Sustainability

The Seventh Dimension of Quality

Donal J O’Donoghue
Protecting health of future generations

“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.”
“Health and social care services must be planned, financed and delivered in ways that allow them to meet the needs both of today’s population and of future generations.”

Some service areas are already leading the way. For example, Green Nephrology includes a network which brings together clinicians, patients, renal technicians and industry partners.

5% of transport emissions in the UK are estimated to be accounted for by healthcare facilities.

Ingredients in a steak and kidney pie served in one hospital had travelled a total of 31,000 km.
NEWS

NHS could save £1bn by adopting green strategies used in kidney units

BMJ 2013; 346 doi: http://dx.doi.org/10.1136/bmj.f588 (Published 28 January 2013)
“Quality and value are the only organising principles of the NHS”
Value in Health Care

“Measurement of value is challenging...the critical first step is measurement. Provider organisations need to capture data on outcomes that matter to patients and carers.”

Sustainable value in healthcare:

Value = \frac{\text{outcomes} \ (\text{goods} - \text{harms})}{\text{environmental} + \text{social} + \text{financial costs} \ (\text{the “triple bottom line”})}

Informed by patient values

Academy of Medical Royal Colleges, 2016 (with CSH)
“Sustainable healthcare delivers the highest possible value to patients from a radically reduced resource input.” Green Nephrology Summit 2012 – position statement
NHS England CO$_2$e footprint 1990-2020 with Climate Change Act targets

Graph 1: NHS England Carbon Footprint
Carbon footprint – NHS England

- Clinical: 65%
- Estates: 19%
- Transport: 16%
- Supply chain (pharmaceuticals, equipment, everything else): 16%

CENTRE for SUSTAINABLE HEALTHCARE
NHS carbon footprint – goods and services carbon hotspots
Models of care

Primary driver

Outcome needed

Reduce carbon without reducing health

Primary driver

Reduce activity

Reduce carbon intensity

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Mortimer-F. The Sustainable Physician
Models of care

Outcome needed

Reduce carbon without reducing health

Primary driver

Reduce activity

Secondary drivers

Prevention

Self care

Lean pathways

Primary driver

Reduce carbon intensity

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Mortimer-F. The Sustainable Physician
Models of care

Primary driver
- Reduce activity
  - Reduce carbon without reducing health

Primary driver
- Reduce carbon intensity
  - Sustainable estates

Secondary drivers
- Prevention
- Self care
- Lean pathways
- Low carbon alternatives

Sustainable clinical practice
- e.g. dry powder inhalers (1/18 x carbon of MDI)

Outcome needed

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Provision and commissioning of kidney care

Complications including AKI

Normal
- Screening for CKD risk factors

Increased risk
- CKD risk factor reduction, screening for CKD

Damage
- Diagnosis & treatment, treat comorbid conditions, slow progression

↓GFR
- Estimate progression, treat complications, prepare for replacement

Kidney failure
- Replacement by dialysis & transplant

EOL Care
- Supportive & palliative care

Public Health England

Primary Care

CCG

NHS CB

CCG

Modified from Levey AS et Al. KI 2005:2089-2100
SUSTAINABLE KIDNEY CARE (1)

1. Prevention of kidney disease, slow progression
2. Patient empowerment (at all stages)
3. Lean care systems: minimising low value activities (including travel)
4a. First, **measure** carbon impact of alternative modes of renal replacement therapy (RRT)

4b. Then provide capacity for **preferential use of effective RRT with lowest carbon footprint** (where of equal or greater clinical effectiveness)
Green Nephrology

• **The low carbon dialysis unit:** reducing and recycling dialysis consumables

• **Water and energy savings:** love your technicians

• **Best practice service delivery:** why preventative, patient-centred care saves carbon

• **Grassroots change:** the Green Nephrology Network & rewarding green innovation in your department
Case studies - infrastructure

Salvage of reject water from RO plant (Ashford, Canterbury, Stevenage)
   – 3+ million litres water & £6,000+ saved per year

Central delivery of acid for haemodialysis (Bradford)
   – 16 tonnes CO$_2$eq & £22,000 saved per year

Energy-efficient lighting (Bradford)
   – 2.3 tonnes CO$_2$eq & £600 saved per year, improved environment for staff and patients
Retrofit of heat exchangers to haemodialysis machines

Heat exchangers have been retrofitted to 52 Braun Dialog+ machines across the East Kent renal service:

- 20% improvement to energy efficiency
- Implementation costs: £11,600
- Carbon savings: 27,905 kWh ➞ 14 tonnes CO$_2$e / year

**Saving:** £2,980 per year
Salvage of reject water in haemodialysis

In Canterbury dialysis unit, reject water from the purification system is salvaged to supply the hospital toilets, saving £7,500 each year on mains water and sewerage costs. A similar system was designed into a new-build dialysis unit in Ashford at even lower cost – saving £10,558 each year.

