

2022

NURSING KNOWLEDGE: BIG DATA SCIENCE

CONFERENCE PROCEEDINGS

JUNE 8-10, 2022

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Complete Conference Information

To see the conference agenda, action plans from this year and previous years, abstracts and presentations, visit z.umn.edu/bigdata. For all the resources and products from the Nursing Knowledge Big Data Science Initiative and related content, visit the eRepository at nursingbigdata.org.

Save the Date

2023 Nursing Knowledge Big Data Science Conference, June 7-9, 2023 in Minneapolis, MN.

Introduction

The 10th annual Nursing Knowledge: Big Data Science (NKBDS) Conference brought national experts to Minneapolis to discuss the alignment of the NKBDS Initiative's strategic plan and the future of nursing informatics priorities. The conference was held June 8-10, 2022, and celebrated the initiative's accomplishments over the past decade and the adoption of a strong strategic plan, with a new vision and mission, for the next five years.

The three-day think tank started with the pre-conference on June 8, providing four half-day tracks. The first track, "Artificial Intelligence: A Paradigm Shift in Nursing," led by Martin Michalowski, PhD, FAMIA, included several experts in the field of artificial intelligence: Whende M. Carroll, MSN, RN-BC, FHIMSS; Craig Kuziemsky, PhD; Kenrick Cato, PhD, RN, CPHIMS, FAAN; Alvin Jeffrey, PhD, RN-BC, CCRN-K, FNP-BC; and Alain Junger, MS, RN. These experts discussed how artificial intelligence has been transformative for many public and private industries and how the society is currently observing an AI-led revolution, specifically in healthcare. The speakers highlighted nursing's key role in the translation of AI to practice. The importance of nurses changing their mindset about AI, from treating it as a trend to considering it as a paradigm shift, was emphasized. The session provided insights into aspects of nursing that will soon change because of AI's adoption and use in practice.

The second track, "Nursing Knowledge Big Data Requires Radical Educational Transformation – Let's Build It," was led by Dorcas Kunkel, DNP, MS, RN/PHN, CNE, CPHIMS, CDIP; Brenda Kulhanek, PhD, MSN, RN-BC, NPD-BC, NE-BC; and Marisa Wilson, DNSc, MHSc, RN-BC, CPHIMS, FAMIA, FIAHSI,



FAAN. This not only created awareness and momentum, but also introduced tools and strategies which ensure nurses have sharable and comparable nursing data to demonstrate nursing's contributions to health and healthcare outcomes. Fundamental issues delaying the community from achieving that mission, such as education, were discussed. Additionally, many direct care nurses, advanced practice nurses, faculty and educators lack the basic information, information technology competencies and capabilities to fully participate in the digital health evolution. Participants and track leaders collaborated to highlight the issues and brainstorm possible next steps to close the gap.

A third track, "Question everything! Conversations On Radical Transformations to Address Workforce Issues," led by Rebecca Freeman, PhD, RN, FAAN, FNAP and Jane Englebright, PhD, RN, FAAN, challenged the audience to think outside the box related to workforce, informatics, health access and outcomes. The World War II crisis in nursing supply, similar to what is being experienced today as a result of the COVID-19 epidemic, rallied discussion on how nurses will respond



to the current crisis and what could be considered new approaches to nursing education and staffing.

Last, “OMOP? Oh My! Hands-on Data Science using the Observational Health Data Sciences and Informatics (OHDSI) Platform,” was led by Steve Johnson, PhD, FAMIA and Alvin Jeffrey, PhD, RN-BC, CCRN-K, FNP-BC. Following a popular tradition that has emerged in recent years, this was a hands-on track where participants could experiment with new tools. With the increase of healthcare data scientists and research networks using the OHDSI ecosystem to accelerate research productivity and improve results, the track explored the need for nurses to acquire knowledge and skills on this topic. Participants examined the OMOP data model and its rich concept ontologies and learned about the OHDSI analysis platform. Participants were guided in a hands-on exercise to gain a better understanding of the power of the platform by using these tools to define, characterize and analyze cohorts using simulated data.

During the main conference, June 9-10, several panels, meetings, and workgroup activities took place. Panel topics included national patient outcome initiatives, future of artificial intelligence, and the challenges and opportunities for using large amounts of data for clinical applications. The conference opened with a panel dialogue, “National

Patient Outcome Initiatives at the Intersection of Nursing, Informatics, and Big Data,” including national experts Judy Murphy, RN, FACMI, LFHIMSS, FAAN (moderator); Victoria L Tiase, PhD, RN-BC, FAMIA, FNAP, FAAN; Marisa Wilson, DNSc, MHSc, RN-BC, CPHIMS, FAMIA, FIAHSI, FAAN; and Joyce Sensmeier, MS, RN-BC, FHIMSS, FAAN. The panelists discussed current recommendations provided by *The Future of Nursing Report*, *The AACN Essentials*, and the *Unique Nurse Identifier* and described alignment with the NKBDS Initiative’s five-year strategic plan. The dialogue addressed the opportunities and challenges different stakeholders face in their efforts to improve patient outcomes through the adoption and implementation of these national initiatives. Another panel, “Artificial Intelligence Informed by Big Data: Challenges and Future Potential,” was moderated by Catherine Ivory, PhD, RN-BC, RNC-OB, NEA-BC, FAAN and featured Asta Thoroddsen, PhD; Kenrick Cato, PhD, RN, CPHIMS, FAAN; and Laura Heermann Langford, PhD, RN. The panelists gave an overview of the use and potential of applying AI for big data research and the use of nursing terminologies as a way of generating standardized big data, potentially facilitating the application of AI. Panelists discussed how national and international standards facilitate this process and the current challenges and opportunities for improvement.

The closing panel, “Ethical, Social and Workforce Considerations for Nursing, Big Data & Artificial Intelligence,” was moderated by Martin Michalowski, PhD, FAMIA, with panelists Rebecca Freeman, PhD, RN, FAAN, FNAP; Alain Junger, MS, RN; and Martha Turner, PhD, RN-BC, FAAN. The panel discussed different experiences in implementing information systems where AI can be used for burden reduction and alleviate specific nursing tasks.

Examples include a European perspective with a proactive focus on patient rights and privacy in relation to AI, and an ethicist who discussed equitable and ethical AI implications and implementation from a nursing code of ethics and ethicist perspective.

The 11 workgroups reported on major achievements, along with the challenges and opportunities of the past year, 2021-2022. Top priorities for the upcoming year were highlighted. An overview of each NKBDS workgroup was presented, along with their structure (membership, meetings, agenda, goals), setting the stage for the new attendees who wanted to learn more and engage with the workgroups. The main products (publications, presentations, etc.) from each workgroup were presented and are listed at the end of the proceedings. Workgroups met to discuss their priorities for the upcoming 2022-2023 year, aligning priorities with the 2021-2026 NKBDS Initiative's Strategic Plan. Opportunities for further refinement, alignment, and additional actions needed to make goals achievable were included.

