HOSPITAL EFFICIENCY, MARGINAL COSTS AND HOSPITAL SYSTEMS PLANNING

UNDER UNIVERSAL COVERAGE

CONCEPTS, METHODS AND POLICY

A Thesis

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by

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ABSTRACT

The thesis of this work is that hospital inpatient costs, expressed as average cost per hospital case, are affected by both policy and environment in a system in which individual hospital costs differ due to differences in casemix, in efficiency, and in patient characteristics. Further, it asserts that there are possibilities to manipulate costs favourably through policy analysis and application.

This is an exploratory work which concentrates on identifying key economic parameters and assaying their policy implications using standard techniques of economic analysis. The theory pertaining to hospital economic behaviour and to relationships between cost and significant hospital variables is discussed. More attention, however, is paid to methodological problems, particularly multicollinearity among the variables.

The results suggest that long run marginal costs of hospitals are not significantly different from average costs and, therefore, that size of hospitals is only an important determinant of cost insofar as it promotes more efficient utilization. Short run marginal costs, however, are well below average costs at all observed levels of utilization. Therefore, within the hospital sector, at least, the best policy measures that could be taken by politicians and health care

administrators to improve efficiency would be those which aimed at optimum utilization of existing capacity rather than those which aim at the creation of larger central facilities in the hope of achieving reduced costs per case.

CHAPTER 1

INTRODUCTION

In the 1960s and early 1970s health care costs in most countries
in the Western world climbed dramatically. The increases were not
merely in line with the rate of inflation, but, in most cases, out-
paced the general increase in prices. For example, in Britain costs
rose at an average annual rate of 7.0 per cent during 1961-1965.
(Abel-Smith, 1967; Anderson, 1972). Today's popular wisdom would
suggest that countries such as Britain, where health care is not only
financed, but largely organized by government, would be more prone to
cost escalation. However both the United States, where the private
and voluntary sectors are large, and Canada, where government acts as
a fiscal intermediary between patients and providers, have seen similar
if not greater cost increases.

Between 1960 and 1974 total Canadian health care costs, paid by
both consumers and government rose from $2.1 billion to $8.2 billion
(current dollars) an average annual increase of 11 per cent. By way
of comparison, U.S. costs rose from $27 billion to $99 billion during
the same period, an average annual increase of 10.5 per cent. About
80 per cent of the Canadian costs, by 1973, were met by government
programs; the proportion was considerably less in the U.S. where
private insurance still finances a large portion of care provided.[1]

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[1] Statistical material pertaining to historical costs in Canada
and the U.S. is derived from: Expenditures on Personal Health Care in
Canada, Dept. of National Health and Welfare, Research and Statistics
Directorate, Ottawa, 1975.

Some of this cost increase is accounted for by population increases. Still, during 1960-1975 costs in Canada rose from $118 per capita to $572 per capita; about 9.2 per cent per year. The comparable U.S. figures were $149 and $472 (or 9.3 per cent per year). During this period Canada's average annual rate of inflation (Consumer Price Index) was estimated at 3.5 per cent (Statistics Canada, Prices and Price Indices). The Health Care price index increased at an average annual rate of 4.3 per cent during the same period (Statistics Canada Cansim Data Retrieval).

Increases of this magnitude represent a real relative diversion of national product. In 1960 Canadians spent 5.5 per cent of Gross National Product on health care. By 1975 the proportion was 6.9 per cent. Three personal health care items, hospital costs, physician and dentist costs and drug costs represent about 75 per cent of overall health care cost and, by 1973, about 5.3 per cent of Canada's G.N.P.

The experience in Manitoba paralleled that of the nation. Manitoba expenditures on the three personal health care items mentioned above rose from $77 million in 1960 to $264 million by 1973 -- or to 6.5 per cent of total personal income. Per capita costs went from $86 to $264; about 9.1 per cent per year. The 1973 Manitoba per capita cost was somewhat less than Ontario's ($298) and somewhat higher than Saskatchewan's ($229).

By 1973, considerable concern had been demonstrated by both the industry and government about "runaway" health costs. Blueprints for reorganization of health care, intended principally to control cost escalation, had appeared in several provinces, Manitoba included, and

at the national level. Some not inconsiderable efforts were being devoted to attempts to implement some aspects of cost control strategy.

For example, the 1970 Federal Task Forces on the cost of Health Services recommended both institutional changes to provide the incentives to use resources more efficiently and technological changes which would alter the mechanisms of health care delivery (Canada, 1970). These recommendations were echoed in the 1970 Economic Council of Canada Review which also wanted to provide incentives for the substitution of less costly personnel for highly trained professionals, where appropriate, thereby improving the efficiency with which care is delivered.

