A Tale of Two Camels: Implementing Lean Operations in Healthcare:

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Process Improvement in Healthcare
is more than just a cost issue

• A defect in healthcare can be deadly
  – In 1998, the Institute of Medicine estimated that up to 98,000 deaths per year occur due to medical errors.

• Recent report by James (2013) revised this estimate upwards to approximately 400,000 deaths per year due to preventable adverse events.
  – Third leading killer in the U.S.
    1. Heart disease: ~600,000 per year
    2. Cancer: ~575,000 per year
    4. Chronic lower respiratory disease: ~140,000 per year
  – For comparison, traffic accident deaths: ~30,000 per year

• From the same study, serious (but non-lethal) harm occurs to approximately 4-8 million patients per year…
“Lean” in healthcare

Just like the two camels, there is a toolkit to improve outcomes in manufacturing that is reasonably well-understood, much of it is based on “Lean” (aka the Toyota Production System). But,

Hypothesis: Implementations of lean in healthcare, while having some success, are limited and difficult to scale because the change in context between manufacturing and healthcare is not fully considered.
Goals of this talk

- Explain the context in which process improvement (especially lean) was developed and compare it with healthcare.

- What are the problems of importing lean methods wholesale into healthcare?

- Illuminate where in healthcare:
  1. Lean might help directly
  2. Some higher-level Lean “PI principles” might make sense, though the Lean tools need modification
  3. Lean does not apply.

Lean Production in the Mfg. Context

- Built on std. “Fordist” Mfg. assumptions
  - Limited menu of identical products, truly interchangeable parts
  - Well defined processes, knowledge embedded in machines, highly specialized, but unskilled workers doing simple jobs

- Identify customer goals

- Value-map processes to enable continuous improvement to eliminate waste (Kaizen)
  - 5 S’s (Sort, Streamline, Spic-and-Span, Standardization, Sustain)
  - Sustained reduction of inventory (Kanban, Just-In-Time)

- Empower line workers to use their knowledge in improving process
  - With respect to “defects,” separate process from people
  - Mistake-proofing, visual management
  - Scientific method to PI (Plan-Do-Study-Act Cycle, Ishikawa/TQM tools) led by line workers

- Create long-term “Marriage” relationships with suppliers to help process improvement (Keiretsu)
  - Small number of large, empowered, first-tier suppliers
  - Includes production leveling (Heijunka) to enable suppliers to also be lean
General Challenges: The Healthcare Context

• **Unclear objectives**: What does it mean to say that healthcare is “working”?  
  – Every patient’s goals are different (and those change over time)  
  – Different stakeholders: patient, insurance company, etc.  
  – Who is the customer? Payer, insurance company, physician etc.?  
  – The economics of healthcare are **poorly understood**, relative to industries such as manufacturing.

• Healthcare involves **highly customized work, process, and outcomes**.  
  – Irreducible uncertainty in diagnosis, progress of disease, etc. is much greater  
  – More dependent on **professionals** and less on mechanized processes

• Many healthcare providers’ strategies are in **flux**.

Specific Challenges to Lean in Healthcare

1. Standard “Fordist” mfg. assumptions are violated

**Patients are unique** with ever-changing objectives based in part on interaction with healthcare providers.  
  – Irreducible uncertainty in the course of patient and level of evidence, disease and medications interactions are exponential. Each patient is his/her own context!  
  – Human body limits spacing out activities like in a factory or other 5S’s.  
  – More akin to automotive or MIS repair than factory assembly
Challenges to Lean in Healthcare (cont.)

2. Continuous improvement to eliminate waste is difficult
   • Crucial aspects of treatment are in the “heads” of professional clinicians
     — Because each patient is unique, there is often no “process” to improve
   • Every clinician is trying to do a good job for each individual patient first and foremost (any process improvement work must necessarily take second place).
     — Hence, incentive misalignment create a tendency to “work around” problems.
     — Many problems are due to lack/misplacement of information, medicine, or supplies (e.g. pumps, IVs, wheelchairs).
     — Aggregate vs. individual data.
   • Cultural misalignments can lead to “over-production” in testing & procedures

Challenges to Lean in Healthcare (cont.)

3. Other issues in leveraging “line worker” knowledge
   • Who pays for process improvement work, particularly as professionals are expensive and process learning is diluted by fragmented processes?
   • Fragmented specialties and hierarchy inhibits cross-functional communication.
     — Huddles are not quality circles. They are primarily for coordinating the treatment of individual patients, rather than process improvement
   • “On the ground” ambivalence about adverse events and near-misses, rather than treasuring them
Challenges to Lean in Healthcare (cont.)

4. Relationships with suppliers are poorly defined

- **Little influence** over too many “suppliers”
  - Economically, hospital looks more like an iPhone than a factory
  - Suppliers are picked for—in lean terms—“low cost” rather than “low price.”

