

Nursing Science: The Theory-Practice Linkage

Maeona K. Jacobs, R.N., Ph.D.
Assistant Professor
College of Nursing
University of Utah
Salt Lake City, Utah

Sue E. Huether, R.N., M.A.
Assistant Professor and Director
Family Nurse Clinician Program
College of Nursing
University of Utah
Salt Lake City, Utah

THE STATUS OF SCIENCE IN NURSING

SERIOUS CONCERN about nursing science and its relationship to practice is relatively new in nursing. Although word symbols related to science are familiar to most practitioners, their use evokes many and varied ideas, actions and attitudes. Schlotfeldt states, "thoughtful nurses are now thoroughly convinced they need, but do not have a body of structured science to guide them in practice."^{1(p140)} Perhaps the most certain statement to be made is that there is no consensus among nurses that nursing science exists, is of value to practice or should be pursued. When agreement about the value of nursing science prevails, debate centers around the direction it should take and the method of its derivation. Clearly there are many schools of thought about nursing science which are worthy of pursuit

and which will contribute to the advancement of nursing.

The Nursing Tradition

Modern nursing has emerged from a tradition of apprenticeship with a strong image of servitude, humility and humanitarian aims. Good arguments can be made that the tradition still holds—that there has been little change in nursing. Our aims are still humanitarian, and if one reads Nightingale it is evident they have hardly altered. Certainly most of nursing still retains the humble image ascribed to us by professional peers and clients and perpetuated by ourselves. Moreover, most of the changes that have occurred can be argued to have resulted from societal forces such as the knowledge explosion, advances in technology, medical specialization, government policy and wars, rather than from challenges and diversity arising from within the profession.

These external forces will have less influence on nursing when it creates its own internal stimuli for change and redefinition based on knowledge and practice generated by nursing science. Unless and until nursing science emerges to define common goals and

guide the practice of nursing, our profession can expect to gain very little control over its practice. Without science, 100 years hence we are likely still to be struggling against our traditional image, being directed in our functioning by others and having precious little control over the care provided to clients.

Present attitudes of nurses and others about scientific endeavors in nursing have strong historical roots. Early "nurses" received no formal training and often came from the undesirable element in society. By historical accident, when the Nightingale school was imported to North America, it came under the control of service institutions and did not remain autonomous as Nightingale advocated. The school's superintendent headed the hospital as well as directed the school. Under the pressures of this dual role there was little time to attend to the education of recruits.

During the 19th century, hospital schools proliferated quickly, necessitated by urban growth, industrialization and disease. A period of open recruitment occurred when virtually all who came were admitted for training. The recruits were women, a source of readily available manpower, who conformed to and perpetuated the image of nursing. Early reformers undertook brilliant, farsighted efforts to upgrade the educational preparation of nurses; however, they were not successful in moving this training into the mainstream of higher education.

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followed the Flexner report of 1910, nurses were needed in even greater numbers to carry out medical tasks delegated to them as physicians became unavailable to staff wards. But the pattern for modern nursing was set. Young women were trained to fill service positions and were locked into a system which demanded obedience, humility and submissiveness. This pattern persisted despite the advent of national organizations in nursing, control by licensing, growth of college-based educational programs and the admonitions of several reports commissioned by governmental and private organizations.

Current Professional Features

Historical influences on professional nursing are evident in present professional characteristics. Nursing is a highly diverse profession. Its practitioners differ widely with regard to level of educational preparation, practice environment or location and area of specialization; they also differ greatly regarding their own role and objectives. Nursing appears, on the surface, to agree on common goals such as those expressed by the concepts of "caring," "health" and "intervention." However, when elements of the concepts are elicited, there proves to be much disagreement both about goals and the means of achieving them.

Multiple suborganizations exist within nursing to support and perpetuate interest group goals. Formally proposed changes which affect large groups of nurses initiate seemingly unending con-

troversy. An example is the 1965 position paper of the American Nurses' Association on educational preparation of nurses which is still under debate today.^{2(pp106-111)} The unclear goals of nursing are both a result and a cause of lack of clarity and disunity within the profession. Several factors contribute to this state of affairs. Since most nurses are women, they enter and practice nursing with strong and socially sanctioned loyalties to family as well as professional life. This leads to competing demands and conflicts between roles and to a lack of primary commitment to advancing the profession. This in turn works against the development of definite goals.