Also in 1970 Canada's two largest provinces issued major reports on the state of the health care sector. Ontario's Committee on the Healing Arts was primarily concerned with educational and regulatory arrangements affecting the health disciplines, but also considered economics to be within its purview (Ontario, 1970). The Committee pointed to increasing sophistication in the care available, the growing complexity of skills and equipment to provide it, and the peculiar economics of the health care sector in which market price allocation plays only a limited role, as key causes of cost escalation. The Committee recommended experimentation with new forms of organization and systematic evaluation in order to improve the system's efficacy and efficiency.

Quebec's Castonguay Report (1970) was issued in the same year. This report, too, focused on organization as the key to efficiency and control of costs. With regard to hospital and other institutional

costs it recommended that ambulatory health care centres undertake greater responsibilities, that the numbers of acute care hospital beds be reduced and that preventive care services be augmented.

By 1972 concern with rising health care costs and the enormity of effort apparently required to check them had reached the proportions of a national debate. In that year, the landmark "Hastings Report" appeared (Hastings et.al. 1972). It cited duplication, lack of co-ordination and inappropriate incentives to providers as principal causes of rising health care costs. Its principal recommendation was that health services be integrated at the local level under a single jurisdiction: the "Community Health Centre" concept. Such an approach, Hastings claimed, would direct patients to the appropriate service, avoid unnecessary hospitalizations and excessive use of curative services, and ensure utilization of appropriate preventive care and substitution of lower cost for higher cost services where appropriate.

While the perspective of the economist was not lacking in Hastings' report, a rigorous analytical framework based on acceptable behavioural and technological postulates was. Critics have attacked the Hastings document because it failed to develop a model explaining why a publicly funded health centre, any more than a hospital, should seek objectives which are compatible with cost minimization and appropriate resource utilization (see, for example, Migué and Bélanger, 1972).

Manitoba's 1972 White Paper on Health Policy (Manitoba, 1972) anticipated and enlarged on the recommendations of the "Hastings

Report". It focused on integration and administrative linkage at the local level.

Despite the flurry of attention directed at health care costs in the early 1970s, the rate of increase was not slowed. Health care costs continued their rapid escalation until 1976 or 1977. This was possibly due to the economic expansion and associated increases in government revenues occurring during 1972-1975 throughout Canada. In most quarters a basic belief remained that while the health care cost situation was of some concern, it was not yet critical and governments could still provide the wherewithal to fund ever-growing health care budgets. Cost increases accelerated. The average annual rate of cost increase for services funded by the Manitoba Health Services Commission (M.H.S.C.) was 20 per cent per year between 1973 and 1976 -- or 10.3 per cent net of inflation (M.H.S.C. Annual Reports, 1973, 1977; Statistics Canada, Prices and Price Indices) as measured by the Consumer Price Index.

Throughout both the earlier period (1960-1973) and the latter period, hospital costs have escalated more rapidly than other health care costs. Their contribution was significant; in Manitoba, hospitals account for 63 per cent of all health care costs funded by M.H.S.C. During 1960-1973 hospital expenditures increased at an average annual rate of 11 per cent (compared to 9.6 per cent for the total) and stood at $166 million by 1973.

The rate of hospital cost inflation also accelerated during the mid-1970s. From 1973 to 1976 it was 20.7 per cent per year (or 11.0 per cent, netting out increases in the consumer price index). This

compared with average annual increases in physician costs of 10.6 per cent and in administrative costs of 14.2 per cent (M.H.S.C. Annual Reports).

TABLE 1-1

HEALTH CARE COSTS IN MANITOBA BY COMPONENT:

1973, AND RATE OF INCREASE, 1960-1973

Component	Total Cost (Millions of Dollars)	Per Cent of Total Cost	Average Annual Rate of Increase 1960-1973 (%)
Personal Health Care	264.	100	9.6
All Hospitals	166	63	11.0
Physicians	64	24	9.4
Dentists	16	6	8.2
Drugs	19	7	6.9

Source: Health and Welfare, Canada: National Health Expenditures in Canada 1960-1973.

Economists and others have sought to understand the reasons for rapid escalation of hospital costs.. Some are simple and straight-forward. For example, populations have increased and the population has aged. These two factors have no doubt accounted for some of the increase. Yet, in Manitoba the population increase between 1960 and the present has been less than one per cent per year. The aging of the population is a long run process and its implications are slight on a year-to-year basis. In 1961 the proportion of Manitoba's popu-

lation which was aged 65 years or more was 9.0 per cent (1961 Census of Canada). By 1976 this had increased to only 10.2 per cent (M.H.S.C. 1976 Statistical Supplement).