- Who are the suppliers?
  - Nursing homes
  - Primary care

- Who are the customers?
  - Patients?
  - Payers?
  - Employers?

Summing Up

Lean, which was developed for mass production, is problematic in healthcare, because some aspect of healthcare are more like **artisanal (craft) production** than mass production.

But are there some **principles** we can take from lean to help with these artisanal aspects?
What can we take from Lean?

Create constancy of purpose for improvements of product and service...improvement in all areas of business should be expected (Deming’s 14 points)

– Must convince people system improvement is everyone’s job in a meaningful way.
– Everyone in the system must be more observant (including the patient!)

W. Edwards Deming 1900-1993

“We have learned to live in a world of mistakes and defects...It is time To adopt a new philosophy.”

What can we take from Lean?

Pay attention to fundamental issues in process

– **Which parts** of healthcare can be fruitfully treated as a process?
  • Can some parts be made to look more like processes
– Be mindful of process gaps (e.g. between depts. or at discharge)
  • Minimize handoffs
– **Smoothing** flow and reducing time in process is useful where practical
  • Physical design of facilities (this has already had some success)
– **Eliminating** unnecessary/redundant process steps where feasible.
What can we take from Lean (cont.)?

Co-opt clinicians so that they want to make process improvement part of their job, not so that they can help you do it, but rather because they are the only people who understand how to do it.

- Can we standardize (and other 5S’s), where standardization is feasible?
  - Standardization, etc., only works when done at grass-roots level
  - Minimize supply and information issues
- Can we separate process from people and learn from our mistakes?
  - Employ mistake proofing and visual management as much as possible
- Can we leverage statistically varying time-series data to improve the process?
  - Needed for using scientific method on processes.
  - Use by individual chronic patients

What can we take from Lean (cont.)?

Pay attention to the “supplier” interrelationships

- Be mindful of interrelationships in process that lead to communication/coordination gaps, between personnel in different
  - Departments, Specialties,
  - Professions
  - Housekeeping
  - Administrators
  - Social workers
  - Primary care practices
- And, of course, the patient!
Where Lean Can’t Help!

There are many areas in which lean (or any other form of process improvement) cannot help, because there is no process, high irreducible variability, or both.

For example:
• Diagnosis
• Treatment, where disease evolution is highly uncertain
• Rehabilitation
• Mental health treatment

Systems improvement is still necessary, but something other than process-based improvement methodologies is needed.

Takeaways

• There are some aspects of healthcare that resemble lean/mass production and others that resemble craft (artisinal) production. We need to understand which is which.

• While a direct arbitrage of lean methods to most areas of healthcare is problematic, many of the high-level principles apply.

• Filling out the remainder of the operational principles and toolkit for healthcare is a vital task, and I’d love your help.
Thank You!

• Edward Anderson

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Healthcare Delivery Challenges

• Healthcare involves highly customized work, process, and outcomes.

• The economics of healthcare are poorly understood, relative to industries such as manufacturing.

• What does it mean to say that healthcare is “working”? — Different stakeholders have different interests — Every patient’s goals are different (and those change over time).

• Strategies of many healthcare providers are in flux.

• Other challenges???
“Lean” in healthcare

• There is a toolkit to improve outcomes in manufacturing that is reasonably well-understood, much of it is based on “Lean.”

• But, the context of manufacturing differs from the context of healthcare

• Hypothesis: Implementations of lean in healthcare, while having some success, are limited and difficult to scale because the change in context is not fully considered.

Goals of this talk

• Describe exactly what lean manufacturing is in its original manufacturing context, so that you can make your own judgments as to what might work (easily) and what won’t work (or will only work with considerable difficulty) in healthcare.

• Explain what I see as some of the problems of importing the lean toolkit/methodology wholesale into healthcare

• Illuminate some higher-level “lean principles” that could make sense in a healthcare context.

• Leverage your knowledge as to what other aspects of lean might work well in a healthcare context.
What is “Lean”

• Developed by MIT researchers in early 1990s

• Genericized the Toyota Production System (and—to some extent—Honda), which is the dominant paradigm in manufacturing
  – It includes a quality component

• To understand Lean, it helps to have an understanding of mass and craft production.

