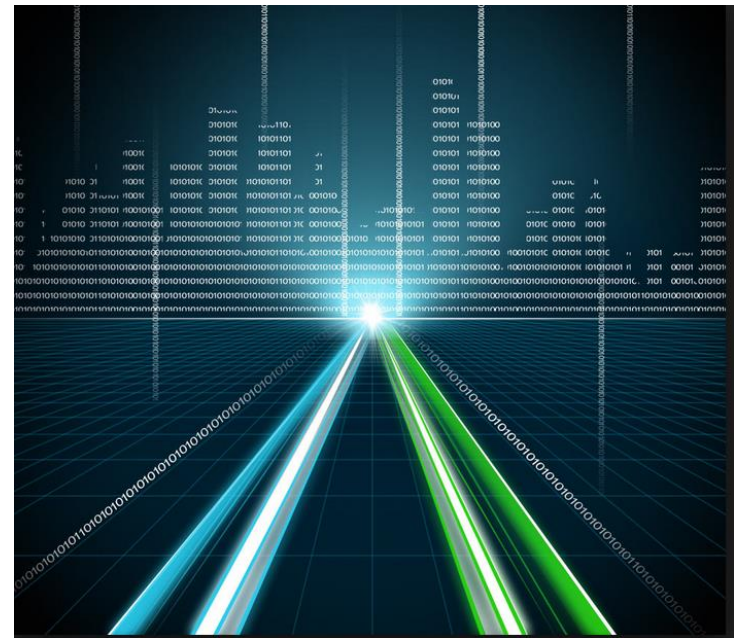# Clinical Informatics:
From Dirt Roads to Superhighways

Patricia Korolog Mulberger, MSN, RN-BC

Along Montana's "Information Superhighway"
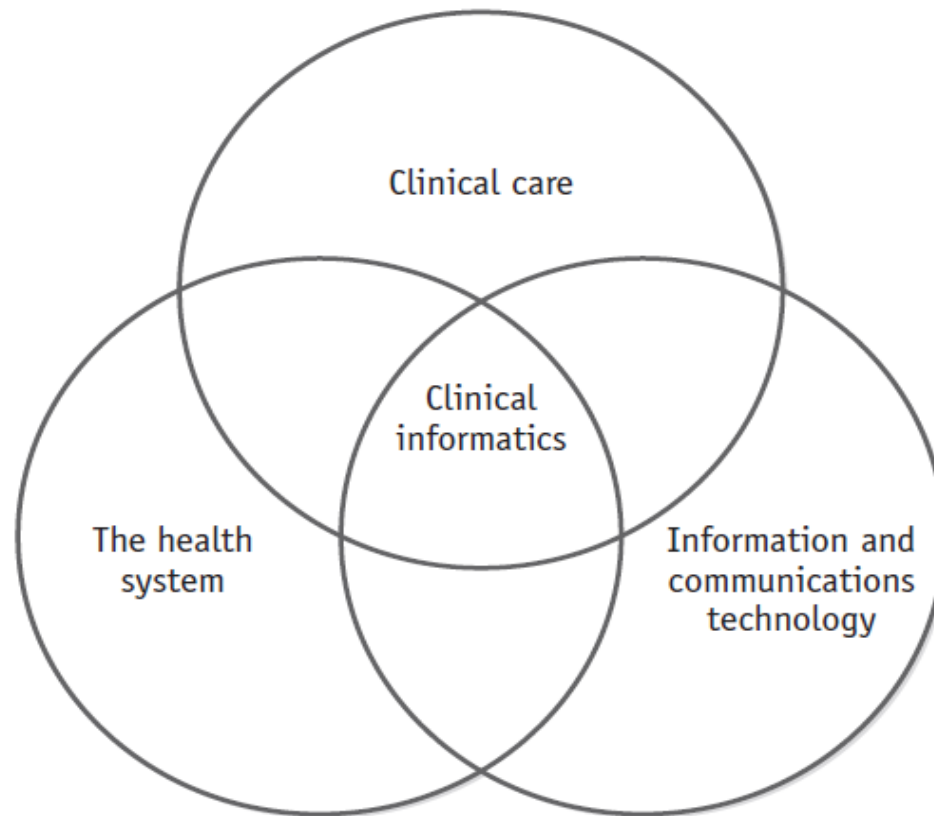

