特　集：人工臓器の最近の進歩とケアリング

# Theory-Based Nursing Practice in the World of Anthropomorphic Intelligent Machines

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SUMMARY

How will human nurses practice nursing with advancing technologies particularly involving anthropomorphic intelligent machines? Nursing as an expression of caring in nursing is oftentimes appreciated as acts of endearment or TLC（Tender loving care）by nurses towards persons who are in situations craving for human-to-human contact. Such situations often define nursing as demanding for nurses' emotion. However, if feelings or emotions is the criterion that makes the 'caring' live meaningfully in nursing situations, in the future, how will caring be expressed when nursing engagements in practice will be primarily with anthropomorphic intelligent machines? Contemporary understandings of 'humanness' may be obsolete and human-to-human contact as we know it today may consequently remain imaginary. The realities of nursing care perpetuate increasing dependence on technology, and interactions between persons and intelligent machines will need to be redefined. The theory of Technological Competency as Caring in Nursing provides dynamic nursing process events in which technological knowing, mutual designing and participative engaging encompass theory-based nursing thereby furthering quality nursing care outcomes as the foundational rationale for engagements in theory-based nursing practice with anthropomorphic intelligent machines.

Key words : Theory-based nursing practice, anthropomorphic intelligent machines, Theory of Technological Competency as Caring in Nursing（TCCN）, Futurist nursing care, Advancing technologies.

## Introduction

Nursing has earned a remarkable place in the delivery of human health care. Through a variety of foundational perspectives supporting this practice, processes of nursing have been advancing nursing as a discipline of knowledge and a profession.

One of the popularized practice views is patient-centered nursing. It is the ideal focus of practice perhaps since the realization of Florence Nightingale's modern

nursing practice. Many versions of this type of nursing have been developed based on various theoretical, philosophical, economic, and political viewpoints which exist to this day. From a theoretical perspective, an example of patient-centered nursing is caring-healing nursing based on Jean Watson's[1] *Transpersonal Caring theory*. This perspective addresses the person from a holistic understanding, so that caring-healing practices which are grounded in the ten caritas factors are focused on human care attributions. An example of patient-centered nursing from a philosophical perspective is by Martha Rogers'[2] *Science of Unitary Human Beings*. Nursing practice is presented as 'knowing participation in change'[3], a view of persons as always whole, unpredictable, irreducible, and therefore do not need to be fixed or to be made wholes again. Nursing practice, therefore, while focused on the patient, is knowing that persons participate in their care and that change is a constant and consistent in their being. As such, predicting or prescribing nursing practice actions does not serve persons well, instead, nursing is celebrating, affirming, and supporting persons in their change.

An example of patient-centered nursing practice derived from an economic perspective is Marilyn Ray's *Bureaucratic Caring in Nursing*[4]; the dynamic rhythmic relating between and among persons as caring transpiring and celebrating in their human relationships, while from a political viewpoint, patient-centered nursing is addressed as 'gendered.' These are differentiated practices by women nurses and men nurses focused on how women nurses and men nurses practice nursing, are often demarcated by their gender-men nurses' presence in Labor and Delivery situations are often not allowed, and their brute expressions are often wanted in Emergency Departments, and Psychiatric and Mental Health Units. Women in their loving kindness are often preferred in settings where children predominate, and mothers' care is required. With these theoretical and philosophical viewpoints, frequently, debates ensue within nursing and in various health care systems because of the attention and expectation that nursing has attained as a valuable and legitimate professional health care practice in many health care situations and settings.

Nevertheless, while these theoretical and philosophical viewpoints ground patient-centered nursing, contemporary health care settings frequently are inundated with issues and problems concerning technological advances and the influence these have on nursing care practice. How does theory-based nursing practice transpire in the world of technologies, particularly with automatons and revolutionary technological gadgets and instruments?

The aim of this article is to describe theory-based nursing practice and its relevance and influence in the world of anthropomorphic machines in health care settings. It addresses and values the theory of Technological Competency as Caring in Nursing (TCCN) as a legitimate theoretical base supporting contemporary and futurist nursing care with advancing technologies as essential accoutrements.

## The Popular Nursing Process

The popular way of practicing nursing is simply following a routine process or recipe often called the nursing process. As such, this process is a guide that predicts the effects of nursing actions or interventions often leading towards healing. Understood as an apprenticeship in which decision-making is made by others such as head nurses or team leaders, nursing practice depends on the nursing care planning activities with outcomes often prepared as the evidence of the traditional nursing process. The practice of nursing is dictated simply by the prescribed procedure towards accomplishing a particular task. With these situations, some questions are raised, focused on the nature of professional practice of nursing.

> *Does the nursing process allow the nurse to really know the patient?
> *Should the nurse know patients as participants in their care rather than the object of his or her care?

Following the nursing process recipe, these questions stimulate discussions about the real nursing practice of professional nursing.