<table>
<thead>
<tr>
<th>Year</th>
<th>Canterbury (retrofit)</th>
<th>Ashford (built in)</th>
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<tbody>
<tr>
<td></td>
<td>Investment</td>
<td>Savings to date</td>
</tr>
<tr>
<td>1</td>
<td>£15,000</td>
<td>7500</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>15000</td>
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<tr>
<td>5</td>
<td>0</td>
<td>37500</td>
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<tr>
<td>10</td>
<td>0</td>
<td>75000</td>
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</table>
Salvage of reject water (2)

Lister Hospital dialysis unit now recycles the reject water from the reverse osmosis (RO) water treatment system to the main hot water supply of the hospital.

Capital investment (break tank, pumps & pipe-work):
approx. £6,000

Water saving: 3,145,000 litres / year

Cost saving: £6,300 / year
Upgrade of water treatment system

Renal technicians at St Luke’s Dialysis Unit, Bradford, realised that their two older RO units were discarding 70% more water than newly installed units. The old units have now been replaced.

Investment: £60,000

Water saving: 8 million litres / year

Carbon saving: 3 tonnes CO₂e / year

Cost saving: £18,000 / year
Central acid delivery

Use of 6L acid canisters for dialysis treatments in Bradford has been replaced by central acid delivery. This reduces acid wastage, as well as packaging, deliveries and manual handling.

Investment: £44,000 (tanks, plumbing, bund)

Cost savings:
- Acid: £19,000 / year
- Clinical waste: £3,900 / year

Total saving: £22,900 / year
Case studies – process (1)

Paperless reporting of routine lab results (Doncaster)
  – 0.4 tonnes CO₂eq & £120 saved per year; ↑ patient safety

Improved waste segregation (Fife, Glasgow x6, Leicester)
  – 50-85 tonnes CO₂eq & £11-15,000 saved per year

Reduction in dx consumables (Cornwall, Fife, Glasgow)
  – 10-26 tonnes CO₂eq & £15-30,000 saved per year
Low carbon dialysis unit

Case study: Queen Margaret Hospital Renal Unit, Fife

- 20 station dialysis unit (14,000 treatments/year)
- 24 inpatient beds
- Green Nurse (£4,000/year)
- **Annual savings: £45,000**

Green Nurse: Mary Thomson
Waste hierarchy

**REDUCE** – reduce the amount of waste produced in the first place

**REUSE** – using materials repeatedly where possible

**RECYCLE** – send used materials to make new material for use

**RECOVERY** – recover energy for waste

**LANDFILL** – safe disposal into landfill sites
Waste Watch Week

2.9kg per dialysis treatment

40.3 tonnes / year

100% incinerated as clinical waste
Reduce... dialysis consumables

• Normal saline bags, together with priming sets and drainage bags, replaced with online infusion

• Dressing packs replaced with individual items used

Saving: £24,900 per year
Recycle... improved waste segregation

Saving: £10,818 per year
Clinical vs. domestic waste

£300 /tonne

£85 /tonne
Low carbon dialysis unit

Case study: Glasgow Renal and Transplant Unit

• 6 dialysis units; 505 patients; 78,780 Rx per year

• Green representatives audited equipment use to identify opportunities for waste reduction, including:
  • disposal of bicarbonate cartridges into domestic waste
  • segregation of domestic from clinical waste
  • online priming to reduce saline bags

• Savings: 85 tonnes CO$_2$e and £15,567 per year

• Additional savings 43 tonnes CO$_2$e and £92,832 possible from removal of Griff Bins®
Case studies – process (2)

Coordination of dialysis transport (Cornwall)
– 17 tonnes CO₂eq & £18,000 saved per year, improved patient experience

Linen reduction (Cornwall)
– 2 tonnes CO₂eq & £5,000 saved per year

Bolus administration of IV antibiotics (Fife)
– 10 tonnes CO₂eq & £17,000 saved per year; increased nurse-patient contact

Green Nephrology
CENTRE for SUSTAINABLE HEALTHCARE
“Sustainable Action Planning”

Cornwall unit green plan:

• Aborted ambulance bookings eliminated by synchronising treatment times: cost saving per year £18,000.

• Food waste reduced from 35% to <5% by establishing a new sandwich menu: £4,000.

• Linen use reduced by 70% through patient collaboration: £4,800.

• Bicarbonate cartridges changed to reduce packaging and volume: £11,000.

• Wastage of 5 dialysis sets per week avoided by not setting up machines in advance: £13,000.

Total saving: £57,528 per year

http://sap.sustainablehealthcare.org.uk
Reduce... IV infusion

- 6,175 antibiotic doses per year – previously given by infusion
- Cost of consumables: £11,158
- Cost of consumables if IV bolus instead: £1,327
  - £9,830 (procurement)
  - £165 (disposal)

