

# Innovation in Health Services: Theoretical Framework and Review of Research

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*The arrangements comprising the health care delivery system are analyzed in terms of social organization, and selected characteristics of the system are discussed that are pertinent to the study of diffusion and adoption of various types of innovations. Research currently under way or completed is then reviewed in terms of its contribution to overall understanding of the phenomenon of innovation, on both the individual practitioner and the organizational levels. The analysis is then used to delineate problem areas needing further study. The article provides a useful context in which to consider substantive findings of future empirical research.*

Although health care delivery in the United States is facing increasingly serious difficulties, some consensus is emerging about the general direction of needed changes. The difficulties extend far beyond the need to eliminate financial barriers to basic health care: rapid technological change has outstripped the ability of the existing system to respond effectively; increasing specialization of physicians and the rapid development of other health-related professional and paraprofessional groups, as well as an increasing differentiation and specialization of health facilities, have made coordination difficult; health care tends to be fragmented and costly and produces far from optimal results.

Growing from these concerns about health care is an increasing interest in innovation within the health care system. Several major empirical studies have been completed or are currently in process to assess the problems associated with acquisition and use of new information and technology to increase the effectiveness of health services. One problem, however, is that any pattern resulting from this research, and particularly its applicability to the health system in operational terms, remains implicit and is embedded in a considerable volume of reports published in a wide range of sources.

Some assessment is currently available in recent reviews [1-3] and bibliographic reports [4-5], but none of these offers a comprehensive review, since each centers on one selected theme. Kaluzny and Sprague [1], for example, review mainly empirical research on the innovation of health services in health

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Based on a paper presented at the National Institutes of Health Conference on Medical Innovation, Cornell University, Sept. 24-27, 1972.

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care organizations as it relates to available organizational theory; McLaughlin and PENCHANSKY [3] focus primarily on utilization of scientific information by physicians; and Bauer and Wortzel [2] review only studies that relate to physicians' behavior toward sources of drug information.

It is hoped that, by placing studies on health services innovation in a broad theoretical framework, this article will provide a more complete assessment of research on innovation than has been available previously. First an overview is presented of selected elements within the health care system that relate to or have potential implications for questions of innovation. Then published research on various elements of the innovation process in the health care system is reviewed, and problem areas needing further study are discussed.

### **The Health Care System**

The United States has many different arrangements for the provision of various types of health services. These include, for example, private medical practices, group practices, hospitals, health departments, and the newly developed health maintenance organizations and neighborhood health centers. These various elements represent divisions of function with respect to the prevention, diagnosis, and treatment of illness. When viewed together, they exhibit the integration and coordination of a social system. Through this system of social relations, society deals with recurrent and functionally vital problems of illness. Thus the health care system may be defined as a social institution in society, similar to familial, political, and economic institutions [6].

As a social system, or more correctly as a subsystem of the larger society, three distinct forms of health arrangements have emerged for the control of illness. Each of these forms has a different structure and function and operates more or less independently of the others [7]. The first, which can be called the public health sector, includes not only the official public health authority but also voluntary associations such as the National Tuberculosis Association and the National Heart Association. These organizations focus their activities on the community rather than on the individual; in a sense, the community is their patient. A second identifying characteristic of the public health sector is that it has a high degree of administrative unity and its activities are subject to relatively tight administrative control.

The second sector consists of community-organized services provided through the general community and available to the community as a whole. This sector consists of community hospitals under voluntary auspices and other direct-service organizations. As distinguished from the public health sector, the individual is the primary focus of attention and the organizations are loosely inter-related, with no integrated system of communitywide administrative control. The structure of these organizations has been traditionally characterized by dual lines of authority, one line dealing with the organization for work and the other with the conduct of work [8].

The third sector consists of private practitioners, such as physicians and den-

tists, who provide professional health care on an individual basis. The individual is the exclusive object of service, and there is a complete and legally protected absence of administrative authority in the conduct of professional practice.

The role of innovation within such a system concerns essentially the question of how well the system (or more specifically, organizations and individual practitioners as elements within that system) is able to adapt and meet changing environmental demands. New health problems emerge and changes occur in expectations, in cultural norms and values, and in economic and political power; all these place demands on elements within the health care system, and failure to adapt to them lessens the efficiency and effectiveness of the entire health care system.

### **Key System Characteristics**

Pervading all three sectors of the health care system are certain generic characteristics especially pertinent to the study of innovation: the autonomy of the medical profession, of the various specialties, and of the individual practitioner; the ascendancy of formal organizations within the health system; and the tendency of advanced technology and associated values to influence the elements of the system.

