FULL REPORT

SNOMED International

University of Nebraska Medical Center

SNOMED CT Case Studies

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Case for Investment

Case Studies

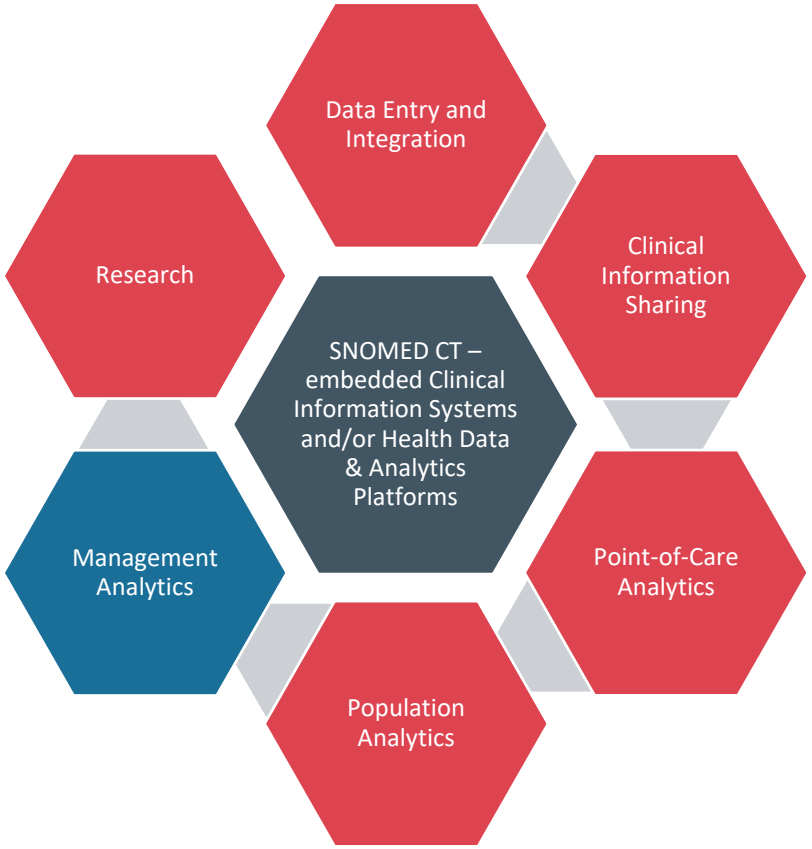
7

University of Nebraska Medical Centre

- The University of Nebraska Medical Center (UNMC) is one of four campuses of the University of Nebraska and is located in Omaha, Nebraska. UNMC has over 4,200 students in a variety of healthcare disciplines (e.g. medicine, nursing, pharmacy, dentistry, public health and allied health).
- UNMC has a clinical partnership with Nebraska Medicine which covers metro Omaha and region providing access to more than 1,000 doctors and nearly 40 specialty and primary care health centers. Two hospitals, Nebraska Medical Center and Bellevue Medical Center have more than 800 licensed beds.
- Nebraska Medicine implemented the Epic clinical information system (called One Chart), including a patient portal in 2013. The data from Epic and other sources (e.g. Biobank, Cancer Registry) are extracted and loaded into the i2b2 data warehouse and analytics platform at UNMC and then made available for clinical and translational research.
- The challenge with i2b2 is that it very difficult to render poly-hierarchical terminologies such as SNOMED CT in the platform. UNMC is collaborating with the Veterans Health Administration and their SOLOR[7] initiative to integrate the "Big Three" terminologies in the U.S. (i.e. SNOMED CT, LOINC and RxNorm) into a common ontology for use in the i2b2 platform.
- UNMC has also created SNOMED CT terminology extensions (i.e. the Nebraska Lexicon) for: genomics data sets supporting care; detailed coding of Cancer Synoptic data, thereby expanding the UNMC cancer registry; expanded SNOMED CT coverage of the organisms hierarchy that is integrated with laboratory coding for microbiology - this feature supports 13 healthcare centers across Nebraska with decision support capabilities for antimicrobial stewardship ; and extended analytics capabilities of SNOMED CT observables for laboratory medicine - this feature supports advanced querying of the laboratory database for research and quality improvement.
- UNMC and its i2b2 platform supports three streams of research:
    1. National PCORnet sponsored research – UNMC provides query response and datasets for approximately 100-125 research projects annually.
    2. National COVID Cohort Collaborative - UNMC sends data extracts for national COVID-19 research to a central research repository about 25-30 times a year, since June 2020.
    3. Nebraska Medicine – UNMC supports approximately active 25-35 investigator-initiated research projects annually.

