# INPUT UTILIZATION IN PHYSICIANS' GROUP PRACTICE

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Group practice is becoming a more important force in the American medical care industry. Between 1965 and 1969 the number of physicians in groups increased 29 percent while the number in solo practice declined eight percent. (Frech and Ginsburg, p. 36.) The trend toward group practice will be accelerated by government programs like the HMO Act of 1973. By definition an HMO has a prepaid group practice at its core. HMO's and group practice in general are seen by many as a means of providing entry into a system of comprehensive health care at reasonable cost in presently underserved areas.

Only fragmentary evidence exists on the economic performance of group practice relative to solo practice and on the operations of various types of groups. Existing studies, although limited by the quantity and quality of the data, are useful. They add to the set of established empirical regularities in the data. The regularities suggest hypotheses and help to focus the search for better data. Subject to stringent assumptions, they give quantitative evidence on hypotheses drawn from *a priori* reasoning and casual empiricism. Exploring the available data also suggests attributes of groups for which measurement techniques would be helpful in future research.

This paper presents some empirical evidence on the utilization of medical labor inputs in group practice. Of particular interest is the effect of alternative schemes of physician remuneration on input utilization. The scheme of remuneration and the resulting pattern of input utilization have an impact on physician satisfaction with the group. If the group structure is not conducive to physician satisfaction, it will not provide a stable source of medical care.[1]

[1] Friedson and Mann have documented the relationships among group structure, input utilization, and physician satisfaction. (pp. 789-790.) Frech and Ginsburg (1974) have found that small groups and very large groups are more efficient at the margin than groups in the middle size range.

## The Model

It is convenient to begin with a simple theory of behavior for the individual practitioner. It is assumed that there is excess demand for physicians' services. Under excess demand the physician may be usefully treated as having a lexicographic utility function. The first priority item in the utility function is a target rate of return on total training costs. Excess demand allows price to be set residually to obtain the desired return. The second priority item is the physician's contribution to the population's health. Health has been operationally defined by Culyer and Fanshel and Bush. For present purposes the important points are (1) that persons are aggregated with weights that reflect their ability to function normally, not their ability to pay for services, and (2) that it is a greater contribution to bring a person to a given health state A from state C than from state B when A, B, and C are progessively worse states. That is, if a cure can be achieved for an urgent case or a discretionary case, it is preferred to treat the urgent case. The second priority in the utility function is that all urgent cases be treated.[2] Discretionary cases will receive treatment only incidentally to the process of screening them from the urgent cases.

The third priority is physician leisure. Leisure is determined by the number of urgent cases and a "quality" constraint on the production process. The nature of the quality constraint has been suggested by Kovner (pp. 254-258). There is a limit to the permissible substitution of capital and nonphysician labor for physician labor. Additional substitution reduces quality below the acceptable limit. The limitation is justified on grounds of the psychological nature of the doctor-patient relationship and an economic grounds. Somers and Somers (pp 455-476) note that the traditional role of the physician is part

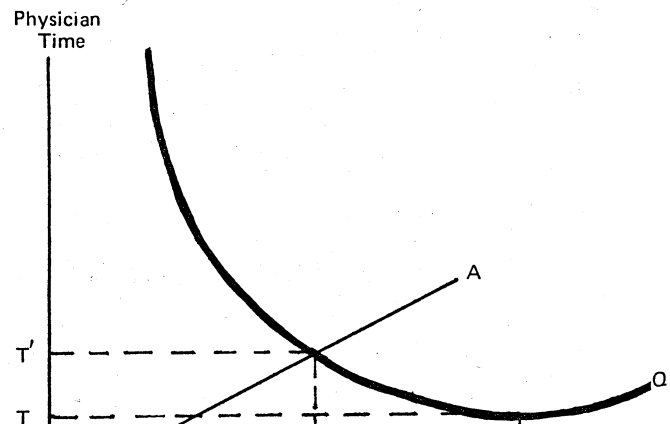
[2] For a full development of a model of physician behavior incorporating a health argument into the utility function see Kushman and Kushman and Scheffler.

priest, part technician, and part counselor. The roles of priest and counselor require that many functions be performed by the physician when they could technically be done by a paramedic. Procedures take an added significance because it is the physician who performs them. The mysticism which traditionally surrounds medicine make the physician the purveyor of reassurance as well as technical skill. The economic rationale for limited substitution is that paramedics may have less skill in many tasks than the physician. By performing tasks himself, the physician provides a form of insurance against incompetence.

For simplicity, a linear homogeneous production function for patient care services is assumed. The figure describes the equilibrium position of the sole general practitioner. Isoquant Q represents the output of health dictated by the patient load. In the absence of a quality constraint, the physician will produce Q with the least possible physician time. The marginal product of paramedic time will be reduced to zero. The equilibrium position will involve physician time T and paramedic time M. The quality constraint confines the input ratio to be on or above the ray OA. In the present case, the optimal combination will be T′ physician hours and M′ paramedic hours. The number of paramedic hours per physician will be M′.