#### **Autonomy in Medical Practice**

The organization of medical practice as a key element within the health system has received considerable attention [9,10]. Three aspects of that organization are particularly relevant to an understanding of innovation. First, the profession itself is autonomous. Here the central issue is not only autonomy legitimately granted for the technical performance of the practice of medicine, but also the ability of the profession to demand autonomy in questions involving nontechnical issues as they relate to the organization of the practice itself [10]. The extent to which this autonomy is manifest is particularly important for the success of any basic system change (innovation) in the delivery of services.

Second, the profession may be viewed as a loose amalgamation of various medical specialties with different objectives and approaches, more or less delicately held together under a common name at a particular point in time [11]. This conceptualization contrasts with the more traditional view of the medical profession as a static and relatively homogeneous community whose members share values, roles, and interests [12]. Although the two concepts are complementary, the former has a number of implications for the study of innovation within the health system, paramount among them the reminder that the profession is not simply a receptacle that receives or opposes innovation. The concept of an underlying dynamic involving shifting power struggles and various emerging disciplines within the profession suggests that innovations have utility beyond simply the provision of health care and may suggest why certain innovations are accepted more readily than others.

Third, at the level of the practitioner, the nature of the task and the type of

psychological orientation needed to perform it affect the practitioner's approach to innovation. This is best illustrated by Freidson's concept of "clinical mentality" [10]. The clinician, guided by the demand for action but dependent on a science as yet incomplete, develops an experiential approach to learning. Thus he can only act on the basis of what he himself experiences, and if his own activities seem to get results he resists change on the basis of statistical or abstract considerations. This behavior is documented by the study of Coleman et al. on drug adoption [13], which strongly suggests that the practitioner feels he must himself try out a new drug on a patient and not simply take someone else's word for its use.

### **Ascendancy of Formal Organizations**

The second key characteristic of the system for the study of innovation is the ascendancy of formal organizations (i.e., organizations characterized by an authority structure and definite predetermined goals) in the delivery of health services. The hospital as the dominant organization acts increasingly as the major repository of medical skills through which the available technology is presented to the population. Such formal organizations may be viewed as intermediate between the source of the innovation and the eventual utilization of such innovations by medical practitioners. This ascendancy raises the question of what is the proper dependent variable in the study of innovation and what is the appropriate unit of analysis in a medical setting.

Rogers and Shoemaker [4] provide insight into the process involved when they posit a two-phase process of innovation in formal organizations. The first phase involves the decision, by someone in authority, to implement an innovation within the organization; the second phase involves acceptance or rejection of the innovation by those within the organization who are affected. For example, a hospital administrator may decide to implement a home-care program in his hospital, but the success of the program will ultimately depend on acceptance by physicians on the hospital's medical staff, because only they can refer patients to the program.

Associated with the ascendancy of formal organizations such as hospitals in the delivery of health services has been the increased dominance of administration within such organizations. This dominance is based on the need for coordinating an increasingly complex array of nonroutine functions [14]. One implication of this development relative to innovation is that for all practical purposes administration represents the decision unit within such organizations. Although empirical data are not available to assess all the implications, several points are important to note. First, since most administrators are not medical experts, decisions within such organizations that relate to technical matters require a high degree of participation by professionals themselves. As suggested by Rogers and Shoemaker [4], participation is an important ingredient in facilitating the linkage between the decision to implement and the decision to adopt.

Second, while the administrator traditionally has deferred to the medical profession, he is under increasing pressure to pursue goals of greater cost effi-

ciency and community responsiveness. These are in potential conflict with the more technically oriented goals of the medical community and will probably affect the relative speed with which subsequent technological innovations are implemented within the organization.

### **Technological Demands on the System**

The development of an exceedingly sophisticated technology has been basic to the ascendancy of formal organizations. The differentiation of this technology vis-à-vis its goals and resources has implications for the ability of the system to adapt to changing environmental demands as well as its receptivity to various types of innovation.

As the technology becomes more sophisticated and based on an increasingly esoteric body of knowledge, the system becomes increasingly self-limiting and self-controlling, organized around a dynamic involving its own technological requirements and processes. This dynamic predisposes the system to accept or reject certain types of innovations quite independently of environmental demands.

