Minicourse Objectives

After completing this course, you will be able to:

1. Explain why system complexity requires us to take a methodical approach to system design, operation, and improvement.
2. Explain how the absence of this methodical approach will cause complex systems to fail predictably.
3. Propose specific applications of this methodical approach to the design, operation, and improvement of health care.
Healthcare inflation

- 4.3% per year over the last 30 years
- Driven by technology and expectation
- Only 0.4% attributable to ageing
- Need to deliver over 20% more care in 5 years’ time
- Need to deliver over 50% more care in 10 years’ time

UNSUSTAINABLE
Activity

- Please form a line in rank order of distance travelled to the Forum

Activity

- Please form a line in rank order of distance travelled to the Forum

- Introduce yourself with:
  - Name
  - Place of work
  - Role
  - Expectation of the day
Exercise Debrief

- Physical demonstration of complexity
- The challenge of rapid problem solving in the absence of full information
- Novelty – a new problem
- What did you learn?

A Patient Story

- Painful hand
- Surgery
- Oral antibiotics
- NIV antibiotics
- Discharge

Sunday Monday Tuesday Wednesday Thursday Friday Saturday
Ford Mustang

Royal Hallamshire Hospital
Age-standardised five-year relative survival rate, female breast cancer, England and Wales, 1971-2009

* England only

Health care: Good News / Bad News
A Patient Story

- Painful hand
- Workaround admission
- Surgery
- IV antibiotics
- Discharge
- Painful hand
- Oral antibiotics
- Wound examined
- Wound redressed
- Antibiotics late
- Antibiotics late
- Calls unanswered
- Second operation
- Staph / Strep mop
- No antibiotics
- No antibiotics
- Oral antibiotics
- No antibiotics
- 3 hours to access
- No antibiotics
- Second operation

Within 2 weeks two adults died of identical strain of streptococcal infection
A successful outcome
- due to fantastic individuals
- despite the system

What if the system design had overcome the complexity?
- Would patient satisfaction have been higher?
- Would length of stay have been shorter?
- Would second operation have been necessary?
- Were the two deaths avoidable?

TOYOTA
1. Focus Factory
2. Pull system
3. Standardisation

1. Job shop to focus factory
1. Job shop to focus factory
2. Chaotic Push to Self Pacing Pull
Patient Flow

[Diagram showing patient flow with labels for various areas such as Physio Assessment, Nursing Assessment, Waiting Area, and OT Assessment]

Patient Flow

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Patient Cycle Times in DRU Falls Clinic

[Graph showing patient cycle times with time in clinic (minutes) on the y-axis and consecutive tested patients on the x-axis. The graph includes a trend line with key values: Split Start 1 5, Median ~106.5 105.0]
3. Improvisation to Standard Work

Standard installation
Practical Exercise

Coffee Break
15 minutes
SEE

Toyota Factory
“Too much airplane for one man to fly.”

The first checklist

By implementing the checklists, they flew 1.8 million hours with 18 B-17s without incident, proved to the government they were safe, and eventually nearly 13,000 were built.
WHO Surgical Safety Checklist

Surgical Safety Checklist

**SIGN IN**
- Patient has confirmed
  - Identity
  - Site
  - Procedure
  - Consent
- Site marked: not applicable
- Anaesthesia safety check completed
- Pulse oximeter on patient and functioning
- Does patient have a:
  - Known allergy? **NO**
  - IS the airway aspiration risk? **NO**
  - Is the equipment assistance available? **YES**
  - Risk of abnormal blood loss? **YES**
  - INR
  - YES, and adequate intravenous access and fluids planned

