Climate, Health & Sustainable Care

Inaugural Symposium

2024

UNIVERSITY OF TORONTO

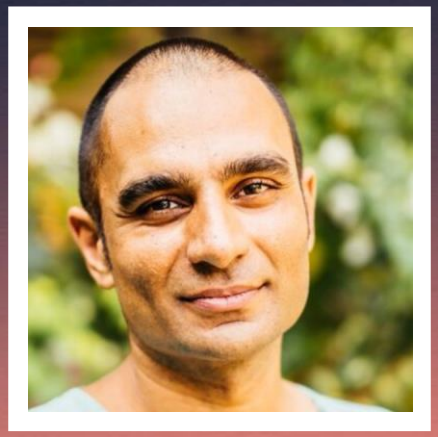
COLLABORATIVE CENTRE FOR Climate, Health + Sustainable Care

@climate-health

climate.health@utoronto.ca

Mahmood Bhutta

Modern Medical Supply Chains: *Environmental Destruction, Sweatshops & Child Labour*



Introduced by: Fiona Miller

UNIVERSITY OF TORONTO

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Inaugural Symposium

	The Fairley *First floor* *(cap=28)*	**Wedgewood Dining Room** *First floor* *(cap=140)*	**Upper Dining Room** *Second floor* *(cap=55)*
1:45 - 3:00	**Governance & System Change for Sustainable Health Systems** **Speakers:** Brittany Barber, Carlene van der Heiden, Melanie Seabrook, Sara Allin, Camila Heredia **Moderator:** Fiona Miller	**Environmental Co-Benefits of Reducing Low-Value Care** **Speakers:** Thomas Bodley, Brenda Chang, Anita Rao **Moderator:** Karen Cameron	**Research for Climate, Health & Sustainable Care** **Speakers:** Jimin Lee, Jacques Du Plessis, Jeffrey D'Souza **Moderator:** Mahmood Bhutta
3:00 - 3:15	*Break & Posters (Main Lounge)*		
3:15 - 4:15	Keynote: **Towards Addressing Climate Change and Sustainability: A Values-Driven Triple E Transformation** **Speaker:** James Orbinski		
4:15 - 6:00	*Announcements (Wedgewood), followed by reception & posters (Main Lounge)*		

Medical Supply Chains

Environmental destruction, sweatshops, child labour

Prof. Mahmood Bhutta

Chair in ENT Surgery & Sustainable Healthcare
Brighton & Sussex Medical School

Consultant and Academic Lead in ENT
Trust Clinical Green Lead
University Hospitals Sussex

Founder
BMA Medical Fair and Ethical Trade Group

THiS Institute Fellow

brighton and sussex medical school

NHS
University Hospitals Sussex
NHS Foundation Trust

CENTRE for SUSTAINABLE HEALTHCARE

THIS.Institute The Healthcare Improvement Studies Institute

2008

CLIMATE CHANGE

Wanted: a green NHS

We welcome the *BMJ*'s latest issue on climate change (26 January), which suggests some strategies for health professionals in response to global warming, including adaptation and surveillance and forecasting of health risks.[1] "Climate change: what can doctors do?" asks the *BMJ*'s cover. We believe that doctors must do more than respond to the crisis as it unfolds. Health professionals at all levels must lead by example in their own practices.

Rachel C Stancliffe director, Campaign for Greener Healthcare, Oxford OX2 7LG
rachel.stancliffe@soundshealthy.org
Mahmood Bhutta cofounder, Medical Fair and Ethical Trade Group, c/o International Department, BMA, London WC1H 9JP

thebmj

2023

2006

Fair trade for surgical instruments

Mahmood F Bhutta

We may all be trying to buy fair trade coffee and bananas, but do we know where our surgical instruments are made, and under what conditions?

The global trade in medical commodities amounts to billions of pounds each year (www.standardsandpoors.com), with much trade between the developed and the developing world. The pricing and availability of pharmaceuticals, medical equipment, and biotechnologies, and the potential conflicts of interest and ethical issues, have all been questioned. Perhaps the most publicised case has been that of the provision of affordable medicines to combat the spread of HIV in the developing world,[1] where international pressure resulted in drug companies cutting prices. Many other medical commodities (such as MRI scanners and endoscopic equipment) are too expensive for the developing world because costs of research and development are high.

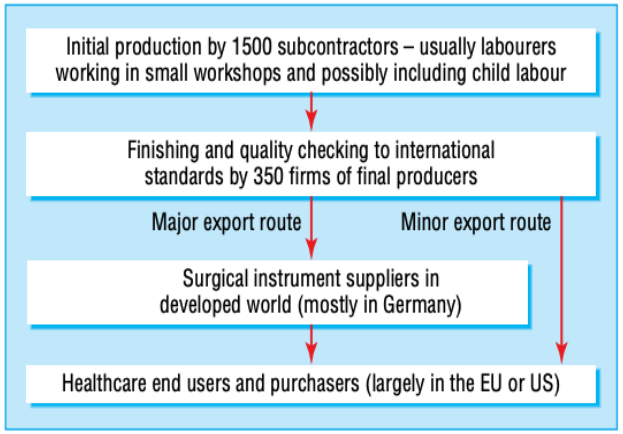


Fig 1 The manufacture and supply process of stainless steel surgical instruments from Pakistan

thebmj

Scale of the problem

Consumption of medical goods in the NHS in England

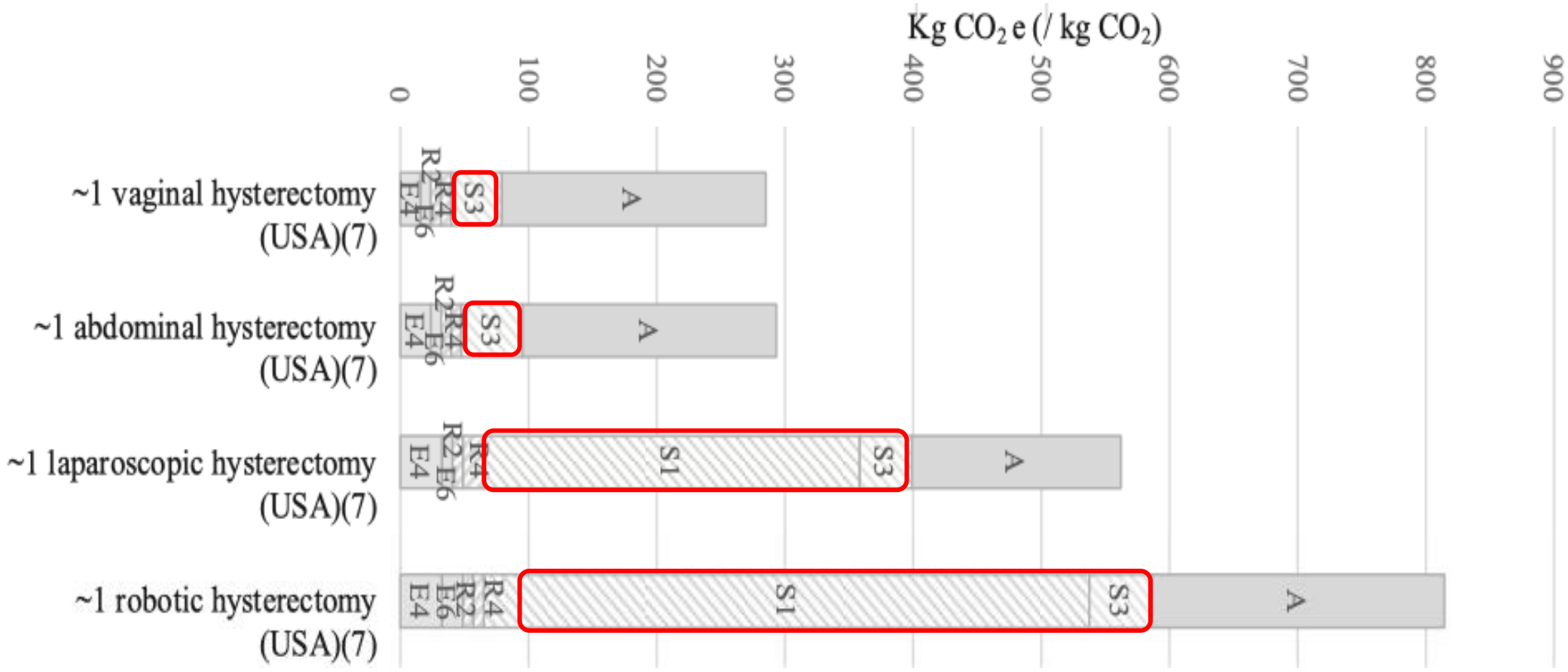
- 10% of the carbon footprint of health systems in high resource settings (0.5% of the entire carbon footpring of the nation)
- Dominated by linear consumption: 73% of products single use
- £10bn medical devices per annum, of 592,000 different product types
- 240,000 tonnes per annum of clinical waste (96% from hospitals, 3% primary care).

