medical students, physical educationists, coaches and trainers. It was arranged by the executive committee of the sport medicine section of the OMA, and Dr. T. Fried of Downsview was program committee chairman.

Dr. Alan Bass of Hamilton, section chairman, who welcomed the audience, noted that the section has grown to a membership of more than 200 in less than two years. Many of them are family physicians, who find that three to four percent of their practices are sports injuries for which they had little preparation in their formal training.

BETTY LOU LEE

CPS publishes manuals

Two major projects of the Canadian Paediatric Society have culminated in the publication of important additions to the reference literature of child health. The books are Learning Disabilities, a practical office manual, and a Manual for the Transport of High Risk Newborn Infants.

The former is authored by a group of University of British Columbia pediatricians and educators, Dr. J. U. Crichton, Dr. H. G. Dunn, J. H. Catterson and D. Kendall, and is aimed at filling the gap caused by lack of formal education of physicians in the medical approach to diagnosis and management of learning disorders. A systematic approach to the problem which can be readily applied in a busy office practice, is provided by the manual which outlines a practical management program in two stages — one for a relatively rapid and superficial assessment, and another for the detailed, interdisciplinary assessment of severe cases.

The Transport of High Risk Newborn Infants was authored by Dr. Sydney Segal with contributions from members of the Fetus and Newborn Committee of CPS. Its 200 pages contain an impressively comprehensive accumulation of data that overlooks no aspect of the subject.

The two publications can be obtained through the Canadian Paediatric Society, Dr. V. Marchessault, Secretary, Centre Hospitalier Universitaire, University of Sherbrooke, Sherbrooke, P.Q., at a cost of $5 each.

Medical care costs ∝ physician manpower: A new economic theory

By Dr. M. A. Baltzan

Analysis of data based upon Canadian experience in the delivery of physicians' services suggests that:

- **The cost of these services is not related to the income of physicians.**
- **The cost is directly related to the number of doctors.**
- **Price per service is also related to the number of doctors.**
- **The volume of services received by the public is also related to the number of doctors.**
- **The number of services per doctor does not progressively increase after the removal of financial barriers to access and is not diminished by the reintroduction of a small direct charge to the patient.**

These observations were unanticipated and a hypothetical scheme linking the various cost and services parameters in physician care delivery has been proposed. Additional analysis leads to the suggestion that the most logical way to control escalating costs without impairing quality or quantity of service is to avoid excessive numbers of physicians and ensure that the payment mechanism stimulates the highest possible number of services per physician with due regard to quality.

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Recently there has been considerable concern expressed over the increasing segment of the Canadian gross national product which has been devoted to health care.[1] Projections, based on the rate of increase of health care costs during the past few years, have suggested that persistence of the present trends will result in these expenses consuming an exhorbitant portion of the gross national product within the foreseeable future.[2] Review over a longer term indicates that this recent rise was preceded by a plateau.[3] Moreover, the current acceleration has coincided with the removal of financial barriers to hospital and physician care. Thus, it is possible that the present period is a "catch-up" one and therefore not a reasonable basis for the prediction of long-term trends.

Furthermore and notwithstanding their recent increase, health care costs consume a relatively minor portion of the family budget in respect to such other fundamental items as transportation, education, food and shelter.[4] This relationship is such that in total dollars even a major percentage saving in health care is much less significant than is a minor saving in the costs of the other noted essentials. Despite this, it is clear that there is public and governmental concern over health care costs. While rationale for this concern appears obvious, an important feature may be that health care expense is now readily identifiable owing to its

grouping in central government budgets. The other living costs are born by families or multiple governmental agencies and are therefore less readily totalled, and hence less visible.

Nevertheless, it seems sensible that society should concern itself fully with health care costs and attempt to obtain the highest quality service at the lowest possible price.

Health care costs may be separated into many categories: physicians' fees, hospital costs, drug costs, etc. While physicians' fees account for less than 20 percent of this total expenditure,[5] they are of major interest and it is their analysis which concerns this report.

What is the relationship between physician net income and the cost of physician services?

It seems reasonable to suggest that the mean net income of physicians would be a significant and major factor in the determination of the cost of physician services to the public. If this were so, a positive correlation should develop between the mean cost per capita of physician services and physician mean net income. Data to test this relationship are available[6] and are plotted in Figure 1. Inspection of the graph indicates that there is no correlation between these variables. This would strongly suggest that physician mean net income is not a major factor in the determination of the cost of physicians' services in the various Canadian provinces.

