

Welsh Clinical Leadership Fellowship

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Content

My journey

Orthopaedic Patient Scheduling Project

- Background

- Proposal

- Methods

- Building the model

- Results

- The Future

Some 'mini' projects

Leadership style

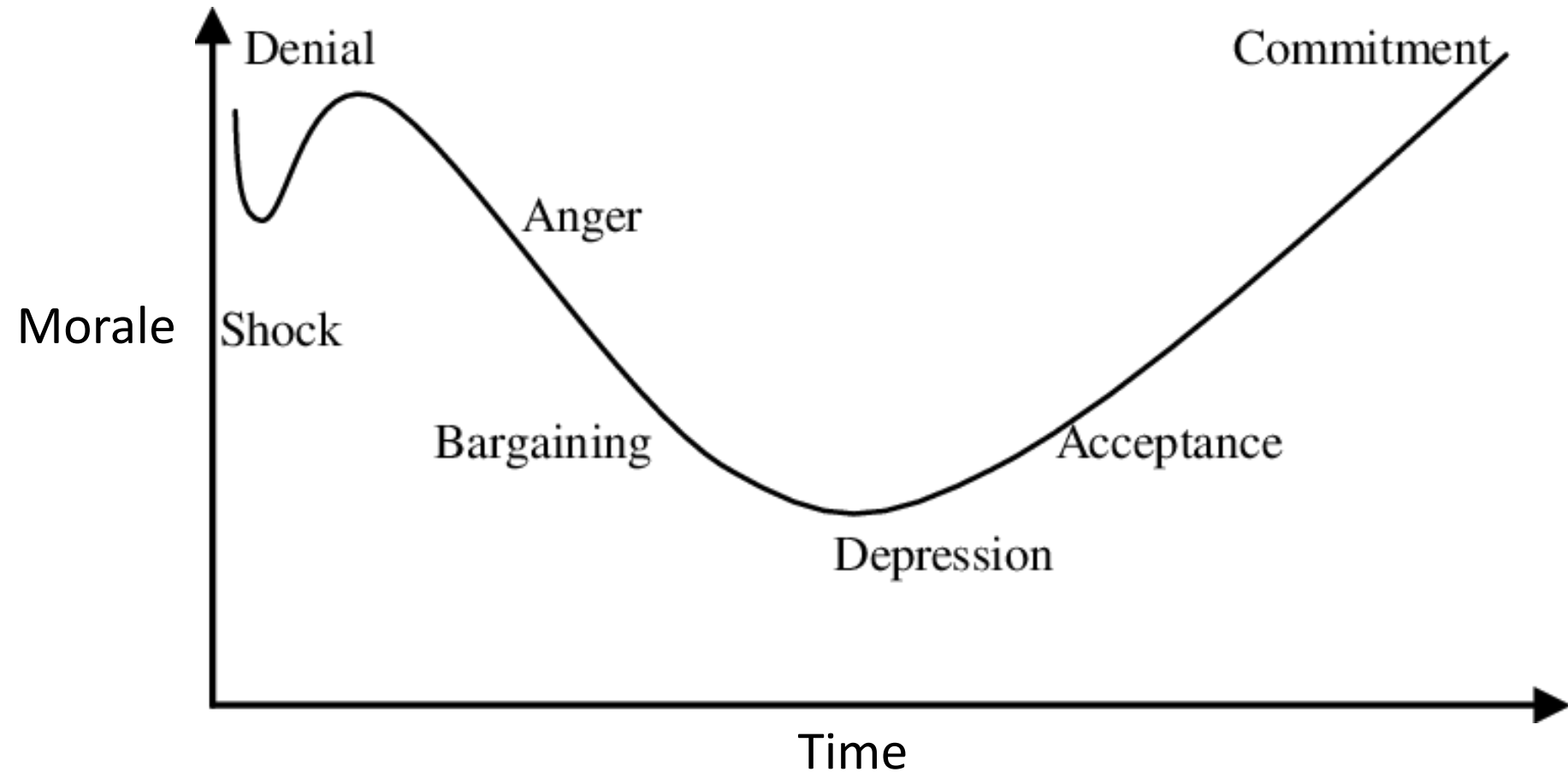
The journey continues...



My Journey...