Without clear goals, nursing has experienced frequent shifts in approaches to care. The profession has seen the eras of team nursing and primary care, problem solving and nursing process, clinical specialization and humanistic nursing as well as technical and professional nurse classifications. Each of these may be viewed as nursing's attempt to come to grips with its purposes and the related educational and socialization processes. Thus today's nursing bears the burden of its heritage—diversity, fragmentation and amorphousness accompanied by confusion and anti-intellectualism.

The accounting appears bleak; however, nursing has always existed in some form and always will. Collectively, nurses are performing needed services and constitute a potentially powerful group of health care providers. Individual practitioners are making contributions which effect positive changes in in-

dividuals, families and communities. Moreover, attempts to improve the profession and its functioning are in evidence. Attempts to upgrade the profession's educational level by mandatory continuing education for licensure are underway. Unity is evidenced by groups attempting through legal and legislative processes to implement commonly held goals. There is debate and controversy in nursing, as well as participation in interdisciplinary and intradisciplinary communication and health care services. All this is occurring in the face of encroachment by numerous other groups providing health care services, and represents a collective commitment by nurses to advance the profession.

ADVANCING NURSING AS A SCIENCE

Now, more than ever, the nursing profession needs cohesiveness. The concept of cohesiveness implies unity and dedication to certain processes of thought and action which give rise to an evolving and changing, yet known and communicated, goal. Nursing science provides coherence and unity and interrupts processes that fragment and confuse. Assuming cohesiveness to be a desirable goal, fostering the evolution of nursing science will hasten its advent.

What exactly is nursing science? Nursing science is the process, and the result, of ordering and patterning the events and phenomena of concern to nursing. Thus discussions of nursing science can be unclear about what is under consideration—the body of knowledge or the process of deriving that knowl-

edge. This process-product ambiguity of science is discussed by Jacox.^{3(p4)} In the present context, science refers to the method of inquiry, the process, as well as to the outcomes of that inquiry, the product.

The Nature of Science

Science is morally neutral. When science is equated with technology, one of its many products, the tendency is often to rebel against it, devalue its contributions and espouse humanism as an alternative. Although science is morally neutral, the uses to which it is put are based on values. Thus applications of science can be humanistic or hedonistic, good or bad. The point to be made is that science does not blindly move itself; it is directed toward some purpose.

Science is an attempt to organize experience. To quote Frank,

science advances through the formulation of a body of postulates and assumptions, a conceptual framework. . . (which) provides a coherent, internally unified way of thinking about the events and processes in each discipline for which it is relevant. This approach fosters the conception of science as a systematic and never ending endeavor. . . .^{4(p45)}

Frank's conceptualization suggests that science is a *product* that advances, as well as the *process* by which it evolves. The two aspects are mutually dependent: science is a product created by a process and the process is directly dependent on the product created. Unsatisfactory notions of science are those which assume the existence of an elusive "truth" or which do not help to identify the high

order relationships, or theories, that impart coherence.^{4(p45)}

The Structure and Functions of Science

All sciences function within an area of concern, that is, they deal with delimited events and concepts using specialized techniques. There is nevertheless much blurring of borders and overlap among sciences, especially ones that are interrelated. As scientific knowledge within a discipline advances, branches of the discipline develop and boundaries are extended and redefined. When sufficient differentiation occurs, a new discipline emerges with its own scientific processes. Thus differentiation within anthropology gave rise to the physical and social branches, each concerned with concepts of human beings through time but working with different subconceptualizations of humans consistent with its special interests.

Nursing has not yet achieved the status of a science. The practice of nursing is still directed by medical orders and institutional policy rather than being grounded in the findings of nursing research. However, the science of nursing is indeed evolving as can be seen in the increasing number of research publications, the integration of research content in nursing undergraduate and graduate curricula, the growth of doctoral programs in nursing, the increased federal funds for nursing research, and the development of centers for nursing research.

