Elective DC cardioversion; using care pathway analysis to identify carbon hotspots

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Epidemiology of AF

• Affecting 1-2% of the population
• May be silent and found as an incidental finding
• Increases with age
  < 40-50 years < 0.5%, > 80 years 5-15%
• Those of 40 years, the life time risk of developing AF is ≈ 25%
• Paroxysmal to Persistent to Permanent
Risks of atrial fibrillation

• Hospitalisation for AF accounts for 10% of hospital admissions for arrhythmias
• Emboli leading to stroke and ACS
• AF doubles death rates
• Left ventricular function impaired
  – Cardiac output reduced 5-15%
• 1 in 5 strokes is due to AF
• Cognitive decline (vascular dementia)
• Effecting quality of life and exercise capacity
“Natural” Treatment Progression

Developed with the special contribution of the European Heart Rhythm Association (EHRA) et al. Eur Heart J 2010;31:2369-2429
Questions

• What is the carbon footprint (CF) of an elective DC cardioversion?
• Where are the hot spots?
• How does this compare with Sustainable Development Unit Care Pathway Guidance?
Methods

• Snap shot of a single DC Cardioversion list
  We collected:-
• Postcodes of patients, GPs and staff to calculated distance travelled.
• The number of journeys made
• Estates Return Information Collection (ERIC)
  — Calculate the energy use per bed per day
• Duration of day case stay from the ward admission to discharge
• Recorded all drugs, disposables and gases used
• Collected all the waste generated and weighed it
• Converted the costs of disposables to a CO$_2$e
  — Carbon intensity 700g/£ spent

Total CO$_2$e compared with the SDU model
What to include and how

- Consumables
- Equipment
- Pharmaceuticals
- Building energy, waste and
  Water
- Staff travel
- Patient and visitor travel
- Medical gases

Environmental Impacts

- GHG emissions
- Fresh water use
- Waste generated
DC Cardioversion

Atrial flutter

Sinus rhythm

Atrial fibrillation

Synchronised DCC

Sinus rhythm

Synchronised DCC
Data Collected

• Single list 5 representative patients in AF
  – All on novel oral anticoagulants
• Patient travel distances mean 98.45 miles (157.5km)
  – 25.2Kg CO₂
• Staff travel 0.5 miles per patient
  – Self travel
• Energy 175 kWh/bed per day
  – 70 kg CO₂ per bed per day
  – Stay mean hospital stay 7.1 hours
  – 20.7 Kg CO₂ per DC cardioversion
Data collected

- Drugs 200 mg propofol 10 ml saline per patient
- Disposables 25 different items including sheets, pillow cases, scrubs £40.93
  - Self-adhesive DCC pads £13.71
  - Total 28.6 Kg CO$_2$e
- Oxygen use 81 litres per patient
  - In the anaesthetic room and into recovery
- 305g clinical waste 88g domestic waste per patient
  - All combusted will produce 1k85g CO$_2$
The image shows two pie charts comparing the consumption of resources across different categories for two locations labeled DCC and SDU.

For DCC:
- **Consumables**: 28.6
- **Equipment**: 20.7
- **Medical Gas**: 25.2
- **Travel, patient**: 1.54
- **Travel, staff**: 1.7
- **Energy**: 0.083
- **Water**: 0.078
- **Plastic**: 0.19
- **Paper**: 0.9

For SDU:
- **Consumables**: 15.35
- **Equipment**: 15.67
- **Medical Gas**: 2.9
- **Travel, patient**: 4.59
- **Travel, staff**: 1.7
- **Energy**: 0.52
- **Water**: 0.52
- **Plastic**: 0
- **Paper**: 0

The diagram indicates the following hotspots for CO₂e emissions:

**79 Kg CO₂e**
- **Hotspots**
  - Consumables
  - Patient travel
  - Building energy

**42.6 Kg CO₂e**
Discussion (Energy + Transport)

• Difference nearly two fold
  – SDU extrapolation from Airedale Hospital

• Building energy
  – Total and covers university research and labs as well as wards
  – Leaky 1970s designed with modern additions
  – Could be worse without the two CHPs

• Transport
  – Single visit to GP, but five journeys to UHS
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- 2005 North Wing
- 1970’s concrete façade with operating room air intakes
- Brand new entrance
Energy Performance Certificate EPC

- Poor at 148
- Getting worse year on year
Discussion (Consumables + NOAC)

- Short procedure the consumables same irrespective of the length of the procedure
  - 3 hour post procedural observation period
- Treatment with NOAC for 3 weeks sufficient. Warfarin control difficult results in more late cancellations
Taking this forward

• Audit whether warfarin treated patients have more cancellations, more visits and further to travel

• Look at the process of DC cardioversion
  – One stop shop

• Admit to a trolley not to a bed
Questions?
Thank you for listening.