Systems Thinking and Synergy

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System Overload
Functioning System at Work
Safety: An Example of Why We Need a Global System for Clinical Research and Healthcare

Statistics on Air Transport Safety With a Global System

- **System** based on 10,500 Universally Applied Standards and Recommended Practices**
- # of Airline Passengers (2014)*: 3.3 billion
- # of Accidents (2014)**: 402
- # of Passenger Deaths (2014)**: 761

* IATA "Strong Demand for Air Travel Rises in 2014"
** ICAO correspondence

Statistics on Drug Safety when Clinical Research and Healthcare are Conducted Without a Global System

- **Non-System** resting on Non-integrated, Inconsistently Applied ICH Guidance, Best Practices and GCPs
- # of Prescriptions Written (USA2014)***: 4.0 Billion
- # of Serious Adverse Events(USA2014)****: 807,270
- # of Resulting Patient Deaths (USA-2014)****: 123,927

*** Estimates are USA represents 50% of prescriptions written
****FDA FAERS Reporting by Patient Outcomes by Year
Healthcare is a Complex System

- Simple – easy to manage with existing methods
- Complicated – difficult, but amenable to rules and procedures
  - Outcome of randomized control trial
  - Safety procedures – contact tracing, checklists
- Complex –
  - very difficult, too many unknowns, unpredictable interactions
    - Lack of response to preferred treatment
    - Fix one thing, another breaks (anti-stall feature of 737MAX)
  - Possible solution
    - Empirical observation to quantify components of your model
    - AI to identify patterns for study and inference
    - Progressively include more data types to approach personalization
Health System Map
System Thinking and Personalized Decisions

- Personalized healthcare decisions – study the influence of all components of your system model on the outcome
  - *Better manage patients with multiple chronic diseases*
    - Most guidelines are disease oriented
    - No controlled studies for treating patients with multiple problems
  - *Define longer term outcomes – healthier patient in 5 years*
  - *Decision support is, in part, prediction*
    - Who will benefit from this intervention, who will have an adverse response
    - Who will have a beneficial immune response to Covid19, who will have a cytokine storm
To Be Continued ..... In 2021

ACRES Synergy II Conference

Continuing the Discussion on the Application of Systems Approaches To Health Care and Clinical Research

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