Big Data and Nursing Wisdom: The Key to Unlock Healthcare Innovation

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Project NeLL: Presentation Objectives

- After this presentation, you should be able to answer the following questions:

  - What is Project NeLL
  - What data/ resources are available in the NeLL suite of Applications
  - How to access and use NeLL

How did it all begin?

Students are given access to an enormous database with more than 5 million anonymous records — information on every hospital patient in the state for the preceding two years.

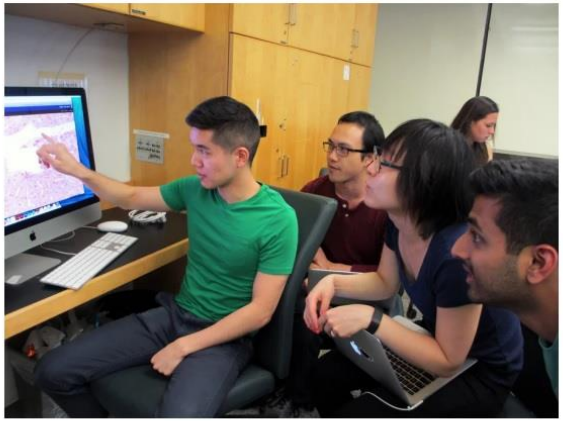
TREATMENTS

Medical Students Crunch Big Data To Spot Health Trends

October 30, 2015 · 1:24 PM ET
Heard on All Things Considered
By Julie Rovner

FROM KFF Health News

4-Minute Listen PLAYLIST Download Transcript



(Left to right) NYU medical students Brian Chao, Michael Lui, Hye Min Choi, and Varun Vijay take the team approach to learning about the anatomy of cells, and how disease can disrupt them. Analyzing big data sets is now a routine part of their

Students use analytic tools provided by the project to look at quality measures for things like heart failure, diabetes, smoking and high blood pressure, and drill down and look at the performance of the practice as a whole, and individual doctors.

Why not something like this for Nurses?

Why Nurses?

- Nurses are the largest segment of the healthcare workforce
- They spend the most time with patients
- If you can change Nursing, you can change Healthcare

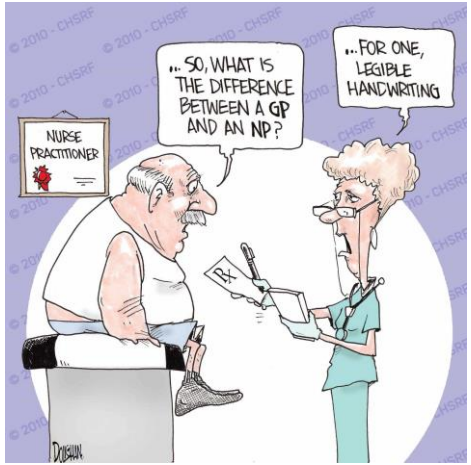
Nursing vs Medical Paradigm

MEDICAL PARADIGM

Disease Centered

Focuses on diagnosis and treatment of diseases and medical conditions

Somewhat uniform between clients presenting with similar problems



NURSING PARADIGM

Patient Centered

Focuses on a holistic approach to patient care (not only physical, but also the psychological, social, and spiritual dimensions)

Varies between individuals

Modern healthcare encourages a team-based approach that values the unique contributions of both nursing and medical professionals.

AACN New Era report recommendation

Integrate nurse researchers into developing informatics programs. Vast investment by medical schools and health systems is flowing into developing informatics programs, many of which emphasize clinical informatics. **As these programs are planned, organized, and resourced, they should incorporate the perspectives and talents of academic nursing.** Nurses trained as informaticians will be invaluable complements to developing an informatics initiative, extending to the development of graduate training programs and other resources. Achieving meaningful results with "big data" will require nursing involvement to overcome, including establishing standard data definitions, patient engagement applications, decision support, and security, to name just a few.

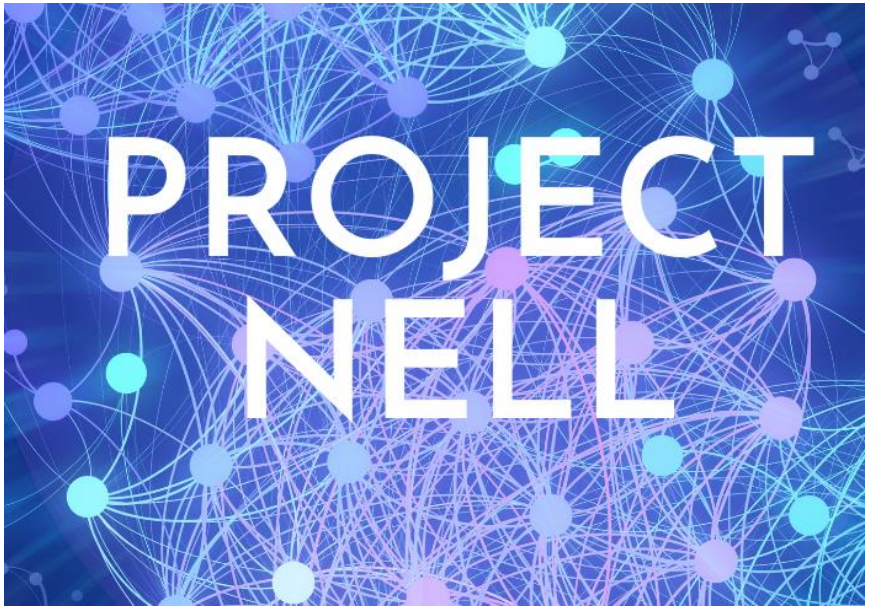
American Association of Colleges of Nursing (AACN). (2016, March 1). Advancing healthcare transformation: A new era for academic nursing. Retrieved from http://www.aacnnursing.org/Portals/42/Publications/AACN-New-Era-Report.pdf

What is Project NeLL?