The NKBDS Initiative Steering Committee, led by co-chairs Connie W. Delaney, PhD, RN, FAAN, FACMI, FNAP; Rebecca Freeman, PhD, RN, FAAN, FNAP; and Lisiane Pruinelli, PhD, MS, RN, FAMIA, oversees the NKBDS initiative and strategic plan, including the workgroups, conference, and eRepository.



Steering Committee

Connie W. Delaney (co-chair), PhD, RN, FAAN, FACMI, FNAP, Professor & Dean, University of Minnesota School of Nursing, Minneapolis, MN

Rebecca Freeman (co-chair), PhD, RN, FAAN, FNAP, Vice President of Health Informatics for the University of Vermont Health Network, VT

Lisiane Pruinelli (co-chair), PhD, MS, RN, FAMIA, Associate Professor, University of Minnesota School of Nursing, Minneapolis, MN

Christel Anderson (Member), MA, Vice President, Informatics, HIMSS, Chicago, IL

Jane Englebright (Member), PhD, RN, FAAN, Chief Nurse Executive and Senior Vice President for HCA Healthcare, Nashville, TN

Alvin Jeffery (Member), PhD, RN-BC, CCRN-K, FNP-BC, Assistant Professor of Nursing & Biomedical Informatics, Vanderbilt University; Nurse Scientist, U.S. Department of Veterans Affairs, Nashville, TN

Laura Heermann Langford (Member), PhD, RN, FAMIA, Graphite Health, Salt Lake City UT; University of Utah College of Nursing, Salt Lake City, UT

Cathy Ivory (Member/eRepository Liaison), PhD, RN-BC, RNC-OB, NEA-BC, FAAN, Associate Nurse Executive, Practice Excellence, Vanderbilt University Medical Center and Associate Professor, Vanderbilt University School of Nursing, Nashville, TN

Susan Matney (Member), PhD, RNC-OB, FAAN, FACMI, FHIMSS, FAMIA, FHL7, Farmington, UT (on leave)

Erin D. Maughan (Member), PhD, RN, Executive Director Center for School Health Innovation & Quality, Arlington, VA. Association Professor, George Mason University, Fairfax, VA

Judy Murphy (Member), DN (hon), RN, FACMI, LFHIMSS, FAAN, Nurse Executive, Health IT Leader, Lake Elmo, MN

Joyce Sensmeier (Member), MS, RN-BC, FHIMSS, FAAN, President, IHE USA, San Marcos, CA

Charlotte Weaver (Member), PhD, RN, MSPH, Board Director, PIH Health, Whittier CA, Seattle, WA



Care Coordination

Lori Popejoy,
PhD, APRN, GCNS-BC, FAAN

Mary Hook,
PhD, RN-BC

PURPOSE

To identify nursing-sensitive essential shareable and comparable data elements for exchanging across settings to support care coordination activities and improve patient outcomes.

Context of Care

Amber Olson,
DNP, RN-BC

Heather Shirk,
MSN, RN

PURPOSE

To demonstrate sharable and comparable nurse data across the care continuum by capturing nursing “big data” in the Nursing Management Minimum Data Set (NMMDS), the Nursing Minimum Data Set (NMDS) and the Nursing Knowledge: Big Data Science Conference Nursing Value Data Set (NVDS) to increase nurse data usability, provide patient, family and community centric data and, fortify data generated by nurses, about nurses and nursing care across the care continuum and across care transitions in all settings where nurses provide care.

Data Science and Clinical Analytics

Lisiane Pruinelli,
PhD, MS, RN, FAMIA

Steve Johnson,
PhD, MS, FAMIA

PURPOSE

To apply data science and clinical analytic methods, incorporating validated information models derived from diverse sources of health care data, to address nurse-sensitive clinical research questions that have the potential to inform and educate nursing and multidisciplinary approaches for better patient care and outcomes.

Determinants of Health (formerly Social and Behavioral Determinants of Health)

Ruth Wetta,
RN, PhD, MPH, MSN

Robin Austin,
PhD, DNP, RN-BC, FAMIA, FNAP

PURPOSE

To support the inclusion of Determinants of Health (DOH) in electronic health records and digital health tools to empower nurses to partner with patients, families and communities for whole-person care.

Education

Dorcas Kunkel,
DNP, RN/PHN, CNE, CPHIMS,
CDIP

Marisa L Wilson
DNSc, MHSc, Rn-BC, CPHIMS,
FAMIA, FIAHSI, FAAN

PURPOSE

To ensure that all faculty teaching or educating nurses at any level understand the process of informatics and how that supports nursing work and care; to ensure nursing faculty understand the breadth of health information technology used in care and the best evidence to support that use; to offer a tool for faculty to self-assess basic informatics and information technology competency; to develop a vetted listing of professional development resources, including Case Studies highlighting informatics and information technology in use by nurses; and to collaborate and coordinate with other nursing informatics organizations also engaged in developing resources.

Knowledge Modeling

Kay S. Lytle,
DNP, RN-BC, NEA-BC, CPHMIS,
FHIMS

Bonnie L. Westra,
PhD, RN, FAAN, FACMI

PURPOSE

To validate previously developed information models using flowsheet data to extend national standards with nurse-sensitive data, and continuously improve and adapt the knowledge model validation and creation process using flowsheet data and other nurse-sensitive information.

Encoding and Modeling

Tess Settergren,
MHA, MA, RN-BC

Stephanie Hartleben,
RN-BC, MSN, MHA

PURPOSE

Curate LOINC® and SNOMED CT® mappings for nursing-specific value sets, submit requests for new codes where appropriate, and incorporate the content and standards into a framework and repository for dissemination.

Mobile Health for Nursing

Tami H Wyatt,
PhD, RN, CNE, CHSE, ANEF,
FAAN

Melissa C.S. Breth,
DNP, RN-BC, CPHIMS

PURPOSE

Explore the nurse's use of mobile health (mHealth) data including both nursing and patient generated data. Identify and support activities and resources to address unmet needs and create opportunities to utilize mHealth data within workflows.

Nursing Value

Martin Michalowski,
PhD, FAMIA

John Deckro,
DNP, ANP-BC, RN-BC, CPHIMS

PURPOSE

Continue development and testing of a Nursing Value Model, with respect to a broad definition of value: 1) Explore value in reference to nursing with quantitative metrics such as outcomes, cost, and available resources; also, more qualitative metrics related to clinical reasoning and values such as caring, engagement, connectedness, and spirituality. 2) Employ artificial intelligence methodologies to further define the application of nursing value/values in service to health and health care. And 3) Consider the context of nursing care with respect to value/values.

Policy and Advocacy

Whende M. Carroll, MSN, RN-BC, FHIMSS

Brenda Kulhanek, PhD, MSN, RN-BC, NPD-BC, NE-BC

PURPOSE

Elevate the voice and visibility of each workgroup's nurse-led Big Data initiatives. We will be lending policy recommendations and advocacy support for the dissemination of the initiatives workgroup's leading-edge collateral and work products.

Transforming Documentation

Bonnie Adrian, PhD, RN-BC

David Boyd, DNP, RN, CNS, RN-BC, CPHIMS

PURPOSE

Explore ways to decrease the documentation burden and serve up information in the electronic health record at the right time in the workflow to support evidence-based and personalized care. Elevate purpose-driven, role-based, patient-centric, evidence informed documentation transformation to capture nurse observations and interventions and drive purposeful secondary-use and precision nursing.