If the issue of hospital costs is approached through a basic accounting framework it is apparent that changes in cost must be due to either changes in price and/or changes in quantity of service used. Changes in quantity used can be generally related to changes in the health condition of the population (morbidity or "objective" need) (Fuchs, 1975) and to predisposing and enabling variables which affect demand for service (Wirick and Barlow, 1964) especially the incentives to use or not to use services facing consumers and providers (Berki, 1972; M. Feldstein, 1971; Klarman, 1970; McNerney, 1962; Sorkin, 1975; Migué and Bélanger, 1972). Changes in price depend on the prices of inputs into hospital care (e.g., doctors, nurses, hospitals' lab and x-ray equipment) and the productivity of these inputs. Technology is a variable with more complex effects. It can improve productivity, thereby reducing prices; or it can introduce new processes, stimulating demand and increasing both prices and quantities consumed as well as increasing the derived demand for complementary factors of production (Fuchs, 1975; Klarman, 1974; Russell, 1976; Russell and Burke, 1975; Blomquist, 1979).

Changes over time in quality of hospital care or intensity of service appear to have played a particularly important role in hospital cost increases (M. Feldstein, 1971; Elnicki, 1974; Salkever, 1972). The extent of these changes can be appreciated by studying changes which have taken place in labour inputs to hospital care in

recent years. Similar if not greater increases have occurred in
utilization of other factors of production, but labour absorbing 75 to
80 per cent of Canadian hospital costs (Soderstrom, 1978) can be taken
as representative. As Table 1-2 shows, paid hours per patient day in-
creased by more than 2.6 per cent per year in Manitoba hospitals
between 1969 and 1976. These increases can reflect either produc-
tivity declines or the changing nature of the hospital product.

TABLE 1-2

AVERAGE ANNUAL INCREASE IN PAID HOURS PER PATIENT DAY

PUBLIC GENERAL HOSPITALS IN CANADA AND MANITOBA 1969-1976

	Canada	Manitoba
	per cent annual increase	
Total Hospitals	1.21	2.64
Nursing Divisions	1.13	1.52
Diagnostic and Therapeutic Divisions	5.78	8.93
Administration and Support Divisions	0.65	4.91

Source: Statistics Canada 83-212, 83-217.

Since 1976 much of the furore surrounding health cost increases
in general and hospital cost increases in particular has subsided.
Annual expenditure increases have fallen from the twenty per cent
range to below five per cent (M.H.S.C. Annual Reports) -- a rate which
is well below general price inflation. Between fiscal 1978 and 1979
hospital cost increases were drastically cut back, to only three per

cent. The reduction in escalation has, no doubt, been associated with more stringent government control over increases of hospital budgets; the actual economic path of causation is, however, difficult to trace. One possibility is that rising real prices to the user (due to lower quality and longer queues for service) reduced demand. Another is that, relative to hospital budgets, the cost of health care resources increased prompting economizing measures, including reduced output.

The success of governments in controlling costs without apparent significant harm to either the health status of the population or to the functioning of the hospitals raises questions as interesting as the original cost spiral which occurred during a period of more relaxed government attitudes. In both cases they are: what are the peculiar economics of the production of health services? What are the behavioural attributes of hospitals that underlie these economics; and what are the implications for hospital cost performance and government policy?

A number of behavioural reasons have been postulated for rising health costs. A growing population with larger incomes, more education, greater sophistication and better access to care fostered by universal hospital and medical coverage is one group of reasons. Higher priority for health matters in both public and private decisions may have led to a view that health expenditures have greater utility than was previously believed (Grossman, 1972). The greater utility, as expressed in the decisions of the 1960s and early 1970s to opt for universal medicare and a major building program for hospitals and medical schools, has led one writer (Evans) to suggest that greater utilization,

quality and costs are due to increased production of health personnel
and facilities in earlier years. These personnel have some influence
over the extent of their employment and have persuaded society to opt
for more and better health care (Migué and Bélanger, 1972; Illich,
1976).

There is a wage "catch-up" theory that argues that much of
hospital cost increases are due to the larger than normal wage in-
creases in the recent past which have brought the earnings of lower-
echelon health care workers into line with those of workers in other
industries (Blomquist, 1979; Sorkin, 1975).

