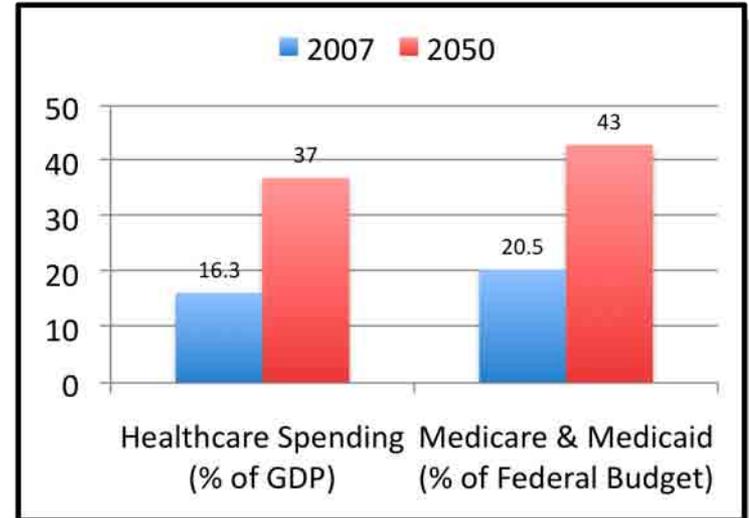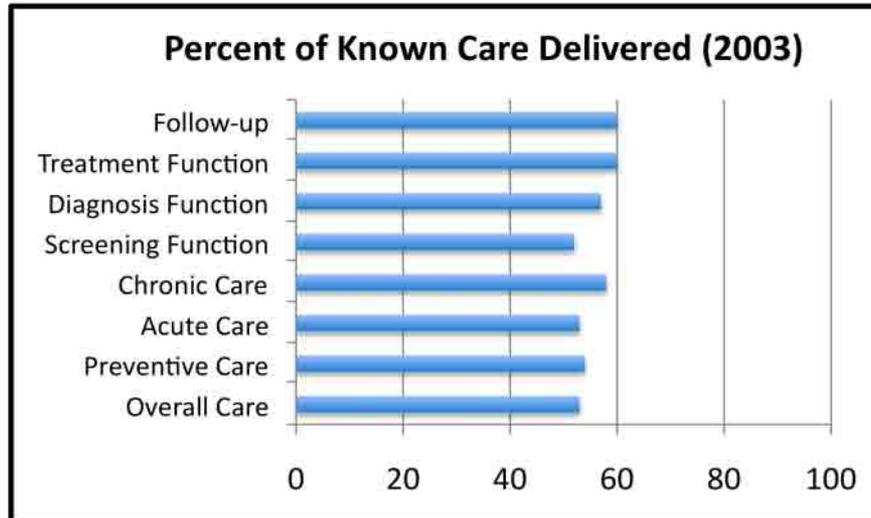# Lean Healthcare Simulation Segment I:
Baseline Performance

Learning Objectives

At the end of this module, you should be able to:

- **Explain the mechanics and rules of the simulation**

- **Execute the process in the simulation**

- **Experience the difficulties and convey the frustrations inherent in a relatively uncontrolled process**