Examples (NHS England data)

- >93m drapes and gowns in UK
- 52m metal instruments
- >1.7 bn gloves pre-pandemic
- 48m electrosurgical products
- 4bn stapling devices

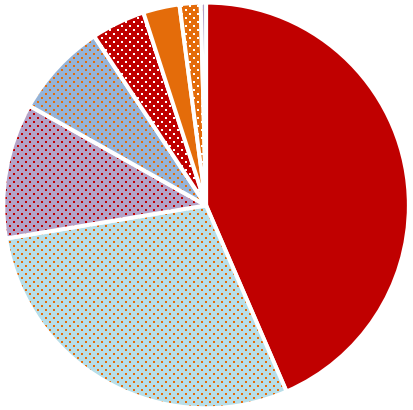
Harms from the linear economy of medical goods

CO2 of different approaches to hysterectomy

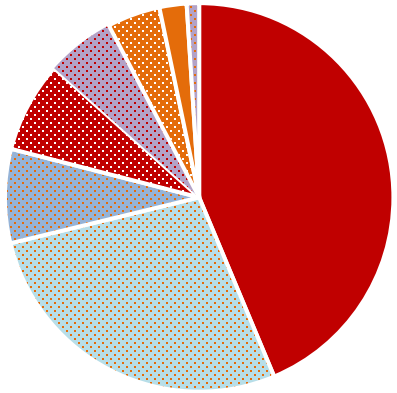


Rizan C et al. Annals Surgery 2020; 272(6): 986-995

Contribution to CO_2 from goods in the operating theatre

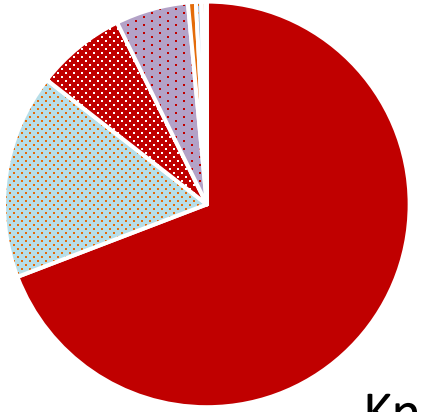


Tonsillectomy

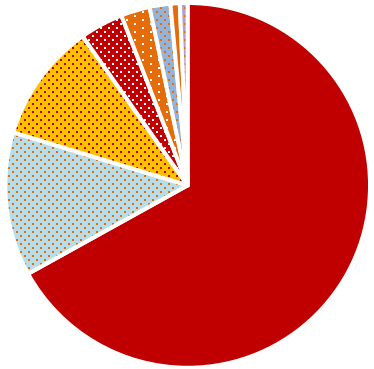


Laparoscopic cholecystectomy

Production single-use equipment
Decontamination
Waste



Knee arthroplasty



Carpal tunnel decompression

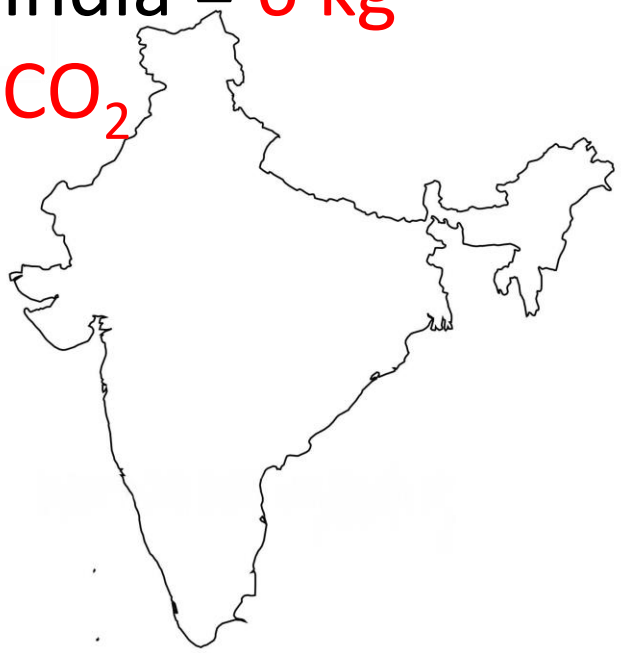
68% of carbon of products used is due to single use products

Rizan C et al J R Soc Med 2023;116:199-213

CO2 of cataract operation in different settings

Cataract operation in UK = 182 kg CO_2

Cataract operation in India = 6 kg CO_2



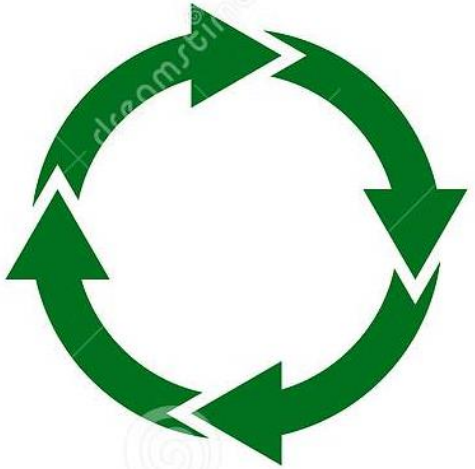
Highly efficient systems

Reuse of equipment

Lower rates of infective endophthalmitis

Rizan C et al. Annals Surgery 2020; 272;986-995

REDUCE



REUSE

RECYCLE

CO_2 Reduction	100%	38-56%	3-4%?

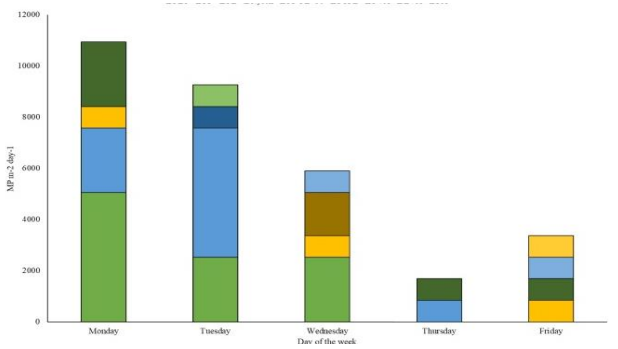
Keil et al Eur J Pub Health 2023;33:56–63
Rizan C et al J R Soc Med 2023;116:199-213

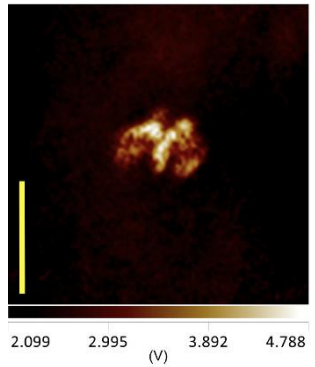
Lack of resilience

- 19% of operations have issues with availability of equipment
- NHS Supplies have become disrupted

