The Decision Making Process in Cancer Patient Care

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In recent years, the "interdisciplinary" or "multidisciplinary" approach to health care has been widely and rightly acclaimed as an important facet of cancer management. But what "disciplines" are involved and what are the objectives of group effort? How do they achieve their goals? What logical steps does the physician working alone or in a group take to arrive at decisions? How are interdisciplinary decisions measured and what types of errors are most common? Who is responsible medicolegally for multidisciplinary decisions? What methods best insure cost-effectiveness? In order to answer these and similar questions, the medical profession must define relevant and achievable objectives (formulated with the patient's perception of need kept in the forefront); develop managerial methods for coordinating and evaluating interdisciplinary decisions; and form explicit medical logic systems.

There is generally adequate time to effectively plan for cancer patient care, planning which is itself a logical process requiring coordinated efforts. At present, this decision making process is too often given over to the logic of the computer. Most computer methods now in use, ranging from the simple procedures of multiple regression to more highly sophisticated statistical and mathematical procedures, were established years ago; they are taken from the textbook and written into computer programs with medical data to give a "diagnosis." In the rush to produce such computer diagnoses, the statisticians, mathematicians, engineers and programmers who usually make the computer programs have often overlooked the essential elements of the physician's medical logic as well as the patient's objectives. In addition, the medical logic employed by every practicing physician is seldom sufficiently detailed to form the basis for computer programming. Of course, a highly trained physician utilizes many logical rules. But the expert often does not learn these rules in explicit form; rather he gains his knowledge through observing, emulating and performing. Through repeated attempts and repeated failures, he finally attains a state of high skill. He is so intent on the subject matter during the training period that he is often unaware of the rules formulated in his mind, subconsciously. These rules may be simple or highly complex; it is seldom known, for often they are not even well enough understood to be evaluated. But rules there must be, or else the expert could not be so frequently correct. He may say that a certain phenomenon belongs to a certain class simply because it looks that way to him; there are certain rules but they are unknown to his consciousness. The problem is to transform these subconscious, "gut-feeling" rules into explicit form which can be analyzed.

The analysis of medical logic is facilitated by operations research (OR), a form of management logic developed during World War II, which requires

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that: (1) problems are clearly formulated; (2) a mathematical model is constructed to represent the operational system; (3) a solution is planned from this model; (4) the model and the solution are tested; (5) controls are established over the solution; (6) the solution is implemented.

In operations research the objectives are always of primary importance. In cancer care, all objectives must be relevant to the patient’s interest. The patient or potential patient is regarded as a functional unit who wishes to remain functional as long as possible at a tolerable cost to himself, his family and society. The objective is, then, to maximize the individual’s functional longevity with the least amount of inactivity (downtime) in the most cost-effective manner.

In order to attain this objective, a mathematical model is constructed to represent the operational system. The logic of an operations research model generally conforms to the logic of games in game theory. The objective of the health game or “clinical process” is to maximize the functional longevity of each individual (clinical medicine) or of the entire population (public health). Psychological, social, economic and physical variables can affect function and are integral parts in the operational model. For the purpose of this mathematical model, function is defined as the capacity of the individual to earn money at his usual rate. Common downtime factors in the clinical process that can work to the advantage or disadvantage of the individual are listed in Tables 1 and 2.

As the operations research approach requires, the variables in the mathematical model must include an accurate estimate of the age-specific characteristics which might affect longevity, the capacity of the treated individual to earn money at his usual rate, any loss of functional capacity, downtime factors (Tables 1 and 2) and the risk of diagnosis and treatment.

| Table 1: Downtime Factors Accruing to the Advantage of the Patient |
|---------------------------------------------------------------|
| A. Diagnostic effort leading to effective treatment of diseases |
| B. Beneficial treatment to alleviate symptoms, restore function or preserve longevity at a tolerable cost |
| C. Beneficial rehabilitation |
| D. Education and motivation of people to request health services |
| E. Education and motivation of people to participate effectively in their own health care and rehabilitation |
Time consumed by diagnosis, treatment, inefficiencies in the clinical process, morbidity, reduced function, premature death and unnecessary cost are irrevocable losses for the individual. From the standpoint of operations research, a cancer control system must be designed to minimize these downtime factors while maximizing the preservation of functional capacity for each individual cancer patient and, when possible, to eliminate cancer morbidity through avoidance and prevention.

Unfortunately, maximizing these downtime factors and thus increasing the patient’s usage of the system without necessarily providing him benefits now results in an economic reward for the providers of health care. Outside the operations research framework, interdisciplinary participation can compound downtime sources; within an operations research framework, coordinated disciplines can help increase the number of functional man-days.

A simple example of the use of operations research to correct this abuse and improve cancer patient response is a follow-up system to detect early, treatable recurrences. Another example is a study which seeks an optimum solution to the problem of colon polyps through the use of existing experience and technology (Figure). The complexity of the decision making process requires a logic diagram which presents the more common problems of colonic polyps and identifies the necessary diagnostic, pathologic, and therapeutic variables or actions that must be measured or taken. Other special techniques could be integrated into the diagram to become an established part of the rationale of practice. In a cancer control program, such a logic diagram has to be related to the cost and logistics of the program determining the number and distribution of persons at risk, the skilled manpower available, the distribution of manpower, the motivation of persons at risk, equipment distribution, and other

| Table 2. Downtime Factors Accruing to the Disadvantage of the Patient |
|---------------------------------------------------------------|
| **A.** Time lost in diagnostic effort not leading to beneficial treatment |
| **B.** Treatment not restoring or preserving function |
| **C.** Treatment not preserving maximum longevity |
| **D.** Cost in excess of ultimate value |
| **E.** Time consumed by the coordination of interdisciplinary consultation and unbeneficial treatment |
| **F.** Time wasted in travel and waiting |
| **G.** Time wasted by avoidable morbidity |
| **H.** Avoidable mortality from elements of the clinical process |
| **I.** Time lost in delaying rehabilitation |
complex, often competing factors.

The monetary value of preserved functional man-days to individuals of different ages can frequently be calculated by dividing the average age-specific complement of residual man-days into potentially lost earnings. A percentage of these lost earnings is the maximum an individual devoid of savings, earnings or insurance could afford to pay for a clinical process. How much can or must be paid is one of the current problems in the health game. The variance in the dollar value of one functional manday to individuals with different residual earning potential can make the same clinical process valuable to one individual and of no value to another. The monetary value of preserving life and function—an objective observation without moral, philosophical or economic judgment—is also affected by how the individual sets his economic priorities.

The goal of the health game is to minimize the time and cost wastage of clinical medicine, discard clinical actions

Figure. An operations research approach to the management of colon polyps.
that do not contribute to the preservation of functional man-days, and deliver planned treatment with a maximum degree of efficiency and economy at the lowest possible mortality rate. Comparing the proportion of functional man-days preserved per dollar spent is an unbiased way of choosing the most effective treatment method. Operations research can contribute to the more effective coordination of beneficial clinical effort and a reduction in the economic morbidity of the cancer patient.

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