Sustainability in quality improvement

Dr. Frances Mortimer
Medical Director, Centre for Sustainable Healthcare, Oxford
February 2017

Sustainability in Quality Improvement training materials, developed by the Centre for Sustainable Healthcare with grant funding from North Bristol NHS Trust.
Aims – you should be able to:

1. Recognise sustainability as a domain of quality in healthcare and discuss its relationship to other domains.

2. Review the environmental, social and economic inputs to a given health system, and identify relevant carbon hotspots.

3. Apply the principles of sustainable clinical practice in the design of a QI intervention.

4. Identify outcome and activity measures in order to evaluate impact on sustainability / sustainable value.
“Our vision of sustainable health and care: A sustainable health and care system works within the available environmental and social resources protecting and improving health now and for future generations.”
Sustainability as a domain of quality

Safe  Timely  Efficient
Equitable  Effective  Sustainable
Patient Centred

But quality is not enough - we need to improve value
Value = \frac{\text{Outcomes for patients and populations}}{\text{Environmental + social + financial impacts (the 'triple bottom line')}}
Sustainability in QI: redefining value

**Technical value**
Are the right patients being seen or is there either:
- harm from diagnosis
  or
- inequity from underuse

**Efficiency**
Outcomes/resources

**Productivity**
Outputs/resources

---

Triple resources
- Financial
- Environmental (carbon)
- Social (eg time — not only clinician time but also time of patients and carers)

Fig 2. Productivity, efficiency and technical value (adapted with permission of M Gray, University of Oxford): Muir Gray et al. How to get better value healthcare. Offax press.
The SusQI framework
## QUALITY IMPROVEMENT

**Sustainability in quality improvement: redefining value**

Authors: Frances Mortimer, Jennifer Isherwood, Alexander Wilkinson and Emma Vaux

### Table 2. Building sustainability into quality improvement (‘SusQI’): intended benefits

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<td>Drives sustainable change; allows benefits to be communicated to broader audience, not exclusively regarding financial cost-benefit</td>
</tr>
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*From Mortimer et al, 2010. QI = quality improvement*
1. Setting QI goals

Including sustainability within your project aims (how will this affect engagement with colleagues and wider stakeholders?)
Aim of Sustainable QI:

“to deliver care in a way that maximises positive health outcomes and avoids both financial waste and harmful environmental impacts, while adding social value at every opportunity.”

\[
\text{Value} = \frac{\text{Outcomes for patients and populations}}{\text{Environmental + social + financial impacts}} \quad \text{(the 'triple bottom line')}\]
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<tr>
<td></td>
<td>NHS; ‘seven capitals’ matrix</td>
<td>thinking</td>
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<sup>a</sup>From Mortimer et al, 2010. QI = quality improvement
2. Studying the system

Understanding environmental and social resource use and impacts
Carbon hotspots

Primary care and acute - business services

Primary care – pharmaceuticals including GP prescriptions

Acute - building energy use (gas and electricity)

Acute – medical instruments and equipment
## Environmental hotspots

<table>
<thead>
<tr>
<th>Env impact</th>
<th>Hotspots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse gas emissions</td>
<td>Inhalers, anaesthetic gases, medical equipment, pharmaceuticals, operating theatres, energy use</td>
</tr>
<tr>
<td>Air pollution</td>
<td>Staff travel, patient travel, energy use</td>
</tr>
<tr>
<td>Deforestation</td>
<td>Gloves - rubber plantations</td>
</tr>
<tr>
<td>Water consumption</td>
<td>Dialysis, laundry, cotton linen</td>
</tr>
<tr>
<td>Scarce resources</td>
<td>Conflict minerals in medical instruments</td>
</tr>
<tr>
<td>Plastic pollution</td>
<td>Single use (133,000 tonnes plastic/year)</td>
</tr>
<tr>
<td>Eco-toxicity (PBT)</td>
<td>Antibiotics, OCP, antidepressants, propofol</td>
</tr>
<tr>
<td>Ozone depletion</td>
<td>Nitrous oxide (maternity, emergency care, theatres)</td>
</tr>
</tbody>
</table>
Understanding env/soc/£ impacts: process map

**Key**

**Ecological Cost**
1. Patient travel
2. Staff travel
3. Building construction, electricity, heating
4. Equipment manufacture & disposal

**Social Cost**
1. Patient time
2. Patient discomfort / restriction
3. Risk of patient harm
4. Staff time

**Financial Cost**
1. Equipment purchase and disposal

1. Patient presents to Emergency Department

Cannula inserted

Cannula used?