For medical specialists the situation will differ due to caseload, technology, and the quality constraint. From any given population, the number of patients seen by a specialist will be less than the number seen by a G.P. Only a subset of the population is at risk for the ailments treated by any one speciality. An offsetting force is that there are fewer specialists per capita than G.P.'s. In terms of health, specialists are apparently more productive than G.P.'s. (Fuchs and Kramer, pp. 28-9.) Specialists tend to deal with more urgent cases, so that a "cure" means more health output. In terms of the isoquant map in the figure, the isoquants will be radially displaced toward the origin. The pertinent isoquant may be for an output level greater than or less than Q depending on the number of cases and the output per case. It is also expected that the isoquants will be warped. It is more difficult to substitute paramedic time for physician time in speciality practices. The available paramedics are trained in general skills. The tasks of specialists are less routine than those of a G.P. As a result, the isoquants for specialists are apt to become horizontal, reflecting a zero marginal product of paramedics, at a higher physician-paramedic ratio than the isoquants of a G.P. Reflecting the technical possibilities of substitution, the quality constraint ray will be steeper for specialists than for G.P.'s. At the same level of health output, specialists will employ fewer paramedic hours than G.P.'s. Output differences may tend to offset the decrease in paramedic employment.

Fig. 1. Equilibrium for the Solo G.P.




Groups will be formed if they offer some advantage in terms of physician leisure. There will be an advantage if the quality constraint ray is shifted to allow more substitution of paramedic time for physician time. It is significant that the arguments for advantages of group practice have centered around the issue of quality care. (See Rayack, pp. 146-53.) As Somers and Somers note, group advocates have stressed the scientific nature of care. Groups are said to produce better care by allowing extensive consultation, providing regular peer view, and allowing physicians and paramedics to build up expertise in a subset of tasks. The role of priest is replaced by the role of scientist. The role of counselor is replaced by a more routinized educational function. Because supervision is formalized and made more efficient and because each member of the team builds up expertise in a few tasks, paramedics can be substituted for physician time with no loss of competence. Thus, in a group setting the quality constraint ray shifts down. More paramedic time and less physician time are used for a fixed level of output.

It is further argued that the advantages of group practice can be best realized in a multispeciality group with enough members to permit consultation within and across specialities[3] (e.g., Fein, Somers and Somers, Graham). The implication is that larger groups and groups which have more than one speciality will be able to employ more paramedics with no loss in quality. It is argued that groups which share costs and income will be able to exercise more supervision and peer

[3]There is some sociological evidence that information flows are markedly different within and across specialities with better quality control information flowing between broad specialty groups. (Friedson and Rhea.)

review, allowing more substitution between inputs. Groups which retain fee for service remuneration seem to be formed only for tax purposes with no real interaction among the members in patient care, (Friedson and Mann). Fee-for-service groups will employ fewer paramedic inputs than groups with other remuneration schemes.

### Empirical Evidence on Medical Input Utilization and Physician Hours

There exists very little empirical evidence on input utilization in group vs. solo practice and even less on variation within groups. Using a very small sample of groups, Newhouse found that cost-sharing arrangements are associated with higher per-visit salary costs and fewer physician work hours. The difference in work hours was not statistically significant, although it was in the expected direction. Unfortunately, salary costs for direct patient care were not separated and group composition was not accounted for. Bailey studied internists in the San Francisco Bay area in 1967. He found that group members tended to work fewer hours than solo practitioners, and they tended to employ more paramedic hours per physician or per physician hour. (p. 270) The relationships were not pronounced and were based on a small sample, but they were in the expected direction. Since all of the groups were fee-for-service, a weak relationship would be expected. Kehrer and Intrilligator recently studied task delegation in physicians' practices. They found that delegation for instructions, blood pressure, and immunizations is much more frequent in group than solo practice for five different specialities. (p. 296) Again, the difference in delegation is consistent with the model.

Above, a group's size, composition, and form of remuneration were identified as potentially important characteristics affecting input utilization. The results reported so far give some evidence on the effects of the size of practice and the presence of a cost-sharing scheme, but no inferences can be made on the effect of group composition. In addition, all the accumulated evidence is based on small samples. It is desirable to validate the results by analyzing additional data.

The results to be reported here are based on a survey of medical groups in North Carolina conducted in 1972. Eighty groups were surveyed and 59 usable responses were received. The survey questioned groups on their membership, forms of decision making and remuneration, and input utilization.

The groups tended to be small, only one had more than fifteen members. Table 1 shows that the representation of large groups was approximately equal to their presence in the AMA national survey. On the other hand, the proportion of single specialty groups was below the national figure for groups of fifteen or fewer physicians while multispeciality groups were more common in the sample. The difference is probably due to the low population density of North Carolina relative to other areas. Single specialty groups require a larger population within convenient travel distance than multispecialty or G. P. groups. The survey sample and the national sample have similar utilization rates for medical and non-medical personnel per physician.