CELEBRATING THE NURSING KNOWLEDGE BIG DATA SCIENCE INITIATIVE AND CONFERENCE

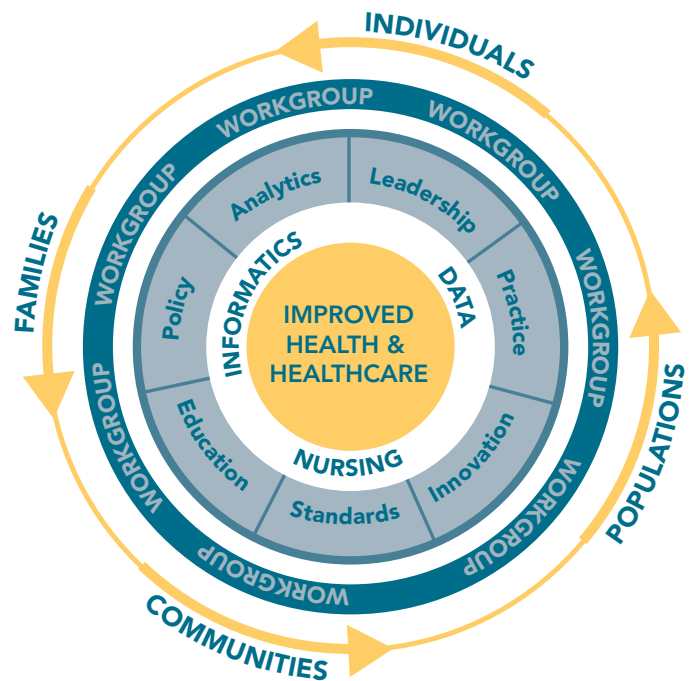
In 2021, amid the COVID-19 pandemic and the increasing use of informatics to facilitate care delivery, the steering committee recognized the need to accommodate the ever-changing landscape of nursing, informatics, and healthcare. As a result, following the 2021 annual conference, the steering committee met to update the vision, mission, and establish a 5-year strategic plan that incorporates other current national initiatives influencing nursing and informatics.

With a vision to “improve health and healthcare by using nursing knowledge empowered by informatics,” the Nursing Knowledge Big Data Science Initiative’s mission is to:

1. Generate and enable nursing insights and evidence to support individuals, families, communities, and populations in the promotion of health and the delivery of health care; and
2. Leverage informatics and data to redefine and magnify the value of nursing in all settings.

The “NKBDS Initiative’s Framework to Improve Health and Healthcare” (Fig. 1) captures and represents all major aspects of the initiative, its vision and mission.

Figure 1: NKBDS Initiative’s Framework to Improve Health and Healthcare



The vision of improved health and healthcare is noted in the center of the framework. The core concepts—informatics, data, and nursing—are operationalized by the initiative’s workgroups to strategically lead efforts on policy, analytics, leadership, innovation, standards, education, and practice. These concepts and interconnections generate and enable nursing insights and evidence to support care recipients, including individuals, families, communities, and populations, in and across all settings.

The new 5-year strategic plan was approved at the end of 2021 (z.umn.edu/bigdata) and is now under implementation. The plan encompasses

a year-round set of activities distributed among workgroups and includes a variety of activities to foster nursing evidence-based informatics. The key priorities for the next five years are to:

- refine outcome measurements congruent with the initiative’s vision and mission,
- establish a clear plan for a research agenda or a consortium model to generate evidence, and
- expand the initiative’s partnership with key stakeholders.

The short (1-year) and long-term (5-year) goals are focused on the intersection of *The Future of Nursing Report*, *The AACN Essentials*, and the *Unique Nurse Identifier*.



Table 1: The 5-Year NKBDS Initiative’s Priority Short and Long-Term Goals and Outcomes

	UNIQUE NURSE IDENTIFIER	FUTURE OF NURSING REPORT	AACN ESSENTIALS
Year One Goal	<p>Increase awareness</p> <p>Increase engagement to teaching and seminars; present at conferences; speaking to different institutions and informatics groups; podcasts; social media</p>	<p>Make recommendations for informatics nurses that align with the Future of Nursing report</p> <p>Build academic practice partnerships (such as with AONL) to disseminate the advantages of using data for decision making</p> <p>Build academic practice partnerships (such as with AONL) to disseminate the advantages of using data for decision making</p>	<p>Focus on Domain 8 and the essentials</p> <p>Ensure all workgroups align with the Education Workgroup</p> <p>Educate nurses to use all of the data available to them and align it with Domain 8</p>
Outcome measure 1 year	<p>Document number of attendees, breadth of attendees</p>	<p>Roadmap plan for sharing information</p>	<p>Expand collaboration among NKBDS workgroups and Education workgroup to expand alignment with Domain 8</p>
Five Years Goal	<p>Roadmap plan for implementation -</p> <p>Based on people knowing about it, valuing it, and wanting to support it</p> <p>Technical pieces needed to make implementation possible</p> <p>Time frame dependent on the roadmap plan</p>	<p>Reinforce that EHR/clinical systems infrastructure adds value through creating nursing knowledge models and mapping them to national standards</p> <p>Prioritize impact on equity</p> <p>Expand value to the current state of the EHR. What would be the infrastructure needed to achieve value?</p>	<p>Roadmap to educate beyond academia</p> <p>Educate nurses on the use of data to the full potential, including data literacy aspects</p> <p>Collaborate with certification/ AACN/educators</p> <p>Align this strategy within the NKBDS framework, including the clinical aspect of NKBDS work</p>
Outcome measure 5 years	<p>Did we get the roadmap plan done?</p> <p>Do we have vendors working to implement new informatics elements into their systems?</p> <p>Do we see hospital systems adopting the unique nurse identifier?</p>	<p>Identify milestones and achievement</p> <p>Facilitate interoperable systems through knowledge generation and standardization</p>	<p>Expand Roadmap plan for education beyond academia milestone</p>

THE WORKGROUPS' ALIGNMENT WITH THE NKBDS INITIATIVE'S VISION AND MISSION

WORKGROUPS' ANNUAL REPORTS AND THE NKBDS INITIATIVES' STRATEGIC PLAN

All 11 workgroups have developed activities that are, directly or indirectly, aligned with the initiative's vision and mission. Summaries of the workgroups' activities and major accomplishments, with an emphasis on the collaborative work developed during 2021-2022, follow.



The **Care Coordination Workgroup** completed a study entitled "Identifying Information Used by Care Coordinators in Ambulatory Settings" (IRB # 668-20-EX). This work was led by member Dr. Carol Geary from the University of Nebraska Medical Center. The aim of the study was to identify the information and processes that ambulatory care coordinators use to deliver patient care. The cross-sectional survey captured characteristics of the care coordinators, their process, and the information and outcomes that are important. The workgroup is currently analyzing the results to identify gaps (missing data that is needed but not currently exchanged) to support communication across the care continuum including patient preferences, goals, strengths, and ability to self-manage. The workgroup will

submit their findings for publication. This study will serve to inform future work around care coordination and the potential to improve health and healthcare.