A second consideration affecting the system's receptivity to particular technological innovations is the propensity for action on the part of both the provider and the consumer of health services [9]. In part, this simply reflects a cultural bias against a passive response and a strong need to "do something" in most situations of uncertainty. This predisposition to active intervention, coupled with the system's dynamic involving its own technological requirements, favors certain types of innovation. An example is the rapid adoption of organ transplants [15].

### **Health Care Innovations**

The framework for this review of empirical research is based on the four critical elements in the analysis of the diffusion of new ideas proposed by Rogers and Shoemaker [4]: (1) the innovation, (2) which is communicated through certain channels, (3) over time, (4) among selected units of the social (health) system. Conceptual issues and relationships are identified for each of these analytical elements. Within each, available research is assessed as it relates to physicians and organizations.

Studies of innovation related to the consumer's use and acceptance of new health services are beyond the scope of this paper. Much research on, for example, family planning services [16], utilization in prepaid group practice [17-19], Medicare and Medicaid [20], new forms of health manpower [21,22], preventive health services [23], and fluoridation [24] is therefore excluded.

### **The Innovation**

A primary focus of studies on innovation in the health system has been drug adoption and utilization by physicians. Early work in the area dealt primarily with the diffusion of drug information and physicians' attitudes toward different sources of information [25-27]. More recently, physician characteristics as they

relate to prescribing patterns [13,28] and attitudes toward drug use [29] have received attention.

Two other types of innovation are of interest in this review. Most recent and least developed is the assessment of various types of manpower innovation and their acceptance by physicians and other health professionals, including nurse practitioners [30], physician assistants [31], and various dental auxiliaries [32]. A second focus, also using the physician as the unit of analysis, is that of adoption of various systematic changes in health care delivery. Although the concepts have often not been labeled as innovation, the implementation of Title 18 [33–35], prepaid group practice [36], and the merger of medical facilities [37] may be considered large-scale innovations.

Finally, several types of innovation have been assessed using the organization or the community rather than the physician as the unit of analysis. Among empirical studies in this category are those that focus primarily on the innovation of programmatic services [38–52]. Others have emphasized innovation primarily concerned with administrative efficiency and effectiveness [53–57], biomedical technology [15,58–60], and medical education programs [61] in health care organizations. Still others have emphasized community innovation and have focused on neighborhood health center projects [62], mental health facilities [63], and fluoridation [64].

Little attention has been given to the innovation itself. Research has tended to focus on adopter characteristics and to regard all innovations as equivalent from the viewpoint of study and analysis. Available data clearly indicate that this focus is not only oversimplified but incorrect. Bauer [65], for example, in his study of drug adoption and company preference by physicians, finds that company preference has more influence in the decision to adopt where the drugs are characterized by higher risk.

The role of attributes of an innovation has also been documented in the study of health services. For example, Kaluzny and Veney [66] find that different attribute patterns are differentially associated with implementation of health services in hospitals and health departments. They find that services implemented in hospitals are primarily characterized by high payoff in terms of the quality of services already being provided by the organization, low rate of cost recovery, and low social approval. For health departments, services manifesting high divisibility, high association with the preventive orientation of the department, and relatively low payoff had a high level of implementation. The respective attribute patterns accounted for 58 percent of the variance in the implementation of health services in hospitals and 50 percent of the variance in health departments.

Another approach focusing on the innovation itself assesses the sequence in which innovations are adopted. When this kind of analysis was applied to organizations, the evidence seemed to indicate that the existence of a pattern depends on the type of organization rather than the type of innovation. In a study of health services in hospitals and health departments [67] and one of technological innovations in hospitals [58], it was found that the pattern of

innovation in hospitals reflects a unitary rather than a random sequence and thus constitutes a Guttman scale, whereas in health departments, adoption of health service innovations follows a different pattern and shows no scalability.

Several issues need discussion relative to the innovation itself. Central is the very definition of innovation and the need to differentiate its various meanings. There are at least two specific senses in which the term "innovation" has been used: (1) the first use ever, or an early use, of a new product or program within a set of adopters (physicians [13,28] organizations [43], communities [64]); and (2) the first use of a product or program by a given adoption unit with no reference to its newness (e.g., organizations [45,58,68]). Time is the basic discriminating variable between the two definitions. The first definition is highly dependent on time in absolute terms and attempts to differentiate adoption units that innovate early from those that innovate later, since early innovation vis-à-vis other adoption units tends to involve increased costs and high degrees of risk [69]. The second definition uses time in more relative terms and approximates the more generic concept of organizational change commonly found in the literature on organizational theory [70,71].