Case Study #7

Clinical and Translational Research



University of Nebraska Medical Center

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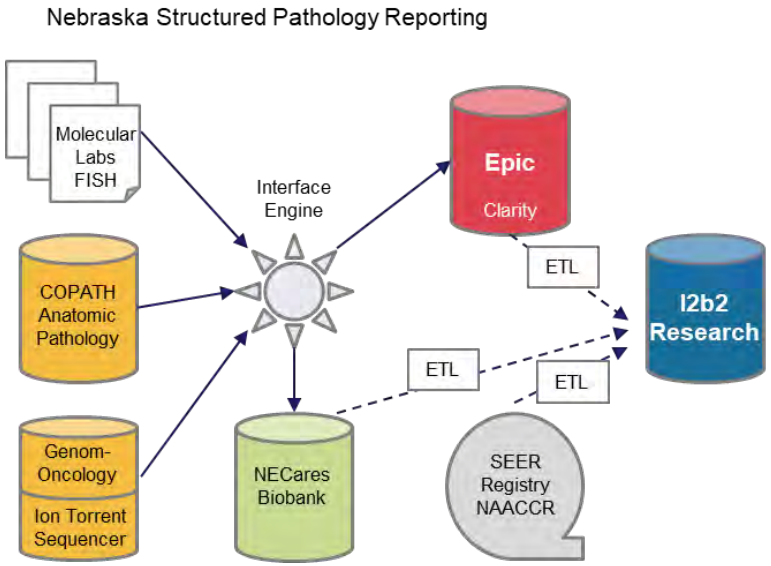
United States – University of Nebraska Medical Center, Nebraska, USA.

- Founded in 1869 and chartered as the Omaha Medical College in 1881, the college became part of the University of Nebraska in 1902. The University of Nebraska Medical Center (UNMC)[1] is now one of four campuses of the University of Nebraska and is located on Omaha, Nebraska. UNMC has over 4,200 students in a variety of healthcare disciplines (e.g. medicine, nursing, pharmacy, dentistry, public health and allied health).
- UNMC has a clinical partnership with Nebraska Medicine[2] which covers metro Omaha and region providing access to more than 1,000 doctors and nearly 40 specialty and primary care health centers. Two hospitals, Nebraska Medical Center and Bellevue Medical Center have more than 800 licensed beds. Nebraska Medical Center is regularly ranked in the top 50 Hospitals in the U.S.
- Nebraska Medicine implemented the Epic clinical information system (called One Chart), including a patient portal in 2013. Clinical data is entered directly or integrated from other sources (e.g. Sunquest COPATH Anatomic Pathology laboratory system). See the architecture example for Structured Pathology Reporting in the diagram to the right.
- The data from Epic and other sources (e.g. Biobank, Cancer Registry) are extracted and loaded into the i2b2 data warehouse and analytics platform at UNMC and then made available for clinical and translational research.



1. University of Nebraska Medical Center. See https://www.unmc.edu/
2. Nebraska Medicine. See https://www.nebraskamed.com/

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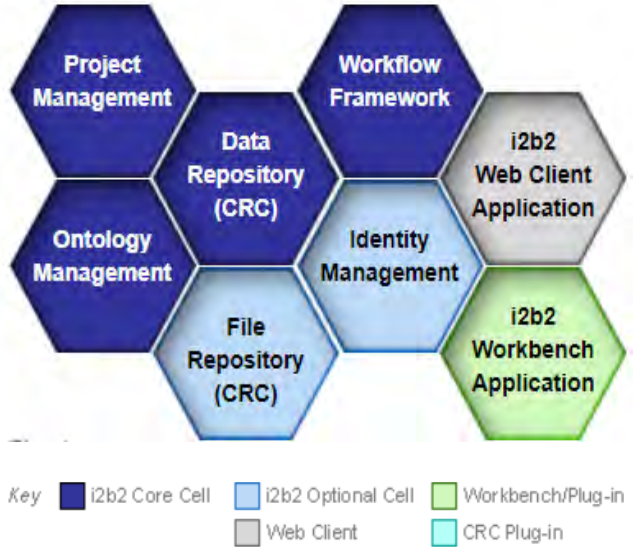
Clinical and Translational Research

United States – University of Nebraska Medical Center, Nebraska, USA.