No

Unnecessary cannulation

Yes

Unnecessary cannulation

Yes

Appropriate use of cannula?

No

Appropriate cannulation

Yes

Appropriate cannulation
Social impacts – on whom?

- Patient
- Staff
- Carers
- Dependants
- Local community
- Distant communities (e.g. supply chain workers)
“Labourers in surgical instrument manufacture are often paid less than US$1 per day, have poor job security, have woefully inadequate protection of health and safety, and many employees are children, some as young as seven years old.”

BMA Medical Fair & Ethical Trade Group
The ecosystem model of settlements

Barlow and Grant 2010
Social sustainability

- Basic needs, including housing and environmental health
- Education and skills
- Employment
- Equity
- Human rights and gender
- Poverty
- Social justice
- Demographic change (ageing, migration and mobility)
- Social mixing and cohesion
- Identity, sense of place and culture
- Empowerment, participation and access
- Health and Safety
- Social capital*
- Wellbeing, Happiness and Quality of Life

*defined as “networks together with shared norms, values and understandings that facilitate co-operation within or among groups” (OECD)

## Scanning for social impacts

<table>
<thead>
<tr>
<th>Housing</th>
<th>Patients</th>
<th>Carers</th>
<th>Community</th>
<th>Supply chain</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poverty</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety/security</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social gradient</td>
<td></td>
<td></td>
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3. Designing your QI intervention

Applying the principles of sustainable clinical practice
How will 80% carbon reduction be achieved?
Sustainable clinical practice: principles

Outcome needed

Reduce carbon without reducing health

Primary driver

Reduce activity

Secondary drivers

Prevention

Self care

Lean pathways

Low carbon alternatives

Operational resource use

Primary driver

Reduce carbon intensity

Sustainable clinical practice

E.g. dry powder inhalers (1/20 x carbon of MDI)

Estates & clinical

Mortimer-F. The Sustainable Physician
Improve sustainability of respiratory inhaler prescribing

1. Prevent avoidable respiratory disease
   - Reduce smoking
   - Review referral rates to smoking cessation service
   - Reduce cold/mould exposure
   - Investigate housing improvement referral scheme
   - Reduce air pollutant exposure
   - Input to local transport policy
   - Review referral rates to smoking cessation service
   - Ensure patients receive air quality health advice

2. Empower patients to improve disease management
   - Co-production
   - Ensure yearly care planning
   - Social prescribing
   - Rescue packs for acute exacerbations
   - Singing/ pulmonary rehab referral forms

3. Ensure lean prescribing and dispensing systems
   - Lean communications
   - Introduce paperless prescribing/ repeat requests
   - High value prescribing
   - Introduce annual inhaler reviews
   - Update prescribing guidelines

4. Switch to lower carbon alternatives
   - Preferential use of DPI vs MDI inhalers
   - Preferential use of DPI vs MDI inhalers
   - Update prescribing guidelines
   - Write article for local GP newsletter

5. Improve operational resource use
   - Inhaler recycling
   - Signpost recycling points
   - Waste, energy, travel
   - Relevant actions
Lean systems... spotting waste

- Out of date stock
- Single use items
- Cancellation
- Packaging
- Standby
- Non compliance
- Waiting time
- Commuting time
- ...*can you add 2 more euphemisms for waste?*
The Lean approach: 7 types of waste

1. **Overproduction** e.g. automatically requesting blood tests for pre-op assessments or duplicating patient information across different teams.