Suite of apps for teaching, practicing Data Science specifically designed with Nurses in mind.

It includes a:

- Searchable EHR big database
- User friendly front end
- Proprietary Data Dictionary
- Basic data visualization tools
- PICOT worksheet/ tutorials
- Data Science Course
- Video library (demos/ case studies/ tutorials)



Nurses electronic Learning Laboratory

(Designed by nurses for nurses)

To enable nurses to develop data driven evidence based practices

Project NeLL Timeline

2015

Project Started

PIs – Dr. Vicki Hertzberg, Dr. Roy Simpson, Andi Plotsky

2016 - 2020

Data acquisition, cleaning, programming, development, Emory negotiations, and more

20,000 patients – Oracle DB

100,000 patients – PostgreSQL

December 2020

1 Million Patients - MongoDB

January 2021

AWS at Emory Overhaul

2022

NeLL Soft Launch

- Rutgers Beta Site
- Emory DNP Rollout

Project NeLL: System Configuration

- Application completely built and managed in-house.
- Database – MongoDB (NOSQL database).
- Hosted on AWS cloud
- Front End created using R Shiny.

- Users don’t need to download or install any software/packages to access NeLL.

Project NeLL – Current state

NeLL Student

3 years data (2017, 2018, 2019)

~700,000 patients

7 million+ encounters

Counts available for full data

Downloadable data only for 1,000 encounters

Immediate, real time data download

NeLL Research

Full data access (2012 – 2019) (Now expanding to 2021)

1 million+ patients

15 million+ encounters

2.7 billion+ records

37 trillion+ concepts

Few minutes/hours lag in obtaining data depending on query

Project NeLL Data Overview

Data from Hospitals and Clinics in Emory Healthcare System

Time Period – January 2012 to December 2019 (now expanding to 2021 December)

Number of patients – 1.2 million, Number of encounters >15Million

Structured Data Tables:

Patient Demographics

Clinic/Hospital Encounter details

Procedures (CPT)

Diagnoses (ICD9/ICD10)

Labs (LOINC)

Medications (History /Administered during encounter)

Orders

Surgery/Anesthesia

NeLL Data is de-identified. So users don't have to get IRB approval to access data.

Project NeLL Data De-identification

Names of patients, addresses, phone numbers removed

Date of birth replaced by age at encounter.

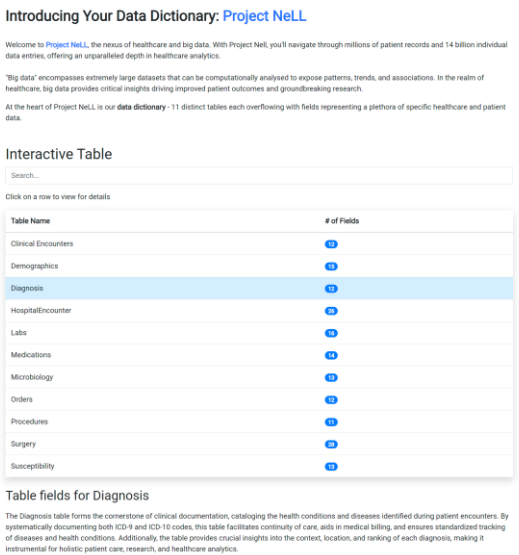
Patient identifier / encounter identifier regenerated

Location restricted to 3 digit zip codes

Healthcare facility locations masked

Dates shifted (forward up to 1 year)

Project NeLL Data Dictionary



Introducing Your Data Dictionary: Project NeLL

Welcome to Project NeLL, the nexus of healthcare and big data. With Project Nell, you'll navigate through millions of patient records and 14 billion individual data entries, offering an unparalleled depth in healthcare analytics.

"Big data" encompasses extremely large datasets that can be computationally analysed to expose patterns, trends, and associations. In the realm of healthcare, big data provides critical insights driving improved patient outcomes and groundbreaking research.

At the heart of Project NeLL is our **data dictionary** - 11 distinct tables each overflowing with fields representing a plethora of specific healthcare and patient data.

Interactive Table

Search...