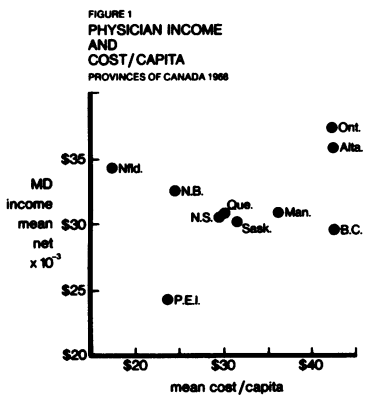

Figure 1. The mean net physician income is this figure for each province in Canada for the year 1968. It includes only those physicians in active civilian practice who earned more than $15,000 in that year from professional sources. The data are obtained from "Earnings of Physicians in Canada 1958-68," Health Care Series No. 25 published by the Research and Statistics Directorate, Department of National Health and Welfare. The specific data are on table A19, page 35. The mean cost per capita is the data for 1968 taken from the same publication and listed in Table A24, page 40, under the title "per capita expenditures on physicians' services, 1958-68."

What is the relationship between the number of doctors/capita and the cost/capita of physician services?

Since physician mean income does not appear to be a controlling factor in the cost of physician services, other factors must be tested. It seemed logical to explore the relationship between the mean number of doctors/capita and the mean cost of physician services/capita. Again data are available[7] to test this hypothesis and are plotted in Figure 2.

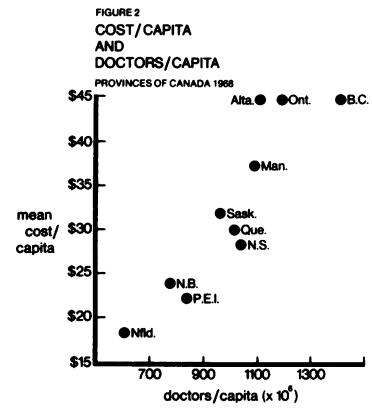

Figure 2. The mean cost per capita is the same data used in Figure 1. The data for number of physicians per capita are derived from the Department of National Health and Welfare.[7]

A positive correlation is present. Furthermore, the relationship appears to be almost exponential for doubling the number of doctors as related to a tripling of the cost of physician services. The fact of this correlation does not prove that the mean number of doctors/capita determines the cost of physician services, although it certainly does suggest such a possibility. Additional data will have to be examined before the causal significance of this correlation is clarified.

What is the relationship between mean price/service and the mean number of doctors/capita?

The mean cost/capita of physician services is the product of the mean price/services and number of services/capita. Comparative mean price indices for visit services in the various Canadian provinces have been prepared by the Department of National Health and Welfare.[8] These prices are plotted against mean net physician income in Figure 3. It is evident that there is a positive correlation between the two variables, not the negative one traditional supply and demand relationships would have predicted. Again this correlation does not prove a cause and effect relationship in either direction or even that the correlation is significant of cause and effect. However, one might speculate that the high number of doctors causes the high prices, not vice versa. In the latter case the noted relationship would only hold in the initial phase, and then be reversed by market forces.

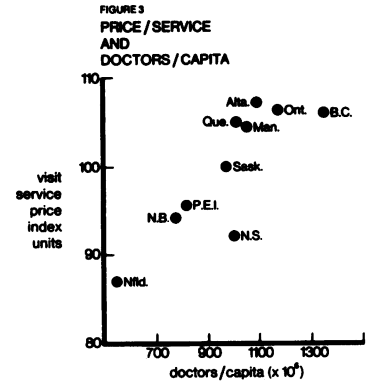

Figure 3. "Mean cost/capita" is the same data that was employed in Figure 1. "Doctors/capita" is the same data that was employed in Figure 2.

What is the relationship between physician services/capita and the number of doctors/capita?

Mean services/capita is the other variable in determining the cost/capita of physician services. It might be anticipated that this would be determined by a multiplicity of factors such as amount of illness, educational, financial and social levels of the population, etc., to a large extent. Therefore no such relationship is examined in Figure 4 which plots

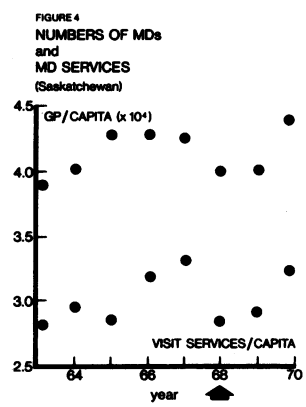

Figure 4. Data for this figure were derived from publications of the Medical Care Insurance Commission of the Province of Saskatchewan.[9, 10]

the mean number of family practitioners/capita[9] against the mean family practitioner visit-services/capita[10] for the Province of Saskatchewan for each year since the introduction of universal government sponsored and tax-financed insurance for physician services in 1962. Again a correlation is demonstrated as the lines are parallel, and again the correlation alone does not prove a cause and effect relationship.