## Theory-based Nursing Practice

Theory-based nursing practice provides opportunities for nurses and patients to engage in activities to facilitate health and wellness. These activities enrich the under-

standing of human health with nursing as a critical factor. Within the contemporary practice of nursing, frequently differentiated is its emphasis on independent or autonomous nursing practice processes, or as dependent procedure-based nursing practice with actions dictated as planned and specific interventions. With advances in nursing science, it is critical to health care that the application of knowledgeable practice is focused on meeting requisite technological demands which is commonplace in health care settings.

Future practices of nursing however, involve theoretically-based engagements dictated by intelligent know-how, these without the prescriptive or predictive practice procedures that have identified traditional nursing. Such imagining of futuristic nursing, often deter innovative practices because of the limitations imposed by popular dependent procedure-based, and prescriptive nursing care practice activities.

Benner's[5] five levels of nursing experience or clinical nursing competence emphasize the demands, capabilities, and knowledge-based practices describing professional nursing practice with competency in nursing actions. The highest form of practice is by expert nurses-those who relinquish their practice decisions to be guided by their knowledge of person, environment, health, and nursing.

Many technologies greatly impact nursing and human caring. The following dimensions[6-9] have been identified to categorize technologies which are influential to nursing and human health care :

*Technology as completer of Human Beings* to re-formulate the ideal human being, such as replacement parts, either mechanical (prostheses) or organic (transplanted organs) ;

*Technology as machine technologies, e.g.* computers and gadgets, that enhance nursing activities to provide quality patient care, such as da Vinci© in the operating theatres[10].

*Technologies that mimic human beings* and human activities to meet the demands of nursing care practices, e.g. cyborgs (cybernetic organisms) or anthropomorphic machines and robots such as 'nursebots' or the 'robo nurse'[11].

Nevertheless, one of the most influential topics on technologies in nursing today, is on technologies that mimic human beings. Biomimicry has become an essential and

critical consideration in contemporary times. Consider Humanoid Nurse Robots (HNRs) that are fitted with Artificial Super Intelligence (ASI) that can compute faster than human beings can do today. Watson©[12], a computer designed by IBM is able to compete in speed-based "Q and A" activities, beating human competitors in Jeopardy-a knowledge-based game show.

While other popular technologies relate to the traditional nursing process-the procedure based nursing practice dictated by planning specific interventions are expected to reap minimum quality outcomes of nursing care. In the future, nursing practices will continue to possess technological competencies in which will be able to participate in higher-level quality nursing practices considering interdisciplinary team approaches as an "other" team member.

How can high-quality nursing care practice be achieved with variations in guides for practice (processes of nursing) and technologies which may facilitate human care? The following formula using concepts thus far described are envisioned to foster nursing outcomes of high-quality nursing care. These engagements are deliberate prescriptions of nursing care planning : Procedure-based nursing practice dictated by the traditional process of assessment, planning, intervention and evaluation (APIE).

In addition, autonomous nursing practice by expert nurses and mutual engagements between HNRs grounded in the Transactive Relationship Theory of Nursing (TRETON)[13, 14] and theory-based nursing care practice guided by the theory of TCCN[15], altogether may result in high-quality nursing care with intelligent machines as partners. These descriptions serve a certain purpose and that is to highlight the value of various types of nursing engagements within the purview of recognizing quality outcomes of nursing care through theory-based practice.

## The Theory of Technological Competency as Caring in Nursing

In the contemporary world of human caring, the dominance of technology continues to support advancing technological marvels, providing ways in which human caring processes coexist in the high-tech world of artificial super-intelligent machines (anthropomorphic mac-

hines). The theory of *TCCN* offers fundamental ways through which the transformation of human caring exalts the values of persons regardless of differing perceptions of human wholeness. Caring in nursing assumes a critical place in the foundational development of the coexistence between technology and caring in nursing[16]. The science of Caring supports and celebrates the understanding of co-created moments[17, 18] and in doing so celebrates the uniqueness of persons as participants in their care, rather than simply objects of care.

The following five assumptions describe the elements that structure the theory of *TCCN*[19].

*Persons are caring by virtue of their humanness*[20].

> In nursing, caring is understood as the substantive focus of the discipline. It is not simply the act or emotion one may portray toward another person but also the substance of the domain that directs the integral nature of nursing as a discipline of knowledge. In the assumption, "persons are caring" is studied as fundamental to the practice of nursing.

*The ideal of wholeness is a perspective of unity*[21].

> Persons are known as wholes in ways shaped by philosophical truths and realities. This allows for the recognition of human beings as complete in their being without reference to composition of parts. As such the nurse focuses on nursing as a shared lived experience between the nurse and the person being nursed[20] rather than focusing on fixing the person or completing the person's lack or missing "parts."

*Knowing persons is a multidimensional process*[19].

> The nurse and nursed engage in appreciating, celebrating, supporting, and affirming each other, while allowing for mutual recognition as dynamic participants in human caring.

*Technologies of health and nursing are elements for caring*[19]

> through which nurses in practice are able to know human beings more fully as persons who are active contributors in their care, rather than simply as objects of care.