ANIA
Where caring and technology meet

Objectives

Journey

Roles

Trends

Whose Driving

Domains of Clinical Informatics

The Reality of Clinical Informatics

- **Multidisciplinary**
  - **Medicine**
  - **Nursing**
  - **Public Health**
  - **Pharmacy**
  - **Radiology**

- **Other Relevant Fields**
  - **Information Management**
  - **Computer Science**
  - **Cognitive Science**
  - **Science of Terminologies & Taxonomies**
  - **Heuristics**
  - **Library Sciences**
 - **Archival Science**
  - **Mathematics**

Very Early Origins

- Hippocrates

Medical record should accurately reflect

    Course of disease

    Probable cause of disease

"I believe that it is an excellent thing for a physician to practice forecasting. He will carry out the treatment best if he knows beforehand from the present symptoms what will take place later"

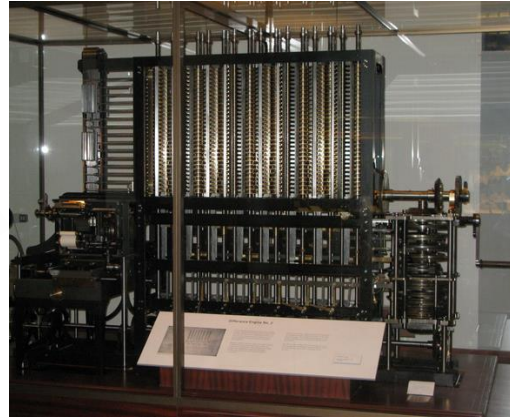http://www.historylearningsite.co.uk/hippocrates.htm
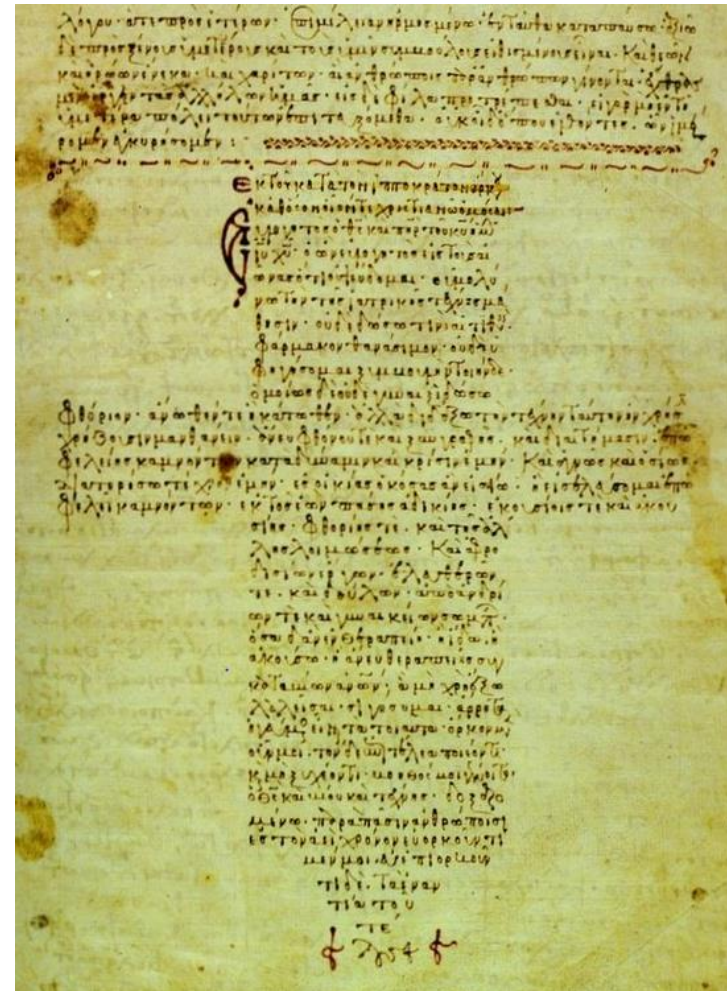
"First Informatics Nurse"
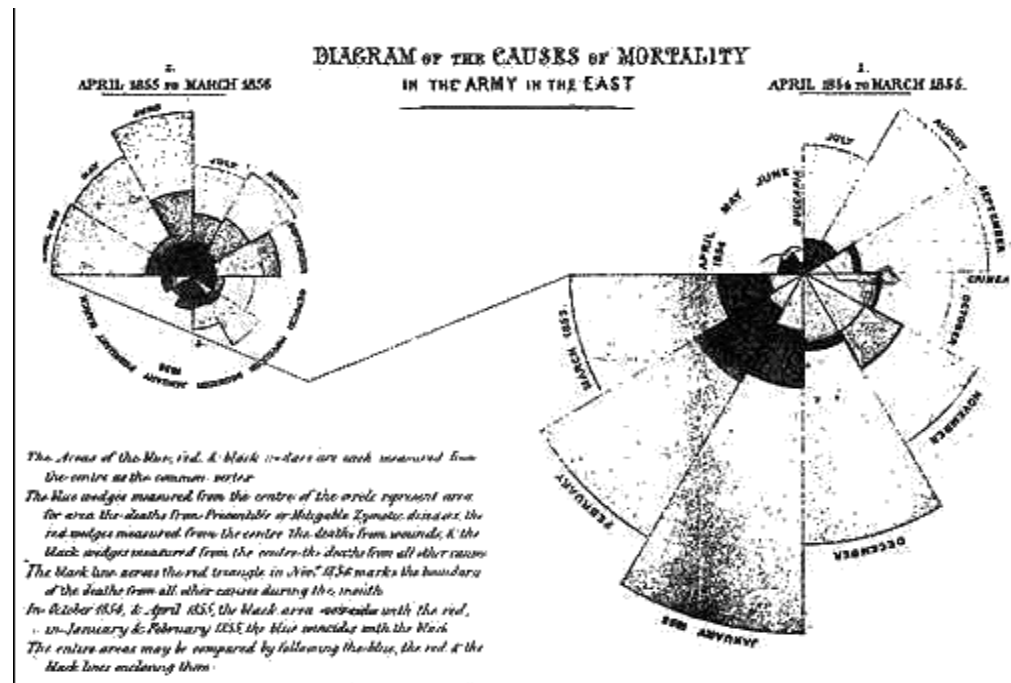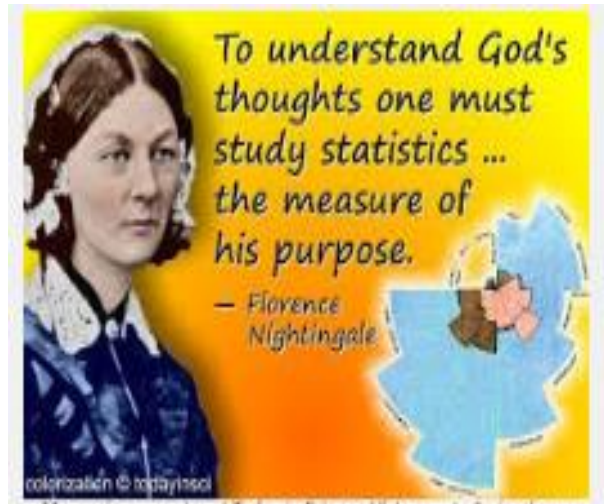
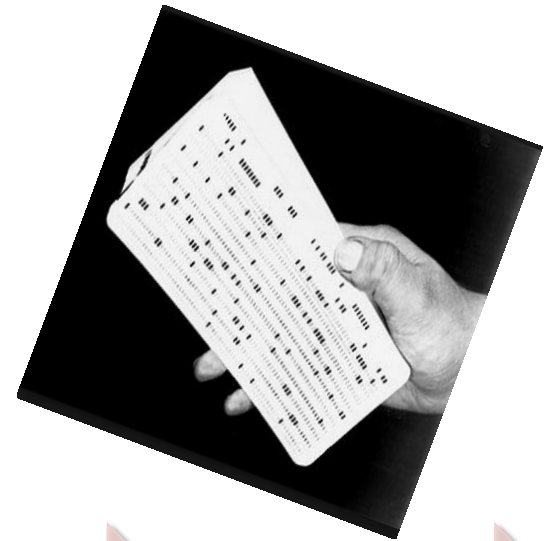| Mid 1600's | • Mechanical Calculator | 1830's | Automated mechanical computer | Late 19th Century | Census Early IBM | 1940 | Binary Code | 1943 | WWII |

