## Guiding Principles for Transforming Curriculum Through Integration of Technology as Expression of Caring

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Abstract: Challenged by a Summer Academy on humanoid caring robots, members of the Anne Boykin Institute for the Advancement of Caring in Nursing created guiding principles for transforming curricula by integrating technology into nursing education. The guidelines were oriented in academy dialogue on nursing as caring and robotic caring. Articles written for a special topics issue for the International Journal for Human Caring addressed robots in healthcare systems and perspectives on robots as providers of caring interventions. Themes in the articles informed the guidelines. The guidelines might incentivize faculty to integrate humanoid caring robots, a technology exemplar, into nursing curricula.

Keywords: humanoid caring robots; guidelines; technology; integration; curricula

## **Background**

The Anne Boykin Institute for the Advancement of Caring in Nursing (ABIACN) presents Summer Academies each June on various topics addressing caring science. Participants meet at Florida Atlantic University, having prepared for conversations with readings posted in anticipation of open-ended questions presented by evocateurs to elicit dialogue. During June 2018, attendees met for 2½ days to explore the intersection between healthcare robots and caring science. The title, *Caring Humanoid Robots: Is it Possible*, focused the academy. Contact hours were available for nurse participants.

In tandem with the conference agenda, another plan was conceived. Academy leaders called for conversations held during the academy and scholar expertise to be transformed into manuscripts for an issue-focused journal that the International Journal for Human Caring (IJHC) committed to publish. A number of attendees and others authored articles published in the 23(2) 2019 special issue of the journal. Because humanoid caring robots (HCRs) have already been integrated into healthcare services, the implications of ongoing technological changes needed to be explored further. Robotic nursing care has already influenced nursing practice and will continue to challenge nurses to master the content and clinical applications of this example of a new industrial revolution.

Members of the ABIACN Board were challenged to create a number of guiding principles for transforming curricula through the integration of technology, specifically HCRs, as expressions of nurse caring. One member reviewed the IJHC 23(3) 2019 manuscripts for themes that might suggest guiding principles. A number of principles were presented in a matrix for members of the ad hoc group to review. Conversations and written revisions and comments on the guidelines led to more changes and additions to the matrix (Table 1).

Terminology describing humanoid caring robots (HCRs) varies. Several terms for robots in healthcare include: humanoid healthcare robots, humanoid care robots, care robots, humanoid social robot, carebots, and HCRs. Terms and definitions need to be standardized in nursing and healthcare literature.

Some HCRs are positioned in physical space where direct care is provided to patients and nursing staff direct and monitor robot-delivered functions. Many have been created to look like human bodies (human likeness). There are active and passive robots. HCRs, as active robots, are engineered and programmed to respond to patient cues and initiate interaction as they stimulate human-responses to robot stimuli.

Engineers are challenged to create plans and manufacture humanoid caring robots that are physically present in care and caring situations, respond to patients' cues, and stimulate patients' responses to robot cues. It is doubtful that consciousness as lived in the present can be engineered to simulate this aspect of human capability. However, super artificial intelligence may in the future be able to mimic complex responses that are engendered in persons being cared for. The fullness of intersubjective caring in nursing, as explained in theories and performed in nursing care situations, will continue to be reserved for human-to-human encounters. However, caring with super artificial intelligence-programmed technology, while maintaining "right" relationships with the technology, may open deeper ways of technical knowing. Patients' perceptions of the functions provided by HCRs may be judged as caring behaviors.

The members of the ad hoc group of the ABIACN Board were committed to the idea that the information in the table could assist nurse faculty to examine specific guidelines and content identified and reflect on the need for curricular integration of HCR content and clinical experiences. Faculty might ultimately add to their understanding of HCR development and engineering, identify the contributions of healthcare professionals to the creation, programming, and implementation of HCRs, and investigate current clinical applications. In recognizing the presence of HCRs in the delivery of nursing care, they could plan curriculum changes: outcome statements, competencies, content integration, and clinical experiences for undergraduate, graduate, and doctoral level courses.