*Nursing as a discipline and a professional practice*[20] provides the essential opportunity for engagement in the scholarship of practice grounded in caring within the universal technological domain.

These assumptions are the foundations from which the theory is built. The structure of the theory is dependent upon the realizations of the assumptions to illuminate the theoretical dynamic nursing process events of knowing persons as caring.

## The Dynamic Nursing Process Events

The Dynamic Nursing Process events occur in nursing encounters interfaced with appreciations for understanding, affirming, celebrating, and supporting persons as caring individuals in an ever-changing world. The three intertwined processes that are expected to occur simultaneously are :

*Technological knowing* is using technologies to know persons in a shared relationship expressed as appreciating persons' humanness, participating in dynamic caring nursing relationships, and extending knowing persons as participants in their care, instead of being simply objects of care.

*Mutual designing* is a process in which both the nurse and the one nursed (patient) together, create a plan of care from which an organized and conjointly rewarding nursing practice fosters, affirms, supports, and celebrates the patient's desire to live and grow in the meaningfulness of one's own life[20].

*Participative engaging* is the simultaneous practice of relating with the other. Its critical feature is evident in the continuous and recursive knowing of persons as caring.

## Illustrating "Knowing Persons as Caring" Process of Nursing

Theory-based practice engages the nurse and person being nursed in a unity of activities in which nursing practice is focused on relating patient-centered care. The use of technologies in a world of anthropomorphic machines considers the futurist perspective in which technological advances attain a critical position in the delivery of quality human care. These technologies can be low-level technologies, for example medication delivery robots with sensors, or the high-level futurist Humanoid Nurse Robots (HNRs), which are commonly
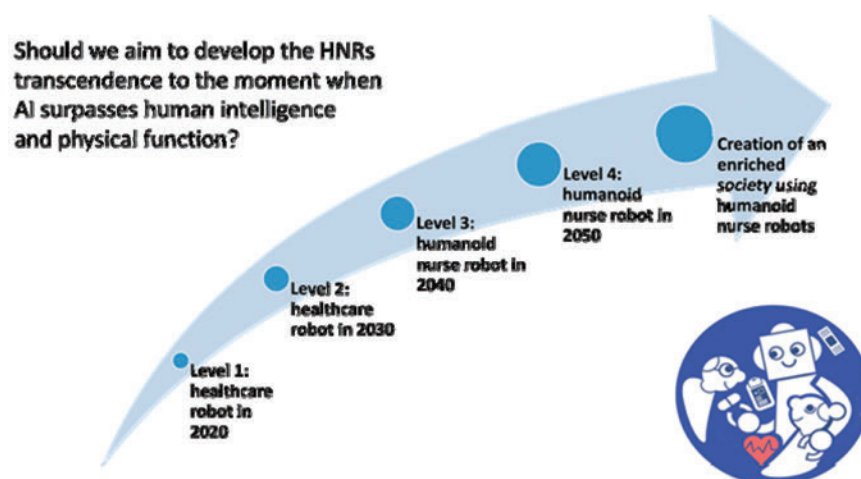
Figure 1.　Healthcare robots, Humanoid nursing robots and its Future Development[13].

perceived as significantly influencing quality health care[13].

From a low-level technological instrument such as the （vein） view finder the engagement of the nurse and nursed is illuminated in the following story.

> One of my patients requested a new IV on her opposite arm, even though the one she had was safely infusing her IV fluids. I was extremely busy but I knew that her IV would not get changed until much later if at all, as shift change was occurring and she did not have veins that were easily accessed.
>
> I requested for the vein finder instrument ［guided by infrared light to detect and pinpoint specific veins］ and successfully inserted a new IV. My patient was so happy and told me that no one else had been able to "get a vein" on the first try. It seemed like a simple task, but it made such a difference to her. I can appreciate that through competent use of the vein finder instrument, I was able to allow my patient to use her dominant hand instead of limiting her range of motion because of the IV location[21].

In this situation, the patient was able to express herself more freely through the use of her dominant extremity. Knowing this aspect of the dominant hand made a lot of difference to the patient. It was so simple an act but so

moment-changing for her, and also for the nurse. The technological knowing, （competence in using the vein view finder） the mutual engagement （the shared relationship during the IV insertion）, and the participative engagement （expressed as mutual appreciation of a life-changing occasion） are altogether illustrated in this story.

## Conclusion

Contemporary understandings of 'humanness' may become obsolete in the future and nursing practice will need to adapt it to serve an integral purpose in health care. Human-to-human contact as we express it today may consequently remain an imaginary situation, although in the future, human-to-machine relationships may be the norm. The realities of nursing care today perpetuate increasing dependence on technologies. Interactions between persons and intelligent machines will need to be redefined as nursing encounters. The theory of *TCCN* provides dynamic nursing process events in which technological knowing, mutual designing and participative engaging encompass theory-based nursing that further delineates quality nursing care outcomes as foundational to nursing care encounters and engagements, with partners in health care such as these anthropomorphic intelligent machines.

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