



# 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

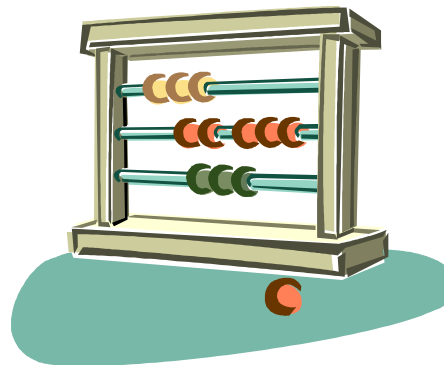
## Data Collection

- 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



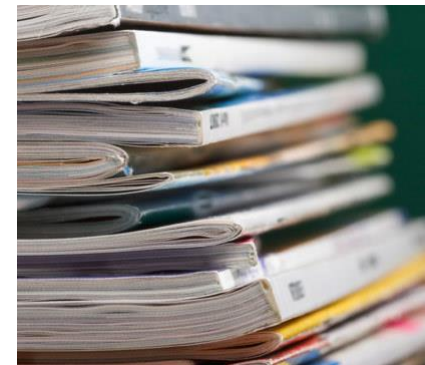
## Data Analysis

- 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



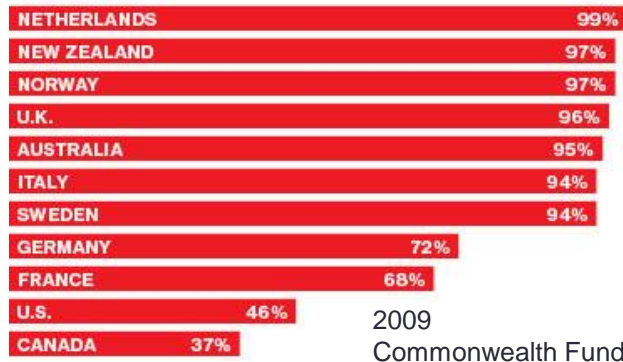
# Better data collection

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

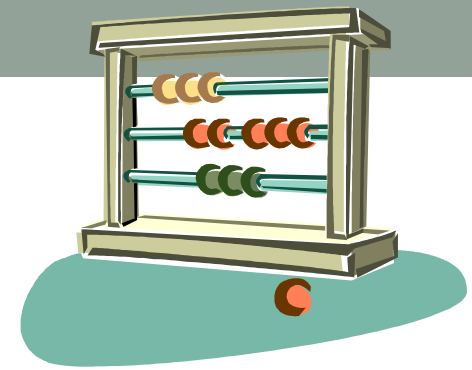
ARAVIND EYE HOSPITAL VISION CENTER- ALANGANALLUR DATE: 23-10-2010			
DETAILS	PREVIOUS DAY PERFORMANCE	LAST WEEK PERFORMANCE	CUMULATIVE PERFORMANCE
NEW OP	15	103	16,956
REVIEW OP	2	32	5,626
<b>TOTAL</b>	<b>17</b>	<b>135</b>	<b>21,582</b>
GLASS PRESCRIBED	1	16	2775
GLASS ORDERED	-	12	2716
CATARACT ADVISED	-	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.

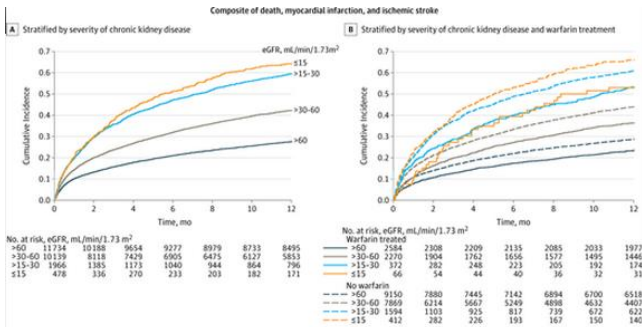
# Better data analysis

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

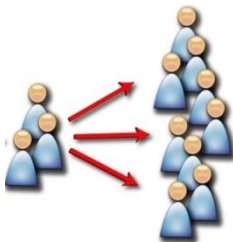
Then...

- 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.

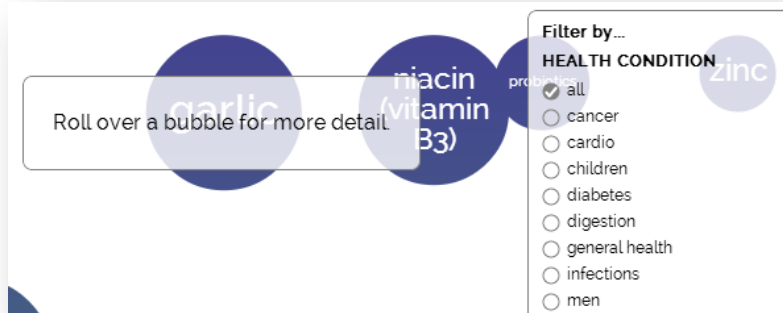
Information should be made:

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

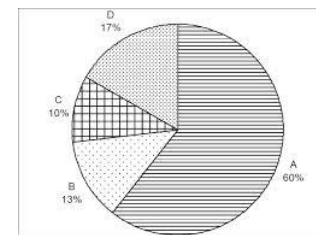
**Accessible  
Tech Enabled**



## Interactive Design

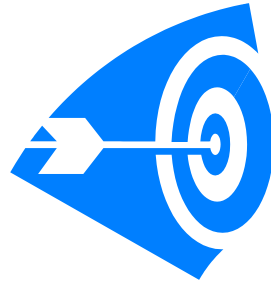


Use **color** for online publications



# 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**

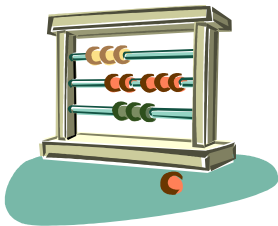
- **Accessible information**
- **Tech-enabled learning**
- **Interactive presentation**



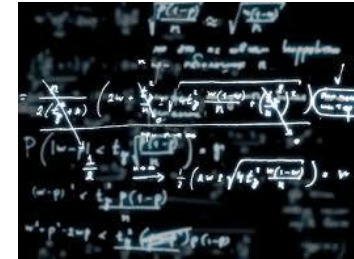
# Conclusions



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.