The ABIACN "robot" group hoped that the guidelines might foster conversations in curriculum committees on the importance of seeing HCRs as a machine, at times enhanced by artificial intelligence. The challenge is to expand their appreciation of HCRs as they function in direct nursing care situations. Of possible concern is how faculty judge HCRs in relation to the provision of nursing care functions replaced by HCRs, and whether patients may perceive robot activities as caring and compassionate. Discussions among faculty could

**TABLE 1.** Guiding Principles for Transforming Curriculum Through Integration of Technology as Expression of Caring Position Statement: Suggested Applications

Guiding Principle	Content	Education	Practice	Research
The education of nurses and other healthcare providers will include content and reflection on ethical principles of autonomy, justice, human dignity, respect, etc. so that they bring awareness of ethical problems to the nurse/healthcare provider-robot-patient situation	Ethical principles: patient autonomy, justice, privacy Humanistic/altruistic values Ethical challenges involved in nurse/healthcare provider-robot-patient situations	Ethical principles applied to robot- patient situations Ethical challenges involved in nurse/health care provider-robot- patient situations	Educational sessions exploring ethical challenges implicated in nurse/healthcare provider-robot-patient situation	Descriptive, observational study on patient responses to HCR provision of direct care functions
The education of nurses and other healthcare providers will include simulated caring situations in which students, practicing nurses, and healthcare providers learn how to manage the technology of robots, manage the physical space where direct care activities are carried out with robots, and prevent patient harm from accidents, such as falls and data leakage associated with robots.	Safety threats of HCR-delivered nursing care Physical space positioning of HCR in patient rooms Data leakage threats associated with HCR-delivered nursing care	Simulated nursing care situations with undergraduate nursing students and HCR Other than HCR (passive), robot applications in healthcare Identification and elimination of safety threats identified in provision of HCR direct care functions	Educational sessions: how to manage HCR in direct care situations; how to integrate and evaluate specific nursing care functions of HCR used patient care; identification and elimination of safety threats in provision of HCR direct care functions	Survey study on registered nurses' positive and negative attitudes on HCR delivery of nursing care functions
The education of nursing nurses will include practice situations whereby direct care is provided and students manage HCRs providing nursing services for assigned patients.	Development of beginning and more advanced skill in point of care functions provided by HCR for patients	Students provide nursing care in long- term care settings to residents with HCR in their rooms Students in clinical leadership practicums monitor patient care functions provided by HCR	Simulated nursing care situations with nursing assistants and licensed practical nurses providing care to residents with robots in long-term care setting rooms  Staff nurses in long-term care settings supervise nursing assistants providing nursing care to residents with HCR in providing nursing care functions	Descriptive, observational study on patient responses and nursing assistants' interface with HCR provision of direct care functions

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Guiding Principle	Content	Education	Practice	Research
The education of nurses will examine the goal that robotic functions serve as extenders of care providers' functions, including caregivers at home, staff of long-term care facilities, nurses and other healthcare providers, including nursing assistants, and other members of the healthcare team.	Specific functions of HCR as programmed and engineered Analysis of HCR functions in relation to basic nursing care needs Responsibility of nurses to develop caring relationships with patients also receiving nursing care functions from HCR	Detailed analysis of HCR functions as engineered Fit of HCR functions in patients'/residents' plans of care Identification of elements of decision-making process for prescription of HCR for patient care functions	Educational sessions providing information on specific nursing functions and limitations of HCR functions  Analysis of HCR prescriptions matching patients' needs assessment	Test of knowledge developed on HCR functions, limitations, safety threats, needs assessments, and prescription process for HCR use in different healthcare settings (item and test statistics)
The education of nurses will explore humanoid care robots as substitutes or complements to nursing care framed by theories on nurse caring.	Healthcare extenders: mobile devices, HCR, telehealth Locsin: Technological Competency as Caring in Nursing theory	Healthcare extenders: technology use and effect on patient/ resident interactions Components of Technological Competency as Caring in Nursing theory	Identification and Implementation of mid- range theories in use of Humanoid care robots	Development of Additional mid-range Theories to guide Nursing practice with Humanoid care robots
The education of nurses will include content on safety threats reported in empirical and theoretical literature on threats associated with robotic and other technologic devices implemented in healthcare services and strategies to eliminate these threats.	Process of searching the literature using search terms, delimiters, and databases Comparison of empirical and theoretical literature	Research and evidence-based retrieval of literature Appraisal of literature obtained with evidence-based practice search processes Synthesis of nursing strategies to improve the quality and safety of nursing care	Identification of nursing strategies gleaned from database searching on strategies to ensure patient safety when HCR are integrated into nursing care plans	Databased review of the literature on HCR safety threats: examples of empirical articles cited in syllabi Testing of identified Safety measures for in Care practices
The education of nurses will include a review of extant cases in which negligence and other charges associated with robots were filed against healthcare providers and healthcare institutions.	Negligence in healthcare situations Case law Lexis Nexis, Westlaw, and Web sources for HCR negligence cases	Definition of negligence pertaining to healthcare situations Review of cases in which HCR were involved in negligence charges	Educational sessions: how to manage HCR in direct care situations; how to integrate and evaluate specific nursing care functions of HCR used patient care; identification and elimination of safety threats in provision of HCR direct care functions	Use of content analysis methods to analyze one case in which negligence was charged during care provided by HCR

