

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

Ramya Govindarajan, MSPH

Director, Database Projects

Emory University School of Nursing

Atlanta, GA



# 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.aacnursing.org/Portals/42/Publications/AACN-New-Era-Report.pdf>

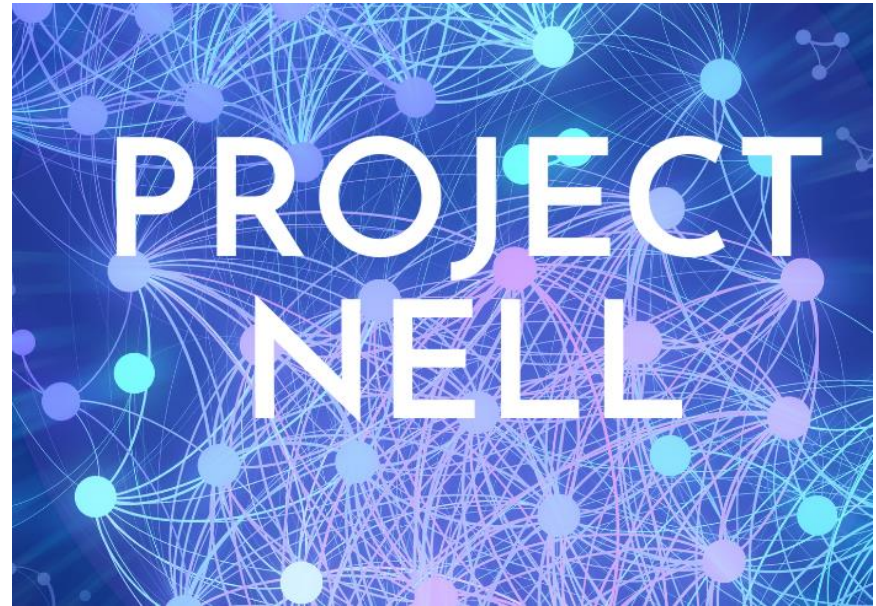
# What is Project NeLL?

---

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 analyzed 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	13
Demographics	13
Diagnosis	13
HospitalEncounter	13
Labs	13
Medications	13
Microbiology	13
Orders	13
Procedures	13
Surgery	13
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

EMORY  
NURSING

Emory Nursing Experience

Login



## Data Science for Nursing Certificate Program

Self-paced

Enroll Now



Courses available in this program:

Data Science - Introduction

Data Science - Part One: Learn

Data Science - Part Two: Discover

Data Science - Part Three: Do

# 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.

Taylor Courtner  
NEF Scholar

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

Sam Ewing, DNP, RN  
ED Nurse and DNP Grad

Dissertation: 50% of abdominal emergencies wrongly triaged.

Emily Newell  
BSN Honors Student

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

Courtney Omary, RN, DNP  
NEF Scholar

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

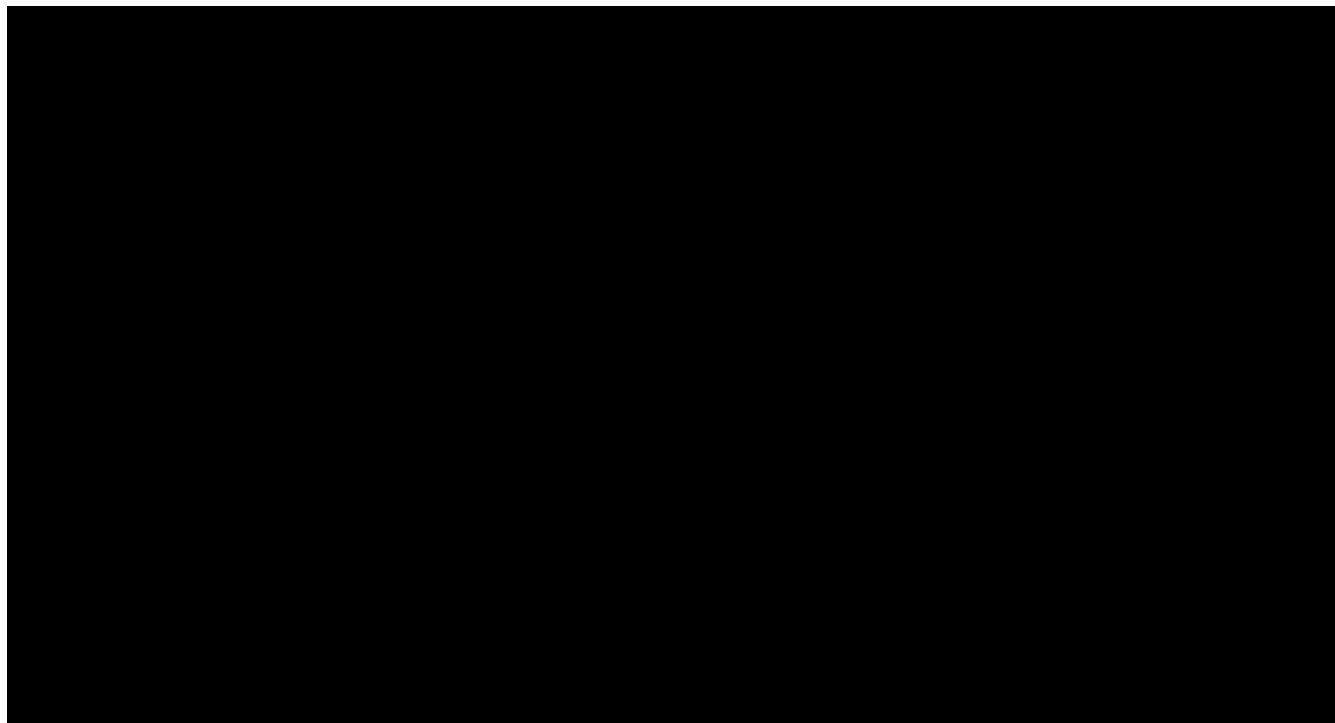




# Project NeLL Next Steps

- 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!

Email me at:

- [rgovind@emory.edu](mailto:rgovind@emory.edu)
  - [projectnell@emory.edu](mailto:projectnell@emory.edu)
- 