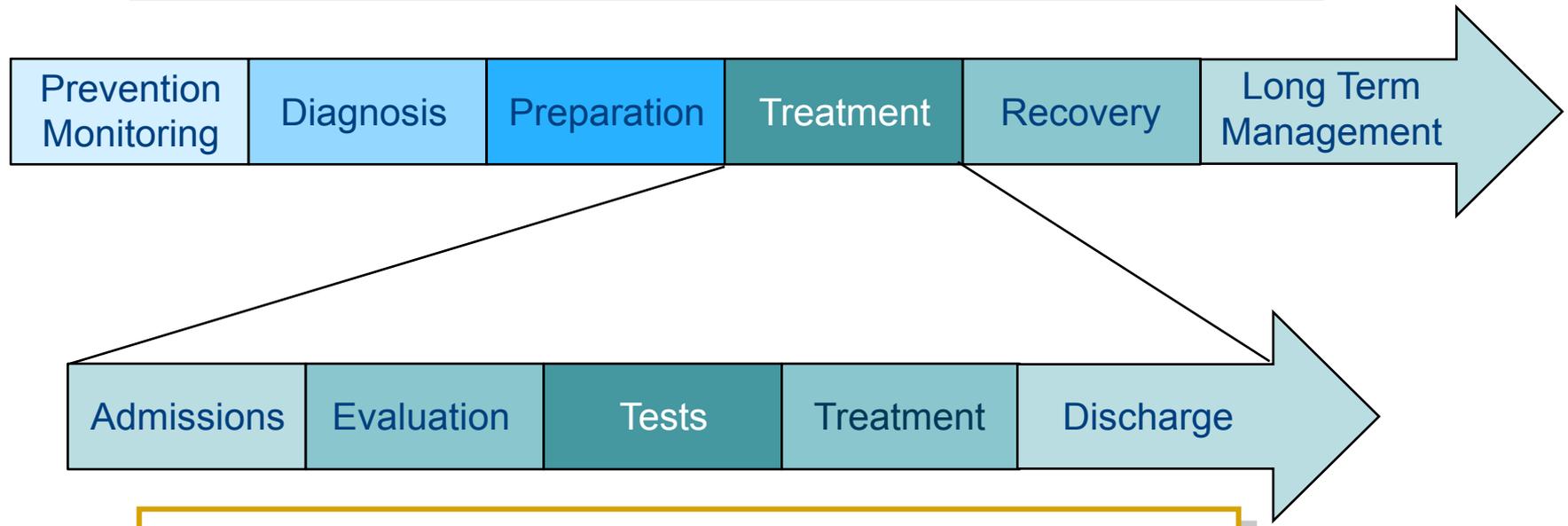- **Apply several simple lean tools to improve clinic performance**

US Healthcare - A Value Crisis

$$\text{Value} \approx \frac{\text{Delivered Care}}{\text{Cost}}$$

Percent of Known Care Delivered (2003)

- Follow-up
- Treatment Function
- Diagnosis Function
- Screening Function
- Chronic Care
- Acute Care
- Preventive Care
- Overall Care

0   20   40   60   80   100

2007 2050

50
40
30
20
10
0

37
43
16.3
20.5

Healthcare Spending (% of GDP)   Medicare & Medicaid (% of Federal Budget)

- **Lean Six Sigma can increase healthcare value delivery by:**
  - **Improving healthcare quality**
  - **Decreasing healthcare costs**
- **It is one piece of a puzzle to solve the US healthcare crisis**

Patient Value Stream

For a given medical condition, the patient value stream has many actions and is fragmented among numerous care givers

Prevention Monitoring	Diagnosis	Preparation	Treatment	Recovery	Long Term Management