Craft (Artisanal) Manufacturing

• Craft production existed before Henry Ford

• Key aspects
  – Total customization as requested by the customer
  – No standardized units of production, and no truly interchangeable parts.
  – No assembly lines, assembly was done by master skilled trades, who read and interpreted schematics
Mass Manufacturing

- Job specialization at the 60-second level
  - Exploits economies of scale
  - Knowledge embedded in an engineered line because most workers illiterate in English and innumerate

- Identical products (at first)
  - “You can have it any color, as long as it’s black”
  - This was relaxed later, which contributed to quality issues

- Truly interchangeable parts
  - Standardized gages

- Vertical integration of suppliers (down to rubber plantations!)
  - No good suppliers originally.
  - Otherwise, spot contracts

- Expert-driven quality

Lean Production

- Limited menu of products

- Eliminate waste in the process thru continuous improvement (Kaizen)
  - 5 S’s (Sort, Streamline, Systematic Clean, Standardization, Sustain)
  - Sustained reduction of inventory (Kanban, Just-In-Time)

- Leverage line worker knowledge to improve process
  - With respect to “defects,” separate process from people
  - Mistake-proofing, visual management
  - Scientific method to PI (Plan-Do-Study-Act Cycle, Ishikawa/TQM tools) led by line workers

- Production leveling (Heijunka)
  - Rapid change-overs between models

- Long-term “Marriage” relationships with suppliers (Keiretsu)
  - Small number of large, empowered, first-tier suppliers
Food for thought

• Taiichi Ohno (co-inventor of TPS) thought that Lean was just a natural evolution of Mass production.

• Is the healthcare environment more like mass production or more like craft (artisanal production)?

Challenges to Lean in Healthcare

• Limited menu of products
  – Patients are unique with ever-changing objectives based in part on interaction with healthcare providers.
  – Metrics are not clear-cut even at system or population level.
  – Who is the customer, hospitals are more akin to iPhones than auto firms?

• Eliminate waste in the process thru continuous improvement (Kaizen)
  – Flow is more difficult to standardize than in manufacturing, outside of public health
  – Fear of litigation, wishes of patients, lead to “over-production” in testing & procedures
• Authority, power is distributed
  – Conflicts in authority, who has relevant information.

• Quality management group
  – UMN reviewer
    • Patient meets admission criteria, continuing care criteria, criteria for discharge. Macassem.

• Need excess capacity to help manage uncertainty
  – Where is this needed?

• Linear issues

Challenges to Lean in Healthcare (cont.)

• Leverage line worker knowledge to improve process
  – Everyone clinician is trying to do a good job for each individual patient
  – Fragmented specialties on many levels
  – Fear of litigation sometimes leads to hiding of adverse events, rather than “treasuring” them

• Production leveling (Heijunka)
  – In many cases (such as ED), patients need help when they need help

• Long-term marriage-like relationships with suppliers (Keiretsu)
  – Little influence over too-many (relative to Lean ideal) “suppliers”

• Other Issues???
What can we take from Lean?

• Create constancy of purpose for improvements of product and service...improvement in all areas of business should be expected (Deming's 14 points)
  – Must convince people it's everyone's job in a meaningful way.
  – Everyone in the system must be more observant (including the patient!)

• Pay attention to the “supplier” interrelationships
  – Be mindful of interrelationships in process that lead to communication/coordination gaps, between personnel in different
    • Departments, Specialties, Professions
  – And, of course, the patient!

• Pay attention to fundamental issues in process
  – Be mindful of process gaps (e.g. between depts. or at discharge)
    • Minimize handoffs
  – Smoothing flow and reducing time in process is useful where practical
    • Physical design of facilities (this has already had some success)
  – Consider eliminating unnecessary/redundant process steps where feasible.
    “Don’t do something, just stand there!”

What can we take from Lean (cont.)?

• Co-opt clinicians so that they want to make PI part of their job, not so that they can help you do it, but rather because they are the only people who understand how to do it.
  – Can we standardize (and other 5S’s), where standardization is feasible?
    • Standardization, etc., only works when done at grass-roots level
  – Can we separate process from people and learn from our mistakes?
    • Employ mistake proofing and visual management as much as possible
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• Other takeaways from Lean?
Takeaways

• There are some aspects of healthcare that resemble lean/mass production and others that resemble craft production. We need to understand which is which.

• While a direct arbitrage of lean methods to most areas of healthcare is problematic, some principles can be applied.

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Challenges to Lean in Healthcare

2. Continuous improvement to eliminate waste is thwarted

- **Skilled Personnel Empowerment paradox.** At least 8% of nurses’ time is spent “working around” problems. None is spent solving them at the root cause
  - Clinicians are empowered and must practice in the presence of “customers.”
  - Who pays for process improvement work?
  - Most problems are due to lack of supplies, medicines, or information.

- **Fear of litigation, wishes of patients,** lead to “over-production” in testing & procedures
Food for thought

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Lean Production

• Lean is this
• But it doesn’t apply well to healthcare
  – Patient safety
  – Reducing waste, UMN is non-lean
    • Distortions of lean
  – Performance feedback, analytical approach, don’t tell you how to fix
• Why, it applies well to some things and not others
  – Which ones are they
• What are the forgotten things about lean that could apply to healthcare?