The major aim of science is to evolve theory. Theory can be variously conceptualized and defined. Herein it means a

coherent set of verified relations useful for explanation and prediction, and consequently for control. Classification of facts, description of events and development of instrumentation do not constitute theory but are often required for the theory-building process. Theory, like science, is not static. Theories change as knowledge and concepts evolve. In the empirical sciences, theory depends on the existence of reality-based events and processes. Without nursing practice, nursing theory has no reality to theorize about or impose order on.

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ing, there must be an intimate and sustaining theory-practice relationship. Theory constructed without a serious consideration of practice will bear a tenuous relationship to practice. Conversely, practice without theory will be carried out intuitively.

Theory Construction in Science

What is the nature of such theory-practice interrelationships, and how do they bear on nursing science? Answers

to such questions require an understanding of how theory derives, that is, how it is constructed. Professional literature in other disciplines offers several approaches to the techniques of theory construction,^{5,6,7(pp163-171)} In nursing, Dickoff and James are well known for their Theory of Theories and their advocacy of situation-producing theory.^{8(pp197-203)} Strauss and Glaser espouse Grounded Theory, which derives from the systematic collection and analysis of data.⁹ Most nurses writing about theory have dealt with theory-related topics and examples of conceptual approaches to nursing rather than with techniques of theory construction. It is such techniques, however, that determine the theory-practice link.

A scientific system for evolving theory involves an interdependent process of linking concepts in theoretical formulations, such as models and conceptual frameworks, and empirically verifying the linkages in an ongoing and evolving manner—a very complex task. According to Piotrowski, there are four essential functions of all scientific theory systems: (1) concept definition, (2) concept representation, (3) formulation of theories and propositions and (4) propositional validation.^{10(pp2-18)} In nursing, the manner in which each of these functions is accomplished determines the theory-practice linkage, and hence the state of nursing science.

CHOOSING AND DEFINING CONCEPTS

Concepts, often called the building blocks of theory, are the most critical elements to be considered when theo-

retical formulations are undertaken, for they determine the direction of inquiry. Concepts are ideas deriving from perceptual experiences of properties, objects or events. The idea or the concept is different from the empirical referents that represent it. One can have an idea or concept of something without having directly experienced it. Two people do not experience the same event in exactly the same manner; therefore it is assumed that certain characteristics of experientially derived concepts are unique. Conversely, since perceptual experiences do have similar elements, certain attributes of concepts are assumed to be similar. The uniqueness of perceptual experience requires that concepts utilized in theories be carefully explicated.

Concepts change and evolve as empirical events are made known. The formulation and modification of certain concepts have occurred via technological advances which have made it possible to secure previously unavailable sense data. The concept of the atom has thus changed considerably since first proposed. However, concepts such as consciousness have changed less dramatically since precise and concrete empirical references still do not exist.

If theory and practice are to be directly related, concepts must evolve from or pertain to practice. This is the key to viable theory-practice linkages in nursing, for concepts comprise the theory. Not only must concepts evolve from, and relate to, practice—they must be operationalized in a particular manner.

For example, to formulate a theory useful in nursing practice, the concept of caring would be a likely choice for incorporation into theory. Caring, rather than curing, would be chosen—for curing is often considered to fall within the domain of medicine. The concept chosen, in this case caring, is determined by its fit within an acceptable definition of nursing practice. On the surface, caring seems a reasonable and prudent choice. However, its appropriateness is less clear when the concept is subjected to close scrutiny. Is curing a part of caring, and do physicians therefore also exhibit caring behaviors? Is cure a part of nursing, and if so what is cured? The nature of caring emerges as very complex, and whether or not caring or curing is acceptable behavior for nurses depends on how each concept is defined. Thus the theoretician in making theoretical linkages must choose a concept acceptable to most of nursing and carefully define it in an acceptable manner. This increases the possibility that theories built will be useful, and facilitates the communication within nursing which is needed to implement the results of scientific processes.