A second issue involves the measurement of innovation relative to selected explanatory variables. When innovation is defined in more absolute terms, one encounters logical difficulties associated with the use of cross-sectional data to explain data on innovation collected retrospectively [56]. In essence one is correlating yesterday's innovativeness with today's explanatory variables [71]. Short of doing longitudinal analysis to assess innovation as a process, several authors have attempted to minimize the difficulties associated with data collected at one point in time. Becker [43], for example, in a study of local health departments, limits the analysis to those variables characterizing the health officers which directly relate to the date when the innovation was first implemented. The difficulty with this approach is that the organization is reduced to the characteristics of the administrator—rather a gross oversimplification. A more common approach is to use the second definition of organizational innovation, with no reference to newness in absolute terms, and either to measure the number of programs implemented within a given period [45,68] or the number of man-years or dollar equivalents added during a given period [38] or to use a subjective measure of organizational innovation [56,72]. While these measures are not substitutes for longitudinal analysis, they do minimize the slippage between innovation measured retrospectively and cross-sectional explanatory data and at the same time permit a more holistic view of the organization.

A final issue involving the innovation itself is the generalizability of determinants beyond the specific items of study. Although there is some concern among researchers about the study of attributes of innovation within various types of innovation categories (e.g., drugs and health services), any practical attempt to generalize from one innovation to others is currently impossible because most studies are essentially case studies. In part, this is the result of a lack of agreement on what dimensions of the items are relevant as well as a propensity within the health field to emphasize unique characteristics rather than commonalities.

A first step toward a more comparative view of innovation within the health system is currently under way at U.C.L.A. [73]. The project is attempting to develop and establish a system to obtain, process, and report information on innovative changes in health care. Innovations of special interest include manpower, organization of medical practice, financing methods, technology, and institutional arrangements.

### Communication Channels

The term "communication channels" refers here to the means by which the message about an innovation gets from the source to the receiver [4]. Identification of these channels has been a primary focus of research, particularly relating to physicians' adoption of new drugs, although there have also been conceptual attempts, using the notion that a distinct sequence of stages is involved in the decision to adopt something new, to differentiate the channels of communication that enter into each stage. A review of the literature dealing with the diffusion of drug information [2] reveals that commercial sources are the predominant ones in making physicians aware of new drugs. Scientific sources become increasingly important in the decision to prescribe a new drug, however, as the condition to be treated becomes more severe or as choice of treatment becomes less clear-cut.

Recently an attempt has been made to determine whether physician preferences for particular sources of information have any relationship to more basic properties of medical practice. Data thus far presented [74] indicate that physicians preferring professional sources are significantly more likely to express conservative attitudes toward the question of when drugs should be used than physicians preferring commercial sources. They also are significantly less likely to feel that medical advice from sources other than a physician is acceptable.

Communication channels as they relate to other types of innovation, particularly in organizations, have received far less attention. Available data, however, strongly support the importance of communications in organizational innovation. Considering specific communication channels utilized by health officers, Becker [43] finds that administrators who tend to use scientific sources of information outside the organization are likely to implement innovations more quickly than those using more local sources of information. Kaplan [47], Mytinger [42], and Kaluzny et al. [68] report similar results.

### Innovation over Time

Perhaps the unique aspect of innovation is its explicit concern with the time dimension. Rogers and Shoemaker [4] designate three aspects that are helpful in considering substantive findings: the innovation decision process, the degree to which the adopter is early in accepting the innovation, and the rate of adoption (i.e., the relative speed with which an innovation is adopted).

*Innovation Decision Process.* The concept of various stages in innovation—e.g., knowledge, persuasion, decision, and confirmation [4]—has received im-



PLICIT recognition in studies of physician drug innovation and in the conceptual literature on organizational innovation [73] but has not been used in empirical studies of innovation in health care organizations. This deficiency is unfortunate, since the concept of stages can provide a link between research on innovation and available strategies for intervention. For example, knowledge of the stage an innovation has reached in a hospital, along with the behavioral or structural correlates associated with that stage, would permit rational deployment of a specific intervention strategy.

Equally important to the concept of stages, particularly as applied to organizational innovation, is the distinction between implementation within the organization and subsequent attitudinal and behavioral acceptance by relevant organizational personnel [4]. Most researchers in the health area have tended to assume that organizational implementation is tantamount to acceptance and utilization by the professionals and the physicians in particular within the organization, but available evidence from industrial and educational organizations suggests that acceptance is subject to additional constraints beyond those considered in implementation within the organization [75,76]. These findings in industrial organizations are consistent with the two-phase process of innovation posited by Rogers and Shoemaker [4].