Toxins from hospital materials

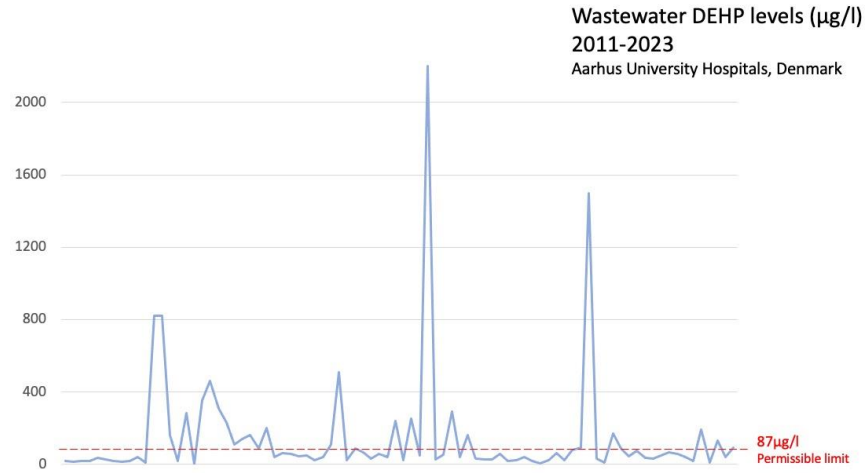
- Estimated 2% of global plastics used in healthcare
  - microplastics in the operating theatre 3x background level
  - Microplastics in iv sets





- Per- and Polyfluorinated Substances (PFAS) in drapes and gowns

- Toxic levels of plasticiser DEHP in waste water from Aarhus hospital (Denmark)



Rizan C et al J R Soc Med 2020;113:49-53
Field DT et al. Environment Intl 2022; 170: 107360
Tarafdar et al, Sci Total Env 2024; 939: 172648

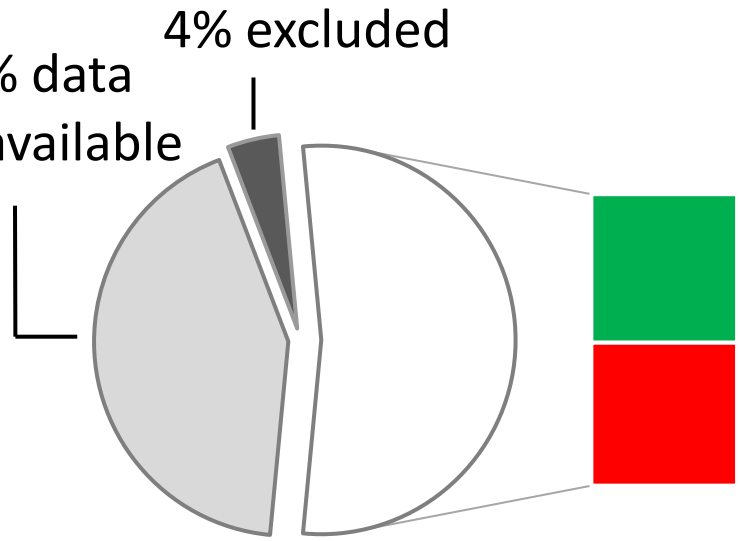
Free market economics and labour risk

Country of origin

ITUC ranking ≥4

SYKEHUSPARTNER

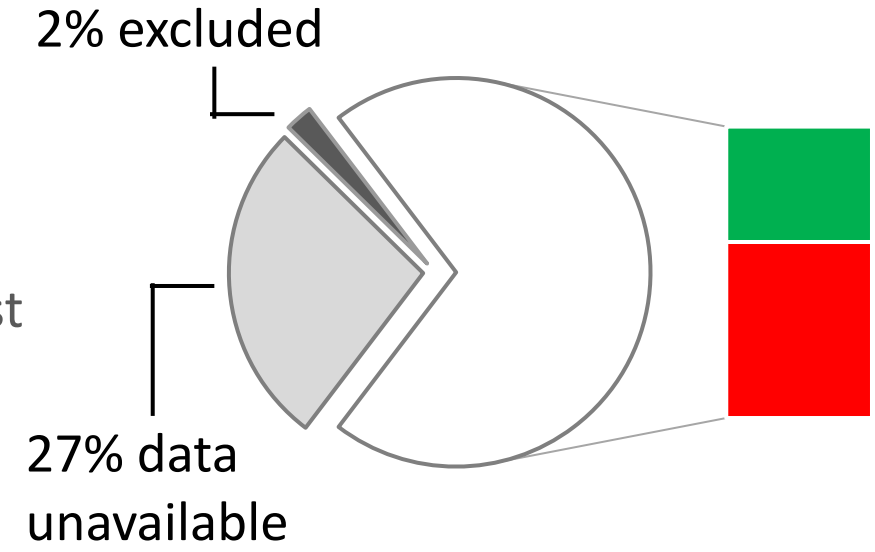
All health contracts
SE Norway: 2015-16
(>29,000 items)



49%

NHS Cambridge University Hospitals NHS Foundation Trust

100 items highest spend: 2018-19



59%

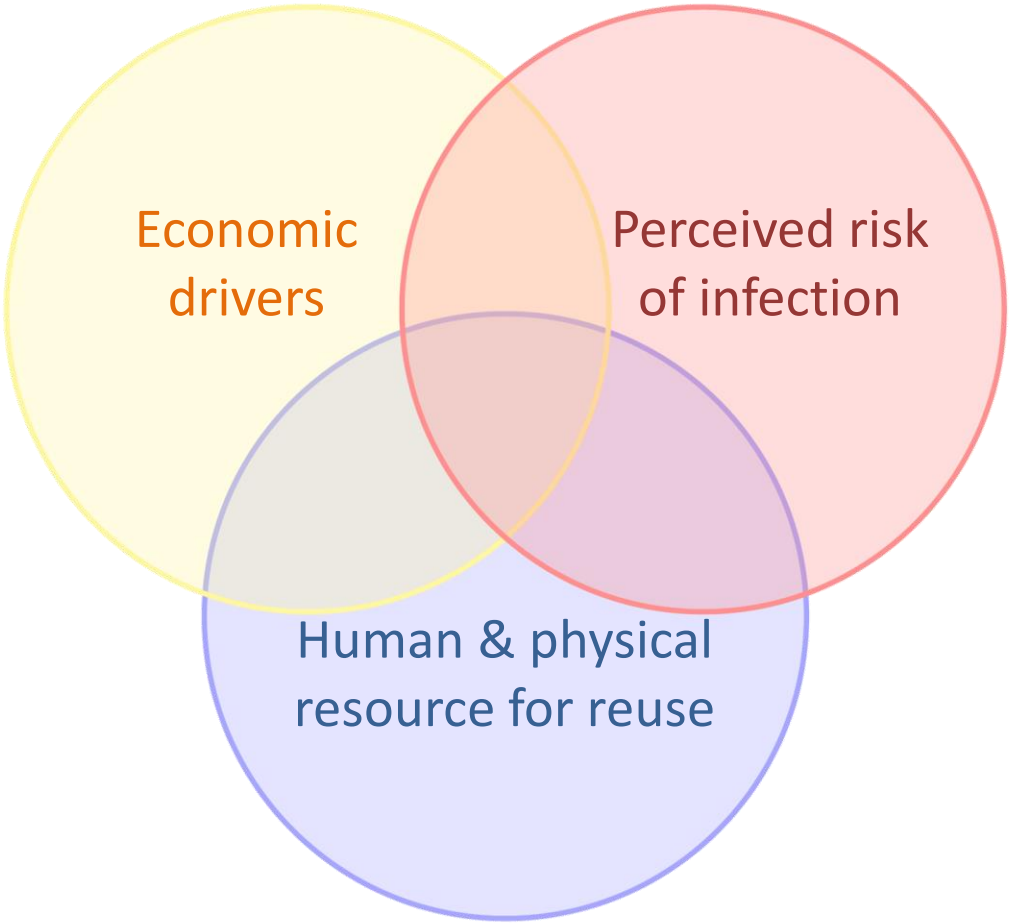
5+	No guarantee of rights due to the breakdown of the rule of law
5	No guarantee of rights
4	Systematic violations of rights
3	Regular violations of rights
2	Repeated violations of rights
1	Sporadic violations of rights