- i2b2 (*Informatics for Integrating Biology and the Bedside*)[3] is an open-source health research data warehouse and analytics platform, originally funded by the National Institutes of Health and developed at the Harvard Medical School. It is now used at over 200 healthcare locations worldwide.
- The i2b2 data warehouse and analytics platform consists of a core cell and a number of optional plug-ins (i.e. file repository, identity management, web client application and the workbench application). Ontology management is part of the core cell and is where SNOMED CT is deployed.
- i2b2's data model is a "star-schema", but does not use a standardized data model (e.g. as with OMOP[3] and PCORnet[4]). Local implementations develop concept hierarchies (called "ontologies") that provide a window into the imported data.



- Data in i2b2 can be queried by a cohort query tool with analytics plugins. For example, the query tool is used by Nebraska Medicine investigators to rapidly assess the feasibility of a research project, as well as prototype data management strategies.

3. I2b2 Informatics for Integrating Biology & the Bedside. See https://www.i2b2.org/
4. Nebraska Medicine. See https://www.nebraskamed.com/
5. The Observational Medical Outcomes Partnership (OMOP). See https://fnih.org/what-we-do/major-completed-programs/omop
6. Patient-Centered Clinical Research Network (PCORnet). See https://pcornet.org/

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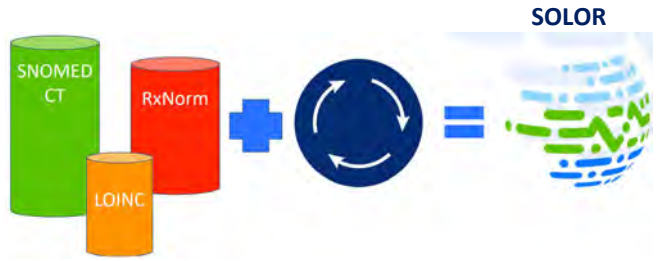
- The challenge with i2b2 is that it very difficult to render poly-hierarchical terminologies such as SNOMED CT in the platform. Each concept in a path in i2b2 metadata can only have a single parent, whereas the SNOMED CT concept model concepts can have multiple parent concepts. UNMC has had to develop a work-around so that SNOMED CT can be reliably represented as a single hierarchy and used in i2b2 for research purposes.
- UNMC has created SNOMED CT terminology extensions (i.e. the Nebraska Lexicon) for
  - genomics data sets supporting care,
  - detailed coding of Cancer Synoptic data, thereby expanding the UNMC cancer registry,
  - expanded SNOMED CT coverage of the organisms hierarchy that is integrated with laboratory coding for microbiology. This feature supports 13 healthcare centers across Nebraska with decision support capabilities for antimicrobial stewardship.
  - extended analytics capabilities of SNOMED CT observables for laboratory medicine. This feature supports advanced querying of the laboratory database for research and quality improvement.

- UNMC is collaborating with the Veterans Health Administration and their SOLOR[7] initiative to integrate the "Big Three" terminologies in the U.S. (i.e. SNOMED CT, LOINC and RxNorm) into a common ontology for use in the i2b2 platform. In addition, UNMC has invested significant resources in collaborations with the National Library of Medicine, Regenstrief Institute and SNOMED International to support the integration of these three terminologies and are a leader in this field.



7. SOLOR. See http://solor.io/

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- **Research Activities Supported** – UNMC and its i2b2 platform supports three streams of research:
  1. **National PCORnet** (see call-out box) **sponsored research** – UNMC provides query response and datasets for approximately 100-125 research projects annually. (see https://pcornet.org/)
  2. **National COVID Cohort Collaborative** - UNMC sends data extracts for national COVID-19 research to a central research repository about 25-30 times a year, since June 2020. (see https://ncats.nih.gov/n3c)
  3. **Nebraska Medicine** – UNMC supports approximately active 25-35 investigator-initiated research projects annually.

PCORnet or the *Patient-Centered Clinical Research Network* is a research "networks of networks" across the United States. It includes 8 large Clinical Research Networks, 2 Health Plan Research Networks, and a Coordinating Center. For example, UNMC is part of the Greater Plains Collaborative (GPC), one of the eight clinical research networks. GPC includes 12 leading medical centers in 8 states, for example, University of Kansas Medical Center, Allina Health, Indiana University, Intermountain Healthcare, and the University of Iowa Healthcare.

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