The **Context of Care Workgroup** continues to focus on interoperability between disparate data sources in support of sharable and comparable data related to the context of care for clients/residents/patients, families, and communities across the care continuum to inform care teams. This past year focused on successful outbound data sharing from acute care to post-acute care settings at five pilot locations. Currently the data sharing includes demographics, discharge medication list, allergies, medical problem list/ICD10 diagnosis, and clinical assessment observations. Initial feedback from end users has supported improved handoff of care, decreased admission documentation time, and a reduction of care gaps within the next level of care. This work redefines handoff of care for post-acute populations as it aids in continuity of care observations, problems, methods, interventions, and goals. Future interoperability goals include expanded use of this data sharing at additional locations as well as including social determinants of health and severity or frailty score information, thus helping to achieve equitable care.

The **Data Science & Clinical Analytics Workgroup** is using nursing focused informatics to improve health and healthcare by performing hands-on data science studies to generate new knowledge, developing data science training and education material to build workforce capacity, and reviewing data science papers to share information with the healthcare community. Additional nursing knowledge and experience were provided to its members, pre-conference attendees, and viewers of the Healthcare Data Science Roadmap video released in 2022 (available at: <https://youtu.be/HfR1WRXvCiA>). Furthermore, by developing additional educational resources and opportunities, the workgroup helped to build workforce capacity to create new knowledge from large datasets in alignment with the NKBDS

Initiative's vision of building nursing informatics capacity. The workgroup encourages nursing trained professionals to be data driven in decision making and the use of data science for evidence generation and evaluation. The Year in Review paper, for example, helps practitioners find nursing relevant data science work, and the hands-on data science project develops skills to bridge clinical and analytic teams in healthcare settings.

The **Determinants of Health Workgroup** aligns with the initiative's vision by focusing on the elements required to store and use DoH data collected within the EHR. This ranges from assessment practices and settings to terminology to analytics design and execution. Determinants of Health and conceptual and operational definitions for Health Disparities, Health Equity and Social Determinants of Health were developed. Moreover, the *Future of Nursing 2020-2030* report was leveraged to guide the workgroup's thinking and activities. Presentations from workgroup members were provided at several meetings during the year.

The **Education Workgroup** is the key actor in leading the initiative's vision. The workgroup is improving health and healthcare by employing nursing knowledge empowered by informatics to ensure that nurses at all levels can fully function and lead in technology and data-rich environments. To achieve this, the workgroup developed a case study and a self-assessment tool for face validity testing and established collaborations and formal interactions with AMIA, NIWG, ANIA, HIMSS and representatives from the Big Ten Academic Alliance (BTAA) programs. Multiple dissemination activities were completed to show this work. The workgroup highlights how informatics and information technology support the understanding of the value of nursing and there has been on going collaboration with the *AACN Essentials Domain 8* leadership.

The **Mobile Health for Nursing Workgroup** subscribes to the assumption that the involvement of a nurse informaticist in design and development of mHealth would enhance interoperability, ultimately leading to improved health outcomes.



The Mobile Health Workgroup continues to examine the shortcomings of mHealth solutions that prevent interoperability with electronic health records, aligning with the initiative's vision of knowledge empowered by informatics. The workgroup is completing a thorough assessment of the literature, presentations, and the current state of interoperability and nurses' roles in current mHealth solutions, after which guidelines for mHealth development teams to adopt will be proposed. Using a multidisciplinary approach that includes nurses, beyond the interface and design phase, will promote interoperability of data collected from mHealth. To guide this work, the workgroup adopts the assumption that nurse engagement in mHealth development leading to interoperability that will enhance patient outcomes. For example, guided by a literature review, the workgroup engaged with a developer who has a successful app on the market in order to understand how nurses were involved in the creation and to determine the interoperability of the data. However, even considering a successful app, the data were not interoperable, and nurses were not involved in the development.



The **Encoding and Modeling Workgroup**, in collaboration with other workgroups (e.g., mHealth, Context of Care), is advancing interoperability of nursing data through application of data standards (LOINC & SNOMED CT) to enable large-scale, cross-organizational research studies to highlight the most efficacious nursing-specific interventions that improve patient, family, community health, and health outcomes. This work will also allow for greater sharing of important patient data to foster efficient and effective transitions of care between facilities. The workgroup completed the pain information model content and submitted the alleviating factors and exacerbating factors value sets to LOINC for new LOINC terms and values mapped to SNOMED CT. They clarified LOINC standardized assessment scale submission heuristics and companion submission spreadsheet directions, submitted three pain assessment scales, and drafted coding submissions for Fall Risk assessment scales. Currently, the group is revising foundational heuristics to update nursing data

mapping rules and comparing observations to re-use LOINC “exact match” terms. The workgroup is also preparing an article that will be published about “how to” submit standardized assessment scales to LOINC, thus creating additional educational resources. A presentation about lessons learned while mapping exacerbating and alleviating factors value sets will be presented at the SNOMED CT Expo in September.

The **Knowledge Modeling Workgroup** supports the understanding that nursing knowledge models will improve practice and enable research by identifying key nursing work that improves care delivery and outcomes while decreasing documentation burden. The development of knowledge models that reflect clinical priorities is 100% aligned with the initiative’s vision of sharable and comparable nursing data. The workgroup focuses on the development/validation of knowledge models that reflect three high priority areas for outcome improvement at the individual, family, and population levels: Standardized Nursing Admission History, Fall Risk, and Venous Thromboembolism (VTE) Prevention. The Fall Risk and VTE Prevention knowledge models include key assessments, interventions, and outcomes that have been validated with clinical SMEs to generate evidence and insights into prevention and care delivery, including the value of nursing’s role. The workgroup collaborated with the Encoding and Modeling Workgroup to understand data standards as well as the vendor community (these two workgroups will formally combine efforts in the upcoming year to increase efficiency and speed processes). The Knowledge Modeling Workgroup also conducted EHR metadata analysis using the FLOMAP tool to identify nursing/ other provider elements documented in EHRs, conducted a literature review, and reviewed subject matter experts (SMEs) input to identify critical data elements and refine model content.

The **Nursing Value Workgroup** bases their work on the assumption that to improve the health of individuals, families, communities, and populations, as stated in the initiative’s vision, it is increasingly essential to demonstrate the

economic value of nursing, while maintaining traditional nursing values in multiple settings. Sharable and comparable data related to value/values is critical in guiding the evolution, not only of nursing, but within healthcare as a whole. Review and integration of the Nursing Value Workgroup data dictionary (developed in previous years) and evidence of nurse caring research and activities/interventions/behaviors in the EHR are under way and will add to the body of knowledge related to how to measure the value of nursing. To share the importance of this work, a presentation was given to the VA Nursing Informatics Field Alliance (500+ members and the National Artificial Intelligence Institute at the Department of Veterans Affairs) highlighting the importance of value, AI and nursing.