ITUC CSI IGB
International Trade Union Confederation

Abbott et al. Cureus 2024;16:e54258

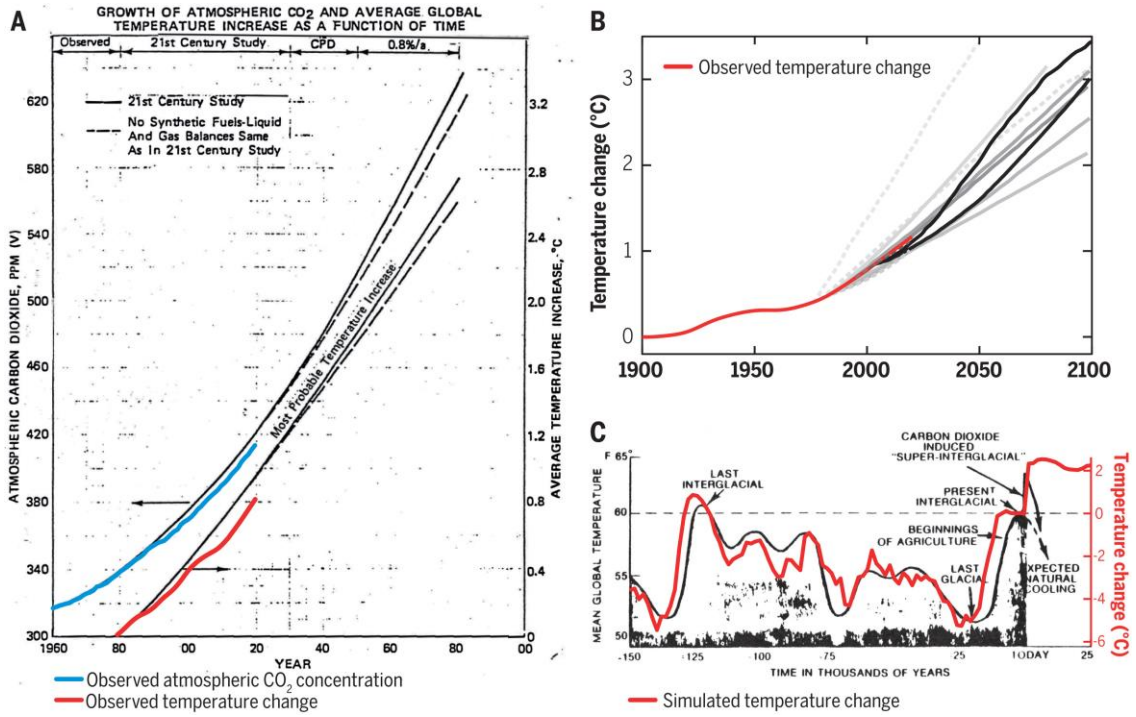
Incentives and barriers

Incentives and barriers



“Washing”

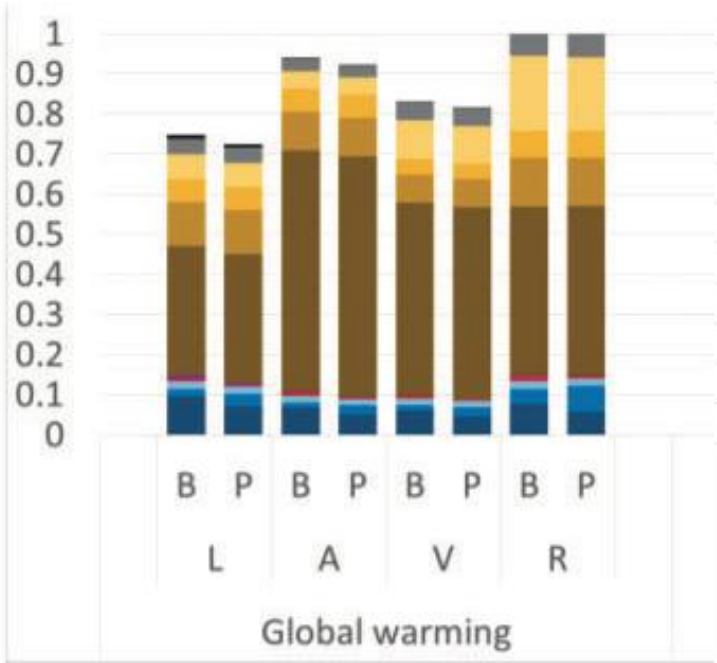
- Whitewash



ExxonMobil

“Washing”

- Whitewash
- Greenwash



“Washing”

- Whitewash
- Greenwash
- Bluewash

TOP GLOVE FOUNDATION

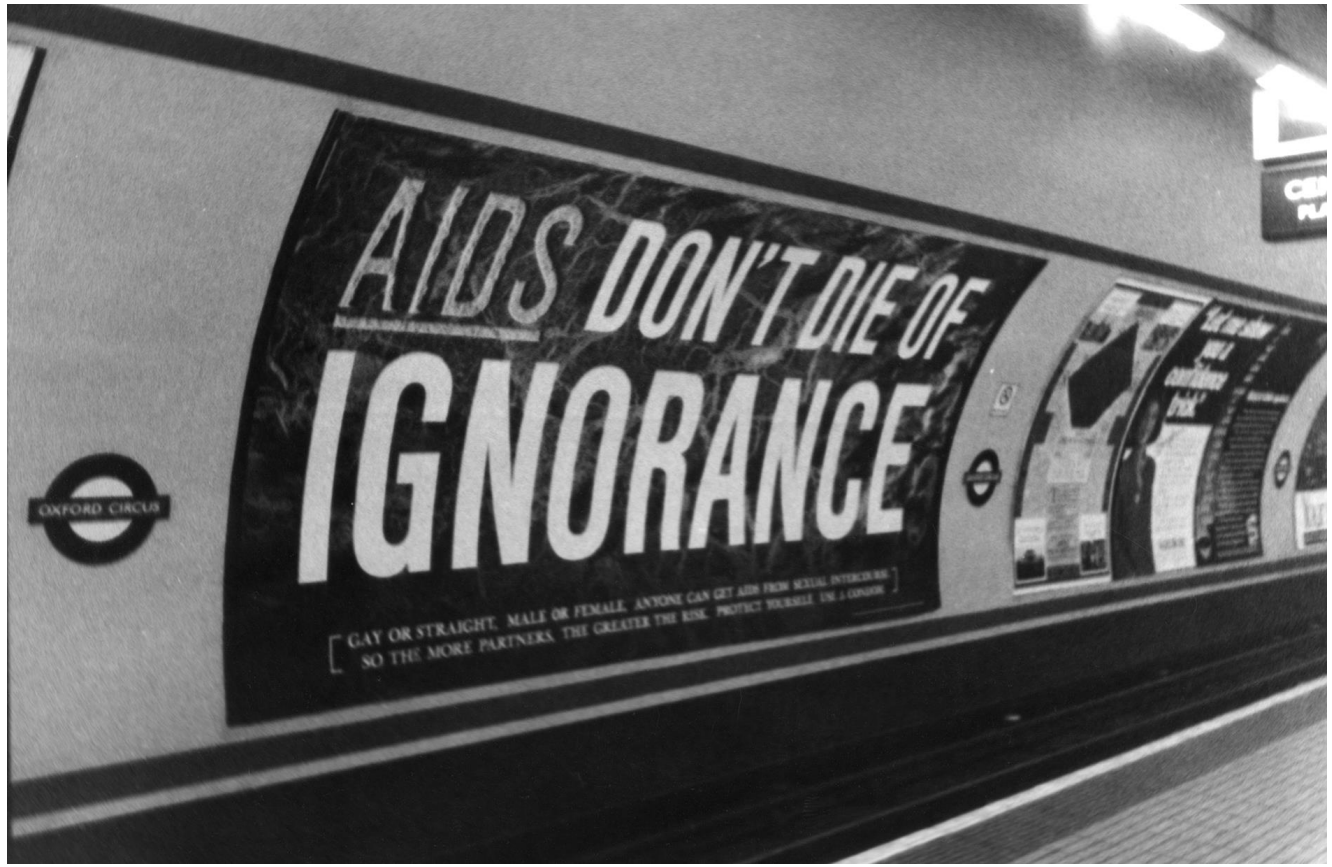
TOP QUALITY, TOP EFFICIENCY

“Washing”

