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HUMAN RESOURCES MODEL

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HUMAN RESOURCES MODEL *

This paper presents a summary of the problems of surgical care in the Cauca Valley and proposes as an alternative solution to these problems the design of a system of surgical care that, on the basis of maximum utilization of existing resources, can substantially reduce costs and increase coverage.

The ideas expressed here have been analyzed by an interdisciplinary team (surgeons, anesthesiologists, nurses, engineers, an architect, a sociologist and an educational psychologist) currently working on the projects in this research program, some already completed and some still under way. The results will be published in medical literature.

The health policies of most countries are based more on the needs of the institutions furnishing these services than on those of the community. In the case of surgery space planning and the development of human resources is based on data on satisfied demand and not on data on the need for surgery, information that frequently does not exist at all. The consequences of such ineffective planning include the defective allocation of budgetary funds and the inadequate utilization of human resources, space, equipment and other resources.

Frequently the final results are high costs, low coverage and variable quality.

The global aim of the Simplified Surgery Program is to design and experiment with models of surgical care that make maximum use of available resources and result in low costs, increased coverage and outstanding quality.

In developing the model it was necessary to classify all surgical operations in four levels. Each level was defined in the light of the resources needed and the complexity of the surgical care required. For example, at level I, skin and breast biopsy; at level II, herniorrhaphy and vaginal hysterectomy; at level III, cholecystectomy and radical mastectomy; at level IV, revascularization of the heart.

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A detailed classification has been given elsewhere.¹

Figure 1 shows the human resources required for level I and II operations. Two surgical operations are undertaken at the same time in the same operating theatre. Before the operation, a nursing auxiliary interviews the patient in order to ensure that the existence of any contraindications for the operation are ruled out. The anesthesiologist uses standardized anesthetic procedures: epidural and general anesthetic, the latter especially in the case of children; he supervises two auxiliaries (anesthesia) who are responsible for the control of vital signs and of levels of anesthesia in the two patients. The two surgeons use standardized surgical techniques and are assisted by auxiliaries. A single peripatetic nursing auxiliary, assists both surgical teams in the operating theatre. Finally a nursing auxiliary supervises patients during recovery and, then when they have fully recovered from the anesthesia, issues orders for their discharge and makes the appointments for their post-operative examinations.

The nursing auxiliaries are chosen to perform specific functions and are trained over a period of two weeks with self-instruction equipment and practical sessions using audiovisual aids.

The present paper seeks to establish the criteria on which estimates of personnel requirements should be based and the budget required to operate a theatre at surgical levels I and II.

Figure 2 shows the relationship between the various criteria. A knowledge either of the surgical requirements (real demand) or of the prevalence of cases requiring surgery is essential. Various studies are being made in this connection while an effort is being made to identify vulnerable groups or population segments at risk. Such information is necessary to plan the number of surgical operations over a given period of time. Data on personnel available: surgeon --special fields and operations they perform. Educational models are also required for the training of surgeons and auxiliary personnel as well as statistical data on the average productivity of surgeons.

A standardized measure of the complexity of the various operations is needed in order to be able to calculate the number of operations that can be conducted in a given surgical unit. In our study we have adopted as the standard unit the average time taken to reduce a unilateral inguinal hernia.

We measured the average time (standard inguinal hernia operation equivalent) in the case of 161 inguinal herniorrhaphies (level II); the

time was 62 minutes with a standard deviation of 17 minutes. In our model surgical unit with two operations simultaneously in progress in the same theatre, we can perform 2,200 hernia equivalents. We have shown in our model that a surgeon can perform 5 hernia equivalents per day. A detailed inventory should be taken of existing operating theatres, areas required, lighting, equipment, types and quantities of fungible materials and percentage of utilization. Should it be necessary to build further surgical units, a modular unit has been developed in Cali.

EVALUATION

The evaluation of this system is based on three parameters: quality, cost and patient satisfaction.

The quality of the surgery is evaluated at the pre-and post-operative stages, in the short and long term and during the operation.

Patient satisfaction is measured in terms both of the disappearance of previous signs and symptoms and of the absence of new signs and symptoms.

The calculation of total cost both to the patient (social cost) and to the institution are vital to the measurement of the cost-benefit ratio.

The number of surgical units needed is calculated by dividing the number of operations to be performed, converted to standard inguinal hernia operation equivalents, by the yearly output which the surgical unit can perform.

For example we find in a study of the productivity of surgeon in the Cauca Valley in 1974 (1) that they performed a total of 25,367 level I and II operations expressed in terms of standard inguinal hernia operation equivalents. A surgical unit can perform 2,200 hernia operation equivalents each year, so that a total of 11 such units would have been sufficient to undertake all the level I and II operations performed in the Cauca Valley. The manpower needed to operate 11 units of this kind can readily be calculated by multiplying the number of staff of each type by 11, i.e., 11 x 2 surgeon = 22 surgeons; 11 x 1 anesthetist = 11 anesthetists; 11 x 7 auxiliaries = 77 nursing auxiliaries.

