The Symptom Science Model: A Shared Mental Model to Advance the Next Generation of Knowledge in the Emergency Nursing Specialty

Jessica Castner, PhD, RN, CEN, AE-C, FAEN, FAAN

Reciting a pledge is a common, inspiring, international right of passage for nurses in graduation ceremonies. One of these pledges, commonly referred to as the International Council of Nurses' Pledge, includes the following line: "I will endeavor to keep my professional knowledge and skills at the highest level."[1] All of us engaged in the *Journal of Emergency Nursing (JEN)* are committed to providing resources and information so that we, as the emergency nursing specialty, fulfill this promise every day.

One of the hallmark skills of emergency nursing is rapidly detecting clinical priority, urgency, and risk based on presenting patient symptom clusters. Emergency nurses are uniquely expert at rapid symptom-based identification of life-threatening morbidity under conditions of diagnostic uncertainty. Patients rarely present with a single symptom alone. Expert nurses synthesize information on the copresentation of other symptoms and symptom clusters with objective assessment findings, patient history, and demographic (eg, age and gender) risk profiles. For example, shortness of breath is one of the most common reasons that patients seek emergency care.[2] From the initial report of shortness of breath, the triage clinican rapidly distinguishes the symptoms of potentially life-threatening cardiopulmonary pathophysiology from less acute conditions such as stable, viral respiratory infections or indicators of emotional anxiety.

Shared mental models are critical to excellent teamwork and collaboration to advance the knowledge that defines the emergency nursing specialty.[3,4] This editorial presents a brief overview of the National Institutes of Health, National Institute of Nursing Research's Symptom Science Model (NIH-SSM) as a shared mental model for emergency nursing scholarship. The NIH-SSM resonates with the knowledge and innovation required to advance practice in emergency nursing. The NIH-SSM also begins with a complex symptom or symptom cluster (Figure).[5] In this issue of *JEN*, the study by Mirzaei and colleagues[6] exemplifies an important emergency care research application of the NIH-SSM. The authors investigated differences in symptom quality on presentation between men and women to further identify rule-in and rule-out acute coronary sydrome (ACS). Foley[7] provides our journal readers with research to practice translation of the findings, with a crucial reminder for emergency clinicians to remain vigilant for possible ACS in women who present with low-intensity chest pain and pressure symptoms. The speciality will benefit from ongoing research, practice, education, and policy efforts to address the clinical meaning of complex symptom clusters throughout the emergency care process.

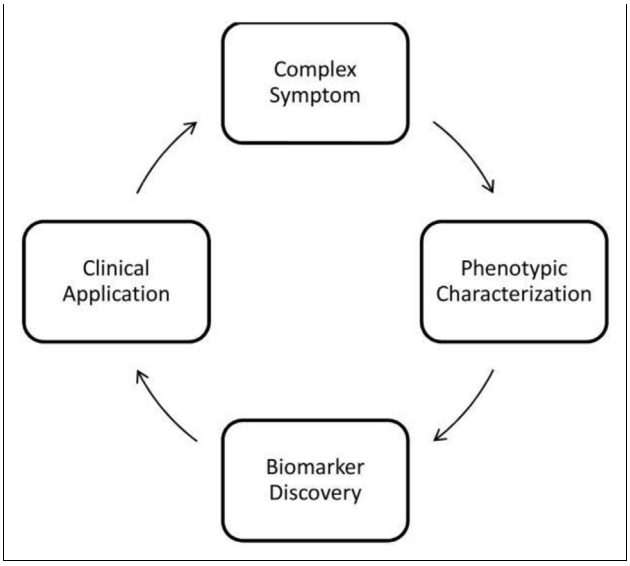
The second concept in the NIH-SSM model is phenotype, which is another label for subtype category based on the observable characteristics of an individual. The complex symptom or symptom cluster is used in combination with observable clinical and biological information to categorize a patient phenotype or diagnostic subtype. Diagnostic tests, such as the 12-lead electrocardiogram, are essential for sorting patients with complex chest-related symptoms and symptom clusters into non-ACS, unstable angina, ST-elevation mycardial infarction (STEMI), and non-STEMI phenotypes.[8] Risk assessment tools are a common intervention to predict patient

Jessica Castner, *Member, Western New York ENA Chapter,* is Editor-in-Chief of *Journal of Emergency Nursing.*

For correspondence, write: Jessica Castner, PhD, RN, CEN, AE-C, FAEN, FAAN; E-mail: jcastner@castnerincorp.com.