The **Policy and Advocacy Workgroup** aligns with the initiative's vision of facilitating the visibility and portability of the work of nursing through the unique nursing identifier (UNI). The workgroup also advances the output of other workgroups through advocacy. The workgroup has initiated, promoted, and completed several POCs for the technical framework needed to obtain nursing insights and evidence through the implementation of the UNI in diverse settings.

The **Transforming Documentation Workgroup** focuses on strategies to decrease the administrative documentation burden on nursing/clinicians through the intentional re-use of EHR data as a means to support evidence-based, personalized care as well as enhance healthcare team communication across the care continuum. Transforming documentation includes the goal of elevating the role and value of nursing through application of informatics practices and principles, similar to the Nursing Value Workgroup. The workgroup finalized and disseminated (via the eRepository and presentations) work on standard admission history by nursing. The *Future of Nursing 2020-2030* report includes documentation burden/transforming documentation. The health and professional well-being of nurses are a key element of focus for this workgroup.

In summary, it is clear from the workgroups' achievements and accomplishments in 2021-2022 that the common direction of these activities is to achieve nursing sharable and comparable data across settings. Each workgroup is key in developing and leading efforts that together capture all aspects of what is needed to make the initiative's vision possible. From policy makers, standards, analytics, aspects of the care delivery (e.g., determinants of health, mobile health, coordination of care), to education and interoperability, the workgroups are leading the way to change the understanding of nursing, informatics, and data. More than isolated concepts, the workgroups and the initiative are engaged in understanding and disseminating the ways these concepts are interconnected and how they make nursing care valuable.

SUPPORTING INDIVIDUALS, FAMILIES, COMMUNITIES, AND POPULATIONS

Aligned with the initiative's goal of supporting care recipients, including individuals, families, communities, and populations in all settings, the workgroups have addressed each of these recipient group's needs to varying degrees.

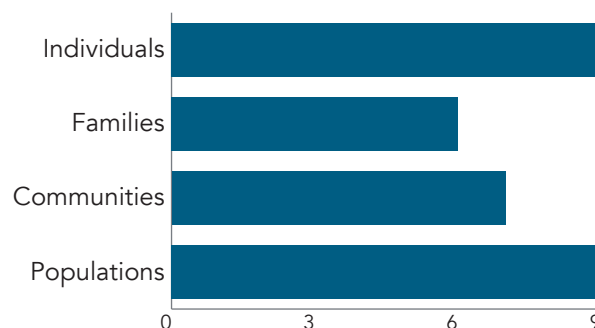


Figure 2: The number of care recipients covered by different workgroups.

For example, the survey developed by the **Care Coordination Workgroup** will capture how care coordinators care for individuals and families, often in the community. The **Nursing Value Workgroup** is addressing individuals and communities by mining research and

HEALTH MEASURES	CONCEPTUAL DEFINITION	OPERATIONAL DEFINITION
Health disparity	A particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage	Measure differential health outcomes
Health Equity	Attainment of the highest level of health for all people	Measure causal factors that influence differential outcomes
Determinants of Health	Factors that influence an individual's or population's health including biology, genetics, and individual behavior, and between health and health services, socioeconomic status, the physical environment, discrimination, racism, literacy levels, and legislative policies	Measure risk and exposure to factors that influence health outcomes

Note: *Healthy People 2020. Accessed September 14, 2021, at <https://www.healthypeople.gov/2020/about/foundation-health-measures/Disparities> 2. Carney, T. J., & Kong, A. Y. (2017). Leveraging health informatics to foster a smart systems response to health disparities and health equity challenges. *J Biomed Inform*, 68, 184-189. doi:10.1016/j.jbi.2017.02.011

practice descriptions for language that supports the concept mapping of traditional nursing indicators about caring/values. The **Policy and Advocacy Workgroup** addresses individuals, but also the entire population by measuring nursing and patient outcomes using the UNI. The UNI has been implemented in a healthcare system, additional inquiries have been received for implementation in primary care, and the workgroup is in the process of developing a nursing research database, an educational database, and a project at an innovation center.

The **Context of Care Workgroup** advanced discovery to address inefficiencies in sharing and comparing data in individuals whose care was transitioning from an acute care environment to a post-acute care environment. The efficiency gained by this data interoperability supports improved care for individuals, families of those individuals, the residential community at that location, the population served by the organization, and the care teams using the systems. And most significant, it raises the importance of interoperability for continuity of care.

The **Data Science and Clinical Analytics Workgroup** and the **Determinants of Health Workgroup** have focused on addressing

population-level issues. The first workgroup efforts were primarily to impact researchers and healthcare professionals' education. The second workgroup adopted the definition-guidance from the National Academy of Medicine (2014) for domains and uses of determinants of health (DoH) as the foundation for their activities. They also identified operational definitions for health disparities, health equity and health determinants:

Almost half of the workgroups (5 out of 11) addressed all levels of care. The **Education Workgroup** developed their activities with the understanding that one provider and one patient are not the sole focus of informatics and information technology. Informatics and information technology impact individuals, families, communities, and populations; thus, the **Education Workgroup** is working to ensure that all these domains are highlighted. During the 2021-2022 year, the **Mobile Health for Nursing Workgroup** gathered information through a thorough literature review about nurses' roles in mHealth development. They encouraged the audience of nurses to participate in interdisciplinary teams of mHealth developers. The workgroup also examined the literature on mHealth applications dedicated to pain, which

further supports the need for mHealth guidelines to ensure gold standard processes for improved health outcomes.

When data mapping is implemented into electronic health records, nursing knowledge generation will inform clinical decision support at the point of care and will guide the care of families, communities, and populations. This is supported by the **Encoding and Modeling Workgroup**. Standardized mapping of data will also allow for easier transmission of patient data, allowing for better communication between healthcare providers and ultimately better care for individuals, communities, and populations. Additionally, standardized mapping of data improves data quality for data analysis and reporting, thus promoting process improvement. Similarly, the **Knowledge Modeling Workgroup** developed models that can be implemented into EHR systems. Individuals, families, and populations will benefit from the evidence generated. With these implementations, communities, such as nursing, will benefit through expected reduction in documentation, and consequently, decreased burden of documentation that is a current concern raised by nurses and other health professionals. All these aspects taken together, along with the ability to aggregate comparable nursing data within and across organizations, support quality improvement and research activities, in turn supporting the population. And finally, the **Transforming Documentation Workgroup** generates EHR data supportive of population health, including individuals, families and communities, and enhances care delivery quality and workforce well-being.

In summary, the NKBDS Initiative's vision and mission aims to address the health of individuals, communities, and populations. Using informatics tools and knowledge, the workgroups are consistently addressing these care recipients in the continuum. It is important to note that some

workgroups address just one group, while other workgroups focus on all care recipients. Moreover, with the combined effort by several workgroups, many changes and opportunities to raise the voice of nurses are being developed and boosted by the use of informatics.

THE NKBDS INITIATIVE'S CORE CONCEPTS

Workgroup engagements are designed to intersect with the initiative's core concepts: informatics, data, and nursing. Some workgroups lead efforts primarily in one concept, such as policy. Most workgroups integrate several of these concepts to accomplish their goals.