- Whitewash
- Greenwash
- Bluewash
- Yellow-wash

PPE

Gloves


AIDS DON'T DIE OF
IGNORANCE
GAY OR STRAIGHT, MALE OR FEMALE, ANYONE CAN GET AIDS FROM SEXUAL INTERCOURSE.
SO THE MORE PARTNERS, THE GREATER THE RISK. PROTECT YOURSELF. USE A CONDOM.
OXFORD CIRCUS

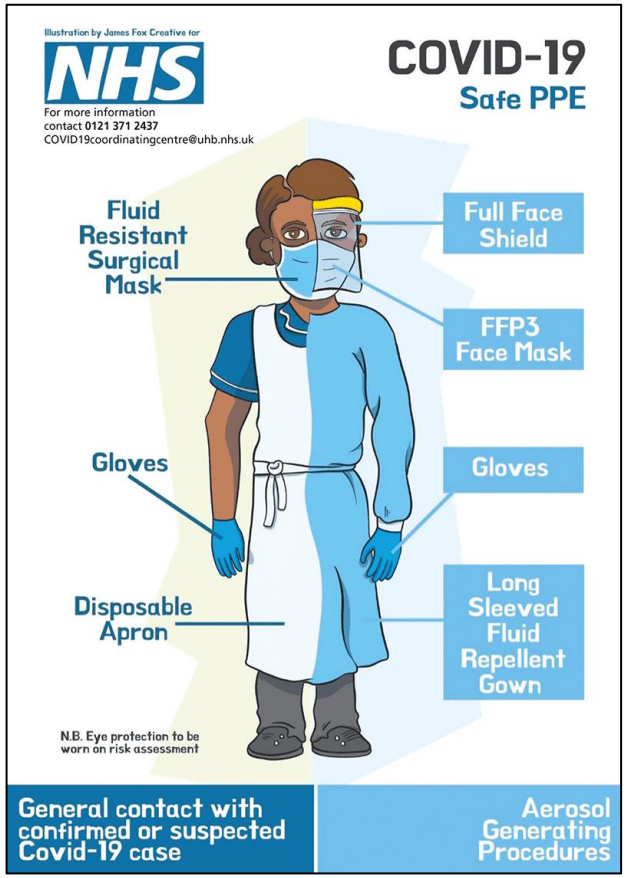


Illustration by James Fox Creative for
NHS
For more information
contact 0121 371 2437
COVID19coordinatingcentre@uhb.nhs.uk
COVID-19
Safe PPE
Fluid Resistant Surgical Mask
Full Face Shield
FFP3 Face Mask
Gloves
Gloves
Disposable Apron
Long Sleeved Fluid Repellent Gown
N.B. Eye protection to be worn on risk assessment
General contact with confirmed or suspected Covid-19 case
Aerosol Generating Procedures

PPE

- PPE increase during pandemic
  - 200% gloves, 650% aprons, 4700% gowns, 6500% masks, 21,000% eye protectors
- Glove volumes prior to pandemic
  - >1.7 billion/annum in NHS prior to the pandemic
  - If placed end to end would almost stretch to the moon
  - Carbon equivalent to driving a petrol car around the Earth 8300 times

Infection risk and gloves

- 60% of glove use is inappropriate
  - Only required when expected contact with potentially infected bodily fluids or broken skin
  - Inappropriate use perpetuated by individuals and institutions
  - Puts patients at risk (spreads infection)

Infection risk and gloves

- Perpetuates to public perception….
  - Google image search “vaccination” shows 81% (81/100) are wearing gloves
  - A survey in Poland two months into the Covid pandemic 93% (289/312) of people using plastic gloves for shopping

A new oil refinery in Malaysia

- A new oil refinery under construction 7.7 million tonnes/annum synthetic rubbers and polymers
- Importing up to 300,000 barrels of oil per day from Saudi Arabia

https://www.hydrocarbons-technology.com/projects/petronas-rapid-project-malaysia/

4 News

TOP GLOVE

TOP QUALITY, TOP EFFICIENCY

TOP GLOVE

TOP QUALITY, TOP EFFICIENCY

Brightway®

Images courtesy
Andy Hall

KEMENTERIAN
SUMBER MANUSIA

TOP GLOVE

TOP QUALITY, TOP EFFICIENCY

Brightway®

2021

WRP

since 1989

SUPERMAX

Healthcare Limited

KOSSAN

Central Medicare

ssn medical products

Hartalega

SMART GLOVE™

International

YTY

Ansell

Forced Labour in the Malaysian Medical Gloves Supply Chain before and during the COVID-19 Pandemic: **Evidence, Scale and Solutions**

July 2021

MODERN SLAVERY & HUMAN RIGHTS POLICY & EVIDENCE CENTRE

Arts and Humanities Research Council

Newcastle University

brighton and sussex medical school

US UNIVERSITY OF SUSSEX

University of Nottingham Rights Lab

impactt

Asad (immigrant worker)
Hartalega gloves factory, Malaysia

Masks

2020

The New York Times

Textiles

Drapes and gowns

- 93m drapes and gowns in UK
  - 60-75% in England are single-use
- Knee arthroplasty (>80,000 per annum)
  - 11 drapes/gowns, 14.5kg CO_2 = driving around 72 miles in an average UK car
- Carpal tunnel (>45,000 per annum)
  - 3 drapes/gowns, 5.8kg CO_2 = driving around 21 miles in an average UK car

“Drapes and gowns must be made of impervious materials. Thin cotton drapes and gowns have no place in orthopaedic surgery”

2014 Consultant Advisory Book

British Orthopaedic Association

Textile performance: standards

- All health textiles are made of plastics (cotton is obsolete)
- Must meet EN13795 standards throughout the lifecycle
  - Reuse is typically 55-75 times and has one third carbon footprint

Liquid penetration

Microbial penetration

Textile performance: single use vs reusable

Tensile strength

4x higher with reusable

Burst

10x lower with reusable

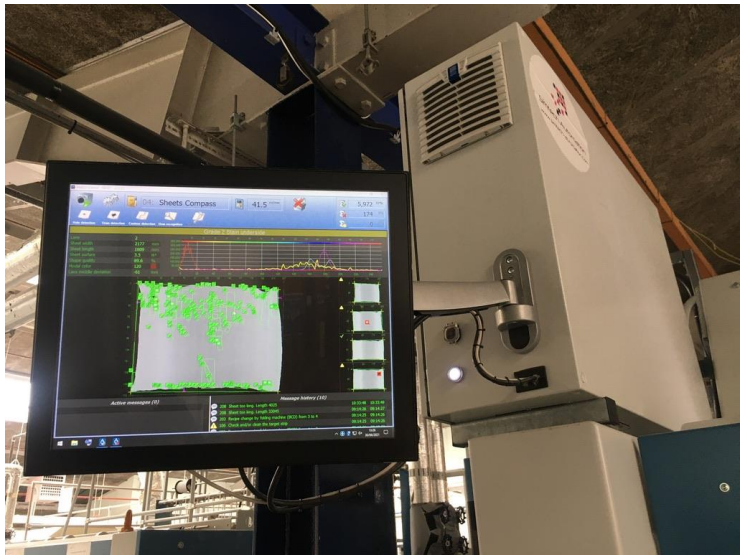
ETSA

EUROPEAN TEXTILE SERVICES ASSOCIATION

Linting (particle release)