Saving: £9,995 /year
## Cost of consumables per dose

13 Antibiotics safe to bolus

<table>
<thead>
<tr>
<th>Consumables / Cost (£)</th>
<th>Infusion</th>
<th>Infusion (mini-bag)</th>
<th>Bolus</th>
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<tbody>
<tr>
<td>Administration Set</td>
<td>1.38</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>50-100mls NaCl/Dex</td>
<td>0.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10ml Syringe</td>
<td></td>
<td></td>
<td>0.12</td>
</tr>
<tr>
<td>20ml Syringe</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21g Needle x 2</td>
<td>0.04</td>
<td></td>
<td>0.04</td>
</tr>
<tr>
<td>10mls NaCl/Water</td>
<td>0.09 (x2)</td>
<td></td>
<td>0.045</td>
</tr>
<tr>
<td>Alcohol wipes x 2</td>
<td>0.01</td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1.96</strong></td>
<td><strong>1.38</strong></td>
<td><strong>0.215</strong></td>
</tr>
</tbody>
</table>
Case studies – models of care

Telephone follow up of transplant recipients (Coventry)

- 2 tonnes CO$_2$eq saved per year; cost: neutral; improved patient experience / empowerment

Electronic consultation as alternative to referral (Bradford)

- 2 tonnes CO$_2$eq saved per year; potential cost reduction from avoided referrals; potential benefits to patient exp/out

Remote monitoring in CKD (Cornwall, Sheffield)

- 0.5-0.8 tonnes CO$_2$eq saved per year; potential cost/patient benefits
Telephone clinics in follow up of renal transplant recipients

- One-third of stable transplant recipients in Coventry have opted for follow up by quarterly telephone consultation
- No adverse events to date (3.5 years)
- Convenience & patient empowerment
- CO₂ savings per year: 2 tonnes
- Potential for financial savings from staff efficiencies
E-consultation as an alternative to hospital referral in CKD

A CKD e-consultation service in the Bradford and Airedale allows GPs to send electronic referrals and share patient electronic health records with a renal specialist, after first obtaining verbal patient consent.

- Convenient and timely advice
- **Avoidance of unnecessary referrals**
- Further evaluation planned to determine whether the service will displace outpatient clinic activity.

Estimated CO₂ savings from avoidance of one outpatient visit: 22-78kg CO₂e.
Remote monitoring in CKD management

Sheffield Kidney Institute & Sheffield Central Consortium of GP practices

• Clinician led CKD-Disease Management Program (DMP) specifies frequency of laboratory and blood pressure testing with individualised targets for care.

• Bloods taken in primary care; self-monitoring or GP monitoring of blood pressure.

• CKD nurse specialist manages remote data and provides tele-consultations, reviewing clinical data with patient whilst maintaining care as set out by treatment targets in CKD-DMP.

• Benefits: devolved, patient-centred care, fewer clinic appointments, less travel
Principles of sustainable clinical practice

1. **Prevention** of disease, health promotion

2. Greater **engagement of patients** in managing their own care

3. Lean care systems: **minimising low value activities** (including travel)

4. Preferential use of effective & proven technologies with the **lowest carbon footprint**

*Mortimer-F. The Sustainable Physician
Clinical Medicine 2010, Vol 10, No 2: 110–11*
Results of Public Opinion Survey:

- % of the public who felt that sustainability should be a top priority - 19%
- % of the public who said that the NHS should act in a more sustainable way even if it would cost money - 33%
- % of the public who think it is important for the NHS to work in a more sustainable way - 92%

Source:
Ipsos MORI
Carbon footprint – NHS England

- **65%**: Energy use
- **19%**: Supply chain (pharmaceuticals, equipment, everything else)
- **16%**: Transport

- Clinical
  - Estates

CENTRE for SUSTAINABLE HEALTHCARE
# Sustainable QI

<table>
<thead>
<tr>
<th>Table 1 Benefits of building sustainability into quality improvement</th>
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<table>
<thead>
<tr>
<th>QI element</th>
<th>Sustainability content</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Setting goals</td>
<td>Sustainability as a domain of quality; relationship to other domains</td>
<td>New motivation to contribute to quality improvement, energy for change</td>
</tr>
<tr>
<td>2. Studying the system</td>
<td>Understanding environmental &amp; social resource use/impacts; carbon hotspots in the NHS;</td>
<td>Highlights wastes and opportunities which are often overlooked; stimulates radical thinking</td>
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<tr>
<td></td>
<td>“seven capitals” matrix</td>
<td></td>
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<tr>
<td>3. Designing the improvement effort</td>
<td>Four principles of sustainable clinical practice (prevention, patient empowerment and self-care, lean systems, low carbon alternatives) – drivers &amp; process changes</td>
<td>Directs towards highest value improvements, future proofing</td>
</tr>
<tr>
<td>4. Measuring impact/return on investment</td>
<td>Triple bottom line/sustainable value equation; measuring carbon</td>
<td>Allows benefits to be communicated to broader audience, not exclusively re financial cost-benefit</td>
</tr>
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Mortimer, F., in submission 2016
CLIMATE SUMMIT

WHAT IF IT'S A BIG HOAX AND WE CREATE A BETTER WORLD FOR NOTHING?

- ENERGY INDEPENDENCE
- PREVERSE RAINFORESTS
- SUSTAINABILITY
- GREEN JOBS
- LIVABLE CITIES
- RENEWABLES
- CLEAN WATER, AIR
- HEALTHY CHILDREN
- ETC. ETC.