1946 — ENIAC

1952 — 1st computer used in clinical practice

1956 — Mobile Telephone

1959 — Robert Ledley

1961 — Dept of Medical Methods Research

More Driving Forces

| 1969 | EHR Software | 1980 | ATARI IBM Personal Computer | 1989-90 | WWW | 2004 | NwHIN |
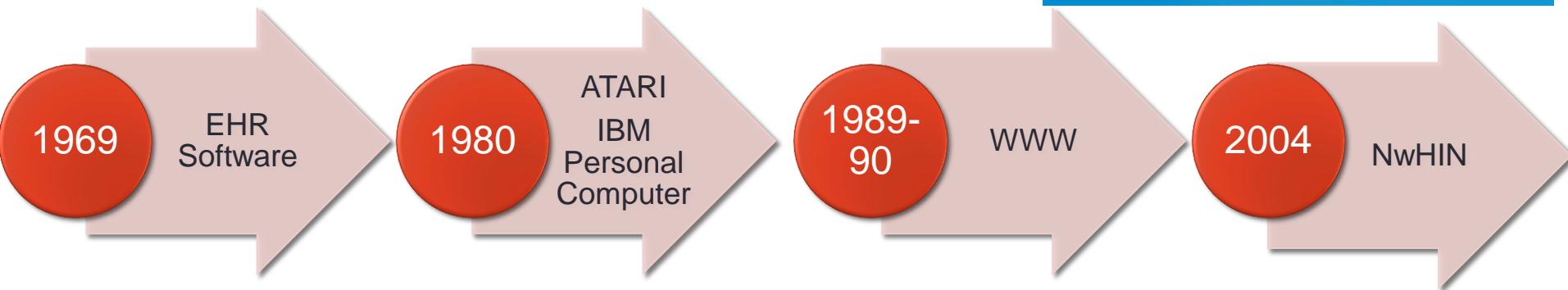
1984-2003 — Human Genome Project

2009 — ARRA

NOW — Need Grows for clinical informaticists

My Journey

Paths To Clinical Informatics Career

Nursing Formal/Academic

- Undergraduate Level
  - *Informatics Nurse (IN)*
    - RN w/ interest/experience in informatics field
      - Mostly on the job learning

- Graduate Level
  - *Informatics Nurse Specialist (INS)*

- Post Graduate Focus
  - PhD or DNP
    - Academic (PhD)
      - Faculty
    - Applied Practice (DNP)

Credentialing

- ANA
  - Nursing Informatics is a nursing specialty (1992)
- Scope and Standards of Practice
  - 1994 1st Edition
  - 2015 2nd Edition

- American Nursing Credentialing Center
  - Nursing Informatics
- HIMSS
  - Certified Professional in Healthcare Information and Management Systems
- American Board of Imaging Informatics
  - Certified Imaging Informatics Professional

American Healthcare Informatics Professional Organizations

The Promises

https://www.youtube.com/watch?v=t-aiKlIc6uk

The Health Data Challenge Series
Helping private, non-profit, and government organizations connect with innovators solving for the major challenges facing health and healthcare.
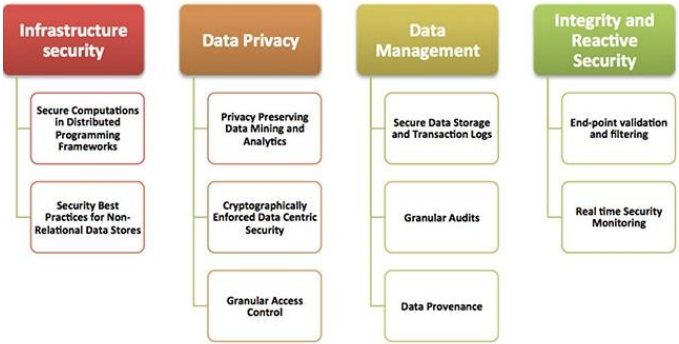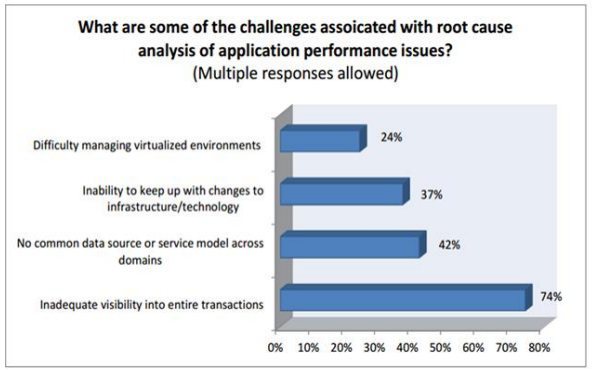
LEARN MORE →