8x lower with

Textile laundry and sterilisation standards



HTM 0104

Robust decontamination & sterilisation

Standards and quality assurance

Microbiological monitoring

Bioburden testing on final products

Processing ref: TM-SP-1

Colony Forming Units/100cm² (CFU/100cm²)

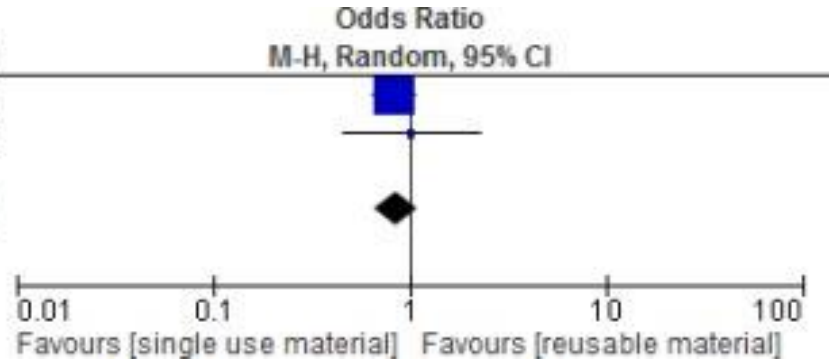
Sample Description/ Alert criteria reference TM-QA-08		~Aerobic Colony Count (ACC) TM-AM-1	Coliforms● (Presumptive) TM-AM-2	*Escherichia coli* TM-AM-2	Faecal enterococci TM –AM-3	*Staphylococcus aureus* TM-AM-4	Fungi (Presumptive) TM-AM-8	*Clostridium difficile* TM-AM-6	Overall alert status
		≤300	≤5	≤5	≤5	≤5	≤5	Absent	
			6-10	6-10	6-10	6-10	6-10		
		>300	>10	>10	>10	>10	>10	Present	
33	70 X 70 Drape	12	<2	<2	<2	<2	<2	<2	Satisfactory
34	42 x 42 Drape	6	<2	<2	<2	<2	<2	<2	Satisfactory
35	Alcoban 100 x 100	4	<2	<2	<2	<2	<2	<2	Satisfactory
36	Alcoban 100 x 140	4	<2	<2	<2	<2	<2	<2	Satisfactory
37	Clean Room Gown	10	<2	<2	<2	<2	<2	<2	Satisfactory

● *Coliforms (without E coli and faecal enterococci) regarded as being of environmental origin: Green = ≤5; Amber = 6-25; Red >25*

Infection risk

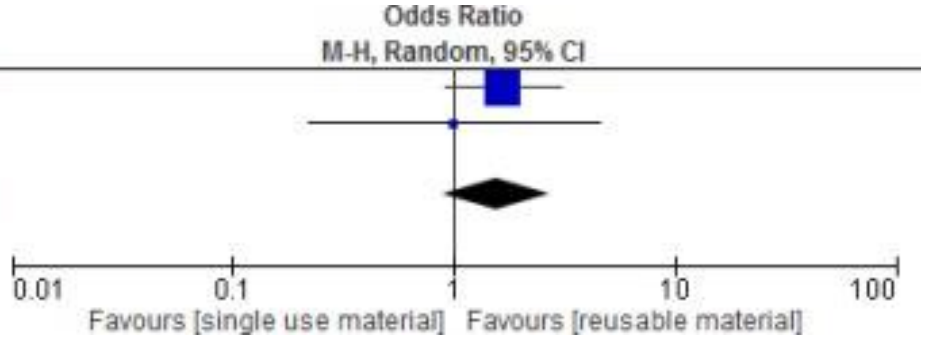
Study or Subgroup	single use material Events	Total	reusable material Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Belkin 1998	108	2139	133	2223	90.5%	0.84 [0.64, 1.08]
Bellchambers 1999	13	250	12	236	9.5%	1.02 [0.46, 2.29]
Total (95% CI)		**2389**		**2459**	**100.0%**	**0.85 [0.66, 1.09]**
Total events	121		145			

Heterogeneity: Tau² = 0.00; Chi² = 0.22, df = 1 (P = 0.64); I² = 0%
Test for overall effect: Z = 1.26 (P = 0.21)

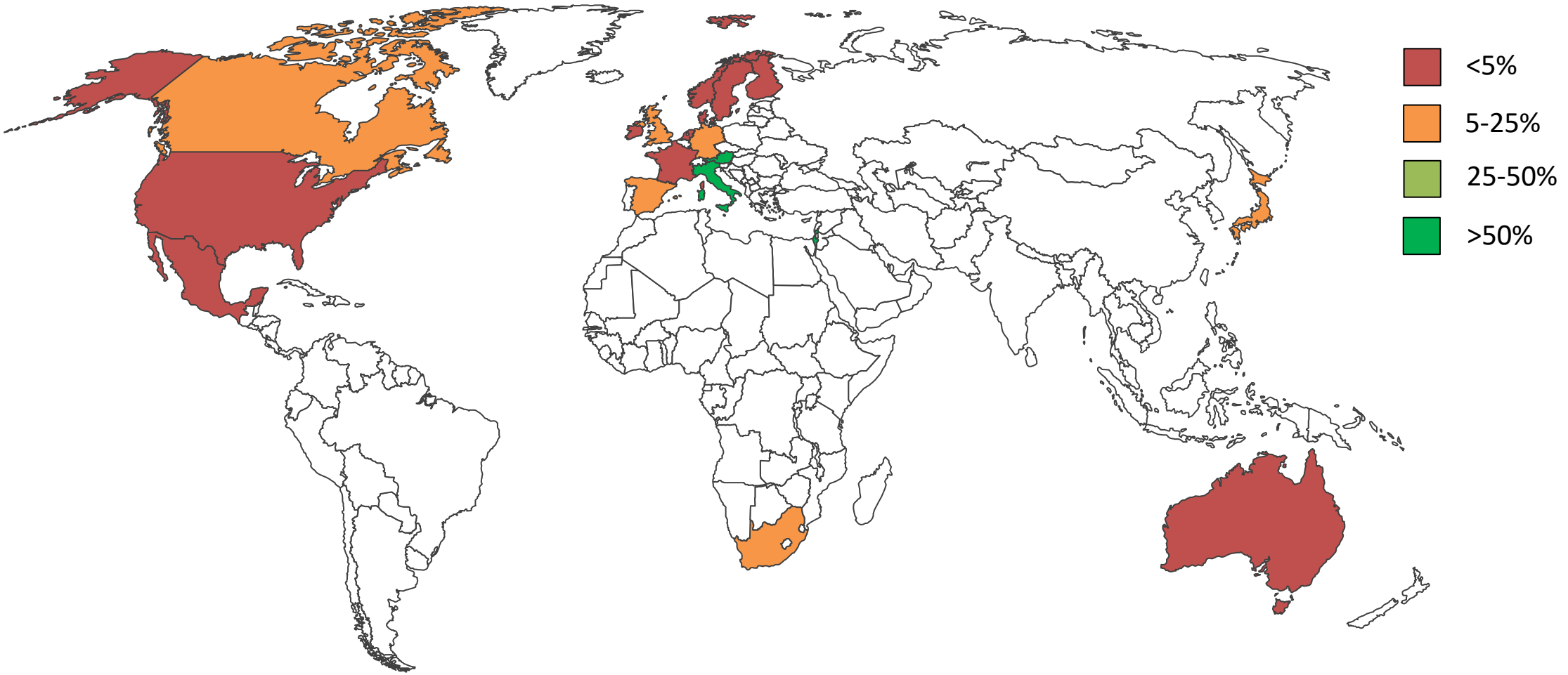


Study or Subgroup	single use material Events	Total	reusable material Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Castro Ferrer 2004	31	421	18	396	86.5%	1.67 [0.92, 3.03]
Treggiari 1992	4	25	4	25	13.5%	1.00 [0.22, 4.54]
Total (95% CI)		**446**		**421**	**100.0%**	**1.56 [0.89, 2.72]**
Total events	35		22			