Admissions	Evaluation	Tests	Treatment	Discharge

This course will focus on only one portion of the full patient value stream.
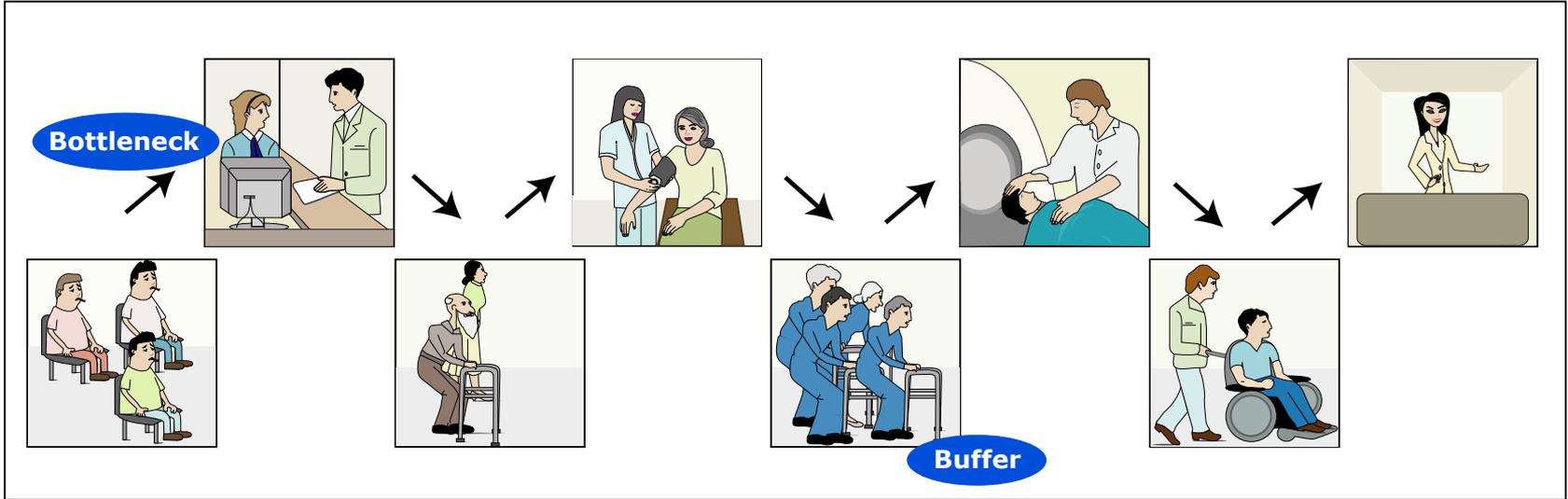
Make Value *Flow*
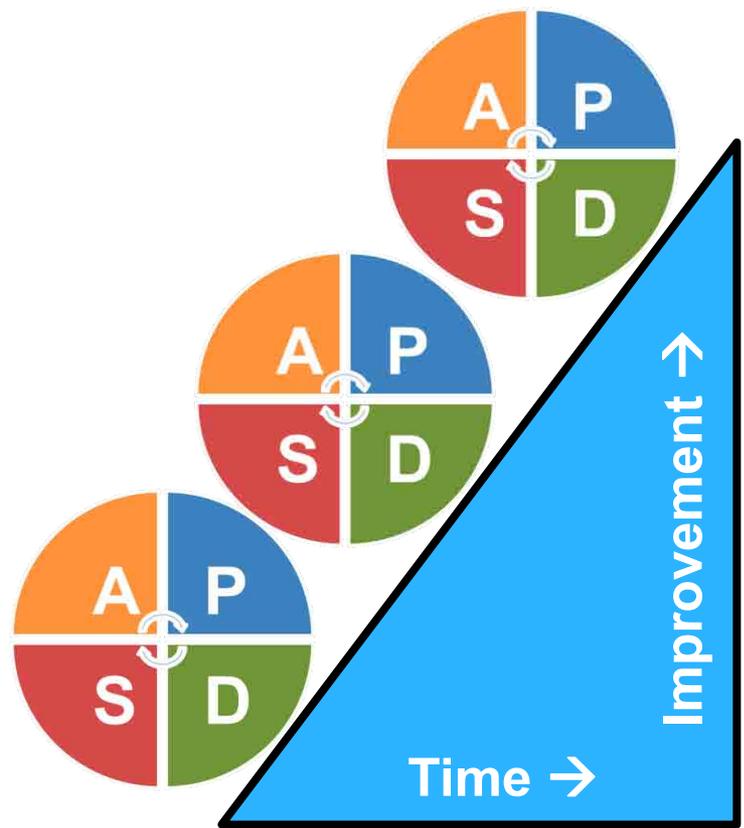

Image by MIT OpenCourseWare.

Creating flow:

- **Focus on what is flowing through the process**
- **Eliminate bottlenecks, minimize buffers**

Let Customers *Pull* Value

- **In a Push system, each activity delivers its output when it is done.**
  - **Results in build up of batches with lots of inventory. Defective goods pile up**
- **In a Pull system every activity delivers its output just as the next activity needs its input.**
  - **Triggered by the end customer**
  - **Results in smooth flow with no batches or voids**
  - **Minimizes inventory and rework due to defects.**
- **Pull systems can be implemented in material flow using a Kanban approach.**
- **Implementation for people flow is more challenging**

Plan-Do-Study-Act

Act
Next PDSA?
Standardize?
Make changes?