The Kubler-Ross Curve



The Rick-Ellis Curve



Thank you



Wales
Deanery
Deoniaeth
Cymru



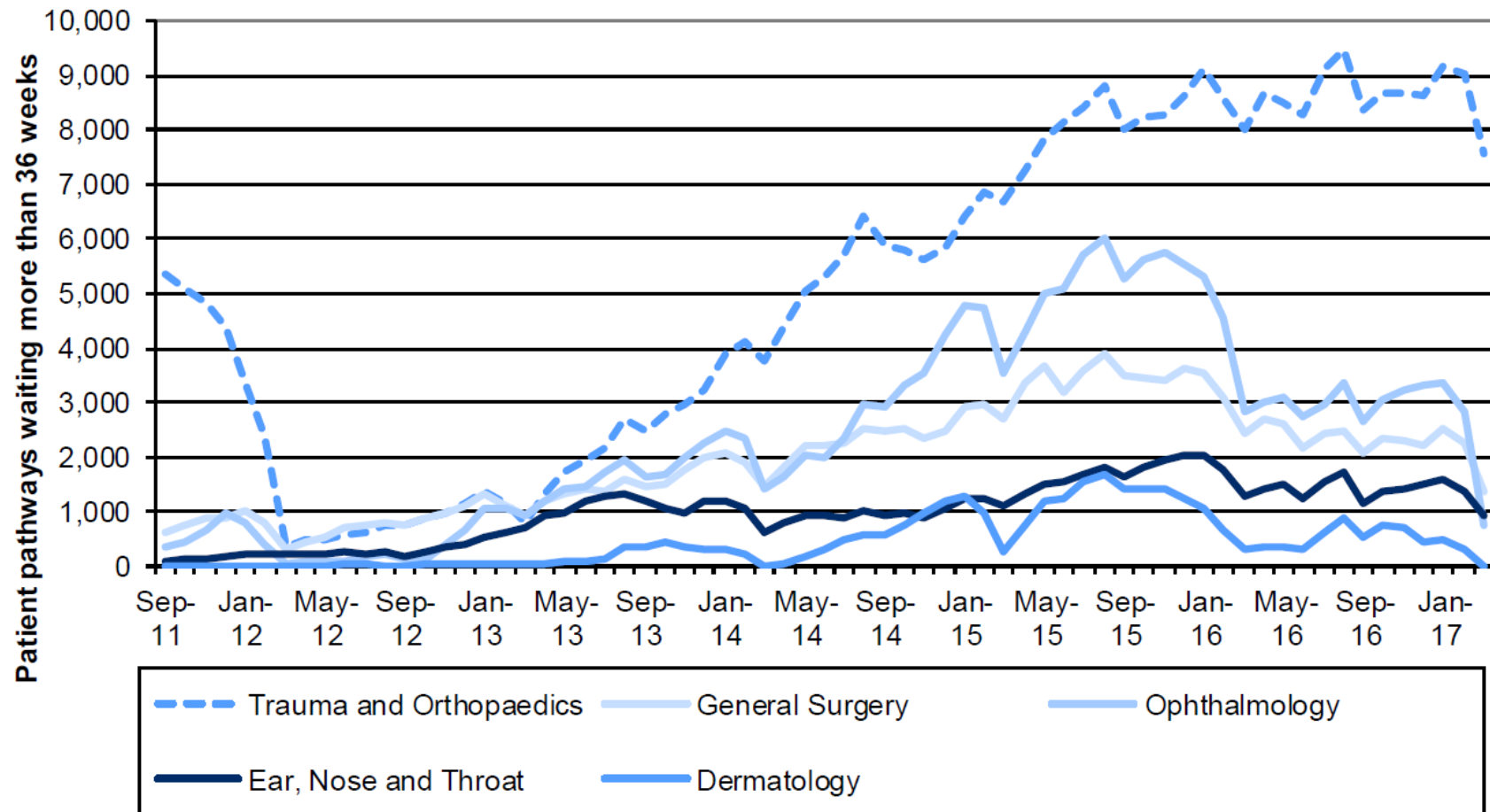
AcademiWales



Orthopaedic Project: Background



Number of patients waiting >36 weeks for treatment by speciality



Source: Welsh Government Statistics

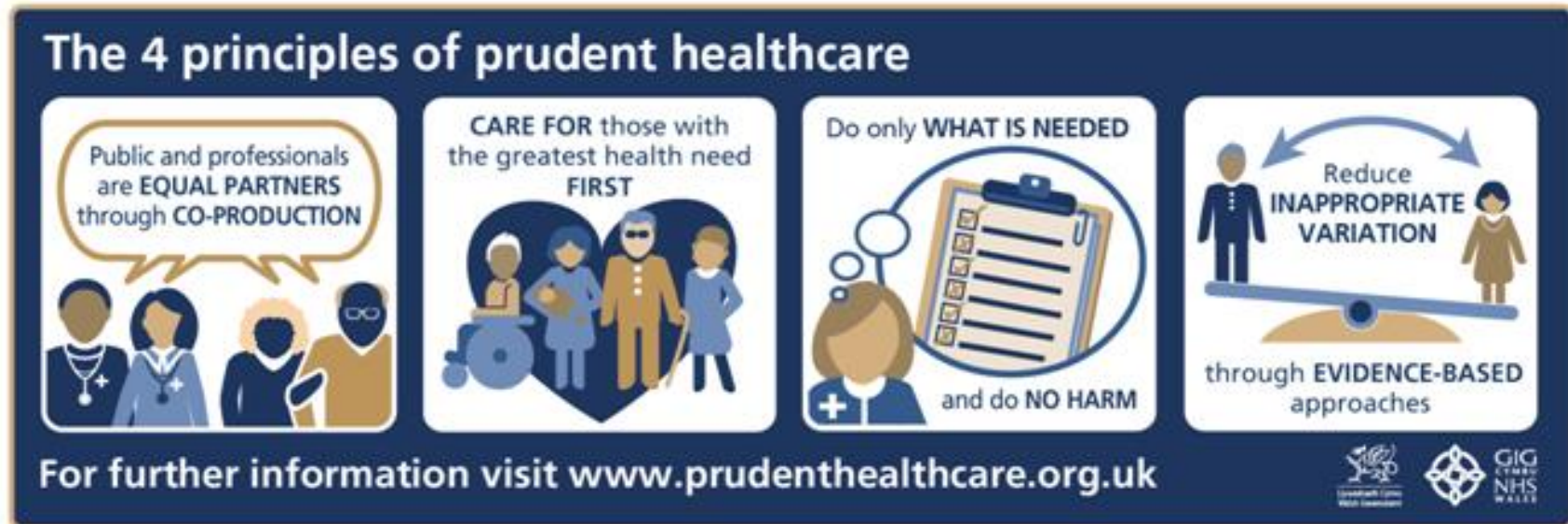
The people...



