences with alternative care: common problems and suggested solutions (chap 11), in *The Hospital Care of Children: a Review of Contemporary Issues*, ROBINSON GC, CLARKE HF (eds), Oxford U Pr, New York, 1980
4. YOST BW: Blue Cross Association perspective on ambulatory surgery (chap 22), in *Ambulatory Surgical Centers: Development and Management*, O'DONOVAN TR (ed), Aspen Systems, Germantown, Md, 1976
5. FAINE JC: The position of independently operated facilities (chap 15). *Ibid*
6. STEHLING LC, ZAUDER HL: Outpatient surgery. *Ted Med* 70: 61, 1974
7. *Hospital Adaptation of International Classification of Diseases, Adapted*, 2nd ed, Commission on Professional and Hospital Activities, Ann Arbor, Mich, 1973, vol 2
8. EVANS RG, KINNIS C, ROBINSON GC: *A Cost Analysis of Alternatives to Traditional Inpatient Care in a Children's Hospital*, unpublished final report (Dec 1978) of a project funded by grant 610-1103-43, Dept of National Health and Welfare
9. EVANS RG: Alternatives to traditional care at Children's Hospital, Vancouver: the economic studies of cost savings (chap 10), in *The Hospital Care of Children: a Review of Contemporary Issues*, op cit
10. EVANS RG, ROBINSON GC: *An Evaluation of the Economic Implications of a Day Care Surgery Unit*, unpublished final report (Oct 1975) of a project funded by grant 610-21-14, Dept of National Health and Welfare
11. SALTZSTEIN EC, SULLIVAN CB: Outpatient surgery. *Wis Med J* 74: 57, 1975
12. DAVIS JE, DETMER DE: The ambulatory surgical unit. *Ann Surg* 175: 856, 1972
13. ELNICKI RA: Substitution of outpatient for inpatient hospital care: a cost analysis. *Inquiry* 13: 245, 1976
14. *International Classification of Diseases, Adapted*, 8th rev, PHS publ no 1693, US Dept of Health, Education, and Welfare, Public Health Service, Washington, 1968, vol 1, p 558
15. BERRY RE JR, BOLAND JP: *The Economic Costs of Alcohol Abuse*, Free Pr, New York, 1977, p 31