Plan
Set objectives
Current state
Develop plan

Study
Analyze data
Summarize
Reflect

Do
Execute plan
Gather data
Document

Improvement ↑

Time →

Lean is not a set of tools. It is a continuous improvement mindset using multiple PDSA cycles.

- **A simulation of a group of outpatient clinics**
  - **A legacy process**
  - **High variation in workload, processes**
  - **Poor performance**
- **A practice field for learning and using lean tools within a consistent problem-solving process**

Clinic

Photos by Jim Schlosser

Patients ready for admission

Images courtesy of Jim Schlosser. Used with permission.

Simulation Progression

- **Segment I: Baseline performance**
  - **Learn and practice the rules**

  We are here ⬅

  - **Use simple lean tools to improve legacy process**

- **Segment II: Applying Lean locally**
  - **Create a process map and add data for a simple VSM**
  - **Find waste and bottlenecks**
  - **Devise clinic process improvement plan**
  - **Execute and stabilize the improved process**

- **Segment III: Applying Lean across clinics**
  - **Face external disruptions and enterprise issues**
 - **Improve enterprise performance with Rapid Process Improvement and Daily Management System**

Learn the simulation

- **The simulation rules are straightforward but interact in complex ways**

- **It is important that you execute the basic rules correctly so that you can concentrate in future rounds on the simulated process**

- Your table facilitators will walk you through the simulation rules
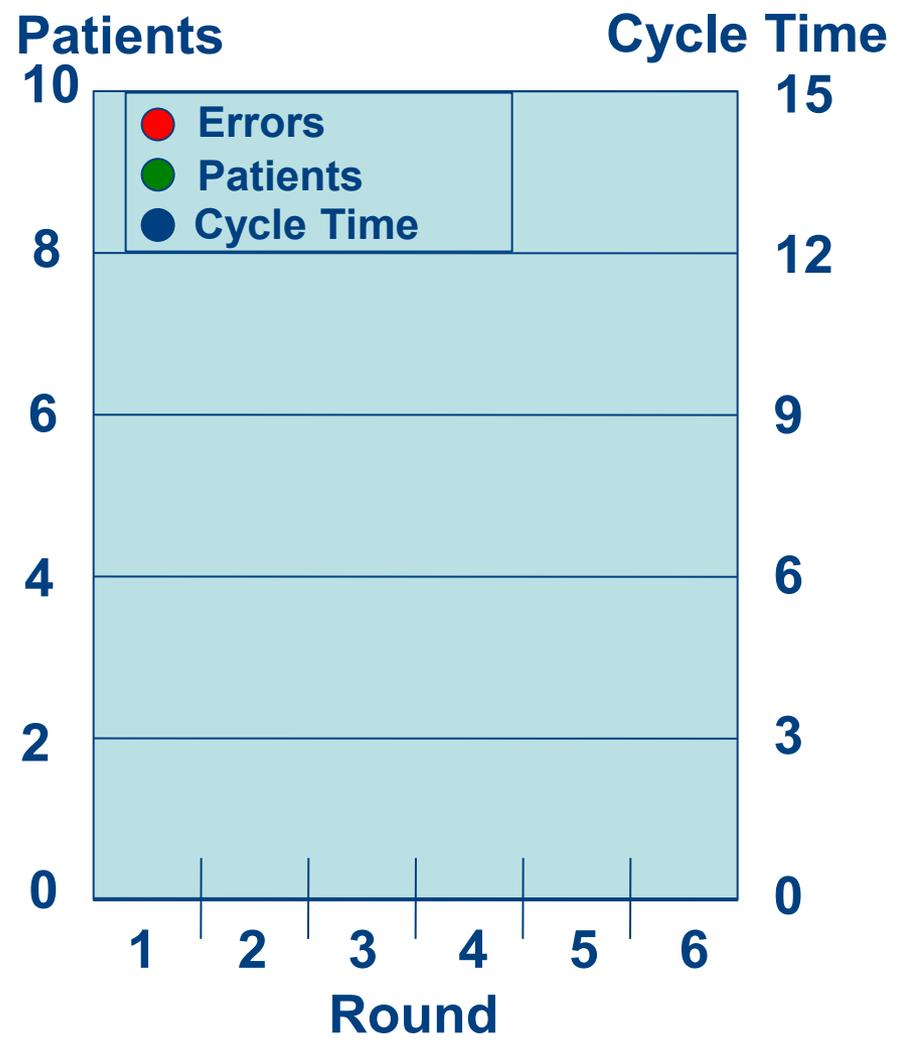
- **Let's Play!**
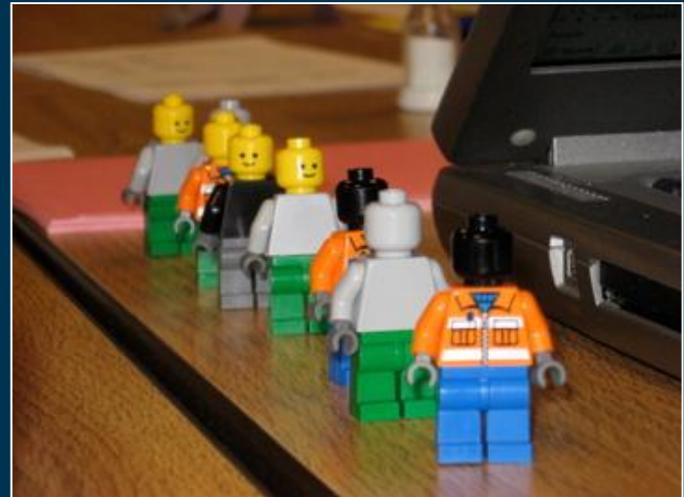
Courtesy of Jim Schlosser. Used with permission.