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Guiding Principle	Content	Education	Practice	Research
The education of nurses will examine similar and contrasting issues associated with computer leaks of personal information and leaks of information when robots and other technologic devices are affected by viruses and other malfunctions.	Social media threats to patient/resident privacy Click farms Robots on the Web Health system Web pages for patient records and services; patient portals, e.g., myPennMedicine Health Insurance Portability and Accountability Act of 1996 (HIPPA) Robots and HCR malfunctions Interruption of nursing care functions associated with robot malfunctions and viruses	Review of HIPAA: Public law: Pub. L. 104–191; Other short titles: Kassebaum– Kennedy Act, Kennedy–Kassebaum Act Enacted by 104th United States Congress Statutes at Large: 110 Stat. 1936 Violations of patient privacy: social media, patient portals, Diagnosis-specific blogs of patients, etc. Examples of robot and HCR malfunctions and virus threats	Educational session on interruption of nursing care functions associated with robot malfunctions and viruses  Educational session on illegal access to protected patient data and threats of social media	Databased review of literature on threats to patient privacy linked to hacking patient data repositories: examples of empirical articles cited in syllabi
The education of nurses will include a comparison of theories on nurse caring and theories on humanoid robot caring	Locsin: Technological Competency as Caring in Nursing: theory Boykin & Schoenhofer: Nursing as Caring theory	Main components of Technological Competency as Caring in Nursing Theory	Application of theories in practice	Evaluation of theories As related to experience of the Person cared for; Effectiveness
The education of nurses will explore the phases of integration of humanoid care robots from needs assessment, purchase, education, roll out, and evaluation of outcomes of patient care linked to humanoid care robotic interventions.	Program Planning and Evaluation Logic Model	Program Plan, Overview: Phases of integration of HCR from needs assessment, purchase, education, roll out, and evaluation of outcomes of patient care linked to humanoid care robotic interventions. Role of the nurse in Influencing policies on the development and use of HCR	Educational session delivered on healthcare institutions' intranet on overview of phases of integration of HCR from needs assessment, purchase, education, roll out, and evaluation of outcomes of patient care linked to humanoid care robotic interventions Interprofessional team/committee analysis of technology costs aimed at cost containment, quality of care, and patient safety	Test of knowledge developed on HCR functions, limitations, safety threats, needs assessments, and prescription process for HCR use in different healthcare settings (item and test statistics)

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Guiding Principle	Content	Education	Practice	Research
The education of nurses will include content and reflections on the literature that distinguishes artificial intelligence from artificial consciousness as applied to humanoid care robots.	Artificial Intelligence Artificial consciousness Types of AI robots	Comparison of artificial Intelligence and Artificial consciousness		
The education of nurses will include the financial gains associated with humanoid care robots following initial financial purchases of this technology for direct care nursing services.	Cost effectiveness of active and passive robots in healthcare settings; other technologies in care provision; remote technologies in care provision as alternatives to 1:1 sitter	Budget implications of HCR, telehealth, telemonitoring	Interprofessional team/committee analysis of technology costs aimed at cost containment, quality of care, and patient safety	Spreadsheet evidence on technology cost: HCR; educational technology in patient/resident rooms; tele sitters, passive robots, etc. HCAHPS satisfaction scores: before and after design Survey study on healthcare providers' attitudes on care extenders (technological)
The education of nurses will include the advantages and applications of humanoid care robots in care provision considering the increased life span of individuals requiring nursing care residing in some countries.	Population patterns of patient/residents and caregivers Present and projected HCR use in countries	Exemplars of HCR applications in selected countries Interprofessional conferences on value of HCR	Utilization of HCR in practice settings as available	Systematic return on investment on role of robots in care of aged and in care of those with dementia
The education of nurses will include the distinct advantages of nurses as consultants on nurse caring behaviors and attitudes and other caring relationship-based content for engineers, manufacturers, and a multi-skilled team that create humanoid care robots.	Consultation opportunities of caring in nursing theory experts to HCR design	Process of consultation Consultant functions and expertise National Nurses in Business Association Education Sole proprietorship, limited liability company (LLC), or Corporation Caring actions of HCR and patient/resident responses	Interprofessional collaboration and dialogue on role of HCR on patient satisfaction and quality outcomes	Interprofessional research on design, implementation and evaluation on expressions of caring from HCR

