



The Intelligent Use of Data for the Improvement of Healthcare Outcomes

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So, what's the challenge?

Background

Healthcare data is underutilized in providing information to physicians for the optimized practice of medicine.



Aims

To elucidate key principles of intelligent data collection, utilization, and presentation.



Study Methods

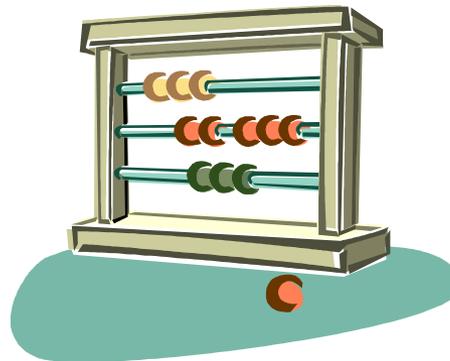
Data Collection

- Examine best practices of electronic health record systems from around the world
- Understand strengths and weaknesses in data collection
- Establish trends in good systems for data collection



Data Analysis

- Critical review of studies from leading journals and how they can be better
- List ways to improve data analysis techniques
- Do's and don'ts for better data analysis



Data Presentation

- Establish a principle and goals behind research
- Provide examples of effective data display for the end user
- Examine how to incorporate technology to advance medical education



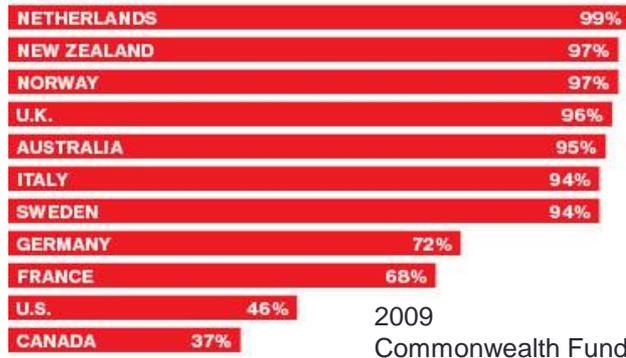
Better data collection

Experts often possess more data than judgment. – Colin Powell



Europe / Australia / New Zealand

- early adopters
- wide-spread



USA – Beth-Israel Deaconess Medical Center

- user-friendly
- high utility for research
- constant evolution with policy changes

The best systems are usually home grown, simpler, and actively used for research, quality control, and performance measurers.

India – Aravind Eye Care System

- recognizes/prevents adverse events
- operational daily **predictive reporting**
- performance tracking

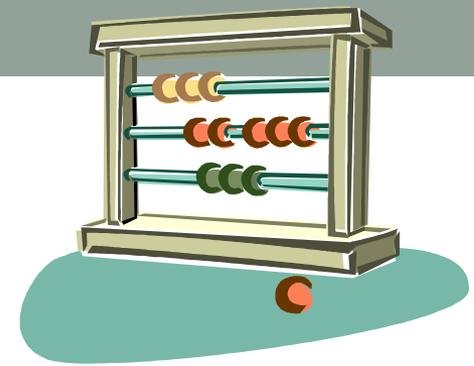
ARAVIND EYE HOSPITAL VISION CENTER- ALANGANALLUR DATE: 23-10-2010			
DETAILS	PREVIOUS DAY PERFORMANCE	LAST WEEK PERFORMANCE	CUMULATIVE PERFORMANCE
NEW OP	15	103	16,956
REVIEW OP	2	32	5,626
TOTAL	17	135	21,582
GLASS PRESCRIBED	1	16	2775
GLASS ORDERED	-	12	2716
CATARACT ADVISED	-	4	1071
CATARACT SURGERY	-	7	993
SPL CASES REFERRED	-	6	1202
SPL CASES ATTENDED	-	6	1196

Good electronic health record systems consider clinical along with secondary uses of EHRs at the initial development stages.

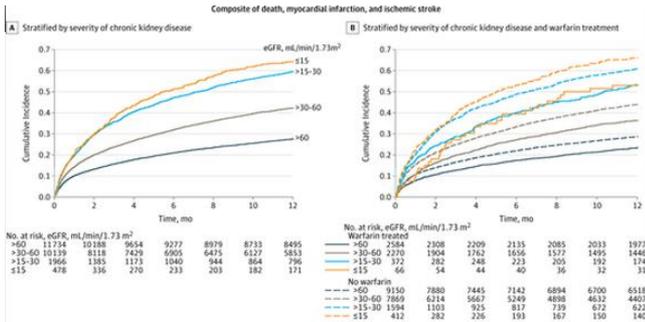
Better data analysis

If the statistics are boring, then you've got the wrong numbers.

– Edward R. Tufte



Turn research results in to easily translatable clinical support tools.