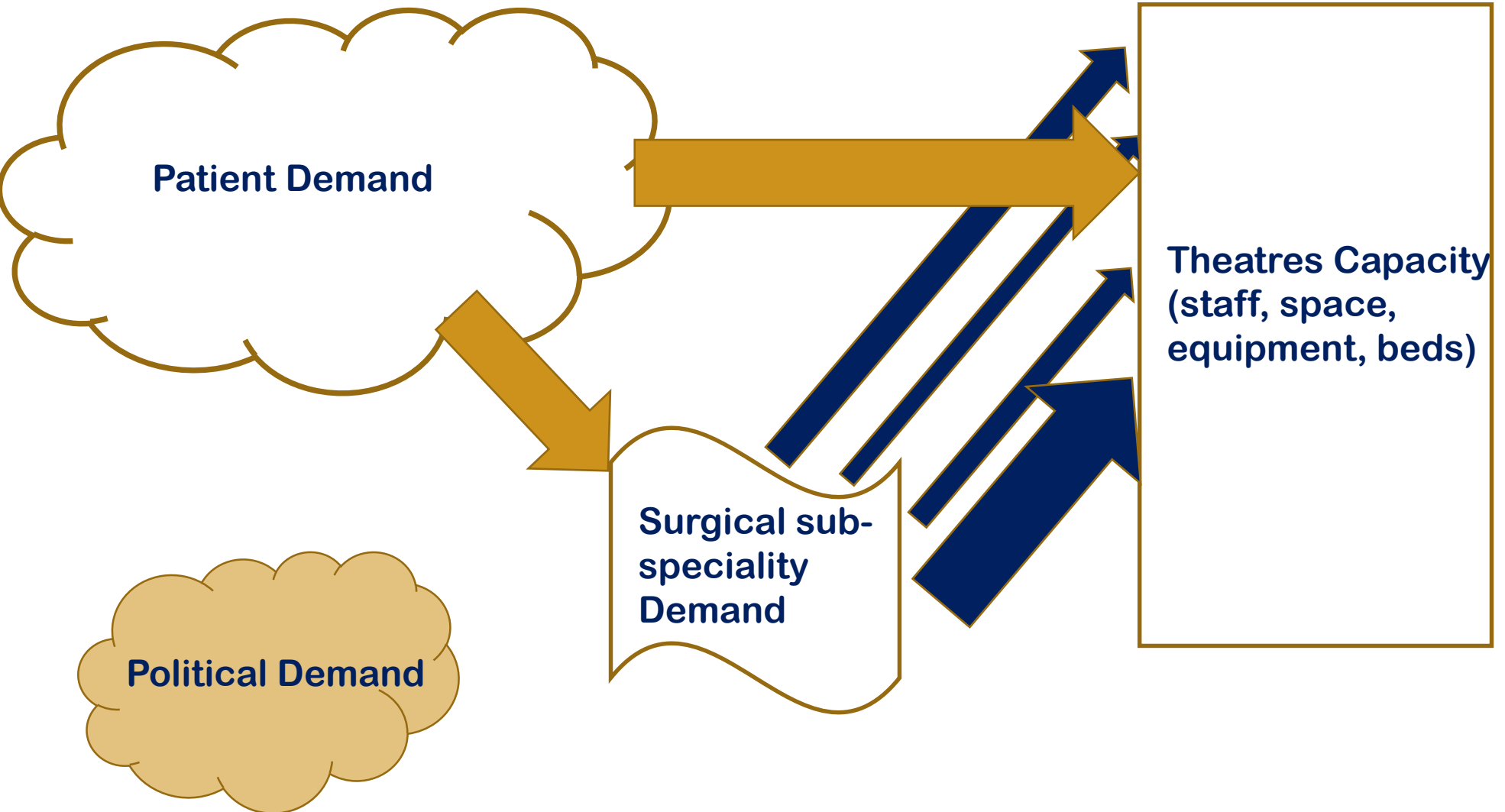
The tech...



Simply made more complex...



What's the problem?



***“Every System is perfectly
designed to deliver the
results it produces”***

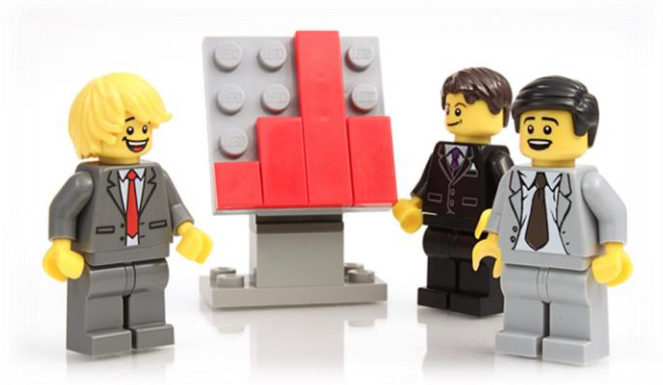
W.E. Deming



Proposal

- Equitably allocate theatre time to orthopaedic sub-speciality according to 'demand'
- Equitably schedule patients according to waiting times, clinical urgency and case requirements (surgical, operational and patient)

Building the model... Stakeholders



Proposal

- Equitably allocate theatre time to orthopaedic sub-speciality according to 'demand'
- Equitably schedule patients according to waiting times, clinical urgency and case requirements (surgical, operational and patient)



How do you allocate time?

Patients:

- Waiting times
- Operation times
- Urgency
- Patient choice
- Time dependent on location/surgeon and skill mix