*Early and Late Adoption.* The concept of adopter categories (e.g., pioneers, early adopters, middle adopters, and laggards) has been a central analytical device in assessing innovations for physicians [13,28], organizations [43], and communities [64]. As indicated earlier, use of this concept requires that the innovation under study not be relative and that the newness of the innovative product be measured by the time since its first use or discovery. Substantive findings that differentiate early from late adopters are discussed below in the section on the characteristics of innovators.

*Rate of Adoption.* The general idea in the diffusion literature is that rate of adoption approximates a normal distribution or, if plotted cumulatively, an S-shaped curve. Data on innovation in the health system indicate that this may be true under certain conditions (e.g., diffusion of health services [19]; technical innovation [15]), but not for all adoption units or all innovations. Coleman et al. [13] find that although adoption of "gammanym" (a fictitious drug name) among physicians integrated into the larger professional community follows an S-shaped curve, adoption by isolated physicians follows a more constant rate not consistent with the normal-distribution hypothesis. Similar findings are reported by Kaluzny et al. [52], in their study of hospital innovation of health care services, and by Mytinger [42] in a study of health department innovation of direct medical care services. This lack of consistency may reflect some of the unique characteristics of the U.S. health care system; it certainly underlines the need for caution in making generalizations about the health system based on innovation studies in other areas.

A further variation from the normal distribution has been documented by Crain [64] in the diffusion of fluoridation among cities. Instead of the expected

traditional diffusion process, in which fluoridation would spread out from various centers to neighboring communities, Crain's data present a U-shaped curve, with late adopters near the early adoption sites.

## Health Care Innovators

The discussion up to this point has focused on the substance and process of innovation. This section presents what is known of the characteristics of physicians and health service organizations as adopters of innovations.

For the physician as the innovation adopter, three sets of variables are presented: sociodemographic and personality variables of the physician, his sociometric status, and characteristics of his practice. Variables associated with organizational innovation are classified as characteristics of individuals within the organization, organizational structure, organizational control processes, and context of the organization.

It should be noted that the studies cited below differ in definitions, operational measures, and explanatory variables and few studies have been replicated. The relationships cited in the following sections must therefore be viewed as semisubstantiated and requiring further study rather than as firmly established generalizations or conclusions.

### Variables Associated with Physician Innovation

*Sociodemographic and Personal Characteristics.* A content analysis of previous research on innovation [4] indicates that innovations are more readily accepted by those who have more professional training, are involved in a specialized activity, have a rational and scientific orientation, and are less dogmatic. How do available data in the health field conform to these expectations?

On the basis of their study on physician adoption of "gammanym," Coleman et al. [13] support the proposition that level of professional training and degree of specialization are associated with acceptance of innovation. However, studies of the adoption of other types of innovation present somewhat contradictory findings, suggesting that these relationships are contingent on innovation type as well. For example, Linn [29] finds that training as measured by the number of postgraduate courses taken within the preceding three years and by specialty training has no relation to physician acceptance of the use of psychotherapeutic drugs.

Further evidence to support the importance of the type of innovation as it relates to adopter characteristics is provided by the study of physician attitudinal acceptance of Medicare. Colombotos [34], in a study of New York physicians, and Coe and Sigler [35], in a survey of Midwestern physicians, find that general practitioners and nonsurgical specialists are more likely to show favorable attitudes toward this innovation.

Several studies relate various notions of psychological orientation to the adoption of innovation. Coleman et al. [13] find that early adopters of "gammanym" are more likely to be interested in medicine as a science and are more

likely to orient their work to other professionals rather than to patients or to nonprofessional personnel. Using criteria for prescribing as a rough indication of psychological orientation, Linn [29] reports that physicians who respond more to patient experience than to professional and scientific references show greater acceptance of the legitimate use of psychotherapeutic drugs. Finally, Colombotos [34] reports that physicians with more liberal attitudes toward welfare and economic issues express a more favorable attitude toward Medicare.

Other sociodemographic and personality variables related to individual adoption are specific to the type of study. For example, in the study of "gammanym," physicians' previous use of the general class of drugs in which "gammanym" belongs, younger age, ability to name an institution to which they look for medical information, and practicing in a community close to their medical school tend to be factors associated with early adoption [13]. In the study of Medicare, ethnic background and urban residence contributed to attitudinal acceptance [33,35].