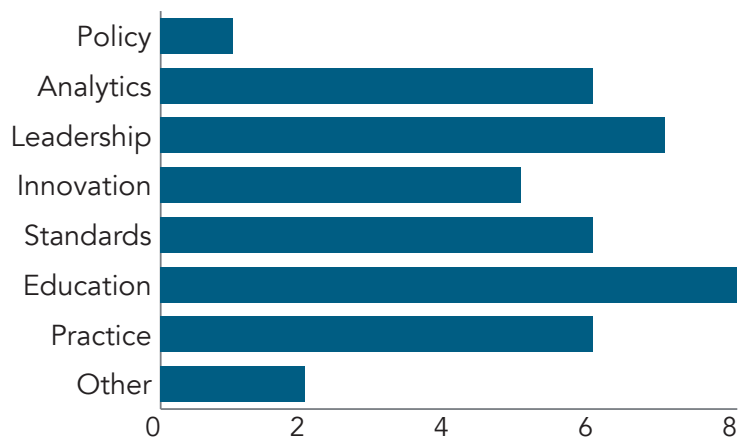


Figure 3: The number of core concepts covered by different workgroups.

Addressing inefficiencies in sharing and comparing data of individuals whose care was transitioning from an acute care environment to a post-acute care environment highly influence practice, as is the case with the work developed by the **Context of Care Workgroup**. Similarly, the research methodology developed by the **Care Coordination Workgroup** to understand the real-world practice of care coordinators also addresses inefficiencies in sharing and comparing data. The **Transforming Documentation Workgroup** is expanding the functional success of the Admission History Standardization and Minimum Data Set to the Adult Head to Toe Admission Assessment.

In addition, they have engaged and leveraged workgroup members with recent burden reduction successes using the workgroup's guiding principles and governance tenets.

The workgroups created innovative paths to solve problems and challenges faced by nurses. For example, the **Mobile Health for Nursing Workgroup** investigated the literature to better understand standards of mHealth development and the role nurses play in their development. There are no standards in the literature, and there is evidence that nurses are involved in the features, functions, and the end user experience.



However, they are not involved in data architecture planning, database organization, and ways to retrieve data for interoperability. Establishing standards for interoperability is also the main effort taken by the **Encoding and Modeling Workgroup**, which also conducted a significant number of educational activities within and outside of the workgroup. To support standardization and interoperable systems where data can be compared, exchanged, and analyzed, the information models developed by the **Knowledge Modeling Workgroup** will

enable analytics through coded concepts and their relationships, information modeling and data standards. In addition, survey data and EHR metadata were analyzed to develop the models, capturing the current practice of nurses, modeling, and clinically validating these models. This process will engage nurses in direct care practice and will ensure that models accurately reflect nursing care. These types of models are relatively new, and the development and validation techniques are innovative, which is the main effort of the **Nursing Value Workgroup**. They are building a network of, and building bridges to, nurse informaticists that practice in health care systems and have access to large patient databases. The ultimate goal is to develop possible strategies to apply artificial intelligence, and in doing so, clarify the value of nursing.

Education is an overarching effort taken by several workgroups, including the **Education Workgroup**. From real world-data projects, developing data literacy, use cases, resources, to dissemination, the workgroups are educating nurses and the current workforce. These efforts reinforce how informatics and information technology, aligned with nursing and the use of data, require nursing leadership, engagement, and innovation to impact education and practice. Emphasizing the role of collaboration between workgroups, the **Knowledge Modeling Workgroup** provided information to the **Education Workgroup** and actively sought education on many aspects of model development and coding.

The **Policy and Advocacy Workgroup** is leading policy efforts to enable the integration of a unique identifier into the EHR and other healthcare technologies, thus supporting interoperability. They serve as a support for other workgroups to develop strategies to advocate for the acquisition of products and resources, and when appropriate, policy.

LOOKING FORWARD — 2022-2023 AND THE 5-YEAR NKBDS INITIATIVE'S STRATEGIC PLAN



Most of the workgroups have committed to continue, or expand upon, the work they have focused on in the previous year, as well as incorporate new strategies that address and align with the initiative's strategic goals.

The **Data Science and Clinical Analytics Workgroup** will support use of the Unique Nurse Identifier by evaluating how it can be incorporated into the OMOP data model and used in nurse relevant data science projects. The workgroup also supports the *Future of Nursing* goals by providing a hands-on project that helps nurses and nurse leaders to build the expertise necessary to understand and use data science, and second, helping to impact nursing practice by developing and delivering recommendations for using and implementing models and CDS at the bedside and within the clinical workflow. The OHDSI platform for informatics and knowledge generation will be incorporated by the Data Science and Analytics Workgroup, along with leveraging MIMIC data and the Google BigQuery platform.

The **Determinants of Health Workgroup** will address the initiative's goals by engaging in the following activities: First, continue participation in the Gravity Project including development and ballot an HL7 FHIR SDOH Implementation. Second, continue work on the Centers for Disease Control and Prevention's Social Determinants of Health Public Health Use Case Workgroup for Chronic Disease Prevention. Third, continue advocacy activities for inclusion of DoH in the *Future of Nursing* report and future activities. Nursing's role and emphasis on the differences between social needs, social relationships, behaviors, psychological and environmental factors, social vital signs, and the inclusion of standardized terminologies in storing DoH data to promote data uses are priorities. Fourth, they will map DoH data captured via standard tools to health concerns, goals and interventions. And fifth, they will engage workgroup members in authoring a qualitative/quantitative



paper exploring implementation (adoption) of Determinants of Health in different settings.

The **Education Workgroup** will continue using the best evidence, case studies, and teaching exemplars to highlight how informatics and information technology are required to understand the value of nursing. Additional work must be done with a self-assessment tool now under development. A dissemination plan with detailed opportunities needs to be developed. Resources, including case studies, will be organized and placed into the eRepository. Opportunities to disseminate information about informatics and information technology competency, including events/conferences which non-informatics faculty and faculty educators attend, or inclusion in journals that faculty or educators read, will occur. Creative dissemination tools will be developed (examples: blogs, Twitter posts, LinkedIn).

As a result of close collaboration and to improve efficiency, the **Knowledge Modeling Workgroup** and the **Encoding and Modeling Workgroup** are merging to become the **Modeling and Encoding Workgroup**. The merged workgroup

will continue their collaboration with LOINC Nursing Subcommittee and SNOMED-CT Nursing Clinical Reference Group, FHIR (Fast Healthcare Interoperability Resources) references and individuals involved with the FHIR work. They will keep using FLOMAP and will further learn about mapping to standardized terminologies and about FHIR in order to further refine the modeling and coding processes. Additionally, they use the Unified Medical Language System Metathesaurus (UMLS) from the National Library of Medicine (NLM), the Systematized Nomenclature of Medicine — Clinical Terms (SNOMED-CT), Logical Observation Identifiers Names, and Codes (LOINC) browsers. In the upcoming year, the merged workgroup will work to clarify the structure and functions of the new KMEW; revise and update the Pain Information Model; revise and update the Nursing Physiologic Assessment (head-to-toe); analyze and encode the Fall Risk Knowledge Model; and complete the VTE Knowledge Model (survey and publication, at minimum). The workgroup will map knowledge models to standardized terminologies and implement in EHRs, and will use social media more effectively to disseminate information about how to implement knowledge models, the benefits of doing so, and to find better ways to partner with vendors on implementation and data exchange pilots. The pilot will use the Pain Information Model, will include FHIR, and show how to better prepare content in the models to accommodate FHIR profiles/resources.