Methods: Mathematical Modelling

Simulation

Forecasting

Statistical

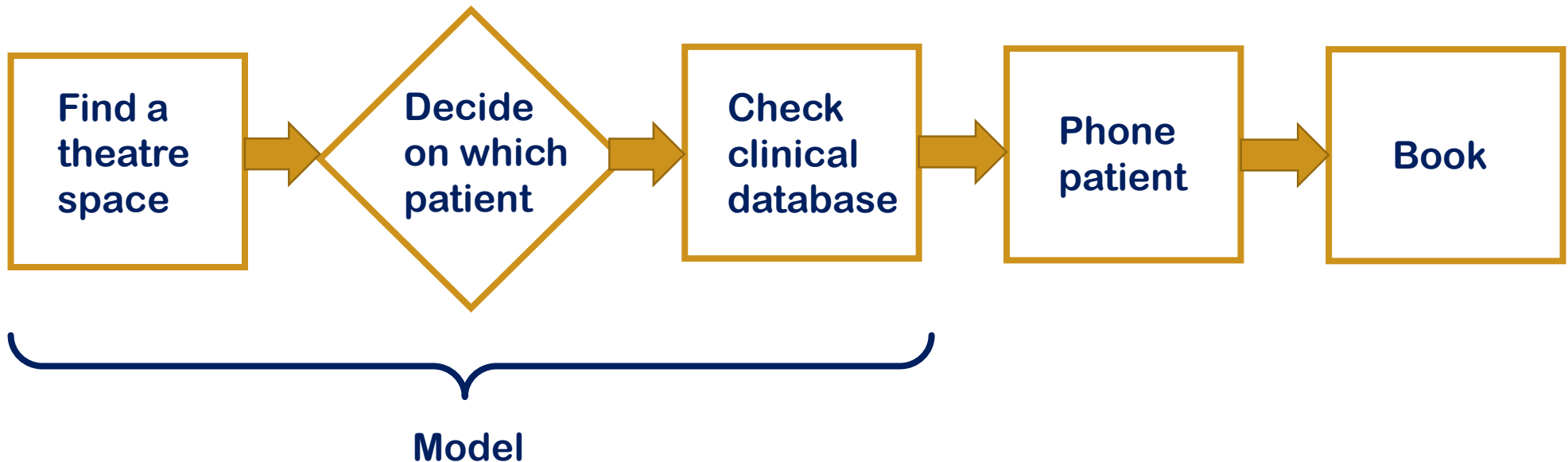


Geographical



Building the model... Process map

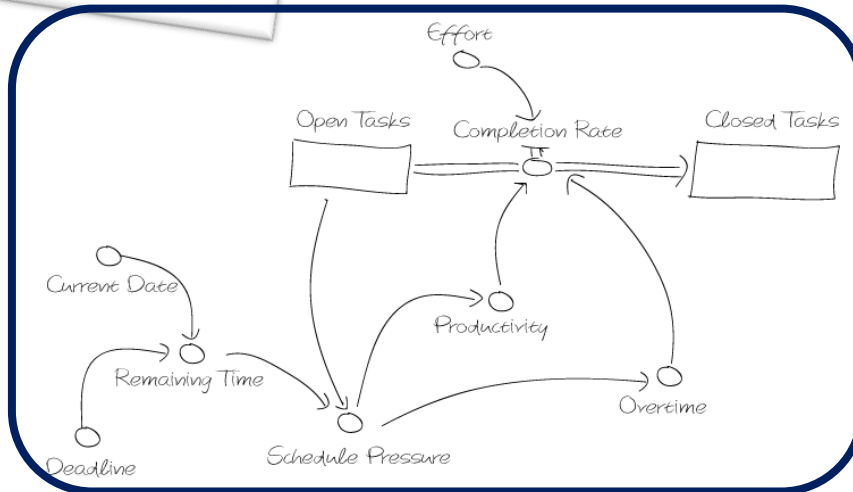
Each consultant list of patients needing theatre – managed by a scheduler



Building the model... communication



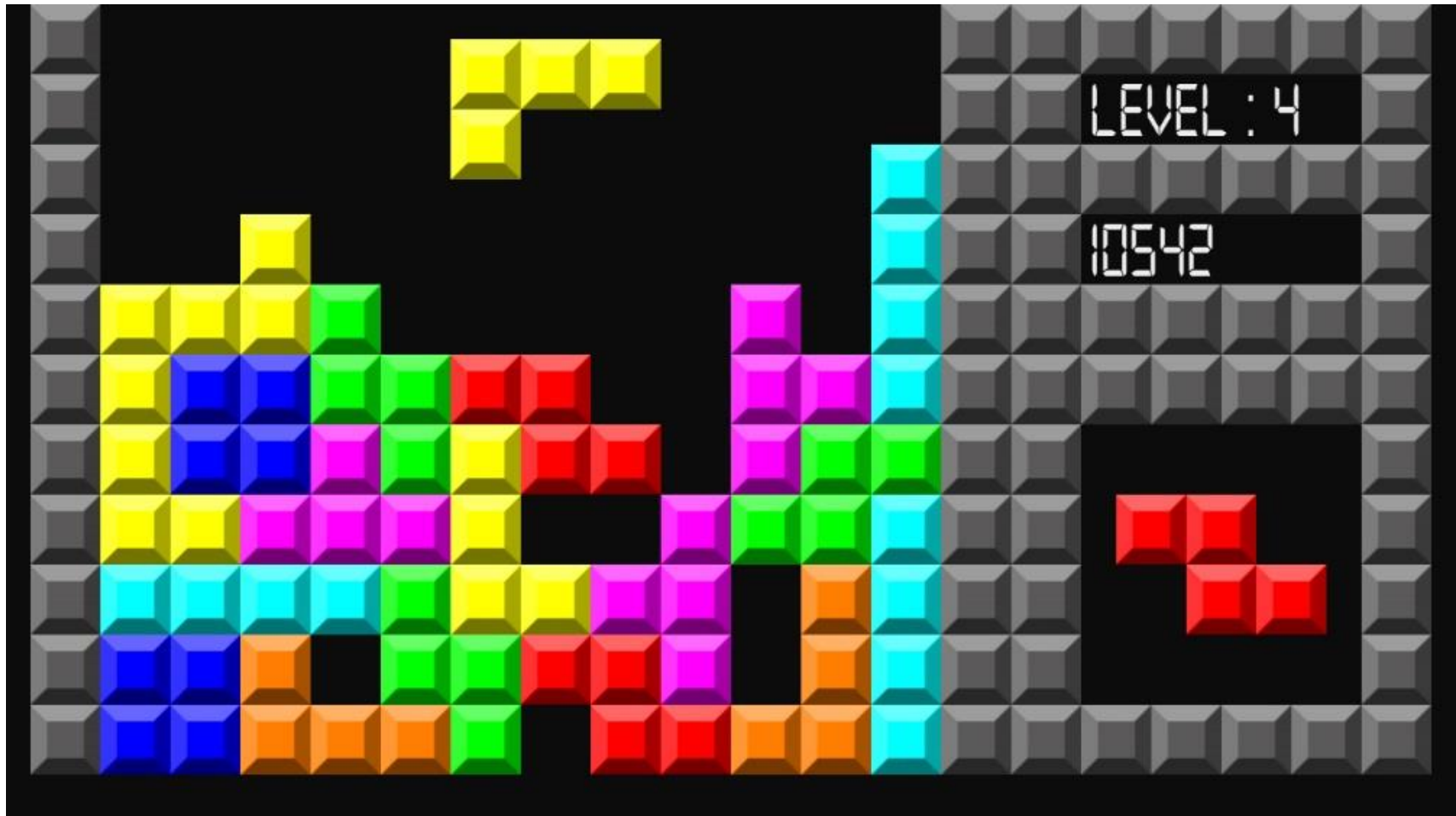
$$\begin{aligned}
 \mathcal{L} &= \int_{\mathcal{X}} \ell(x) e^{-2\gamma \cdot x} dx \frac{d\gamma}{d\theta} \\
 f(w) &= \int_{\mathcal{X}} \ell(x) e^{-2\gamma \cdot x} dx \frac{d\gamma}{d\theta} \\
 \rho \left(\frac{\partial v}{\partial t} + v \cdot \nabla v \right) &= -\nabla p + \nabla \cdot T + f \\
 H &= -\sum p(x) \log p(x) \\
 \frac{1}{2} G^2 S^2 \frac{\partial^2 V}{\partial S^2} + S \frac{\partial V}{\partial S} + \frac{\partial V}{\partial t} - r \cdot V &= 0 \\
 TC(Q, q, m) &= \sum_{i=1}^n \left[\frac{D_i}{m \cdot q_i} S_i + c_i \cdot D_i + \frac{q_i \cdot H_i}{2} \left(m \cdot \left(1 - \frac{D_i}{P_i} \right) - 1 + 2 \frac{D_i}{P_i} \right) \right] \\
 \left[\frac{d \Delta p(s, \phi)}{d \Delta M(s, \phi)} \right] &= \begin{bmatrix} \gamma & -\beta \\ -\beta & 0 \end{bmatrix} \begin{bmatrix} \Delta p(s, \phi) \\ \Delta M(s, \phi) \end{bmatrix} \\
 \int_0^{\pi/2} (\log \sin x)^2 dx &= -\frac{\pi}{8} \left(\log 2 \right)^2
 \end{aligned}$$