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Guiding Principle	Content	Education	Practice	Research
The education of nurses will include visual media in which positive and negative interactions between patients and humanoid care robots are analyzed from a caring, caring science, and quality improvement perspectives.	HCR-patient/resident interactions Watson: Theory of Human Caring/Caring Science	Assessment of nurse- patient/resident interactions in the caring moment	Stories of caring in clinical nursing practice	Research on the experience of one cared for by HCR and the experience of the nurse using HCR as partner in care
The education of students will include assessment methods to obtain data on patients' experiences when cared for by humanoid care robots.	Assessment foci: nursing situation; caring moment Electronic Medical Record data entry locations Exploration of Caring Dialog Database	Analysis of interpersonal relationships	Clinical evaluation of student performance Clinical evaluation of registered nurse performance Electronic medical record documentation	Conduct return on investment re: empathy and emotional capabilities of robots; and return on investment on robot communication
The education of nurses will include content and clinical experiences in which the positive contributions and negative effects of humanoid care robots to the care of patients are explored using evidence-based, caring theory-based, and philosophical lenses.	Evidence-Based Practice efforts for the discipline and profession of nursing Locsin: Technological Competency as Caring in Nursing theory Boykin & Schoenhofer: Nursing as Caring Interprofessional clinical practice and evidence-based nursing	Caring in nursing theories: determining fit with HCR-delivered nursing care in nursing situations  Development of technological competence in nursing situations  Intentional caring practice  Interprofessional clinical practice	Interprofessional teams/committees and HCR integration into patient/resident care services	Analysis of theoretical framework in exemplars of research oriented in caring in nursing theories; articles posted in syllabi
The education of nurses will debate whether intersubjectivity, part of the discourse on human and nurse caring, is not possible or is possible with patient-humanoid care robot interactions.	Intersubjectivity in interpersonal relationships Cultivation of loving kindness: Caritas processes and other theory components of Watson's Theory of Human Caring/Caring Science	Intersubjectivity and interrelationships Caritas process and components of Watson's Theory of Human Caring/Caring Science	Clinical evaluation of student performance Clinical evaluation of registered nurse performance	

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The education of nurses will examine the source of love in human caring and its absence in patient-humanoid care robot interactions.	Watson: Theory of Human Caring/Caring Science, Caritas and Caritas processes; core components Antithesis of Caring: Violence and incivility in workplace	Components of Watson's Theory of Caring Caring science Bullying and violence in workplace	Workplace violence and civility: educational session: review of Joint Commission publications	Analysis of sentinel events reported by Joint Commission
The education of nurses includes content on the patient as the center of care, caring as the essence of nursing, and the distraction that technology, such as humanoid caring robots, provides as technology management may shift the center of nursing attention away from the patient.	Nursing the machine Patient-centered care and evidence-based practice (EBP) Patient preferences and HCR	Tensions in direct care environments: nursing the patient/resident versus nursing the machine Focus on study of nursing as a discipline	Application of nursing theory	
The education of nurses includes content and clinical experience in which therapeutic nurse-patient relationships are compared when humanoid care robots are included in the interaction and relationship with patients and nursing students and when nursing students alone are included in the interaction and relationship with patients.	Therapeutic nurse- patient relationships Nursing responsibility in relationship development	Nurse/patient relationship: Theory and practice applications	Colleague and healthcare team relationships and Joint Commission	HCAPS satisfaction outcomes pertinent to nursing and healthcare team review
The education of nurses includes debate on how humanoid care robots' implementation as nurse extenders in direct patient care will affect patients' trust in nursing.	Nursing: most trusted profession-honesty, ethics	Public Trust and Gallup Poll results Dark side of nursing as antithetical to nurse caring	Daily commitment to practice to ethical practice Patient safety and Safety Net reporting of safety threats	HCAPS satisfaction outcomes pertinent to nursing and healthcare team: review of outcomes/unit