EMPIRICAL REFERENTS

When concepts acceptable to nursing are defined in reference to practice, it is likely they will be operationalized in a manner ultimately useful to the profession. Unless concepts can be empirically referenced in practice, theories built on them cannot be tested or applied in the practice setting. The requirement that concepts be opera-

tionalized in practice tends to limit the breadth of concepts linked in propositional or relational statements. This in turn imposes limitations on the scope of theories derived.

The process of theory building, congruent with the conceptual definition, requires that, once defined, concepts be linked in relational statements; these conceptual links, empirically represented, must then be verified in reality. The nature of concept definition directs this process. For example, assume a theoretical formulation incorporating the global concepts of caring and stress were to be developed. These concepts are of concern to nurses and can be defined in many ways. Suppose the concept of stress were defined to include subcellular changes inaccessible to nurses outside the experimental laboratory. When stress is so defined and operationalized, the theory derived will be of little use to the practicing nurse. If theory which includes the concept of stress is to be useful, then stress must be empirically referenced in terms of behavioral manifestations or clinically available physiological indicators. This does not imply that stress can never be defined as subcellular change. However, it does mean that if finally conceived in these terms, such theory will not be directly useful in practice. The foregoing does not preclude the nurse from developing new means of quantifying important concepts, but the practice area will limit the possible operationalizations of concepts in practice theories.

Many nursing theorists incorporate broad and unfamiliar concepts into their

theoretical formulations. These formulations, though useful, do not provide an immediate theory-practice linkage, and often they create an image of separatism between theoretician and practitioner. Broad concepts embody numerous interrelated, diverse and unclear empirical manifestations. They are thus not useful for prediction precise enough to permit control. These "molar" theories, so called because of their broad scope, appear to explain; but for different users, they explain differently since so much can be accommodated under their umbrella. Broad concepts within theories are not inherently bad; however, until they are carefully analyzed, categorized into subconcepts and their empirically verifiable relationships tested, their utility in guiding practice is limited.

The linking of concepts with their empirical manifestations is part of the scientific process. This operation requires a close relationship between theorist and practitioner. Once concepts are defined and explicated, potential referents for them are evident. Scrutiny of the practice setting for actual referents provides needed input to ensure that possible referents are not excluded and reasonable referents are chosen. The theorist, for example, may wish to reference the concept of stress using a paper and pencil test, along with arterial blood pressure measurements. The practitioner can suggest other references to represent the concept of stress, such as skin temperature or cardiac arrhythmia. The practitioner is also in a position to offer information about the feasibility of testing the

theory, and about potential applications for it if it is verified.

VALIDATION

Once formulated, conceptual linkages in the form of empirically referenced, theoretical propositions are validated. Validation in the practice arena is necessary for a viable theory-practice linkage. Practitioners, as well as theorists, are indispensable to the validation process.

To develop usable practice theory, the concepts chosen and the related formulations must be in what may be called the mid-range, that is, their scope must be sufficiently restricted to allow for clear definition, empirical operationalization and testing. These processes are indispensable to validation, and validation is essential for a theory to be confidently used in practice. Thus molar theory must be made mid-range or perhaps even molecular—that is, even more restricted—before it can be validated and implemented in practice without hazard. On the other hand, molecular theories focusing on concrete and narrowly operationalized concepts often do not take into account enough events to be useful in predicting the complex behavior encountered in nursing. Conceptual relationships in molecular theories may thus have to be combined to develop predictive capability.

Mid-range theories might be perfected out of the pain studies completed by Jacox and her associates.¹¹ In these studies the concept of pain was central and a variety of treatment ap-

proaches were used in an attempt to alleviate it. For illustrative purposes, pain could be considered a subconcept of stress, while treatment measures employed could be linked with the concept of caring. Mid-range theories formulated from these studies might explain how pain could be relieved in like groups of clients by utilization of differing alleviative methods, method choice being determined in part by factors known to affect the pain sensation and pain-alleviation relationship.