Building the model... some definitions

- Objective function
- Constraints
- Planning horizon

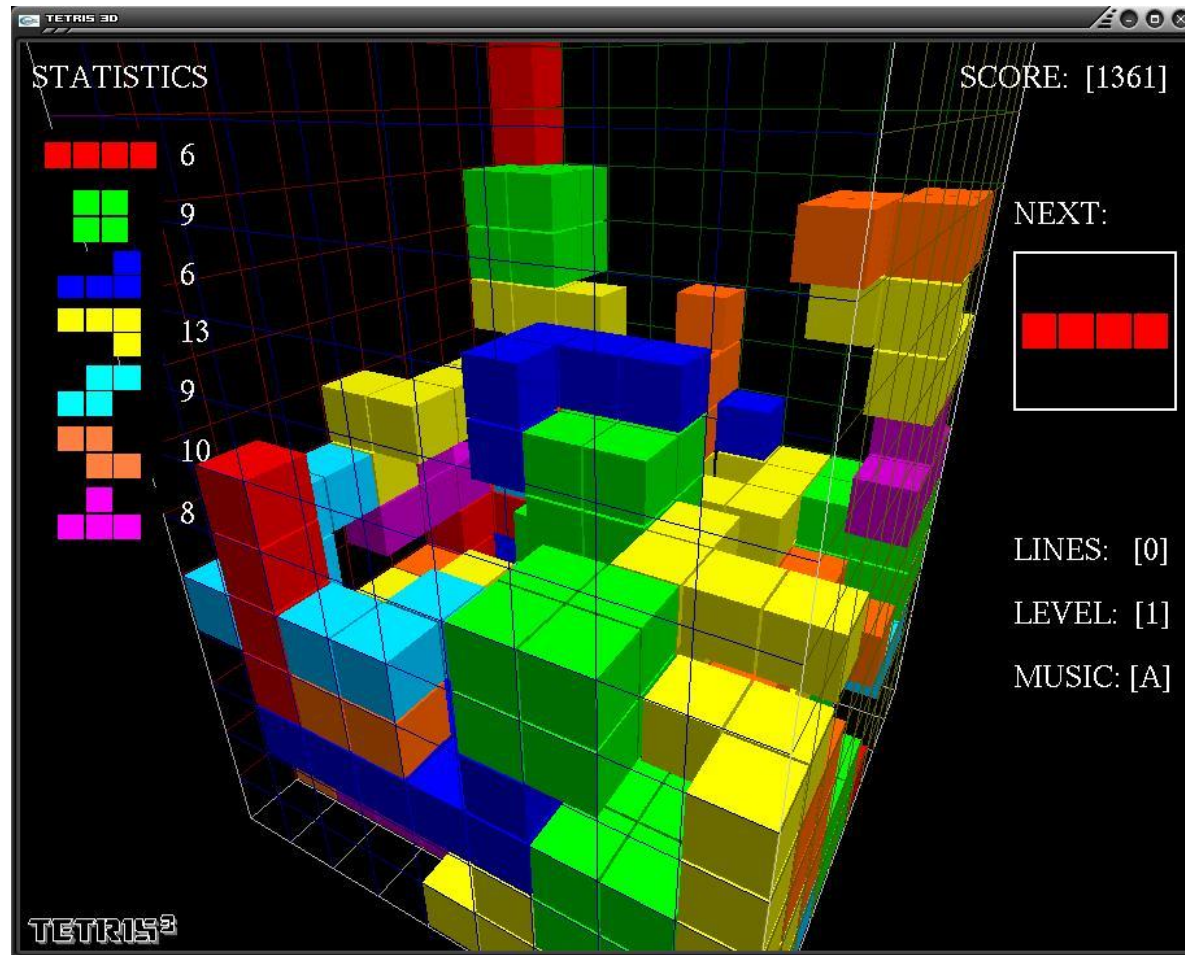
Example: Tetris...