What are some of the challenges associated with root cause analysis of application performance issues?
(Multiple responses allowed)

- Difficulty managing virtualized environments — 24%
- Inability to keep up with changes to infrastructure/technology — 37%
- No common data source or service model across domains — 42%
- Inadequate visibility into entire transactions — 74%

Technology Challenge	Usability Challenge	Cultural Challenge
• **Research** on critical issues to create better clouds • **Innovation**-focused research • **Open-source** as innovation model	• Development and use of **standards** for interoperability • **Legal** framework for international **data protection** and **privacy** • Improved **trust** and **security** levels	• **Educate** users • Provide experim. **Testbeds** • Support **pilot projects** • **Public procurement** to adopt cloud, open standards and open source

Infrastructure security
- Secure Computations in Distributed Programming Frameworks
- Security Best Practices for Non-Relational Data Stores

Data Privacy
- Privacy Preserving Data Mining and Analytics
- Cryptographically Enforced Data Centric Security
- Granular Access Control

Data Management
- Secure Data Storage and Transaction Logs
- Granular Audits
- Data Provenance

Integrity and Reactive Security
- End-point validation and filtering
- Real time Security Monitoring

Figure   Classification of the Top 10 Challenges

WARNING CHALLENGES AHEAD

Challenges: The road to a national EHR
- Cost
- Technology Adaptation
- Liability
- Privacy and Security
- Standardization

Trends

- Emphasis on change in delivery models
  - Providing care outside of hospital setting
    - More cost efficient
      - Clinically relevant
  - Outcome based
- Patient Engagement
- Population Health
- Bioinformatics
- Genomics

Trends

- Rise of Analytics
  - Opportunities to participate, create, and shape tomorrow's healthcare
    - Population Health
    - Community Health
    - PBM (Pharmacy Benefit Manager) companies
    - Wellness care
    - Quality/performance measure

NowTrending.HHS.gov

Individual Apps

- Monitoring, Tracking and Trending
- Connecting
- Digital Coaching
- Disease oriented cookbooks
- Body Measurements.
  - HR, RR, Steps, Stairs, Calories

http://medicaleconomics.modernmedicine.com/medical-economics/content/tags/android/top-10-apps-physicians-recommend-their-patients?page=full

Past Challenges Meet Future Trends

New Healthcare Data Sources

- RFID

- Streaming Device Data
  - Physiological Monitors
  - Ventilators
  - Wearables

- Social Media

- Geographic Information System (GIS) Data

- Open Data
  - www.data.gov

- Internet of Things (IoT)

FHIR – The "Public API" for Healthcare?

FHIR = Fast Health Interoperability Resource

- Builds on previous HL7 data structures to describe data formats and elements

- More powerful & less complex than HL7 V3

- Easier to implement

- Uses web-based http application programming interface

Huff, S., McCallie, D HIMSS 2015

FHIR – The "Public API" for Healthcare?

FHIR Resources

- Well-defined, simple snippets of data that capture core clinical entities
- Build on top of existing HL7 data types
- Resources are the "objects" in a network of URI reference linksWe

SMART Platform –Open Specification for Apps

- "Substitutable Medical Apps"
  - Kohane/Mandl – NEJM (2009)

- A SMART App is a Web App
  - HTML5 + JavaScript
  - Remote or embedded in EHR
  - URL passes context & FHIR li nk

- EHR Data Access via FHIR

SMART™

Who is driving the train!

New Drivers

- Cognitive and Behavioral Psychology
- User Experience
- Human & Computer Interaction
  - Devices
  - Wearables
- Patients & Family

Now on the Team

- AND ALL OF YOU

Contact Information

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