However, it is possible to examine this more fully by inquiring into the decline in mean services/capita in 1968. Up to this point there had been no direct charge by a physician to a patient as the insurance plan provided for first dollar coverage. However in April of 1968 the government changed the regulations so that the physician was essentially required to place a small direct charge on his patients. It has been held that it was this charge which was responsible[11] for the decline in the mean services/capita. However it is also theoretically possible that this decline could have resulted from a decrease in number of physicians. The question becomes: "Did the mean services/capita decline because patients attended physicians less frequently or did the doctors leave for other reasons and the mean services/capita decline as the result of decrease in the number of doctors?" If the former were true, the doctors would be less busy and the mean number of services/doctor would decline. If the latter were true this ratio would not decline, and if the doctors were already maximally busy, it could not increase. Figure 5 plots the mean number of visit services/doctor rendered by general practitioners in Saskatchewan in the years 1963-1970.[12] It is readily apparent that the doctors did not become less busy in 1968 and in fact there has been no progressive change in either direction since 1962. This is interpreted as indicating that the major controlling factor in the amount of general practitioner visit services rendered to the people of Saskatchewan is the number of general practitioners/capita.

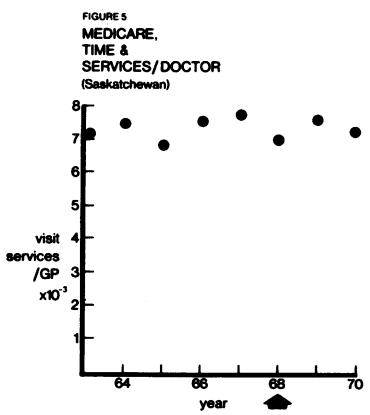

Figure 5. Data for this figure were derived from publications of the Medical Care Insurance Commission of the Province of Saskatchewan.[12]

Discussion

The data tend to negate the significance of physician net income as a major factor in determining the cost of physician services to the public. On the other hand a strong correlation is evident between the cost of these services and the mean number of doctors/capita. Furthermore when visit services are examined, and especially visit services by Saskatchewan general practitioners, a correlation is shown between the mean number of doctors/capita and the two parameters which determine mean cost/capita, mean number of services/capita and mean price/service. When the relationship between mean number of services/capita by general practitioners for visit services in Saskatchewan was examined additional evidence was educed that this was not simply a correlation but was clearly a cause and effect relationship, with the mean number of general practitioners/capita determining the amount of services/capita. Furthermore, this relationship was unaffected by the reintroduction of a small but definite fiscal barrier to physician access.

In summary the data suggests that:

- In the absence of financial barriers to physician services or even in the presence of small such barriers, the volume of rendered medical services is governed by the number of doctors.
- The mean cost/capita of physician services is unrelated to physician income but is related to physician number.
- The mean price/service is directly related to the mean number of physicians/capita.

These observations were unanticipated and hence warrant the formation of an hypothesis for their understanding.

The first of these could be interpreted as indicating that under the study conditions there is perfect elasticity in the supply and demand relationship for medical services. This cannot be totally generalized for two reasons. Firstly, it only applies in the range of supply and demand studied. It might not hold true if the supply were increased by several orders of magnitude. Secondly, the data has been dealt with in terms of the "mean" physician and "mean" service. This does not indicate that it applies to all physicians and all physicians' services but simply to them as an aggregate. Thus, there will be individual physician and service exceptions.

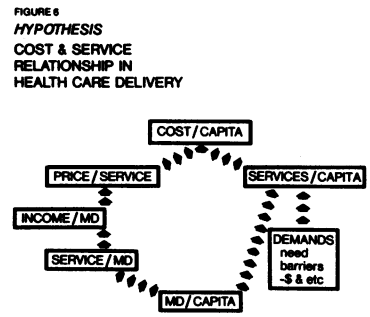

Figure 6. This is a proposed scheme for the relationship between the various parameters of the cost and service in the physician care sector of health care delivery. It should be noted that this does not include the hospital care segment although it may be subsequently shown that this feeds into the proposed system as a box labelled "hospital facility" acting in parallel with the "demand" box and feeding into the "services/capita" box.