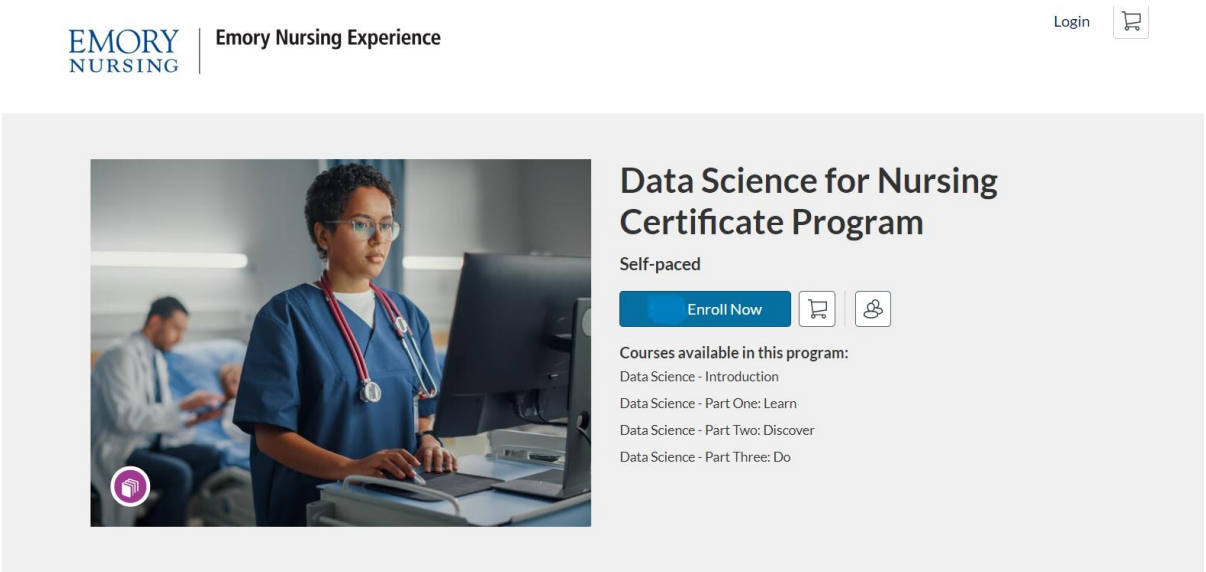
Click on a row to view for details

Table Name	# of Fields
Clinical Encounters	12
Demographics	15
Diagnosis	12
HospitalEncounter	35
Labs	16
Medications	14
Microbiology	13
Orders	12
Procedures	11
Surgery	28
Susceptibility	13

Table fields for Diagnosis

The Diagnosis table forms the cornerstone of clinical documentation, cataloging the health conditions and diseases identified during patient encounters. By systematically documenting both ICD-9 and ICD-10 codes, this table facilitates continuity of care, aids in medical billing, and ensures standardized tracking of diseases and health conditions. Additionally, the table provides crucial insights into the context, location, and ranking of each diagnosis, making it instrumental for holistic patient care, research, and healthcare analytics.

Data Science Course Using NeLL



Project NeLL In Use

- Emory School of Nursing – Nursing Informatics course for DNP students. Integration of NeLL in other courses (Evidence Based Practice, Health Outcomes, Data Visualization, etc)
- Rutgers University, New Jersey – Nursing Informatics course for graduate level students
- Discussions in progress to integrate NeLL into the curriculum at various other nursing schools in US and Canada
- Data Science Course available internationally (comes with a NeLL subscription)
- DNP/PhD dissertations using NeLL data.

Successful Student Examples

Jasmine Nakayama, RN, MSN, PhC
RWJF Data Science Scholar

Dissertation: Cascade of care for HCV in Baby Boomers.

Sam Ewing, DNP, RN
ED Nurse and DNP Grad

Dissertation: 50% of abdominal emergencies wrongly triaged.

Courtney Omary, RN, DNP
NEF Scholar

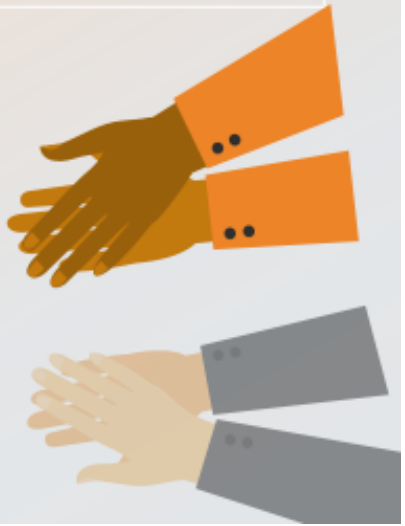
Thesis:
Toolkit for best practice use of electronic health record data in quality improvement.

Taylor Courtner
NEF Scholar

Thesis: Racial disparities in opioid administration among breast cancer patients.

Emily Newell
BSN Honors Student

Thesis: Examining anesthesia and sedation data to determine AA, CRNA and MD results from TAVR.



Project NeLL Next Steps

- NeLL 2.0 (Coming April 2024) – New front end, Expanded data (till 09/2022), more data (vital signs, emergency department data, nursing notes), case study library.
- Extracting information from de-identified Nursing Notes (SDOH, etc)
- Making the front end EHR system agnostic – CERNER/EPIC/OMOP data compatible.
- Expanding data sources
- Generative AI based visualizations toolkit

NeLL Demo

Thank you!

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