**Supplemental Table 1**

**Symptom Science Model 2.0 Concept Development and Revision Methods**

Research Question Concept Development and SSM 2.0 Revision Methods and Timeline

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| Q1: What are the illness symptom theories and models being applied in acute and chronic illness in nursing research?  | NIH Library Service and NIH Librarian: <https://www.nih.library.nih.gov/services/literature-search>Service Requested: Literature Search (also referred to as narrative literature search)Literature Search Dates: October-November 2019Databases used: CINHAL, Embase, PsychInfo, Scopus, Web of ScienceTimeline: Jan 1, 2009-Nov 1, 2019Keywords: nursing models; nursing theory and philosophy; nursing research; symptom clusters; symptom models; nursing methodology; symptom science and symptom management, self-management, and precision health nursing theory* Inclusion criteria: acute and chronic illnesses, organ system involvement (e.g., psychiatric, diabetes, renal, cardiac, neuro), lifespan (e.g., pediatric, older adult), and health setting (e.g., community health, public health, population health); English language; quantitative and qualitative research, mixed methods that supported development of preliminary or mature nursing symptom science theories, frameworks and conceptual models for use in nursing research, systematic reviews. Current use of NIH SSM was emphasized.
* Exclusion criteria: non-English language; case reports; smaller nursing research study findings with limited applicability (i.e. small sample size, or singular phenomenology findings, etc.); non-nursing symptom science models were considered only if they substantiated a significant aspect of nursing illness symptom science theoretical model development.
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| Q2: What concept areas are needed to derive a more inclusive model of scientific inquiry for nursing symptom science research so it can be broadly applied to the healthcare system as a whole? | We identified a preliminary list of keywords for concepts and literature search terms from Symptom Science priority areas presented during the September 17-18, 2019 meeting of the NINR National Advisory Council for Nursing Research (NACNR), (see Research Question 3).October-November 2019:Stakeholder meetings to confirm new concept options and refine final selections based on subsequent literature searches. Approval was received to move forward with the design of the revised SSM 2.0.Additional databases used: PubMed, Google ScholarTimeline: January 1, 2015-November 1, 2019 plus additional COVID-19 SDOH and AI updatesKeywords: social determinants of health (SDOH); machine learning and artificial intelligence (AI); health systems (and health systems integration); policy and population health; patient-centered experience (and Patient Reported Outcomes), (e.g., Institute of Medicine of the National Academies; National Academies of Sciences, Engineering, and Medicine; National Advisory Council on Nurse Education and Practice; World Health Organization; United Nations).* Inclusion criteria: seminal quantitative research (i.e. randomized controlled trials, meta-analyses, systematic reviews); non-profit foundation reports, congressional research reports, government agency reports, and thought leader statements to inform state-of-science health system applications, population health translation methods needed for broader-scale symptom science applications. Included older reports (i.e. World Health Organization) if they were seminal population planning infrastructure; editorials, reviews and critiques of current NIH SSM;
* Exclusion criteria: non-English language, animal studies, case reports.

November-December 2019:Concept Development Finalization and Draft Assembly of SSM 2.0* Selection and approval of 3 new concepts: SDOH, Patient Centered Health; Policy and Population Health;
* “Biomarker Discovery” concept revised to “Biobehavioral Factors”;
* Preliminary sketch of 3 new concepts and 1 revised concept into a final SSM 2.0 visual representation;
* Approval of scientific stakeholders to move sketch forward for formal development by the NIH Medical Arts Branch (MAB).
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| Q3: What are the research methods, designs, and approaches that can be used, and should be used, to organize conceptual model elements to inform a more inclusive version of the SSM 2.0?  | September 17-18, 2019 Meeting of the NINR National Advisory Council for Nursing Research:* <https://www.ninr.nih.gov/aboutninr/nacnr>
* 1/3 of NACNR members appointed by the DHHS Secretary include experts in public policy, law, health policy, economics, and management;
* “NINR-Led Symptom Science Center as an NIH Resource”: Deputy Director, NIH Intramural Program (Patient Reported Outcomes [PROs]; to support broader NIH Intramural program to accelerate advances in information technology, psychometrics and the design of qualitative, cognitive, and health survey research to meet long-term goals of delivery of personalized medicine);
* “NINR Funded Extramural Symptom Science Advances”: social roles and SDOH factors; patient-centered interventions; evidence-based practice; in home, and hospital, health system settings, and community settings;
* “NINR Methodology Training Opportunities”: digital health data, smart technologies; *All of Us* Initiative;
* “NINR Intramural Research Program”: NINR Deputy Scientific Director, overview of currently utilized NIH SSM;
* “NINR Led-Symptom Science Center (SSC): A Precision-Based Health Initiative”; Dr. Leorey Saligan, Acting Chief, Symptom Science Center (quality of life; personalized subjective symptom experiences of patients; expanded collaborators and scientific reach; additional NIH Institutes and Centers; Robert Wood Johnson Foundation; commitment to increased training of diverse scientific workforce of nurse scientists at all levels; building capacity of additional and diverse research approaches to improve scientific rigor of the SSC portfolio);
* NINR, NINDS and Stroke Symptom Science Collaborations;
* Selected NINR Postdoctoral Fellow Symptom Science Presentations;
* Panel Discussion and NACNR Council Review Feedback highlighting need for: SDOHs; vulnerable and marginalized populations especially American Indians and Alaska Natives; and collaborative sharing of additional resources and inter-disciplinary knowledge to support this.

NIH Medical Arts Branch (MAB):<https://www.ors.od.nih.gov/mab/Pages/default.aspx>* Iterative consults with a graphic design medical artist to develop a visually appealing form of the SSM 2.0 Figure for brand marketing to the broader nursing and scientific communities.

December 2019-March 2020: Stakeholder Review and Critical Feedback of SSM 2.0Extramural Nursing Scientific Review:* Distinguished Professor Emerita, Indiana University School of Nursing;
* Senior Associate Dean for Research and Innovation, Professor & Edith Folsum Honeycutt Endowed Chair, Emory University Nell Hodgson Woodruff School of Nursing; Council Member, NINR National Advisory Council for Nursing Research (NACNR); President, Asian American/Pacific Islander Nurses Association (AAPINA).

NIH Scientific and Policy Expert Review:* Deputy Chief, Neuro-Oncology Branch, Senior Investigator, National Cancer Institute;
* Deputy Scientific Director, NINR;
* Chief, NINR Office of Science Policy and Legislation;
* Health Science and Policy Analyst, NINR Office of Science Policy and Legislation.
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