*Sociometric Status.* Past diffusion research has generally indicated that early adopters tend to be highly integrated and show a greater degree of participation in the social system. In one of the few partially replicated areas, data regarding the proposition are not consistent. Coleman et al. [13] report that the more deeply the physician is integrated into his local medical community the more likely he is to be an early user of "gammanym." Institutional ties among physicians, informal professional contacts, and friendship relations contribute substantially to early acceptance of the new drug. Winick [28], in a study similar to the one by Coleman et al., reports no relation between identically defined sociometric status and the use of another new drug, "chemneo" (also fictitious). In an attempt to reconcile these differences, Menzel and Katz [77] speculate that the results of the two studies might have been more consistent if Winick had based the date of adoption of the drug on prescription records, as Coleman and his associates did, rather than simply using subjective recall by the physician to establish the date.

Although these differences may be attributed to methodological discrepancies, other data suggest that the attributes of the innovation may be an important factor. In a specific test of the hypothesis that innovations having different attributes find acceptance among individuals in different positions within the social structure, Menzel [78] assesses various types of innovative behavior by physicians, including early adoption of "gammanym" and other drugs and acceptance of modern principles of patient management. He finds that the location of the individual physician within the social structure—i.e., the degree of integration with medical colleagues—differentially affects innovative behavior relative to the type of innovation. Thus, for example, modern patient management practices, characterized by low risk and low communicability relative to the attributes of "gammanym," are more readily accepted by physicians who are much less integrated in the local professional community and more strongly associated with medical professionals in other communities.

*Physician's Practice.* Two variables relating to the physician's medical prac-

tice have been considered in the study of physician innovation: type of practice (group or solo) and social status of the physician's patients. Coleman et al. [13], in their study of "gammanym," and Linn [29], in his study of psychotherapeutic drugs, note that physicians adopting the drugs tended to have higher-class patients as measured by annual income. The role of solo practice versus group practice differs by type of innovation. In the adoption of "gammanym," physicians in group practices adopted earlier [13], whereas in the case of psychotherapeutic drugs, acceptance was greater among physicians in solo practice.

### Variables Associated with Organizational Innovation

*Characteristics of Individuals in the Organization.* Although organizational innovation is more complicated than individual adoption, it is generally assumed that organizations with members manifesting the sociodemographic and personality characteristics associated with early individual adoption will be more innovative. Studies are divided into those which consider the characteristics of the administrator and those which consider the characteristics of organizational personnel.

Mytinger [42], in his study of health departments, focused on the administrator. He found that level of professional training, awareness of alternative programs as reflected by degree of cosmopolitanism, social status, and tenure of the agency director are positively associated with organizational innovation. Most of these relationships are substantiated in other settings [43,47,68], but data suggest that in hospitals [72], unlike health departments, innovation is more likely to occur early in an administrator's tenure.

Several studies report a positive association between motivation and initiative of the administrator and organizational innovation. Mohr [38] finds that a health officer's ideology and inclination toward activism are highly related to organizational innovation; the relationships remain when size of the community is controlled for. Similar data are reported for health and welfare agencies [47] and for community hospitals [72].

Other data, however, suggest that when organizational size and structure are controlled the importance of administrator characteristics tends to be minimal. Veney et al. [46] report that in a national sample of hospitals, contextual and organizational variables account for 31 and 41 percent, respectively, of the overall variation in organizational innovation. Characteristics of the administrator—including education, attitudes toward specific programs, measures of cosmopolitanism, and tenure within the organization—account for only 5 percent of the total overall variation.

Two studies have attempted to differentiate characteristics of the administrator by type of innovation. Becker [43] finds that early adopters of easily accepted programs (e.g., measles immunization) are opinion leaders, whereas pioneers in innovations with low adoption potential (e.g., diabetic screening) are marginal to their groups. Data presented indicate that pioneers in the latter class innovate to obtain prestige in the community, whereas pioneers in the former class do it to gain the admiration of their professional peers. Other char-

acteristics also differentiate these two types of administrators. For example, pioneers in programs with low potential for adoption are substantially older than their peers, graduated earlier from professional school, and have been in their present positions longer; they tend to go to fewer out-of-state meetings, have low cosmopolitanism scores, and are middle-of-the-road types politically. In contrast, the earliest adopters of innovations with high adoption potential are younger, grew up in more urban centers, graduated more recently, have spent an average length of time in their present positions, attend more out-of-state meetings, have higher cosmopolitanism scores, and are politically more liberal. In a study including both hospitals and health departments, Kaluzny et al. [68] find that, excluding organizational size, the critical variable that differentiates organizations implementing high-risk versus low-risk programs is the cosmopolitan orientation of the administrator.