Metrics and Visual Control

- **Create an Easel chart to record your progress**
- **On the x-axis, put 6 rounds**
- **On the y-axes, put 0 to 10 patients, and 0 to +15 minutes**
- **Track patients treated, errors (patients untreated or treated incorrectly) and cycle times (average and worst)**

Patients ... **Cycle Time**

- 🔴 Errors
- 🟢 Patients
- 🔵 Cycle Time

Patients axis: 10, 8, 6, 4, 2, 0

Cycle Time axis: 15, 12, 9, 6, 3, 0

Round: 1 2 3 4 5 6

6S and Standard Work

- **Sort, Safe, Straighten, Scrub, Standardize, Sustain**

- *Goes beyond clean-ups and neatening*

- *Standardization* **is particularly important in environments with high variation and creative/skilled work**
  - **Standardize the steps and NVA tasks so that time and effort can be concentrated on the VA tasks**
  - **Eliminate unneeded decisions to lower the "Chaos" level**

Visual Control?

Provider status chart in clinic waiting room

Courtesy of Virginia Mason Medical Center. Used with permission.

Resident status chart in long term care facility

Date	1	2	3	4	5	6	7	8	9	10	11	12	13
19-May-11	2200	1580	1795	1015	1785	1460	1935	1710	1735	1835	1835	1260	1675
20-May-11	2080	1490	1910	1260	1585	1385	1810	1710	1735	1835	1835	1260	1735
21-May-11	2180	1705	1960	1375	2010	1710	1935	1860	1735	1835	985	1260	1735
22-May-11	2055	1655	1960	840	1660	1800	1810	1740	1735	1835	1635	1360	1735
23-May-11	2220	1515	2120	1010	1735	1585	1935	1935	1735	1910	1635	1460	1350
24-May-11	1945	1345	2120	1240	1985	1710	1810	1960	1685	2060	1685	1580	2120
25-May-11	1660	1315	1835	670	1935	1535	1810	2395	1785	1860	1635		1400
26-May-11	2245		1935	560	1985	1535	1810	1735	1835	1935	1635	1360	1530
27-May-11	2045	1375	1935	1050	1760	1660	1685	1860	1835	1835	1710	1660	1810
28-May-11	1885		1935	1200	1760	1585	1810	1760	1835	1935	1710	1660	1810
29-May-11	1795		1935	685	1735	1535	1810	1735	1910	2080	1735	1560	2035
30-May-11	1985	1400	1970	650	1910	1725	1975	1675	1805	2055	1600	1135	1435