However, the conventional wisdom used to explain rising costs
is the structure of economic incentives facing both producers and con-
sumers of health care. Consumers do not see a price at the point of
service and may consequently demand more care than they would were they
facing a price that reflected true costs. Even if prices reflected
marginal social costs, however, the consumer's inability to evaluate
the utility of care may result in "excessive" demand (Migué and
Bélanger, 1972). Health care providers in general and hospitals in
particular exist in an economic environment and pursue objective func-
tions which do not promote efficiency (Berki, 1972; Feldstein, 1971;
Arrow, 1963; Cyert, 1972; Davis, 1972; Dowling, 1976; Lee, 1971;
Newhouse, 1970; Pauly, 1973).

The purpose of the present work is not to examine the beha-
vioural aspects underlying the economics of hospital care, but rather
to indicate what the implications of the present behavioural and fund-
ing environment are for hospital cost performance and to suggest

government policy that could improve that performance. Most current models of hospital economic behaviour suggest that hospital management is not required to be efficient, that some of the hospital budget is discretionary. That being the case, it would be expected that variation in costs among hospitals would not be completely explained by the usual determinants such as size, product variation and role. The thesis of this work is that both overall and individual hospital costs can be affected by managerial performance and government policy as well as environmental givens such as casemix and patient or provider characteristics. The approach used in developing the thesis will be a standard cost estimation using regression analysis on a number of significant factors and using the 1977 data from 80 Manitoba acute care hospitals as a sample.

While the method of analysis itself is straightforward, both the theoretical framework and the details of methodology continue to pose problems for researchers in this field. Consequently, this work will first place the analysis in its wider theoretical framework. An understanding of models of hospital economic behaviour is useful background to the analysis. Second, some of the major methodological concerns will be reviewed. Finally the results of the model are reviewed and placed in a policy context.

Chapter 2 reviews some of the recently developed economic models of hospitals and then proceeds to assess results and analytical techniques used in previous hospital cost analyses. Chapter 3 explains the model used in the present analysis, reviews concepts and controversies associated with the selection of variables, and discusses the major

methodological problems associated with estimating the results.
Chapter 4 presents the results and discusses economic and policy
implications.   Finally, Chapter 5 reviews the model and presents
suggestions for improvement and refinement.

CHAPTER 2

A REVIEW OF SOME THEORIES OF HOSPITAL BEHAVIOUR AND COST IMPLICATIONS

Although health matters have engaged the attention of economists since at least the 1930s, the beginnings of health economics as a separate discipline do not appear to have occurred until about 1960. Kenneth Arrow's landmark article "Uncertainty and the Welfare Economics of Medical Care" appeared in 1963; McNerney's volume Hospital and Medical Economics in 1962. Interest in the subject quickened and articles and anthologies began to emerge at a more rapid pace. Klarman (1965) and Mushkin (1964) were two early and seminal contributors.

Although health economics has come a long way towards status as a discipline since that time, it will not come as a surprise that fifteen or twenty years is still insufficient time to answer some of the key questions economists have been asking. Many of these questions centre around what appears to many observers to be an obvious characteristic, that the provision of health care is an inefficient process. After all, it is argued, health care costs, and hospital costs in particular, increased consistently during the 1960s and 1970s at a rate more rapid -- and sometimes much more rapid -- than the general level of prices. In most of the western, industrialized world, health care is largely funded either directly by government or by some other third party payor such as a private insurance company. Many individuals feel that government involvement in itself is an inducement to inefficiency. The health industry is insulated from the market

system of rewards and admonitions, and neither the consumer nor the provider has great incentive to use resources efficiently.

Ro (1977) has clearly articulated the health care industry's central problem of efficiency. He recognizes that health care is not the only sector or industry in which market imperfection tolerates provider inefficiency and may, under certain circumstances, lead to income redistribution from consumers to providers. However, he says:

> "....the exceptional thing about the health care industry
> is the matching of an imperfect market condition, in which there
> is no mechanism to ensure provider efficiency, with the condition
> of discrepancies between the price received by suppliers and that
> paid by consumers out of pocket. The co-existence of two
> anomalies creates further allocative problems since the health
> care sector is the type of service industry whose productivity
> lags behind that of the manufacturing industry under even the
> best of conditions." (p.7)

Ro goes on to point out that in an economy's sectors of less rapidly rising productivity either outputs will vanish (because relative prices must rise) or their cost increases continuously. If demand is inelastic or third party payments sustain demand in the face of rising output, expansion of output with cost increases is possible and indeed highly likely. These productivity effects have been described in detail with respect to service industries by Fabricant (1962) and Fuchs and Wilburn (1967).

Lags in technical productivity growth explain price increases, but do not necessarily imply inefficiency nor do they imply that relatively simple manoeuvres of government policy could favourably affect costs. The existence of institutional arrangements which do not ensure efficiency do not in themselves guarantee inefficiency. What is required is an explicit model of hospital behaviour within the institu-