**TIME OUT**
- Confirm all team members have introduced themselves by name and role
- Surgeon, anaesthesia professional, and nurse verbally confirm:
  - Patient
  - Site
  - Procedure
- Anticipated critical events
- Summary review: what are the critical unanticipated issues, anticipated duration, anticipated blood loss?
- Anaesthesia team review: are there any patient-specific concerns?
- Nursing team review: have the sterilization and other elements been confirmed and are these equipment issues or any concerns?
- Have antibiotics been given within the last 60 minutes? **YES**
- **NOT APPLICABLE**
- Is essential imaging displayed? **YES**
- **NOT APPLICABLE**

**SIGN OUT**
- Nurse visually confirms with the team:
  - The name of the procedure recorded
  - That instruments, sponges and needle counts are correct (or not applicable)
  - How the specimen is labelled (including patient name)
  - Whether there are any equipment problems to be addressed
  - Surgeon, anaesthesia professional, and nurse work the await concerns for recovery and management of this patient

*This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.*

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Surgical Safety Checklist

![Surgical Safety Checklist Graph](image)

Full implementation of Surgical Safety Checklist

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Magee Women’s Hospital, PA

Practical Exercise
Heisenberg

The 17-mile, mega-machine, Large Hadron Collider

SOLVE
Learning Your Way To Greatness

- No team can design a perfect system in advance, planning for every contingency and nuance.
- However, ..., people can discover great systems and keep discovering how to make them better.
- Idiosyncratic confluences and coincidences of people, processes, products, places and circumstances could create a hazardous situation where none had been known to exist.

Dr. Steve Spear, The High Velocity Edge

The Value of “Failed” Tests

“I did not fail one thousand times; I found one thousand ways how not to make a light bulb.”

Thomas Edison
Black Swans

- The Triplet of Opacity
  - The illusion of understanding, or how everyone thinks he knows what is going on in a world that is more complicated (or random) than they realize
  - The retrospective distortion, or how we can assess matters only after the fact
  - The overvaluation of factual information and the handicap of authoritative and learned people

Why Aren’t We Getting Better?

- Craft-based practice models are poorly designed to function in complex environments.
- Vigilance and hard work may be necessary but aren’t sufficient.
- Even the brightest physicians and nurses can’t absorb the exploding quantity of new medical knowledge.


**Understanding Randomness**

“... not only do we preferentially seek evidence to confirm our preconceived notions, but we also interpret ambiguous evidence in favor of our ideas. ... we should learn to spend as much time looking for evidence that we are wrong as we spend searching for reasons we are correct.”

pp. 190-191

**The Dangers of Empirical Evidence**

“... the individual physician may be most impressed by observations made in his or her individual practice. This source of evidence is notoriously vulnerable to bias and error.”

Survival of the Adaptable

“It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change.”

Charles Darwin
Sharing at Thedacare, WI
Learning from experience

Physician Rounding Pilot – 24T

- Recent success in co-locating patients
- Next step is to assign Ahmed as admitting phys.
- Strong downward trend since start of pilot
- Upick in recent data due to long LOS patients in week 37 (74, 36, 14)

CATASTROPHE

- Images of space shuttle disaster
- Explanation of events leading to catastrophe
- Details of other disasters related
Some holes due to active failures eg mistakes, violation of protocol

Some holes due to latent conditions eg equipment failure, inexperienced staff

Prof James Reason's Swiss Cheese model (from BMJ 2000; 320: 768-70)

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**Practical exercise**

1000 slips or mistakes $\rightarrow$ 100 close calls $\rightarrow$ 10 harms $\rightarrow$ 1 death

1,110 chances for someone at that hospital to say, ‘Hey, this is not correct. Let’s do something about it before we kill someone.’

Dr. Steve Spear, The High Velocity Edge
LEAD
LEAD

Thedacare: John Toussaint
Virginia Mason: Gary Kaplan

Lunch Break
Be back in 60 minutes please
Practical Exercise

- How can you apply See, Solve, Share, Lead to your own complex system?
- What will you do next week?

Evaluation

- Did we meet your expectations?
- What went well?
- What could be better?
Steve Spear – The High Velocity Edge

Thank you

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