In studies focusing on organizational members other than the administrator, similar sociodemographic and personality characteristics are associated with innovativeness of the organization. As with characteristics of the administrator, however, the results are not totally consistent. For example, level of professional training among organizational personnel is positively related to organizational innovation in some studies [38,68] and negatively related in others [72]. One possible explanation for this apparent contradiction is that the studies do not focus on the same stage of the innovation process. A high level of training for an administrator is important for implementation, but a high level of training for personnel other than the administrator may have negative consequences in subsequent stages of innovation involving acceptance of the innovation. Part of this may be traced to professional training, in that over time many professionals ritualize their approaches to problems and narrow the range of problems they consider relevant, thus making acceptance of change difficult [72]. The flow of new professionals into an organization, however, is a constant factor influencing both stages of the innovation process.

The personalities and orientations of organizational elites, such as trustees and key professional staff, are also important factors in innovation. The extent to which the actions of the board of directors are independent of local community values has a positive association with program innovation [47]. Moreover, the extent of reciprocal understanding between medical staff and elites such as trustees is positively related to innovation [72]. Hage and Aiken [45] report that attitudes toward change among various organizational participants have no association with organizational innovation, but more recent data indicate that when the values of organizational elites toward change are assessed on a longitudinal rather than a cross-sectional basis, they are important in predicting organizational innovation [79]. In fact, elite values are reported to be slightly stronger predictors of organizational innovation than structure or resource variables.

*Organizational Structure.* Several conceptual models are available [70,80-82] and provide a set of propositions around which to assess most of the empirical work relating innovativeness and organizational structure. These propositions generally state that organizations classified as innovative are characterized by

low procedure specificity, decentralized decision making, and high complexity. The empirical data relating organizational innovativeness and organizational structure generally support these propositions.

Procedural specificity, or formalization, is broadly defined as the degree to which individuals can exercise discretion in the performance of their work. Although studies have operationalized the concept differently, the data generally support the hypothesis that the lower the specificity the greater the amount of organizational innovation [40,45,58,59,68]. On the other hand, although low procedural specificity may facilitate implementation, clarity of rules within the organization is positively associated with the extent to which implemented changes are accepted by organizational personnel [72]. It appears that clarity of rules provides the integration and rationality necessary for innovations to be accepted with minimal confusion. These data again point to the importance of considering the stage of the innovation process.

Using the degree of participation in agencywide decisions as a measure of centralization, Hage and Aiken [45] report a positive association between decentralized decision making and organizational innovation. Similar results are reported by Gordon et al. [58] and by Palumbo [40]. Hage and Dewar [79], however, report that relationships between participation in decision making and innovation based on cross-sectional data are not substantiated in a longitudinal analysis. While this suggests that decentralization is not the cause of organizational innovation, it does not minimize the importance of considering participation in subsequent stages of the innovation process involving individual *acceptance*, since Hage and Dewar confined their analysis to program *implementation*.

Finally, it has been suggested that the more complex or diverse the organization the more likely it is to be innovative [81,82]. Hage and Dewar [79], in their longitudinal study of organizational innovation, note that complexity (measured by the number of specialized tasks within the organization) is the most important structural predictor of organizational innovation. More importantly, they report that the combination of complexity with the values of the organizational elite accounts for 60 percent of the variance in program innovation.

*Organizational Control Processes.* Four factors associated with internal organizational control processes have been considered in the study of organizational innovation: visibility of consequence, communication patterns, coordination, and leadership styles.

Visibility of consequences is defined as the degree to which the organization can and does evaluate the contribution of a program to goal attainment. It is expected that organizational innovation will be directly related to visibility of consequences. Two studies assessing different types of innovation but using similar indexes of visibility report substantiating data. Rosner [59], in a study of drug adoption by general hospitals, reports that hospitals with the ability and willingness to measure the consequences of organizational performance in terms of such measures as utilization review and medical audit are likely to report prompt and frequent use of new drugs. Similarly, Gordon et al. [58], in their assessment of technological innovation in hospitals, find that visibility of conse-

quences is positively associated with adoption of technological innovations and, more important, with organizational structures optimally suited to environmental adaptation—that is, with less procedural specification and more decentralized decision making.