The 1976 cost of a herniorrhaphy under our Simplified Surgical System was COL\$1,002, approximately USA\$30.00. The cost of performing the 25,367 hernia equivalents would have been COL\$25 million or some USA\$800,000.

Under the traditional system, at a cost of COL\$4,922 for each hernia equivalents, the total cost of the 25,367 operations is estimated to the COL\$124 million or US\$3.4 million.

The reduction in costs for levels I and II is effected through a better utilization of human and physical resources and the use of the home for post-operative care. The Simplified Surgery System increases productivity about five times in comparison with traditional models.

The model as so far developed provides for an average production of five hernia equivalents per day and a total of 1,100 hernia equivalents per year per surgeon. This average has been successfully achieved in our program at the Valle University Hospital. The model nevertheless allows for flexibility with respect to the desired production levels. Table 1 has been prepared with this in mind and illustrates the utilization factor per surgeon and per operating table for various numbers of operations each day. It can be readily used as a planning instrument with which to calculate the desired level of output per surgeon based on levels of utilization per operating theatre personnel and per operating table.

By way of an illustration the following is an analysis of surgical production in the Cauca Valley in 1974. During this period 41,681 operations were performed, equivalent to 38,404 standard inguinal hernia operations. Table 2 shows the annual results per number of surgeons based on their daily individual output. It clearly illustrates the low levels of production and productivity of surgeons in the region.

The table can readily be used as an instrument for planning, evaluation and control. For example (a) it can be used to determine, for a given level of production, the number of surgeons needed to achieve a pre-established output; (b) in the case of the total production of a fixed number of surgeons equivalent output levels can be determined and comparisons made between different individuals.

The implications of this investigation of the planning of surgical services appear clear, although action on the conclusions reached presupposes the prior agreement of patients and community, medical and paramedical personnel, health agencies responsible for surgical services, the university and authorities responsible for manpower training programs.

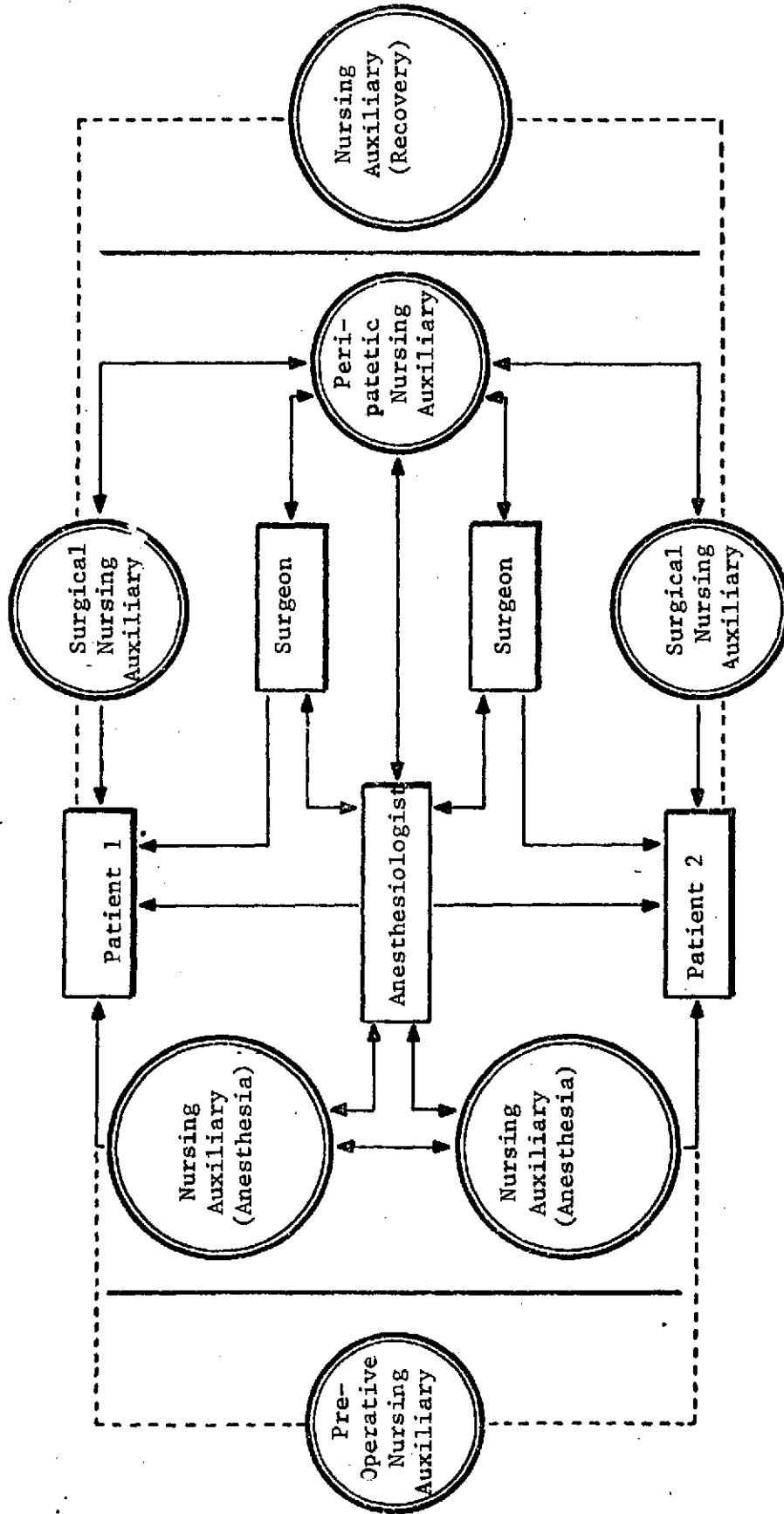
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OPERATING THEATRES