J Emerg Nurs 2019;45:349-51.
0099-1767

https://doi.org/10.1016/j.jen.2019.05.008



FIGURE

National Institutes of Health Symptom Science Model.[5] (Reproduced with permission from Cashion AK, Grady PA. The National Institutes of Health/National Institutes of Nursing Research Intramural Research Program and the development of the NIH Symptom Science Model. *Nurs Outlook*. 2015;63(4):484-487. https://doi.org/10.1016/j.outlook.2015.03.001.)

subtype, or phenotype, and facilitate precision emergency care. Examples of risk assessment tools published in *JEN* include the Emergency Severity Index triage algorithm[9] and the MEDFRAT falls risk assessment tool.[10]

Biomarker discovery is the third concept of the NIH-SSM. Today, serial troponin biomarker results are a fundamental part of ruling out a myocardial infarction, just as the complete blood cell count can point to anemia as the cause of complex patient symptoms. The accuracy and certainty of clinical assessments are strengthened by objective physiologic measures and biomarker information. What part of emergency practice do you think could be improved or accelerated with new or enhanced biomarker diagnostic tests? What uncertainties or patient suffering do clinicians witness every day that could be alleviated with the next generation of biomarker tests? While there is a great deal of interdisciplinary research that will define this next generation of emergency practice, it is exciting to see nurse scientists on the forefront of scientific discovery. Examples include the nurse-led emerging research on blood laboratory tau, glial fibrillary acidic protein, and neurofilament light chain as potential emergency care predictors of mild traumatic brain injury.[11] In other research, early evidence on cell-free DNA levels in the blood of patients presenting to the emergency department with acute neurologic deficits may provide the diagnostic biomarker to differentiate between acute ischemic stroke and other etiologies.[12] With ongoing research replication and validation, some of these biomarkers may become the gold standard of the future of emergency care.

Biomarkers can strengthen the research design of both projects based on the NIH-SSM, as well as projects based on other frameworks. In this issue of *JEN*, Farra and colleagues[13] utilize existing biomarkers in the Anxiety and Stress in Live Disaster Exercise study. One strength of this study was how the authors incorporated biomarkers as an objective measure of stress, which provides additional insights to self-report alone, just as practice is strengthened by using laboratory tests and biomarkers. Similarly, we can deepen understanding of traditionally subjective measures, such as psychosocial stress or symptom reports, with the measurment of an associated biomarker.

Clinical application is the fourth concept in the NIH-SSM. *JEN* continues to highlight clinical innovations in emergency care. Research and practice improvement focused on clinical application innovations appear in every issue of *JEN*. Examples include new interventions for blood culture specimen collection,[14] Telehealth Express Care Service,[15] and creating a sensory friendly pediatric emergency department.[16] Development and initial feasibilty tests for interventions are an important contribution to the next generation of emergency nursing practice and solve persistant problems that our readers experience in practice, research, and education settings every day. Ongoing opportunities to enhance the confidence in the results we publish rely on continued collaboration within the emergency nursing specialty, and with our interdisciplinary colleages, to advance the rigor of the research and practice improvement designs.

The overall purpose of the NIH-SSM framework includes defining the unique contribution of nurse-led scientific innovation to improve patient care through the development of novel clinical interventions. The framework resonates with the work of, and innovations in, emergency nursing practice. Using the NIH-SSM as one of our shared mental models in the speciality, upon which to base our ongoing research and quality improvement projects, promises to advance the speciality's body of knowledge. Our inspiring pledge and shared commitment to maintain our collective professional knowledge and skills at the highest level depends on continued advancement of the research and performance improvement discoveries that will define the next generation of emergency care. We have several examples of publications tied to each of the individual concepts in the NIH-SSM and look forward to opportunities to publish research that cohesively ties together work addressing complex symptoms, phenotype characterization, biomarker discovery, and clinical applications in emergency care.