If...

- atrial fibrillation and has had an MI.... Y/N
- eGFR >60..... Y/N
- Warfarin exposure..... Y/N

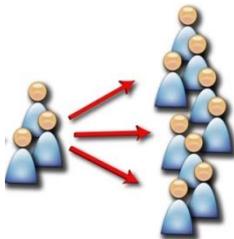
Then...

- x% chance of having an ischemic stroke, MI, or death
- y% chance of having a bleeding event

Warfarin, Kidney Dysfunction, and Outcomes Following Acute Myocardial Infarction in Patients With Atrial Fibrillation, JAMA, March 2014

Don't just take the analysis to a p-value.

Use largest data sets for more meaningful data analysis and more relevant results



Expand knowledge of potential algorithms to make full use of data.

EXAMPLE: Corticosteroids and Transition to Delirium in Patients With Acute Lung Injury, Critical Care Medicine, Feb 2014

Minimize exclusion criteria

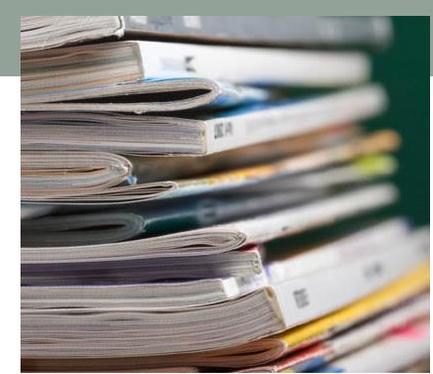
- Run regression repeatedly for various cross-sections of entire dataset

Test all possible explanations of hypothesis

- Collect and test enough data for benzodiazepine use, dementia comorbidity, and chronic steroid users

Better data presentation

Intelligence and capability are not enough. There must be the joy of doing something beautiful.” - Dr. G. Venkataswamy (Aravind Eye Care System)



The medical society and **society as a whole should want original research to be easily consumed** by doctors.

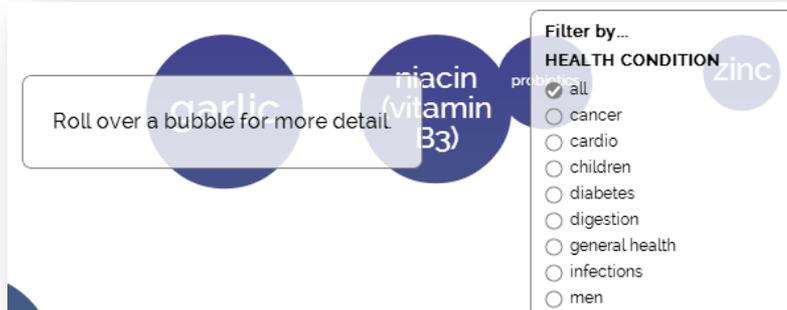
Information should be made:

- readily available and accessible
- easily and enjoyably comprehensible
- interactive for discussions

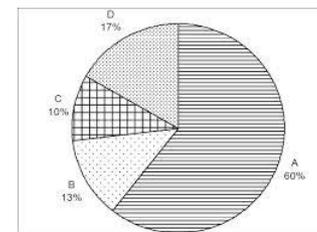
**Accessible
Tech Enabled**



Interactive Design

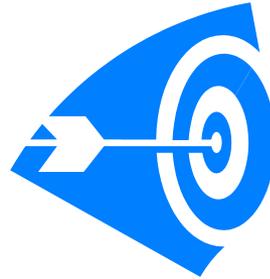


Use **color** for online publications



This is the BIG DATA revolution

Torture the data, and it will confess to anything. – Ronald Coase, Nobel Prize Laureate



Improve health outcomes of patients

How?

Better medical knowledge



Better educated doctors

How?

How?

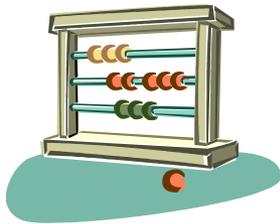
- **More data**
- **Better utilization of data**
- **More meaningful results**

- **Accessible information**
- **Tech-enabled learning**
- **Interactive presentation**

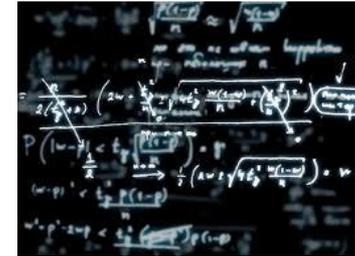
Conclusions



Understand **all potential uses of data** and design systems for effective collection.



Use **high level analyses** on data with an end goal of more **clinically useful results**.



Use technology to **make data accessible, interactive, and easily consumable** for the end-user.