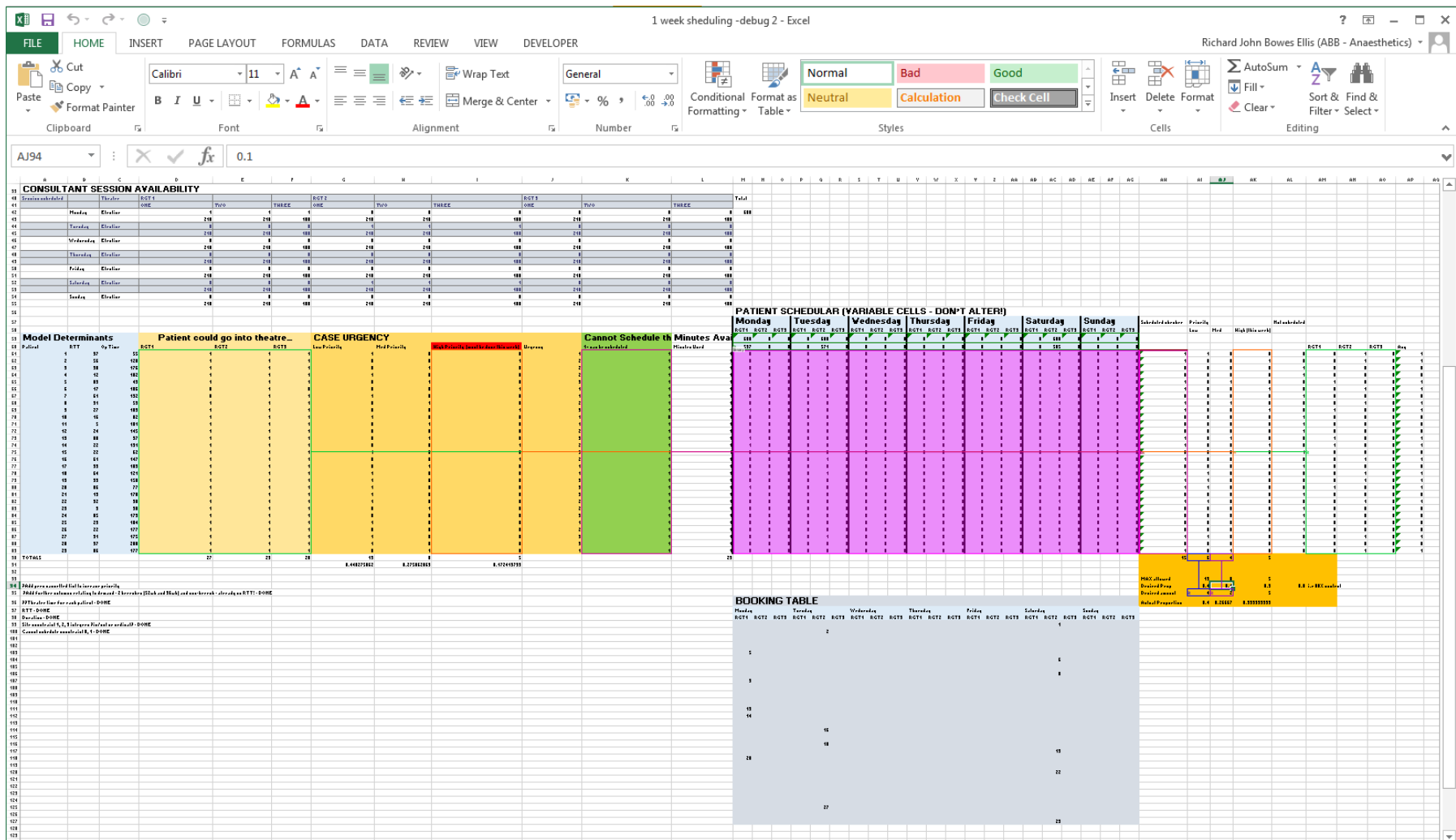
Building the model... to achieve what?

- **Objective function**
 - Minimise waiting time for all patients as much as possible
- **Constraints**
 - Theatre: Time & capacity
 - Consultant: Case mix, urgency, site preference
 - Patient: Choice
- **Planning horizon**
 - 6 weeks

3D Tetris plus, plus, plus...?!?



What does it look like?



Building the model... what can it do?

- Minimise waiting time for patients overall
- Constraints
 - Theatre time
 - Consultant dependent requests
 - Clinical urgency
 - Case mix
 - Theatre location
 - List type
 - Patient request
- Produces a list for the scheduler

Building the model... complexity

50 patients

6 weeks

7 days week

3 theatre locations

3 types of list

$50 \times 6 \times 7 \times 3 \times 3 = 18,900$ 'elements'

Each 'element' can be scheduled or not scheduled... so we have

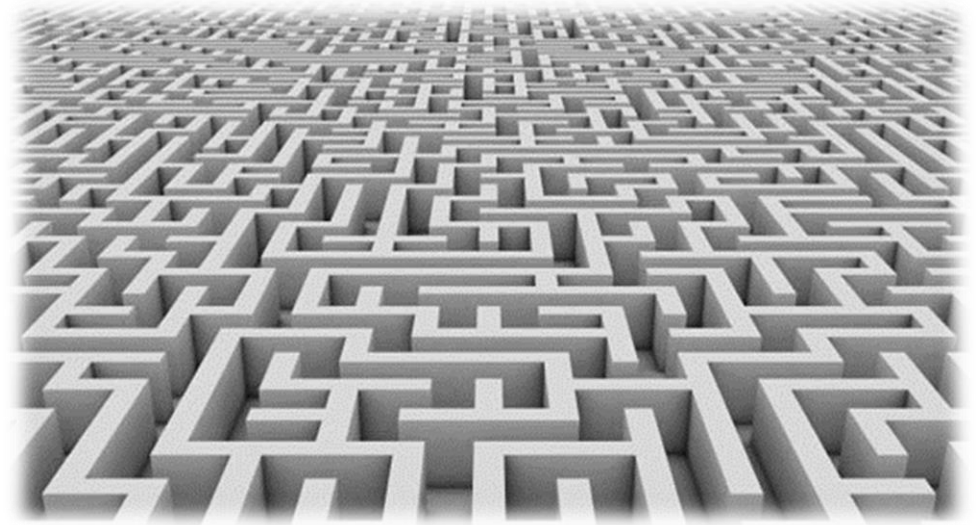
$2^{18,900}$ possible 'solutions'...

Building the model... complexity

1,000,000,000,000,000,000
.... options to choose from!

Actually 1 followed by more
than “300 digits”

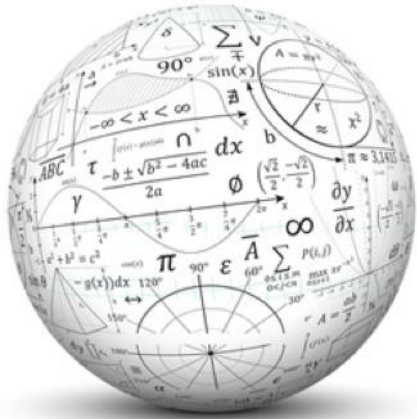
Haven't even factored the
constraints yet!