Heterogeneity: Tau² = 0.00; Chi² = 0.38, df = 1 (P = 0.54); I² = 0%
Test for overall effect: Z = 1.56 (P = 0.12)



Proportion of Surgical Textiles that are Reusable



Gowns in China

2020

The Guardian

Metal instruments

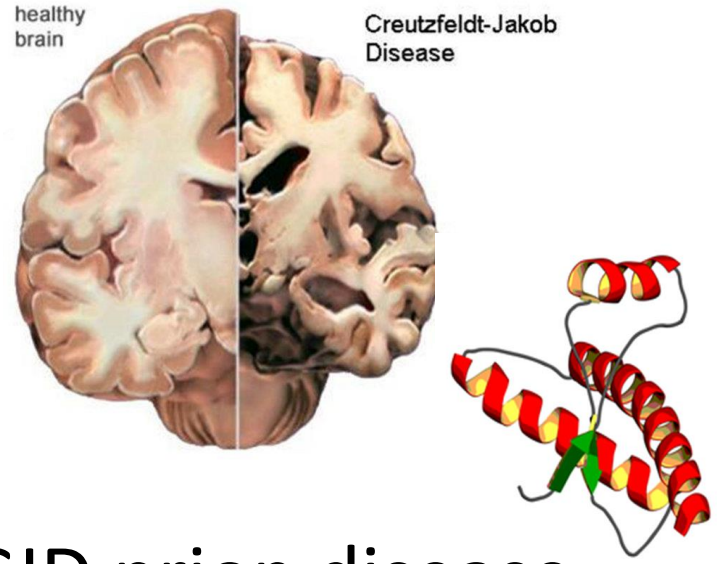
Metal instruments

- 52m single use metal instruments in England (>70% made in high risk countries)
  - Accident and emergency suture sets
  - Outpatient clinics (e.g. ophthalmology, ENT, gynaecology)
  - Removal of sutures

Infection risk and metal instruments

1990s

Inconsistent or inadequate sterilisation



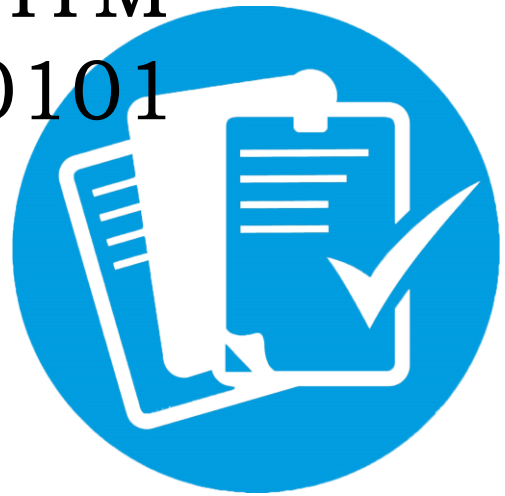
CJD prion disease

J Hosp Infect, 2001: 48; 180, Quintessence Int 1998 29:231, Inf Control Hosp Epidem 2010; 31: 107
J Clin Neurosci 2013;20:1207; J Hosp Infect, 2014: 88; 127

Infection risk and metal instruments

2020s

HTM 0101



Robust decontamination & sterilisation

Standards and quality assurance

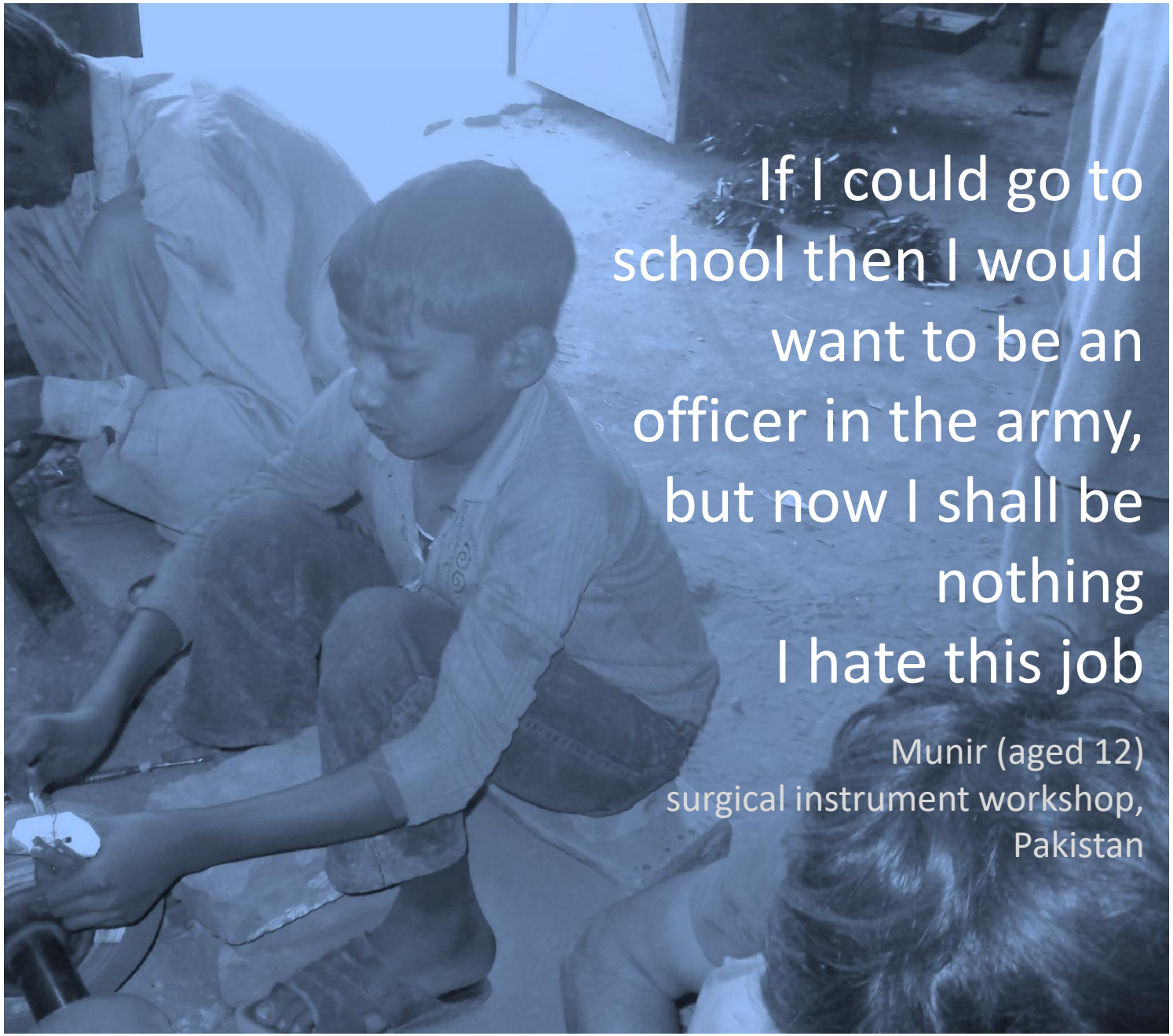
Single use laryngoscope blades

- Single use laryngoscope blades in 95% (21/22) UK hospitals, 2.9m per year
  - but not in Denmark
- Single use instruments for tonsillectomy in Scotland
  - but not England or Wales
- Prion protein found in 0 / 32,661 tonsil specimens

doi: https://doi.org/10.1136/bmj.b1442

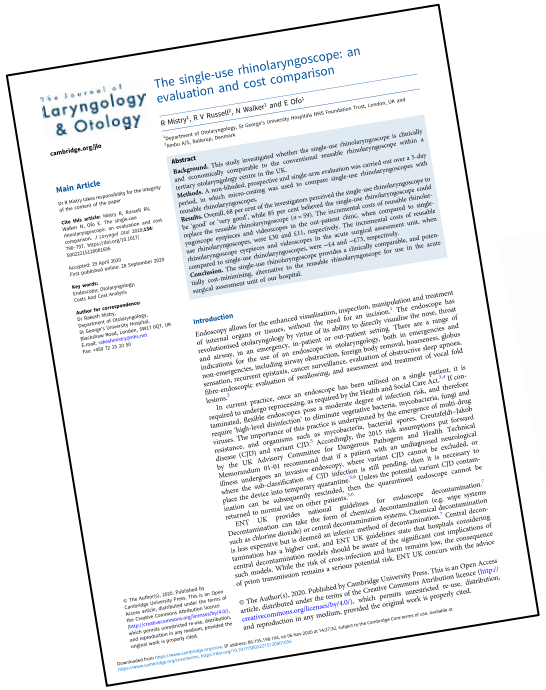

© FairDeal Trad

International Labour Organization


If I could go to school then I would want to be an officer in the army, but now I shall be nothing
I hate this job
Munir (aged 12)
surgical instrument workshop, Pakistan

And more….