2. **Inventory** e.g. inappropriately using inpatient beds for patients who are waiting for tests but could be discharged safely, or ordering excess medical equipment because supply is unreliable.

3. **Waiting** e.g. surgeons waiting for a theatre to become available.

4. **Transportation** e.g. moving a patient to an inpatient bed for review at post-op ward round and then to another ward for discharge.

5. **Defects or errors** e.g. an inaccurate patient history or incorrect recording of a blood test.

6. **Staff movement** e.g. separate sites for outpatient clinics or large distances between clinically related areas.

7. **Unnecessary processing** Using complex equipment or processes to undertake simple tasks. e.g. a referral to a specialist service that involves having to be reviewed by several different people before acceptance.
Figure 3
The Waste Reduction Toolkit

Start by reviewing your use of clinical resources

Check the box in Box 3 on page 35 to determine your use of clinical resources

Are the resources you use make effective, efficient and cost effective?

Complete question C01/D to C01/E

Do you need the patient record to make your decisions?

Case study:

Move on to review your clinical tasks

Waste correction

There is waste occurring in your clinical processes

Complete checklists 2.2.1 - 2.2.3

Yes

There is waste occurring in your clinical processes

Review your use of resources and change your clinical practice

Case study 3.1

Finish here

Move on to review your clinical processes

Checklist 3.2

Case study 4

Case study 4

Case study 5

Case study 5

Case study 6

Case study 6

Case study 7

Case study 7

Case study 7

Case study 8
Your service - sustainable clinical practice

<table>
<thead>
<tr>
<th>Principle</th>
<th>Opportunities?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prevention</td>
<td></td>
</tr>
<tr>
<td>2. Patient empowerment and self care</td>
<td></td>
</tr>
<tr>
<td>3. Lean systems</td>
<td></td>
</tr>
<tr>
<td>4. Low carbon alternatives</td>
<td></td>
</tr>
</tbody>
</table>
## Your service – overuse/underuse

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Opportunities?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overuse of low value interventions</td>
<td></td>
</tr>
<tr>
<td>Underuse of high value interventions</td>
<td></td>
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Targeting overuse

Choosing Wisely was created in part to challenge the idea that *more is better* or in the case of medical intervention: just because we *can*, doesn’t always mean we *should*.

The Choosing Wisely principles encourage patients get the best from conversations with their doctors and nurses by asking four questions.

1. What are the benefits?
2. What are the risks?
3. What are the alternatives?
4. What if I do nothing?

While it may have been true a generation or so ago, it is no longer always the case that the ‘doctor knows best.’ Medical advances have been so dramatic that there is now an armoury of tests, treatments and procedures available to patients. A doctor can only know which course of action is right for *you* after a discussion about *your* experiences of *your* illness; *your* social
# Your service – operational resource use

<table>
<thead>
<tr>
<th>Resource use</th>
<th>Opportunities?</th>
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<tbody>
<tr>
<td>Energy</td>
<td></td>
</tr>
<tr>
<td>Travel (staff, patients)</td>
<td></td>
</tr>
<tr>
<td>Medical supplies</td>
<td></td>
</tr>
<tr>
<td>Non-medical supplies</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
</tr>
<tr>
<td>Waste</td>
<td></td>
</tr>
</tbody>
</table>
Prioritise

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Impact (1-3)</th>
<th>Feasibility (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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4. Measuring environmental and social costs/impacts
Value = \frac{\text{Outcomes for patients and populations}}{\text{Environmental + social + financial impacts (the 'triple bottom line')}}
Environmental Costs

Carbon footprint - the sum of greenhouse gas emissions released in relation to an organisation, product or service, expressed as carbon dioxide equivalents (CO$_2$e).
Carbon footprint: what is included?