Table 1. The survey data and the 1969 national sample

| Characteristic | North Carolina Sample * | National Sample * |
|---|---|---|
| | ..... *percent* ..... | |
| 16 or more physicians | 1.70 | 4.70 |
| 8 or more physicians | 11.90 | 14.40 |
| Size $\leqslant$ 15, single specialty | 20.70 | 52.10 |
| Size $\leqslant$ 15, multispecialty | 62.10 | 35.00 |
| Size $\leqslant$ 15, general practice | 17.20 | 12.90 |
| Medical-technical personnel/size | 1.34 | 1.30 |
| Non-medical personnel/ size | 1.44 | 1.30 |

*National sample data are reported in Todd and McNamara.

All of the respondent groups practice in urban areas of similar sociodemographic composition. It is assumed that the levels of output are equal for physicians in the generalist category and likewise for specialists. The following explanatory variables are used in a multiple regression to explain input utilization: (1) A dummy variable equal one if the group contains more than one specialty or G.P.'s and specialists, (2) A dummy variable equal one if the group is a specialty group, (3) The number of full-time equivalent physicians in the group, (4) Dummy variables for salary remuneration, a percentage split system, and a point system. The reference group contains only G.P.'s with a fee-for-service remuneration scheme. The expectations on the coefficient signs were discussed above.

The dependent variable was constructed by equating a part-time employee to one-half full-time and weighting each category by salaries obtained from a Bureau of Labor Statistics wage survey and a survey of Physicians' assistants reported by Scheffler. The resulting expenditure estimates were divide by the equivalent full-time physicians. Kehrer and Intrilligator reported that tasks were most frequently delegated to registered nurses, licensed practical nurses, and "other" (presumably including P.A.'s)[4] (p. 297). A first variant of expenditure was constructed using the three categories. The results are found in the first column of Table 2. The second column reports results of adding lab technicians. Both expenditure measures are in error insofar as ancillary services are affected by the group characteristics. The second measure will be more apt to include a bias, although the groups are all small enough to expect few services to be added as a result of size.

[4]Fortunately, the physicians assistants involved appear to all be graduates of the Duke P.A. program which provides training for generalist assistants.

Table 2. Medical input utilization by North Carolina groups (t-statistics in parentheses)

| Group Characteristic | 1 | 2 |
|---|---|---|
| Heterogeneity | 44.222 | 52.845 |
| | (1.769) | (2.047) |
| Specialty | -44.619 | -53.127 |
| | (-1.565) | (-1.805) |
| Size | 27.418 | 0.188 |
| | (0.099) | (0.188) |
| Salary | 68.944 | 74.110 |
| | (1.973) | (2.054) |
| Percentage split | 87.618 | 105.803 |
| | (2.359) | (2.759) |
| Point system | 126.420 | 156.126 |
| | (2.487) | (2.974) |
| Constant | 117.774 | 148.116 |
| $R^2$ | 0.198 | 0.263 |

Using either measure of expenditures all the coefficients have the expected signs. In the first case size and specialty fail to show significance at conventional levels. In the second case, only size is not significant. The insignificance of size in the second case tends to confirm that the addition of ancillary services is not important in the sample groups.

Perhaps the most interesting finding is that any departture from fee-for-service remuneration increases expenditures. Some authors have ascribed the difference to X-inefficiency resulting from the free rider problems (Newhouse, Pauly). The model above suggests that it results from a relaxation of the quality constraint with increased interaction. It is not possible at this point to choose between explanations. The coefficients of the three included remuneration schemes are generally not significantly different, so that the important point seems to be departure from fee-for-service.

### Conclusions

The analysis presented here supports the contention of previous researchers that a departure from fee-for-service remuneration is associated with an increase in input utilization per physician. While previous authors ascribe the effect to X-inefficiency, the present model relates it to a quality constraint. A more complete data set, including prices, work hours, and output, is needed in order to discriminate between the explanations. The present results also agree with Newhouse's finding that the group's scale (total output) has an inconsequential effect on expenditure (p. 45). An interesting finding which appears to be new is that the presence of more than one type of physician increases expenditures. Perhaps there is an increase in the scope of services, or perhaps the quality constraint is relaxed. The question is worth further investigation. A final suggestion which emerges is that some measure of the supervision or interaction in a group would be useful in discriminating among competing hypotheses. Such a measure would reflect on the quality issue which lends a feeling of indeterminacy to all current studies of group medicine.

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*This paper is based in part on research supported by a National Science Foundation Fellowship, a Doctoral Dissertation Grant from the Pharmaceutical Manufacturers Association, and a grant from the Earl C. Anthony fund.*