Findings: Quantitative



30 seconds to 20 minutes to find a patient to schedule in a single theatre slot



Findings: Qualitative

“Silver bullet”

- Performance manager

“Really benefit what we do day to day”

- Scheduler

“Crosses two crucial dimensions of operational research which has never done before”

- Mathematical modeller

Patient... reassure and show them the fair system

The future...

Now integrating into current practice

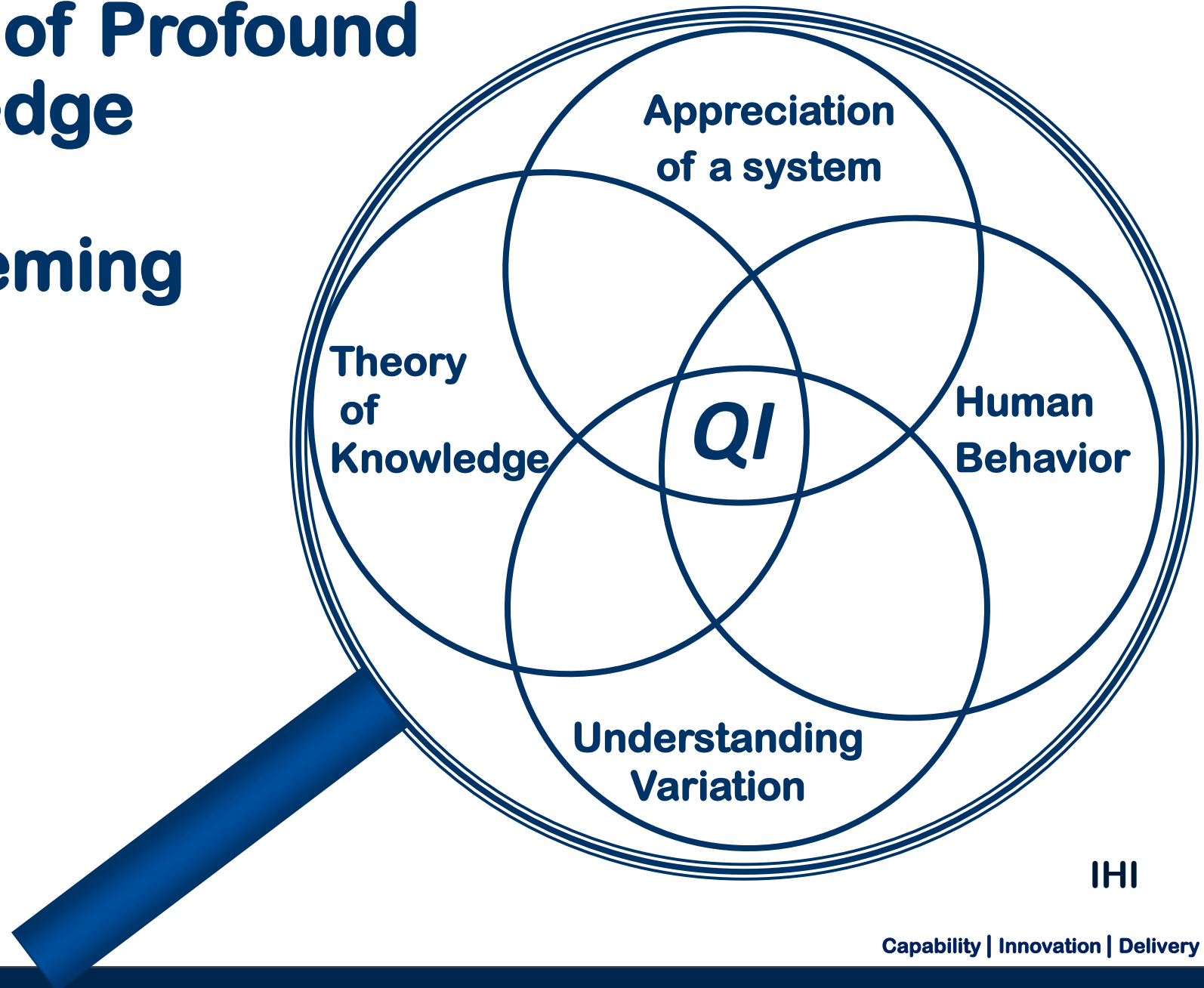
- Challenge of integration
- Single scheduler and consultant
- Utilise QI theory to assess impact



Publication

Theory of Profound Knowledge

W.E. Deming

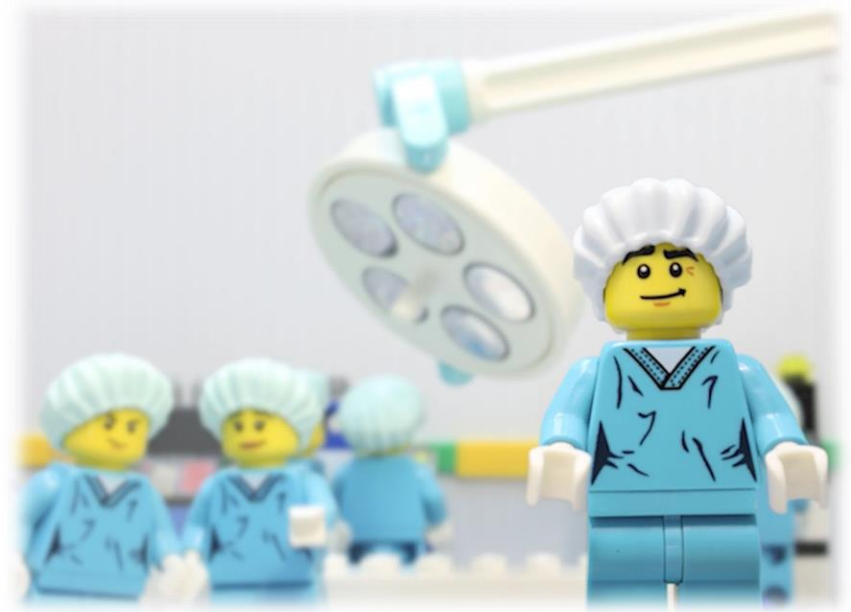


IHI

Some 'mini' projects...