REFERENCES

1. University of Calgary Faculty of Nursing. International Council of Nurses' Pledge. https://nursing.ucalgary.ca/alumni/pinning-ceremony/pledge. Accessed May 23, 2019.
2. National Center for Health Statistics, Centers for Disease Control and Prevention. National hospital ambulatory medical care survey: 2016 emergency department summary tables. https://www.cdc.gov/nchs/data/nhamcs/web_tables/2016_ed_web_tables.pdf. Accessed May 23, 2019.
3. Castner J. Validity and reliability of the brief TeamSTEPPS teamwork perceptions questionnaire. *J Nurs Measure*. 2012;20(3):186-198.
4. Obenrader C, Broome ME, Yap TL, Jamison F. Changing team member perceptions by implementing TeamSTEPPS in an emergency department. *J Emerg Nurs*. 2019;45(1):31-37. https://doi.org/10.1016/j.jen.2018.08.006.
5. Cashion AK, Grady PA. The National Institutes of Health/National Institutes of Nursing Research Intramural Research Program and the development of the NIH Symptom Science Model. *Nurs Outlook*. 2015;63(4):484-487. https://doi.org/10.1016/j.outlook.2015.03.001.
6. Mirzaei S, Steffen A, Vuckovic K, et al. The quality of symptoms in women and men presenting to the emergency department with suspected acute coronary syndrome. *J Emerg Nurs*. 2019;45(3):357-365. https://doi.org/10.1016/j.jen.2019.01.001.
7. Foley A. Not just chest pain: presenting symptoms of acute coronary syndrome by gender. A research to practice summary. *J Emerg Nurs*. 2019;45(3):462-464.
8. Faramand Z, Frisch SO, DeSantis A, et al. Lack of significant coronary history and ECG misinterpretation are the strongest predictors of undertriage in prehospital chest pain. *J Emerg Nurs*. 2019;45(2):161-168. https://doi.org/10.1016/j.jen.2018.10.007.
9. Fernandes CM, Tanabe P, Gilboy N, et al. Five-level triage: a report from the ACEP/ENA Five-level Triage Task Force. *J Emerg Nurs*. 2005;31(1):39-50.
10. Scott RA, Oman KS, Flarity K, Comer JL. Above, beyond, and over the side rails: evaluating the new Memorial Emergency Department Fall–Risk-Assessment Tool. *J Emerg Nurs*. 2018;44(5):483-490. https://doi.org/10.1016/j.jen.2018.01.007.
11. Gill J, Latour L, Diaz-Arrastia R, et al. Glial fibrillary acidic protein elevations relate to neuroimaging abnormalities after mild TBI. *Neurology*. 2018;91(15):e1385-e1389. https://doi.org/10.1212/WNL.0000000000006321.
12. O'Connell GC, Petrone AB, Tennant CS, et al. Circulating extracellular DNA levels are acutely elevated in ischaemic stroke and associated with innate immune system activation. *Brain Inj*. 2017;31(10):1369-1375. https://doi.org/10.1080/02699052.2017.1312018.
13. Farra SL, Smith SJ. Anxiety and stress in live disaster exercises. *J Emerg Nurs*. 2019;45(3):366-373. https://doi.org/10.1016/j.jen.2019.01.012.
14. Bell M, Bogar C, Plante J, Rasmussen K, Winters S. Effectiveness of a novel specimen collection system in reducing blood culture contamination rates. *J Emerg Nurs*. 2018;44(6):570-575. https://doi.org/10.1016/j.jen.2018.03.007.
15. McHugh C, Krinsky R, Sharma R. Innovations in emergency nursing: transforming emergency care through a novel nurse-driven ED telehealth Express Care Service. *J Emerg Nurs*. 2018;44(5):472-477. https://doi.org/10.1016/j.jen.2018.03.001.
16. Wood EB, Halverson A, Harrison G, Rosenkranz A. Creating a sensory-friendly pediatric emergency department. *J Emerg Nurs*. 2019;45(3):415-424. https://doi.org/10.1016/j.jen.2018.12.002.