



UTAH SOCIETY OF
HEALTH–SYSTEM PHARMACISTS

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Big Data, What's the Big Idea?

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Disclosures

- Relevant Financial Conflicts of Interest
 - CE presenter, Shea O'Brien: None
 - CE mentor, Brian Johnson: None
- Off-Label Uses of Medications: None

Learning Objectives: Pharmacist

- Evaluate the current data environment in health care
- Discuss current and potential applications of Big Data
- Choose measures of ensuring health information security

Learning Objectives: Technician

- Differentiate data, information, and knowledge.
- Discuss current and potential applications of Big Data
- List measures of ensuring health information security

Outline

- Background
- Applications
- Cybersecurity
- Outlook
- Takeaways

Background

- Health data is growing exponentially
9,700,000,000,000 bytes per year
- Computing power and analysis capabilities
- Data avalanche



Stanford Medicine 2017 Health Trends Report

What is Big Data?

Define Big Data.

Is it one of these?

- High quality, high value data
- Data that will solve all problems
- Data stored up in a cloud
- Large volumes of data

Its like mapping a new world...

At ground level, as you hack your way through the undergrowth and scramble across ravines, you might struggle to build up a clear picture. But with the right tool (a hot air balloon), you can see the whole landscape and **identify patterns**, like the contours of a mountain or meandering flow of a river.

Sideyardictionary.com

It's like a blue whale's diet...

The largest animal on Earth survives on a diet of tiny plankton and krill – and the key is **volume**. The whale has developed a mechanism for gulping down vast quantities of water and filtering out the nutritious content. In the same way, scientists are gulping down vast data sets and looking to **extract valuable information** on everything from healthcare to crime prevention.

Sideyardictionary.com

Big Data

“Large **volumes** of high **velocity**, complex, and **variable** data that require advanced techniques and technologies to enable the capture, storage, distribution, management, and analysis of the information.” (6)

... **Veracity, Value, Virtue**

Raghupathi W, Raghupathi V. Health Inf Sci Syst. 2014;2:3.

Big Data Sources

- Electronic medical records
- Public records
- Wearable devices
- Smart phones
- Insurance records
- Research
- Many more...

NEJM Catalyst (catalyst.nejm.org)

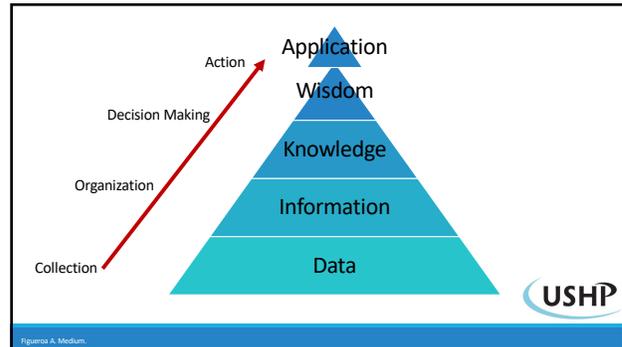


Figure 1. Medium.

Match the following to the appropriate term.

- | | | |
|---|------------------|----------------|
| A. The rate of vaccinations is concerning given the number of flu hospitalizations last year (>100). | _____ | A. Data |
| B. Flu vaccinations in Salt Lake County are falling by 15% each year. | _____ | B. Information |
| C. Free flu shot clinics set up in high volume locations provided thousands of additional flu shots to the community. | _____ | C. Knowledge |
| D. The most effective vaccination strategy will be free flu shot clinics. | _____ | D. Wisdom |
| E. 15% decline per year is very high. | _____ | E. Application |

Why is Big Data so Important?

- Health care spending is not sustainable
- Changing reimbursement structure
- Emphasis on quality and outcomes
- Patient participation

NEJM Catalyst (catalyst.nejm.org)

Applications

- Clinical
- Research
- Security
- Supply chain
- Operations
- Many more...

Applications: Clinical

- Predictive analytics, modeling
- Artificial intelligence, machine learning (Watson)
- Public health surveillance
- Clinical decision support

Applications: Research

- The 'new' Scientific Method
- Participant identification
- Third party app data
- Consumer data (health apps)
- Time to market



Applications: Examples

- Predicting admission patterns to staff most efficiently
- Opioid risk factor identification model
- Google flu trends
- ...even cure cancer?

Erickson A. Pharmacy Today 2014.
Leland M. Business Intelligence 2014.

Data Collaboratives

Participants share data to enhance value

- Vizient Consortium (AMCs)
- 23andMe
- Open source repositories
- Healthdata.gov

GovInfo. Data Collaboratives Explains.

Which is NOT an application of Big Data?

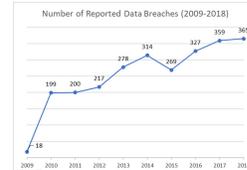
- A. Predictive modeling of E. Coli outbreaks.
- B. Artificial intelligence diagnosis of specific cancer types.
- C. Refining operational workflow in a retail pharmacy.
- D. Cybersecurity of a large health system.

Data Management Challenges

- Volume increasing exponentially
2.5 quintillion bytes daily
- Aggregate, store, analyze, and create value
- Storage capacity
- Security and privacy vs. availability

Cybersecurity

- 2009-2018 total 2,546 data breaches (190,000,000 records)
- Health data sells for 2x more than credit card information



HIPAA Journal 2015 (graph).
Carron L. Health News, Reuters, 2014.

Cybersecurity

- Confidentiality, integrity, availability
- Analogous to the ocean
- "Arms race" of hacking technologies



Cybersecurity

- Health Insurance Portability and Accountability Act (HIPAA)
- Health Information Technology for Economic and Clinical Health Act (HITECH)
- Cybersecurity Act 2015



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Cybersecurity in the News

- AMCA breach = 25 million patients
- Hollywood Presbyterian ransomware attack = system down >1wk
- UW (Washington) Medicine = 973,024 patients, patient searched Google
- Oregon DHS = 645,000 patients, 9 employees provided user credentials to phishing email



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Cybersecurity: Solutions

- Machine learning and predictive modeling
- Password protection/Dual factor authentication
- Data encryption
- Audit trails
- Firewalls



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Which of the following could allow a hacker into the system?

- A. Phishing emails
- B. Weak passwords
- C. Two factor authentication
- D. A and B



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Consider the following.

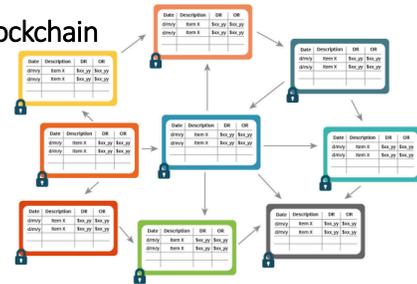
- Are you concerned about the security of your medical data?
- Why or why not?

The Future of Big Data

- Real time analytics and decision support
- Pharmacogenomics standard
- Advanced machine learning
- Telehealth and telepharmacy
- Storage advancement, Blockchain



Blockchain



Linn L. Koo M.

Blockchain

- Decentralized network structure
- Advantages
- Interoperability
- Security
- Patient engagement



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Key Points

- As data volume increases, it becomes increasingly difficult to store, maintain, and secure.
- Analytical techniques applied to big data have the potential to solve complex problems
- Cybersecurity threats emphasize the importance of effective data management



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