Two studies point to the importance of communication patterns, or patterns of information flow within the organization, in implementation as well as ultimate acceptance by organizational personnel. In implementation, it has been reported that the volume in particular unscheduled communication pathways between selected individuals is important to innovation [83]. Evidently the intermediate supervisor acts as a broker for the circulation of ideas, resulting in a criss-cross pattern of communications stimulating cross-fertilization of ideas in facilitation of organizational innovation. A similar pattern is present for acceptance of innovation by organizational personnel. Here the communication patterns between administrators and medical staff, board of trustees, and department heads are particularly important to the extent and speed of acceptance [72].

The only study that explicitly assesses coordination in health care organizations [72] reports a positive relationship with innovation. Specifically, the more activities are coordinated and the lower the level of conflict and tension between departments, the greater the acceptance of innovation.

The final factor in organizational control is the leadership style in the organization. Mott [72] assesses the effect of a democratic leadership style in community hospitals and concludes that measures of democratic supervision are not related in the expected positive direction with acceptance of organizational innovation.

*Organizational Context.* Pugh et al. [84] define organizational context as including organizational size, available resources, and interorganizational dependency. It is generally assumed that, other things being equal, these variables will be positively associated with organizational innovation. Perhaps the most critical variable in most of the studies is organizational size, which is important simply because it reflects the sum of organizational resources; but there is some disagreement as to which aspects of organizational size are related to innovation. Mytinger [42] finds that various indexes of size—e.g., number of staff, size of budget, and sociodemographic characteristics of the jurisdiction—are related to innovativeness in various types of health care programs. Mohr, on the other hand, in a similar assessment of program innovation in health departments [38], reports that resources available as a consequence of size have no impact on the proportion of the total increase of resources devoted to instituting or expanding innovation.

Other studies suggest that the effects of size may be contingent on the type of organization, innovation, or analysis. Comparing hospitals and health departments by type of innovation, Kaluzny et al. [68] report that organizational size as measured by number of beds for hospitals and population of jurisdiction for health departments is a critical variable in innovation of high-risk services in hospitals (e.g., homemaker, indigenous case workers) and low-risk services in health departments (e.g., home nursing). Size is not a critical factor, however,

in the innovation of high-risk services in health departments (e.g., patient care conferences, indigenous workers) and low-risk services in hospitals (e.g., speech therapy). Moreover, panel data on organizations suggest that size has less impact longitudinally than cross-sectionally [79,83].

Data on interorganizational dependency consistently point to the importance of this variable in program innovation. For example, Milio [62] cites power relations among organizations seeking scarce resources as a primary factor in program innovation. Innovation succeeds because interorganizational decision making provides the necessary resources to enhance an organization's bargaining power. Using the number of joint programs as a measure of organizational interdependency, Aiken and Hage [85] find that organizations with more joint programs with other institutions tend to be more innovative.

### **Problems Needing Further Study**

1. Innovations themselves. Insufficient attention has been given to the substantive study of innovations and the attributes of innovations that affect the likelihood of adoption or interact with adopter characteristics. Attention needs to be given to the commonalities between innovations, so that generalizations can be made about types of innovation having similar characteristics. In essence, in order to compare innovations, a profile of innovation attributes needs to be developed. Under this approach, explanatory variables would be related to the respective profiles rather than to a specific innovation, thereby increasing the generalizability of findings.

2. Communication channels. Attention needs to be given to information channels other than drug information, preferably on a comparative basis, so that the various channels of communication may be specified in each stage of the decision-making process. Moreover, greater attention needs to be given to the pattern of communication within organizations and the effects of different patterns at various stages of the innovation process.

3. Factors associated with various decision stages. Research is required to assess factors associated with specific stages in the innovation process, both for individuals and for organizations. The critical question is how factors such as attributes of an innovation, characteristics of personnel, organizational structure, control processes, and context fit together within the innovation process. Are all variables equally important at all stages, or are some variables primary factors early in the innovation process and others in subsequent stages? Are the directions of the observed relationships consistent, or do they vary by stages of the innovation process or by attributes of the innovation itself? Answers to these questions are particularly relevant to the development of strategies of intervention, which are needed to provide a basis for more effective utilization of scientific information.

4. Conceptual framework. A broader conceptual framework is needed to bring together relevant variables that affect innovation by individuals and organizations. This framework is particularly important to account for the orga-



nizational setting of medical practice and the two-step adoption process (hospitals as the decision unit and physicians as the final adoption unit).

5. Longitudinal assessment. Variables affecting innovation by individuals and organizations need to be subjected to longitudinal assessment. This type of analysis will provide insight into causal relationships associated with innovation, so that intervention strategies can be employed on the basis of rational choice rather than advocacy.

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