The **Mobile Health for Nursing Workgroup** will continue to use evidence from the literature, proceedings from conference presentations and posters, and interviews from industry to guide their work to make recommendations for nurses that align with the *Future of Nursing* report. They will work with the **Education Workgroup** to inform AACN Essentials and content that aligns with the

Essentials. A roadmap in the form of a white paper that outlines ways to promote the necessary core informatics competencies in undergraduate and graduate education will be created.

The **Nursing Value Workgroup** is exploring access to large datasets in support of AI driven initiatives in nursing. The workgroup will merge with the **Context of Care Workgroup** due to common topics and strategies of interest. They will collaborate with the **Modeling and Encoding Workgroup** to develop a Nursing Value Workgroup data dictionary and build evidence of nurse caring activities/interventions/behaviors in the EHR. The workgroup seeks congruence with the *Future of Nursing* report. Beyond the NKBDS Initiative's strategic goals, the workgroup will define interventions congruent with the value of nursing related to use cases on oral care and reduction of pneumonia. The workgroup will explore the context of nursing care/value in multiple settings: inpatient, outpatient, behavioral health, and residential sites.

The **Policy and Advocacy Workgroup** has targeted outreach to nursing organizations about the UNI for more awareness/adoption and vendor involvement in an effort to take adoption and implementation to the next level including a dedicated data field(s) in the EHR. In the first year of the UNI 5-year key goal under the strategic plan, awareness was met, and the outcome metric will be to measure (document number of event attendees, depth of reach). The workgroup will expand the UNI information from HCA and author a whitepaper with a case study and technical guide for hospital systems and vendors (will also meet UNI Year 5 outcomes) on the UNI implementation. The workgroup is building a survey to gather information about each POC underway, including a UNI research model used at Vanderbilt University. Questions will address scope, value, implementation steps,

challenges and lessons learned. The workgroup has additional activities, including the Policy and Advocacy Toolkit. The first step will be creating a sub-group to develop a Policy Roadmap. The workgroup will add all its presentations and assets to the eRepository and will continue the outreach to other workgroups for help with advocacy as interested. The **Transforming Documentation Workgroup** is planning to develop a workplan that aligns with the policy roadmap and includes plans to expand partnership development, including with American Nursing Association (ANA), The Joint Commission, American Organization Nursing Leadership (AONL), American Medical Informatics Association (AMIA), American Nursing Informatics Association (ANIA), Health Level Seven (HL7), Healthcare Information and Management Systems Society (HIMSS), and Center for Medicare & Medicaid Services (CMS).

As the workgroups plan their activities and actions for the upcoming year, common themes are apparent. The merging or the cross-collaboration between groups illustrates the unified approach to addressing common problems and how workgroups are restructuring themselves to facilitate and speed this process. Collaborations fill the gaps between workgroups and more consistent results are achieved. With this intense collaboration, it is expected that some plans will move faster and more efficiently.

GAPS, CHALLENGES AND OPPORTUNITIES FOR IMPROVEMENT



The workgroups have realized outstanding achievements and accomplished important goals over the last year. And they wish to accomplish more. The desire for more collaboration between workgroups has been challenging to achieve. The steering committee continuously seeks solutions to improve workgroup communication and collaborations. For example, the **Care Coordination Workgroup** sees the need to work closely with the **Transforming Documentation Workgroup** regarding the care coordination activities both are developing. The **Context of Care Workgroup** sees the possibility of merging with the **Nursing Value Workgroup** to consolidate work on nursing quality metrics related to documentation and patient outcomes. The **Mobile Health for Nursing Workgroup** sees the need to finish the scoping review and address engagement with other workgroups to help promote and disseminate information from the work they have been developing, specifically the need for standards, guidelines and nurse involvement in mHealth development.

Several workgroups report the need to continue to build additional collaborations outside the NKBDS Initiative to move their work forward. Examples include reproducing models (proof-of-concept and/or analytics) across sites. A similar direction is being considered by the newly formed **Modeling and Encoding Workgroup**, which is planning to encourage implementation of knowledge models to determine how they shape nursing decision-making and patient outcomes. This will require working closely with vendors to implement the models into EHRs, perhaps as a proof of concept. To support this work, additional education for members, with a focus on FHIR and how data mappings will align with FHIR resources, are needed. Products as a result of these efforts would help to support interoperable systems.

In order to engage more stakeholders with the work of the initiative, workgroups will increase the number of presentations of their products and achievements at national conferences and venues, such as the AMIA Annual Symposium 2022, ANIA, HIMSS, and others. There is a common goal of ensuring that materials highlight how informatics and information technology support the care and outcomes of individuals, families, communities, and populations, a goal in alignment with the initiative vision and mission.

Workgroups have great interest in engaging student volunteers to help with dissemination plans, basic operations, entering materials into the eRepository, helping with literature reviews, mapping, and evaluating and implementing models. The steering committee is considering developing a mentorship pathway with project matching between mentors and mentees.

WORKGROUP MEMBERS

Care Coordination

Mari Akre
Linda Dietrich
Carol Geary
Diane Hanson
Sharon Hewner
Mary Hook
Laura Heermann Langford
Jeff Morse
Denise Nelson
Lana Pasek
Lori Popejoy
Suzanne Sullivan

Context of Care

Laura Block
Amber Oliver
Lana Pasek
Heather Shirk
Cheryl Wagner

Data Science & Clinical Analytics

Bonnie Adrian
Brady Alasker
Susan Alexander
Samar Ali
Bader Alreshidi
Angela Badillo
Sophia Brown
Cynthia Coviak
Chris Cruz
Fabio D'Agostino
Robert Davila
Brian Douthit
Aissa Feldmann
Thomas Hollingsworth Forbes, III
Grace Gao
Lovely Geevarghese
Cindy Golubisky
Dwayne Hoelscher
Marty Illies
Alvin Jeffery
Ming Ji
Steve Johnson
Terri Kapetanovic
Mikyoung Lee
Heidi L. Lindroth
Gregg T. Maloy
Margaret Mullen-Fortino
Aline Nomura
Michael O'Malley

Jung In Park
Suhyun Park
Jana Pownell
Lisiane Pruinelli
Anita Reger
Jethrone Role
Mary Anne Schultz
Tess Settergren
Marisa Sileo
Maxim Topaz
Pankaj Vyas
Ann Wieben
Dana Womack
Regina Wysocki