Theatres Survey

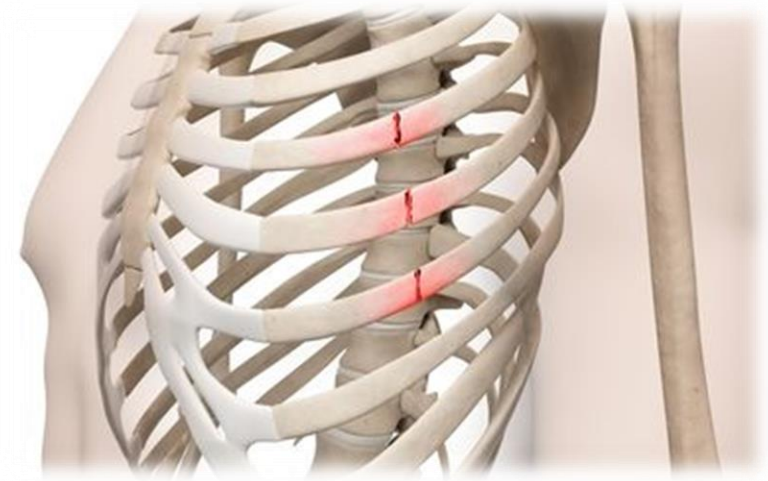
- New Hospital
- Health Board wide survey
- Assess patient care needs
- 90% response rate



Some ‘mini’ projects...

Blunt Force Trauma

- Evidence based pathway management tool
- Reduced time to be seen by pain team from 36 hours to 11 hours
- “Rib fracture 6 months ago”



Anaesthesia 2018, 73(Suppl. 3), 12-123

172

Blunt chest wall trauma: using quality improvement to create a better care pathway

J. Ferry,¹ C. Broome,² R. Ellis,¹ R. Flanagan¹ and D. Burkett-St Laurent¹

¹Aneurin Bevan University Health Board, ²Cardiff University

Some 'mini' projects...

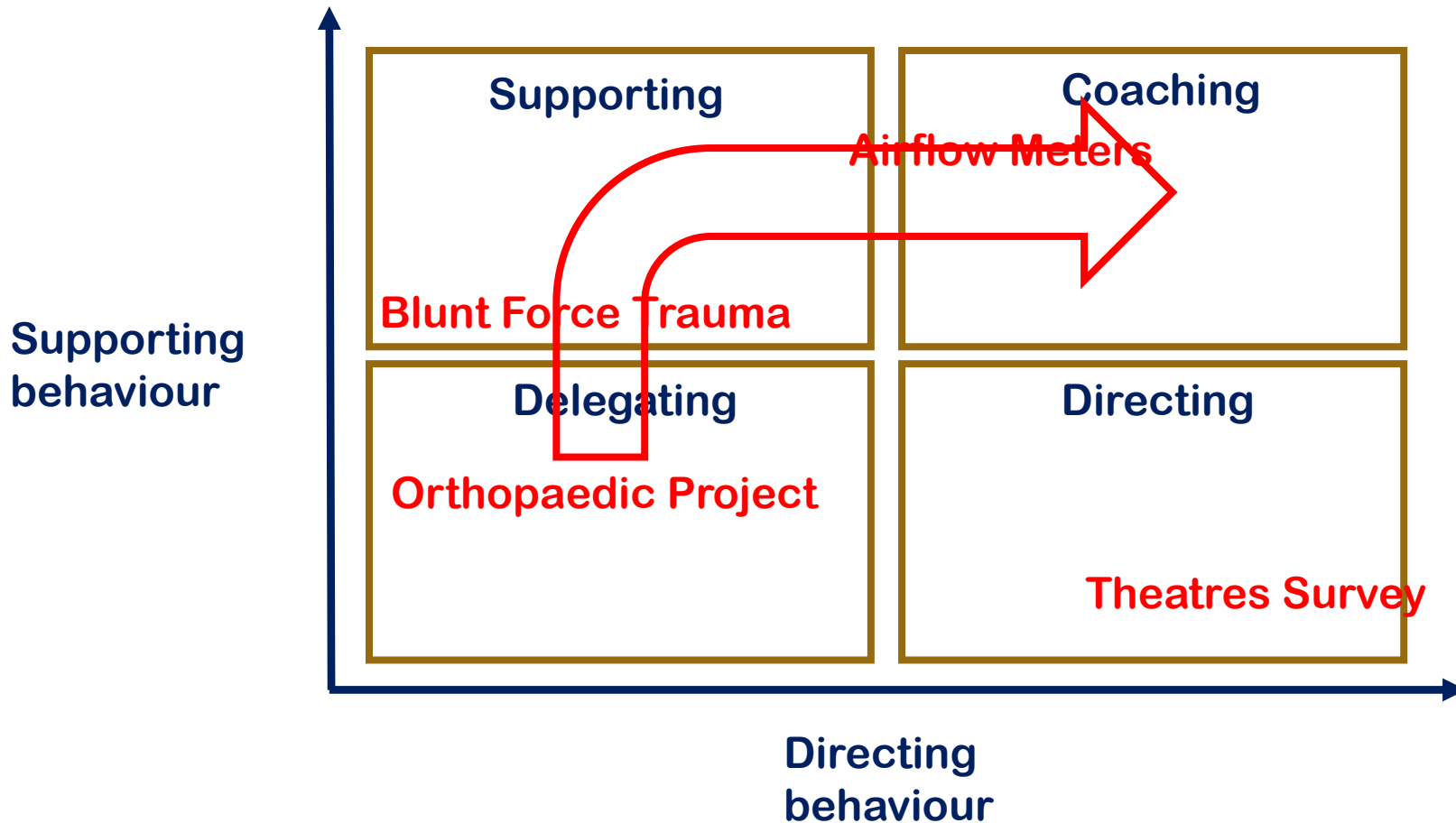
Airflow Meters

- Risk of misconnection
- 60% 'safe' to 95%
- Runner up in National Prize

NHS
*National Patient
Safety Agency*



Situational Leadership (Hersey & Blanchard)



My Journey continues...



*“Don’t be something
you’re not and always
stay true to yourself.”*

*“To care for others you
must first look after
yourself but remember,
to look after yourself you
first need others.”*

Rick Ellis 2018



Thank you for listening...

