Emergency Department as a Complex System

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Emergency Department as a Simple System

- A self Contained Unit
- Patients Enter
  - Acute Medical issue
- Patients Leave
  - Hospital
  - Home

- Problems
  - Some patients die
  - Some patients leave before addressed

Goal Directed Success

- The goal of a ER is to succeed in adressing as many patients as quickly and effectively as possible
- This creates a very good way to evaluate ER effectiveness
- This allows for accurate Complex System Analysis

ER as a Complex System

- Complexity exists in many domains
  - Patients
  - Healthcare providers
  - Operational Decisions
  - Environment
- Every one of these areas can change dramatically at any time causing the whole ER to react and re organize
- None of these Can be described in totality such that the next action can be predicted

Changing Complex Systems

- Only about 15% can be directly effected
- most methods try to steer the system in a more standard brute force manner
  - fail
- instead identify key points and change them a small amount in the desired direction

Building Complex Systems

- Simple Processes - fewer actors
  - Faster response time
  - more robust
- Local Feedback Loops
  - each step in the system is aware of mistakes
  - decreases error rate as they are caught early
  - local improvement is fast

Managing Complex Systems

1. 80% or Return for first 20% effort
    1. design so this is the general case
2. 15% can be changed at one time
    1. pick the right place
3. Avoid over-design
    1. over-design leads to unforeseen consequences
4. Seek Minimum specifications
    1. similar to avoiding over-design
5. Permit self organization
6. Allow system to determine most important aspect
7. Unintended consequences
    1. there will be these any time you influence the system
8. Intelligent actors are very important