Determinants of Health

Noriko Abe
Tucker Annis
Robin R. Austin
Carly Beck
Sue Bell
Dana Bensingier
Heidi Berg
Christina Biovana-Tellez
Laura Block
Kathy Bobay
Joyce Brettner
Christine Broaddus
Terry Bryant
Robert Davila
Sarah DeSilvey
Linda Dietrich
Nancy Dutton
Aissa Feldmann
Catherine Ferris
Amy Garcia
Mina Ghale
Cindy Golubisky
Ramya Govindarajan
Nicholas Guenzel
Coleen Hart
Laura Heermann
Sharon Hewner
Jeana Marie Holt
Mary Hook
Susan C. Hull
Ratachada Jantraporn
Madeleine Kerr
Rebecca Kohler
Brenda Kulhanek
Dorcas Kunkel
Malin Lalich
Karen Lane

Regan Luken
Christie Martin
Erin D. Maughan
Donna Mayo
Kathleen McGrow
Karen A. Monsen
Lisa Moon
Ethan Mooney
Laura Munro
Susan Nokleby
Theresa Noonan
Anne O'Brien
Amber Olson
Dawn Petroskas
Marti Rheault
Heather Shirk
Angela Smith
Joanne Thompson
Vicky Tiase
Cyndalynn Tilley
Gwen Verchota
Prudence Vincent
Ruth Wetta
Maurice Whipple
Marisa Wilson

Education

Deb Adams
Chito Belchez
Connie Bishop
Christina Bivona-Tellez
Joyce Brettener
Julian Brixey
Jane Carrington
Heather Carter-Templeton
Cathy Fant
Kathy Johnson
Dorcas Kunkel
Erin Langmead
Susan Newbold
Carren Ondara
Barb Pinekestein
Jana Pownell
Mary Jane Rivard
Denise Sandell
Marisa L. Tietze
Donni Toth
Marie Vanderkooi
Gwen Verchota
Cheryl Wagner
Ann Weiben
Marisa L. Wilson

WORKGROUP MEMBERS

Modeling and Encoding

Mischa Adams
Mari Akre
Samira Ali
Lisa Anderson
Rivka Atadja
Rachel Buchleiter
Roberta Cardiff
Kathy Dudding
Jodi Erpelding
Chad Fairfield
Jacquelyn M. Finley
Meg Furukawa
Brenda Goodman
Stephanie Hartleben
Maria Hendrickson
Sherri Hess
Mary Hook
Luke Jobman
Steve Johnson
Malin Britt Lalich
Mikyoung Lee
John Lussier
Kay S. Lytle
Susan Matney
Tess Settergren
Christine Spisla
Darinda Sutton
Rachel Tharp
Cyndalynn Tilley
Catherine Turner
Carisa Voightman
Bonnie L. Westra
Luann Whittenburg
Marisa Wilson
Randy Woodward
Joe Zillmer

Mobile Health for Nursing

Natalya Alekhina
Caitlin Bakker
Melissa C. S. Breth
Grace Gao
Lisa Janeway
Catharine Karow
Mikyoung Lee
Christie Martin
Young-Shin Park
Ron Ramirez
Vicky Tiase
Tami H. Wyatt

Nursing Value

Alicemary Adams
Whende Carroll
Kenrick Cato
Fabio D'Agostino
John Deckro
Patricia Dunlap
Julia Focht
Amy Garcia
Sandy Grimm
Karen Hampton
Justine Hanrahan
Robert Harrity
Andrew Hehr
Catherine Ivory
Dorcas Kunkel
Katy Lemke
Karen Lopez
Martin Michalowski
Laura Mickelson
Amber Olson
Suhyun Park
Belle Pearson
Jana Pownell
Lisiane Pruinelli
Cathy Schwartz
Heather Shirk
Liz Sloss
Elizabeth Swanson
Joanne Thompson
Joe Zillmer

Policy and Advocacy

Kelly Aldrich
Susan Alexander
Marianne Baernholdt
Nancy Beale
Dana Bensinger
Whende Carroll
Brenda Kulhanek
Karen Dunn Lopez
Judy Murphy
Roberta Pawlak
Nur Rajwany
Joyce Sensmeier

Transforming Documentation

Cheryl Abbott
Mischa Adams
Bonnie Adrian
Jessica Alexander
Michele Berg
Constance Berner
David Boyd
Sophia Brown
Robert Campbell
Sandy Cho
Avaletta Davis
Jane Englebright
Ben Galatzan
Susan Grossman
Cheryl Hager
Anna Halvorson
Diane Hanson
Stephanie Hartleben
Laura Heermann
Mary Hook
Erin Langmead
Toni Laracuente
Angelo LaRocco
Timothy Le
Kay Lytle
Michelle Martins
Samantha McCullough
Scott Melita
Jennifer Messel
Sarah Michel
Yvonne Mugford
Ann O'Brien
Natalie Peleg
Toni Phillips
Michelle Pogatchnik
Falissa Prout
Laura Ross
Patty Sengstack
Theresa (Tess) Settergren
Gregg Springan
Kari Straub
Gillian Strudwick
Camille Summers
Johnston Thayer

WORKGROUP PRESENTATIONS/ PUBLICATIONS/PRODUCTS

Data Science and Clinical Analytics

Douthit BJ, Walden RL, Cato K, Coviak CP, Cruz C, D'Agostino F, Forbes T, Gao G, Kapetanovic TA, Lee MA, Pruinelli L, Schultz MA, Wieben A, Jeffery AD. Data Science Trends Relevant to Nursing Practice: A Rapid Review of the 2020 Literature. *Applied clinical informatics*. 2022 Jan;13(01):161-79.

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LOINC Standardized Assessment Scale Heuristics

LOINC Standardized Assessment Scale

Augmented Submission Tool

Alleviating & Exacerbating Factors value sets
Heuristics

Mobile Health for Nursing

Podium presentation at HIMSS21 Nursing Informatics Symposium Pre-Conference, August 9, Las Vegas: Nurse Informaticists: Bringing value throughout the product life cycle of mHealth Apps

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Policy and Advocacy

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HIMSS 2021 Nursing Informatics Symposium Presentation: Understanding the Vital Role of a Unique Nurse Identifier

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Tennessee HIMSS 2022 presentation

ANA American Nurse: The fingerprint of nursing:
What a unique nurse identifier means for our
future.

ANIA 2022 Poster: Developing a Model and
Feasibility Study to Identify and Document
Research and

Evidence-based Practice Opportunities with the
Unique Nurse Identifier

HIMSS 2022 Nursing Informatics Symposium
poster: Integration of the NCSBN ID into
Academic Workflows

A Unique Nurse Identifier. Book 4, Chapter
14 - Nursing in an Integrated Digital World
that Supports People, Systems, and the
Planet, in Nursing and Informatics for the 21st
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USCDI v2.0 comments

USCDI v3.0 comments

Transforming Documentation

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Symposium to Reduce Documentation Burden on
US Clinicians by 75%, Virtual, January 29, 2021

B. Varela, L. Wagner, L. Bell, D. Boyd, DNP,
Balancing Documentation Efficiency with the
Need for Discrete Data, Epic User Group Meeting
(UGM), Verona, Wisconsin, August 22, 2022

UNIVERSITY OF MINNESOTA
SCHOOL OF NURSING

5-140 Weaver Densford Hall
308 Harvard Street S.E.
Minneapolis, MN 55455
www.nursing.umn.edu

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