It should be evident that theory can be variously derived. At any point in the theory-building process, the theoretician is concerned with concepts and their relationships. Concepts can be conceived and defined apart from or within the practice environment. Conceptual relationships may also be formulated either by purely cognitive processes or as the result of observation in the clinical laboratory. However, with an empirical verification requirement for theories, concepts must be defined and referenced in a particular manner: neither too narrowly nor too broadly. Empirical referents must be clinically available and feasible. If postulated conceptual relationships are found not to hold, practitioners may offer valuable suggestions for concept redefinition and operationalization, or for control of intervening factors.

Thus the process of nursing science requires that concepts be defined, operationalized, linked into relationships and verified. From verified conceptual linkages accrue the product, which is theory; and the theory explains and

predicts nursing phenomena. Predictive power must be used within nursing to control its practice, so the process, among other things, can continue to exist. If the process of science in nursing is to result in a goal-producing product, the current practice of nursing must be linked with theoretical endeavors via the system of science.

In nursing, practice has not been illuminated and ordered by theory; that is, the process of nursing science has not existed in a significant degree, and the product of nursing science has been sparse. There are many reasons for the underdevelopment of nursing science, and they can be classified in many ways, i.e., historical, educational, political, economic and attitudinal. Also, to understand this underdevelopment, the self-fulfilling prophecy associated with the evolution and growth of scientific systems must be comprehended. When a discipline has poorly developed science—both process and product—it becomes difficult to initiate and advance science. Conversely, once initiated and moving, the process of science generates momentum which tends to perpetuate the development and evolution of the product.

Attitudes and abilities of nurses are of paramount importance in promoting the evolution of nursing science.

EDUCATION FOR NURSING SCIENCE

Differing educational preparation within nursing breeds a multiplicity of aims and means which does not foster

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science. Nurses who have had limited exposure to theory do not appreciate the importance of developing and using it. Educating nurses to a high uniform level is necessary to the development of nursing science that is usable and used. Uniformly high educational levels will provide a common knowledge and process base. Legislation aimed at requiring the baccalaureate degree for entry-level practice is significant. Consideration should be given to requiring progressively higher degrees for entry-level practice. Today a great need for doctorally prepared persons exists, especially to fill research and clinical practice roles. The evolution of scientific systems requires the design and perfection of multiple tools, methodologies and instruments to validate propositional statements. Since nursing's concepts are extensive, their incorporation into theory requires practitioners with a variety of high-level educational preparation.

The shortage of nurses with doctoral preparation has greatly influenced scientific systems in nursing. The few available individuals uniquely prepared to develop nursing science have tended to work in administrative and teaching positions and have not made the contribution they might have in theory development and research.

Type of doctoral preparation is significant in directing the evolution of scientific systems. Nursing science needs persons with doctoral education in nursing; there is also a need for doctorally prepared persons in all nursing-related disciplines. However, the critical requirement for persons educated at this level is not the area of preparation but the commitment to develop science in nursing.

Attention to educational approaches that foster high-level cognitive skills is significant to assuring the future development and use of nursing science. Nursing students must be taught how to think and analyze, and, more importantly, how to synthesize. Coursework that is both related to research, theory and philosophy and offers sound preparation in the content area of nursing is important; it will generate attitudes of inquiry and openness among nurses about values, means and ends, and thereby facilitate the development of science.

Certain attitudes within the nursing profession have formed barriers to the growth of nursing as a science. An important problem has been lack of receptiveness to new and different ideas. Ideas are not deadly, though many people act as if they were. The inability to listen, debate and examine unfamiliar, and perhaps unsympathetic, thought reflects the profession's insecurity. The practitioner must attempt to appreciate the efforts of the theorist, and the theorist must attempt to comprehend the problems of the practitioner—for nursing cannot exist without either.

Further, no person can be expected to be the total embodiment of nursing—practitioner and scholar; only collectively can nursing be both.

Why should nursing be concerned with science? The evolution of nursing science will assure the survival of nursing. As theories evolve which allow for control of practice, the power to control that practice increases. Nurses must become the group of persons who know

most about caring behaviors in health and illness. If nurses develop theoretical formulations which predict in practice, they will be able to care and they will be allowed to care. The power to care will come only from linking practice with theory, and this link will be made only through implementation of nursing science—the process—to create nursing science—the product.

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