The explanation of the latter two observations becomes apparent when the cost and service relationships are linked into an inter-related system as shown in Figure 6. The observed cost and service parameters are linked as cost/capita as determined by multiplication of the services/capita and mean price/service. Services/capita are determined by the number of doctors/capita primarily and secondarily by the demand. Mean gross income per doctor is determined by the mean price/service times the number of services/doctor. It is conjectured (and somewhat established by personal experience) that eventually an excess of doctors will result in a reduction in the mean number of services/doctor. These costs and service relationships are diagrammed in Figure 6.

If the number of doctors is increased, the number of services/

capita will be directly increased. However, if the increase is sufficiently large, the number of services/doctor may fall. The physician income will then fall. Armed with this information and given the present attitudes of society, the doctors will then have a solid case to negotiate an increase in price. Thus with both price/service and services/capita increasing, the cost/capita will increase. If the physicians have not been successful in negotiating a price increase fully compensatory for the decline in services/doctor, their income will decline.

The fact that this hypothesis explains the observations lends to its credibility but does not establish its veracity. With this reservation, it is possible to test the influence of any one of the parameters on the cost of physician services. For example, fixed controls on the cost/capita (capitation) will lead to a reduction in physician income unless the number of doctors/capita is controlled. When this occurs the physicians will have a strong case to negotiate a change in their financial status and the cost/capita control is lost. On the other hand, if the number of doctors is controlled, the cost/capita is automatically controlled. It is interesting that in the two areas where capitation may have been successful (general practice in Great Britain and Kaiser Plans), the number of doctors is also controlled. Until the significance of this aspect is further analyzed it would be unwise to assume that this method of payment confers special cost control benefits.

If the mean doctor income is the primary control (salary), it is likely that the services/doctor will fall.[13] When this occurs the services/capita must fall. At a certain critical point, the public will demand additional services which will have to be supplied by additional doctors on fixed income and again the cost/capita will rise.

If controls are structured to maximize the services/doctor, the doctor income will rise. There will be less justification for an increase in price. In addition some of the doctor-generated services/capita will fall. Thus the cost/capita will fall or at least be controlled and the income of the physician will increase. In traditional economic parlance what has happened is that the productivity of the physician has increased, the term productivity being used to connote a situation in which the price to the consumer falls or is held steady simultaneously with an increase in return to the provider. Group practice and physician assistants enter at this point. If these in fact increase the productivity of physicians (without generating equal or even offsetting costs) they will aid in controlling the cost of physician services. If they do not they will increase the cost of physician services.

In conclusion, it is suggested that major factors controlling the cost of physician services may be the number of doctors per capita. Too few doctors will likely result in lower quality health care. Too many doctors will increase the cost without increasing the health. The precise definition of "too few" and "too many" is not currently available. Furthermore, the physician manpower requirement is to a considerable extent determined by the mean number of services/doctor, and this clearly has a relationship to the method of physician remuneration. The method, in order not to be counterproductive, must not mitigate against the maximum reasonable number of services/doctor.

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1970 income figures show 11.3% increase in net earnings

A decade's progression of incomes of active fee practice physicians is charted in *Earnings of Physicians in Canada 1960-70* which has just been released by the Department of National Health and Welfare. Highlights of the 1970 statistics — which show more of the effects of Medicare on doctors' incomes — include:

- Average net earnings of active fee practice physicians rose to $34,360, an increase of 11.3 percent over 1969. Average for physicians in the over $15,000 a year group was $38,837 — an increase of 8 percent.
- Average gross earnings were up an average of about $3,500 for both groups — a 9.7 percent increase overall, 6.7 for the higher income group.
- Average expenses as related to gross income dropped a percentage point and were $16,459 overall and $18,018 for the $15,000-plus earners — 32.4 and 31.7 percent of gross respectively.
- The most profitable place to practise remained St. John's, Nfld., where average net earnings were $47,790. Newfoundland stayed in first place in the national net income standings with a $41,562 average. Lower average expenses than its closest rivals (Alberta, Ontario, Manitoba), which reported higher gross income averages, kept Newfoundland in first place.

In 1970, the gross earnings of self-employed physicians in Canada averaged $50,819, a rise of