31-May-11	1995		2035	950	1835	1315	2035	1675	1805	2055	1600	1510	1520
1-Jun-11	1700		1990	1380	1610	1570	1810	1625	1850	1835	1610	1355	1625
2-Jun-11	1685		1835	1130	1635	1385	1810	1635	1935	1835	1635	1445	1570
3-Jun-11	1810		1835	1580	1710	1535	1810	1635	1935	1835	1635	1540	1635
4-Jun-11	1810		1835	1480	1685	1580	1810	1585	1935	1835	1685	1330	1580
5-Jun-11	1810		1835	1235	1885	1445	1810	1585	1935	1710	1635	1315	1570
6-Jun-11	2035		1835	1030	1625	1275	1935	1735	2060	1625	1510	1270	1570

Courtesy of Faten Mitchell, Quality Improvement Advisor, Health Quality Ontario. Used with permission.

Hydration Chart for residents
- Each column represents a resident
- Each row represents a day
- Each cell is daily fluid intake in ml
- Colors show fluid intakes levels relative to desired amounts

Standardizing your process

- **Take a few minutes with your table to attempt to standardize your process execution**
  - **Make sure you understand and execute your individual process correctly**
  - **Standardize interactions with other parts of the clinic?**
- **Sort, Straighten, Scrub and Safe your work area**
- **Are there any simple visual controls to improve your process flow?**

- **Let's Play!**
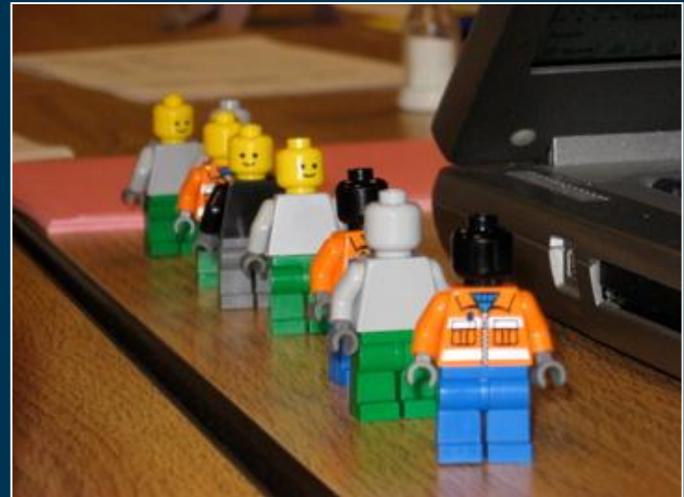
Courtesy of Jim Schlosser. Used with permission.

Segment 1 Thinking Points

- **Could you see the process?**

- **Could you see the bottlenecks?**
  - **Queuing/Inventory/Waiting**
  - **Transport, Complexity, etc.**

- **Do simple lean tools help you execute the process (even if it has problems that the simple tools cannot fix)?**

- **We will return to the sim to fix some of these problems after we learn a bit more…**
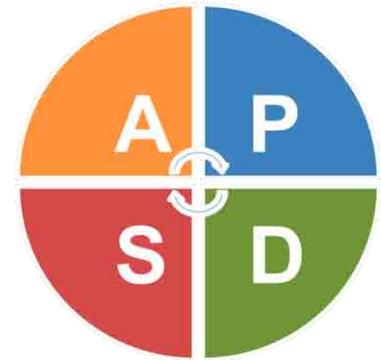
Acknowledgements

Contributors

- **Hugh McManus – Metis Design**
- **Earll Murman – MIT**

Collaborators

- **Faten Mitchell – Health Quality Ontario**

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