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Guiding Principle	Content	Education	Practice	Research
The education of nurses includes evaluation of outcomes linked to a number of technologic innovations that include the integration of robots into diverse healthcare applications.	Quality of care Cost of HCR Cost savings linked to HCR Technology, HCR, and healthcare redesign	Interprofessional contributions to quality of care, cost containment, and healthcare program design Principles of needs assessment and program planning and evaluation	Team leader designation and composition of champions in design, roll out, sustainment of program projects in healthcare settings throughout implementation, evaluation, and sustainment of programs	Before and after quality improvement study: review of outcomes per unit
The education of nurses includes bringing students into a place of "not-knowing" with HCRs, allowing expression of anxiety in the comfort of pedagogical space.	Vulnerability of "not knowing"	Critical dialog Self-reflection Self-knowing	Stories on nursing patients side-by-side HCRs	
The education of nurses explores ontological questions, i.e., What is the nature of the intersection of nurse-technology-nursed? What does it mean to be human?	Being and doing Listening to lived experience of persons engaged in relationship with HCRs	Interdisciplinary dialog Curriculum as lived as well as curriculum as planned (Aoki)	Reflective practice on HCR-provided patient care	Phenomenological study: lived experience of being within the human person-HCR relationship
The education of nurses includes exploring an aesthetic way of knowing to develop understanding the sacred space at the intersection of nurse-technology/robot-one nursed.	Ways of knowing Intersection of nurse- nursed-technology as sacred space Dwelling in tension Arts including poetry, film, photography, personal narratives	Artistic expressions of caring as the nurse Artistic representations of HCR care	Theory development on "being-with" in HCR relationships	Observational study (field notes): nurses' management of care provided by HCRs in the dance of caring persons and HCRs
The education of nurses includes safeguarding/preserving the "right relationship" with technology by understanding the technology/robot as an expression of caring.	Caring Science Feminist ethics Critical social theory	Covenant nurse-nursed relationship Power over, power with relationships Preserving personhood in the joining of person and technology in nursing situations		

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Guiding Principle	Content	Education	Practice	Research
The education of nurses includes an exploration of the integration of culturally competent artificial intelligence that enables HCRs to respond to cues and responses of patients.	Process of developing culturally competent interaction in HCRs Examples of already developed culturally-competent robots AASS Cognitive Robotic Systems Lab; Irena Papadopoulos's Lab	Review of the CARRESSES (n.d.) pilot study (CARRESSES: Culture-Aware Robots and Environmental Sensor Systems for Elderly Support) Update on current CARESSES project: designing culturally responsive and culturally competent elder care robots. Robot adaptation: how they behave and speak to culture, customs, and manners of persons assisted Bruno et al. (2017) Pandey and Gelin (2018)		

lead to decisions that are stimulated by guidelines they could modify to fit nursing program characteristics.

The guidelines presented in Table 1 should not be viewed as a prescription. They are intended to help faculty anticipate the actual and potential integration of HCRs in nursing care, and other technologic innovations. As a work in progress, the guidelines offer some preliminary ideas about nurse caring as some nursing functions are replaced by or enhanced by HCRs. The managing and monitoring of complex patient care side-by-side HCRs is one challenge. Another is how HCRs function in the personal space of patients performing tasks formerly conceived as exclusively human. Table 1 includes the following headings: content, education, practice, and research; they expand the guidelines by offering examples, ideas, and suggested applications to assist faculty and other nurses as HCRs integrate into nursing.

Faculty may choose to adapt the guidelines so that they fit with and enhance content already present in courses examining technologicallyenhanced care. Also, of interest to nursing faculty is the comparison of a language of caring in nursepatient communication and relationships to robotpatient communication and relationships.

The promise of the guidelines lies in their potential to set the stage for the integration of current and future technologies into the personal and intimate spaces of direct nursing care. They might function as a foundation to guide curricular content, clinical experiences, nursing practice, and nursing research. Although nurse faculty, direct care nurses, and researchers have already incorporated many technologic innovations into nursing education programs, workshops, simulations, clinical practice, and research, additional work is needed to ensure that HCRs and other devices are integrated into nursing care systems, replacing some nursing care functions, and supporting or augmenting others.

In additional to basic and advanced professional education programs, other applications of the guidelines are needed. For example, clinical educators could educate teams of health-care providers on HCR integration within direct care services. Educational sessions for basic and advanced sessions need to be site-specific for

practicing clinicians. The guidelines could be adapted to fit a number of settings and situations, such as continuing nursing education programs for ongoing professional development.

HCRs will continue to be used by members of the healthcare team and ideally operate to enhance caring practices. They will be developed and programmed for providing more complex healthcare services as increasingly enhanced by artificial intelligence. Examination of the theories and research on caring in nursing is important for nurses as HCRs are present in nursing situations, complementing nursing functions and stimulating patients' responses. Members of the ad hoc committee of the ABIACN hope that caring science, a formalized body of knowledge that informs caring practice, will frame the nurse-patient-HRC triad as the promise of this and other examples of technology are used. Seminal articles on caring science are found in the Smith, Turkel, and Wolf's (2013) book and in many other resources.

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