Published in final edited form as:

Int J Nurs Knowl. 2014 June ; 25(2): 68–69. doi:10.1111/2047-3095.12039.

Integration of NNN into EHRs: How are we doing?

Gail M. Keenan, PhD, RN, FAAN and Diana J. Wilkie, PhD, RN, FAAN

This special edition of IJNK, includes six articles published in the last 20 years that provide a snap shot of efforts to integrate one or more of the standardized terminologies, NANDA-I, NOC, NIC (NNN), into electronic health records (EHRs). The selection was intentional and demonstrates the progress made toward the achievement of nursing's long term EHR goal: To demonstrate the impact of nursing care on patient outcomes through the analysis of interoperable nursing data gathered in EHRs. The first four articles, written between 1993 and 2000, provide a glimpse of initial steps and strategies. The final two, published respectively in 2009 and 2012, indicate a major shift from the earlier strategies and provide examples of the full integration and use of NNN in EHRs.

In the first article, Harvey (1993) reported a successful pilot study in which a neural network (Art-2 NN) was applied to identify patterns of defining characteristics that aided the correct selection of five related nursing diagnoses. Written questionnaires, containing consistently labeled defining characteristics, were used to gather the data rather than actual documentation or EHR data. In the second, Coenen et al (1995) determined the prevalence of nursing interventions for six nursing diagnoses using data from the nursing information system (NIS) from one public hospital. The extracted data included NANDA diagnoses labels and the locally developed labels for related factors and nursing interventions. The third study by Moorhead and Delaney (1997) focused on describing and applying a set of rules they developed for manually mapping non-standardized nursing interventions to the standardized terms in the Nursing Intervention Classification terms using clinical data from one hospital. In the fourth study, Delaney et al (2000) examined the electronic documentation of 30 patients to assess the frequency with which a specified subset of defining characteristics and related factors were noted for patients assigned the NANDA diagnosis, Impaired Physical Mobility. Collectively these four studies provided preliminary evidence of the potential feasibility and utility of integrating NANDA and NIC into EHRs. Additional studies, however, would be needed to validate the generalizability of the results found in these small convenience samples. Moreover, yet to be considered was how NNN could be integrated into EHRs in ways that would produce standardized data for examining the impact of nursing care on patient outcomes.

Jumping forward to the two final studies published more than a decade later, we see examples of NNN being implemented into EHRs and clear evidence of the feasibility and utility of incorporating NNN into EHRs. In a case study, Klehr et al (2009) provided descriptions of the integration of NNN into a single organization's EHR, the training plan, go live, and post evaluation of compliance and satisfaction. The study is an excellent example of how NNNs are typically being integrated into EHRs today. Each organization designs and tailors the integration to meet its own needs. While successful on a number of levels, the practice of tailoring is extraordinarily costly for two major reasons 1) the data,

though coded with NNN by each organization, are not comparable and thus cannot be readily pooled to establish best practices and cross institutional benchmarks; and 2) updating and maintenance cannot be shared and instead must be addressed separately by each organization.

In the final article by Keenan et al (2012), the authors report the successful results of an AHRQ and NIH funded multi-site intervention study (24 months) of a web deployed standardized electronic plan of care system (HANDS) containing NNN. The database, user interface, and software for the electronic care planning system (intervention) used in the study had been systematically developed, pilot tested in real time, and refined prior to the AHRQ study. The 2012 study involved more than 700 nurses (8 units located in 4 unique hospitals) who maintained the dynamic plans of care throughout more than 40,000 patient episodes. Most importantly, as a result of the rigor and sampling strategy (multi-site) of the Keenan et al (2012) study, the researchers were able to demonstrate the validity, reliability, generalizable feasibility, and utility of implementing a standardized electronic care planning system across diverse settings. This result provided evidence that suggests it is neither essential nor desirable for each organization to build its own NNN care planning system. Moreover, because NNN were consistently integrated across settings, standardized data were generated and are being used to benchmark and identify best practices through data mining and statistical analyses (Almasalha et al, 2013; Yao et al., 2013). This study shows that it is possible now to obtain “nursing big data” on the intellectual work of nurses.

In conclusion, these six articles provide important insights about the historical evolution of the integration of NNN into EHRs and a ready to use system that can be integrated into EHRs now. The progress has been extraordinary and would not have been possible without the solid research efforts of so many over the last three decades including the NNN developers. The future looks brilliant for realizing nursing’s EHR dream particularly if all of us take a role in pushing through the tipping point within our immediate reach. To generate standardized nursing EHR data, it will be critical to implement a system like HANDS widely. By so doing sufficient data will be generated to continuously identify and disseminate knowledge about best clinical and administrative nursing practices. Additionally, wide scale use will support the continuous improvement of the NNN terminologies and cost effective methods of updating and deploying them into a standardized electronic care planning system. Finally, robust nursing diagnostic decision support triggered by nursing assessment data has not been realized. This is because there is no standardized nursing assessment language. Noted by several of the study authors was the potential for the NANDA-I defining characteristics (DCs) and related factors (RFs) to offer a solution to this language gap. To build and refine effective diagnostic decision support with DCs and RFs, however, it will first be necessary to a) remove all redundancies in these and, b) provide a single unique code for each of the unique DCs and RFs. Fortunately this work is underway but will also move more quickly with increased support and advocacy described above.

References

- Al-Masalha F, Xu D, Keenan GM, Khokhar A, Chen J, Johnson A, Ansari R, Wilkie DJ. Data mining nursing care plans of end-of-life patients: A study to improve healthcare decision making. *International Journal of Nursing Knowledge*. 2013; 24(1):15–24. [PubMed: 23413930]
- Yao Y, Keenan G, Xu D, Khokhar A, Al-Masalha F, Dunn Lopez K, Ansari R, Wilkie DJ. Current state of pain care for hospitalized patients at end of life. *American Journal of Hospice and Palliative Medicine*. 2013; 30(2):128–136. [PubMed: 22556281]