(operational boundaries)

<table>
<thead>
<tr>
<th>Scope 1: Direct emissions</th>
<th>Scope 2: Indirect emissions (electricity)</th>
<th>Scope 3: Indirect emissions (other)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Energy generation</td>
<td>• Electricity use</td>
<td>• Supply chain</td>
</tr>
<tr>
<td>• Vehicle emissions</td>
<td></td>
<td>• Travel</td>
</tr>
<tr>
<td>• HFCs, N₂O, etc.</td>
<td></td>
<td>• Waste disposal</td>
</tr>
</tbody>
</table>

### Notes:

- **Scope 1**: Direct emissions include energy generation, vehicle emissions, and HFCs, N₂O, etc.
- **Scope 2**: Indirect emissions (electricity) include electricity use.
- **Scope 3**: Indirect emissions (other) include supply chain, travel, waste disposal.
Methods

Top down
input-output

Emissions factors applied to spend in different economic sectors

Bottom up
process-based

Emissions factors applied to components of a process or product, e.g. materials, energy use

Hybrid
Greenhouse gas emissions factors – UK Govt

<table>
<thead>
<tr>
<th>Activity</th>
<th>Type</th>
<th>Unit</th>
<th>kg CO₂</th>
<th>kg CH₄</th>
<th>kg N₂O</th>
<th>kg CO₂eq</th>
<th>kg CH₄eq</th>
<th>kg N₂Oeq</th>
<th>kg N₂O</th>
<th>kg CO₂</th>
<th>kg CH₄</th>
<th>kg N₂O</th>
<th>kg CO₂eq</th>
<th>kg CH₄eq</th>
<th>kg N₂Oeq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cars (by size)</td>
<td>Small</td>
<td>km</td>
<td>0.14</td>
<td>0.10</td>
<td>0.00</td>
<td>0.01</td>
<td>0.16</td>
<td>0.12</td>
<td>0.001</td>
<td>0.16</td>
<td>0.12</td>
<td>0.001</td>
<td>0.01</td>
<td>0.16</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>Small</td>
<td>miles</td>
<td>0.28</td>
<td>0.22</td>
<td>0.00</td>
<td>0.02</td>
<td>0.34</td>
<td>0.26</td>
<td>0.002</td>
<td>0.34</td>
<td>0.26</td>
<td>0.002</td>
<td>0.02</td>
<td>0.34</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>km</td>
<td>0.27</td>
<td>0.22</td>
<td>0.00</td>
<td>0.02</td>
<td>0.34</td>
<td>0.26</td>
<td>0.002</td>
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<td>0.02</td>
<td>0.34</td>
<td>0.26</td>
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<tr>
<td></td>
<td>Large</td>
<td>km</td>
<td>0.30</td>
<td>0.23</td>
<td>0.00</td>
<td>0.03</td>
<td>0.40</td>
<td>0.31</td>
<td>0.003</td>
<td>0.40</td>
<td>0.31</td>
<td>0.003</td>
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<td>Large</td>
<td>miles</td>
<td>0.30</td>
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<td>0.03</td>
<td>0.40</td>
<td>0.31</td>
<td>0.003</td>
<td>0.40</td>
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<td>0.003</td>
<td>0.03</td>
<td>0.40</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>km</td>
<td>0.36</td>
<td>0.28</td>
<td>0.00</td>
<td>0.04</td>
<td>0.46</td>
<td>0.35</td>
<td>0.004</td>
<td>0.46</td>
<td>0.35</td>
<td>0.004</td>
<td>0.04</td>
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<td>0.00</td>
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<td>0.46</td>
<td>0.35</td>
<td>0.004</td>
<td>0.46</td>
<td>0.35</td>
<td>0.004</td>
<td>0.04</td>
<td>0.46</td>
<td>0.35</td>
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</tbody>
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FAQs

Do the conversion factors take into account the age of vehicles?

The conversion factors are based on information from the DfT (Department for Transport) who regularly analyse the mix of cars on the road in Britain through DVLA records and automatic number plate recognition (ANPR) data.

The conversion factors are updated each year to reflect changes in the spectrum of cars of different types and ages being driven.

I know the average mpg of my passenger vehicles as well as mileage; can this be used to improve my calculations?