MODEL N1 - N2

Fig. 1



BASES FOR THE IMPLEMENTATION
OF THE PERSONNEL MODEL

FIG. 2

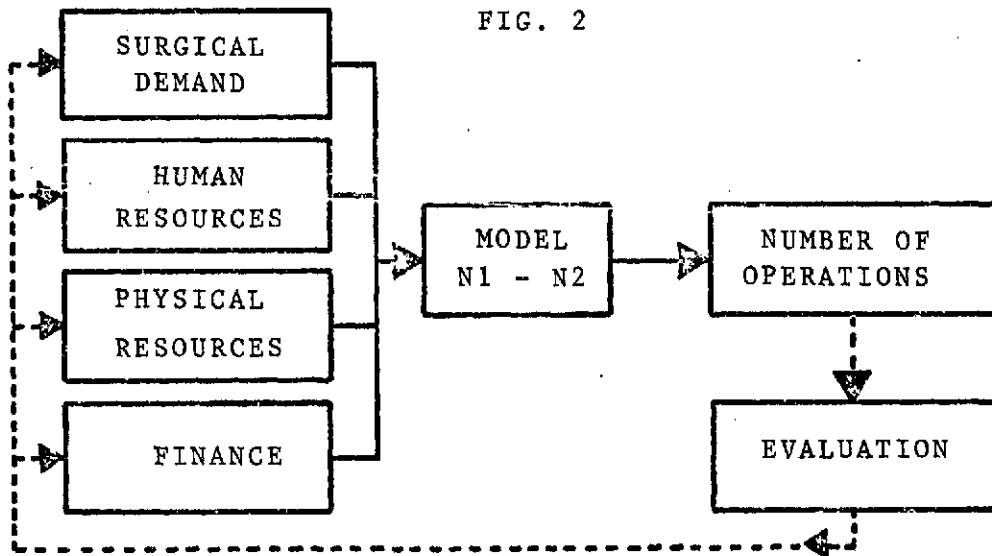


TABLE 1

HERNIA TIME 62 MINUTES

TIME BETWEEN OPERATIONS: 15 MINUTES

NUMBER OF OPERATIONS PER DAY	TIME			UTILIZATION 8 HOURS - 480 MINUTES	
	SURGERY	PREPARATION	TOTAL	SURGEON %	OPERATING TABLE %
5	310	60	370	64.6	77.08
4	248	45	293	51.7	61.0
3	186	30	216	38.8	45.0
2	124	15	139	25.8	29.0
1	62	-	62	12.9	12.9

TABLE 2

EQUIVALENT PRODUCTION AND PRODUCTIVITY OF PHYSICIANS

AND SURGEONS IN THE CAUCA VALLEY - 1974*

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OPERATIONS PER SURGEON		482 PHYSICIANS									
PER DAY	ANNUAL 220 DAYS	36 7.5%	45 9.3%	60 12.4%	89 18.5%	178 36.9%	355 73.7%	482 100.0%			
5	1,100	39.600	49.500	66.000	97.900	195.800	390.500	530.200			
4	880	31.680	39.600	52.800	78.320	156.640	312.400	424.160			
3	660	23.760	29.700	39.600	58.740	117.480	234.300	318.120			
2	440	15.840	19.800	26.400	39.160	78.320	156.200	212.080			
1	220	7.920	9.900	13.200	19.580	39.160	78.100	106.040			
.5	110	3.960	4.950	6.600	9.790	19.580	39.050	53.020			
.37	81	2.916	3.645	4.860	7.209	14.418	28.755	39.042			

* In 1974 physicians and surgeons in the Cauca Valley performed 41,681 operations, equivalent to 38,404 standard inguinal hernia operations.