The mpg (miles per gallon) of the vehicle(s) should be used to convert the distance travelled into litres of fuel used (refer to the ‘conversions’ listing to find values to assist this calculation). The conversion factors are then applied, which will give a more accurate view of the actual emissions from the vehicle (the conversion factor for vehicle mileage expresses the average mpg of the whole UK vehicle population, whereas the actual mpg and using this value will yield more precise results).

I know the average gCO₂/km of my passenger vehicles as well as mileage; can this be used to improve my calculations?

If you know the manufacturers’ gCO₂/km data this may be used as an alternative (and more precise) calculation for your passenger vehicle’s emissions. The factors provided by manufacturers should be multiplied by the km distance travelled in the vehicle.

Where do I find out how these conversion factors were calculated?

For information on the methodology and data sources used to derive the conversion factors presented here, please refer to the accompanying ‘Methodology paper’, which is available from the DEFRA.

Available from http://www.ukconversionfactorscarbonsmart.co.uk/
Carbon by units of healthcare activity

Care Pathways Guidance on Appraising Sustainability (SDU, 2015)
Measuring environmental costs - example

A primary care team noticed that some patients who were referred for hip and knee replacements were being referred back to the GP surgery after pre-operative assessment at the local hospital. This was because parameters, such as blood pressure, were either outside the target range or were not communicated properly in the referral information. An audit revealed that 1 in 6 patients looped through the system – 10/ year.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Outcome</th>
<th>£’s</th>
<th>CO₂e</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra GP consult</td>
<td>[delay to surgery]</td>
<td>£45¹</td>
<td>18 kg²</td>
<td>Patient &amp; carer time/stress</td>
</tr>
<tr>
<td>Extra Hospital consult</td>
<td>[delay to surgery]</td>
<td>£112¹</td>
<td>23 kg²</td>
<td>Patient &amp; carer time/stress (parking…)</td>
</tr>
<tr>
<td>Total (for 10 loops)</td>
<td></td>
<td>£1570</td>
<td>410 kg</td>
<td></td>
</tr>
</tbody>
</table>

1. Unit Costs of Health and Care, PSSRU, December 2015. Available at: http://www.pssru.ac.uk/project-pages/unit-costs/2015/index.php
### Social Impacts – identifying outcome measures

<table>
<thead>
<tr>
<th>Group affected</th>
<th>Impact area</th>
<th>Outcome measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. carers</td>
<td>employment</td>
<td>% in employment / time off work</td>
</tr>
</tbody>
</table>

- **Group affected**: e.g. carers
- **Impact area**: employment
- **Outcome measure**: % in employment / time off work
Can you identify outcome and activity measures to evaluate sustainability impact of...?

• Introducing one-stop service, e.g.
  • Breast lump assessment
  • Peripheral vascular disease
  • Back pain

• Integrating preventative services, e.g.
  • Vascular clinic – smoking cessation etc
  • Gallstones pathway – dietetics

• Overnight > day case surgery, e.g.
  • Laparoscopic cholecystectomy
  • Robotic prostatectomy
Thinking sustainably within a QI project

1. Apply sustainability approach at the different stages of ANY project

2. Choose a project area that relates closely to sustainability, e.g.
   a. Prevention, patient empowerment, etc.
   b. Reducing pharmaceutical waste
   c. Reducing over-investigation / over-treatment
Sustainability in QI Education project (2019-21)

1. **Demonstrate** the inclusion of sustainable healthcare principles within undergraduate and postgraduate health professions education on QI

2. **Evaluate** the impact on student learning, including engagement with QI

3. **Accelerate the adoption** of successful approaches by UK universities, Foundation Schools and other education providers

Dr Stuart D’Arch Smith
CSH Education Fellow
2019-20
Resources

“Sustainability in Quality Improvement: Redefining Value”

“Sustainability in Quality Improvement: Measuring Impact”

SusQI open access learning resources:
http://networks.sustainablehealthcare.org.uk/sus-qí-resources

www.sustainablehealthcare.org.uk/susqi
frances.mortimer@sustainablehealthcare.org.uk