Infection risk from mucosal surfaces



The Journal of Laryngology & Otology

The single-use rhinolaryngoscope: an evaluation and cost comparison

R Mistry[1], R V Russell[2], N Walker[1] and E Ofo[1]

[1]Department of Otolaryngology, St George's University Hospitals NHS Foundation Trust, London, UK and [2]Ambu A/S, Ballerup, Denmark

cambridge.org/jlo

Main Article

Dr R Mistry takes responsibility for the integrity of the content of the paper

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Key words:
Endoscopic Otolaryngology; Costs And Cost Analysis

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Abstract

Background. This study investigated whether the single-use rhinolaryngoscope is clinically and economically comparable to the conventional reusable rhinolaryngoscope within a tertiary otolaryngology centre in the UK.

Methods. A non-blinded, prospective and single-arm evaluation was carried out over a 5-day period, in which micro-costing was used to compare single-use rhinolaryngoscopes with reusable rhinolaryngoscopes.

Results. Overall, 68 per cent of the investigators perceived the single-use rhinolaryngoscope could be 'good' or 'very good', while 85 per cent believed the single-use rhinolaryngoscope could replace the reusable rhinolaryngoscope in the out-patient clinic. The incremental costs of reusable rhinolaryngoscope eyepieces and videoscopes in the out-patient clinic, when compared to single-use rhinolaryngoscopes, were £90 and £11, respectively. The incremental costs of reusable rhinolaryngoscope eyepieces and videoscopes in the acute surgical assessment unit, when compared to single-use rhinolaryngoscopes, were −£4 and −£75, respectively.

Conclusion. The single-use rhinolaryngoscope provides a clinically comparable, and potentially cost-minimising, alternative to the reusable rhinolaryngoscope for use in the acute surgical assessment unit of our hospital.

Introduction

Endoscopy allows for the enhanced visualisation, inspection, manipulation and treatment of internal organs or tissues, without the need for an incision.[1] The endoscope has revolutionised otolaryngology by virtue of its ability to directly visualise the nose, throat and airway, in an emergency, in-patient or out-patient setting. There are a range of indications for the use of an endoscope in otolaryngology, both in emergencies and non-emergencies, including airway obstruction, foreign body removal, hoarseness, globus sensation, recurrent epistaxis, cancer surveillance, evaluation of obstructive sleep apnoea, fibre-endoscopic evaluation of swallowing, and assessment and treatment of vocal fold lesions.

In current practice, once an endoscope has been utilised on a single patient, it is required to undergo reprocessing, as required by the Health and Social Care Act.[2,3] If contaminated, flexible endoscopes pose a moderate degree of infection risk, and therefore require 'high-level disinfection' to eliminate vegetative bacteria, mycobacteria, fungi and viruses. The importance of this practice is underpinned by the emergence of multi-drug resistance, and organisms such as mycobacteria, bacterial spores, Creutzfeldt–Jakob disease (CJD) and variant CJD.[4] Accordingly, the 2015 risk assessments put forward by the UK Advisory Committee for Dangerous Pathogens and Health Technical Memorandum 01-01 recommend that if a patient with an undiagnosed neurological illness undergoes an invasive endoscopy, where variant CJD cannot be excluded, or where the sub-classification of CJD infection is still pending, then it is necessary to place the device into temporary quarantine.[4,5] Unless the potential variant CJD contamination can be subsequently rescinded, then the quarantined endoscope cannot be returned to normal use on other patients.[4,6]

ENT UK provides national guidelines for endoscope decontamination.[7] Decontamination can take the form of chemical decontamination (e.g. wipe systems such as chlorine dioxide) or central decontamination systems. Chemical decontamination is less expensive but is deemed an inferior method of decontamination.[7] Central decontamination has a higher cost, and ENT UK guidelines state that hospitals considering central decontamination models should be aware of the significant cost implications of such models. While the risk of cross-infection and harm remains low, the consequence of prion transmission remains a serious potential risk. ENT UK concurs with the advice

"The single-use rhinolaryngoscope eliminates the serious potential risk of prion transmission"

Mistry et al, 2020

Department of Health

"there are no known cases of vCJD being transmitted by surgical instruments or endoscopes"

Health Technical Memorandum 01-06

Infection risk from wax

- >330,000 procedures performed in England per annum (HES data)
- Large variation in practice in the equipment used

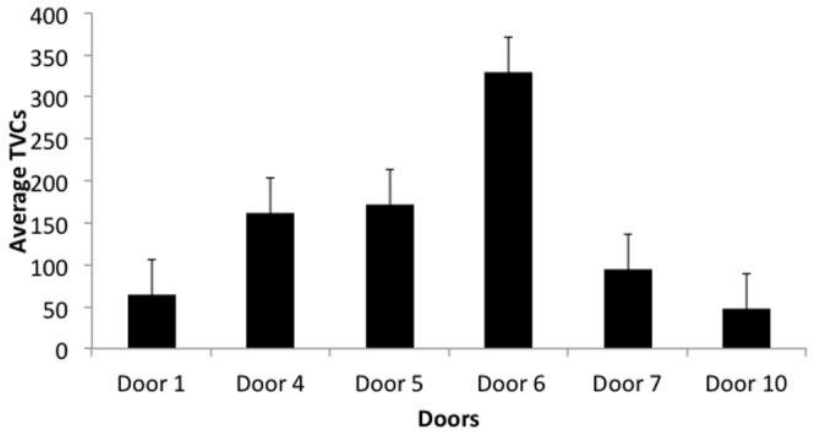
Equipment	Use routinely	Carbon footprint (g CO_{2e})
Single use sucker	100% (n=18)	3.6
Gloves	83% (n=15)	25
Apron	16% (n=3)	65
Gauze to clean sucker	66% (n=12)	2.1
Plastic tubing	28% (n=5)	130
Suction canister lining	6% (n=1)	78

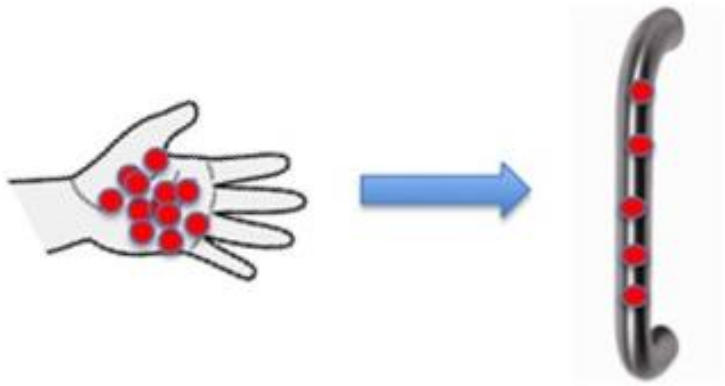
85 fold increase in carbon

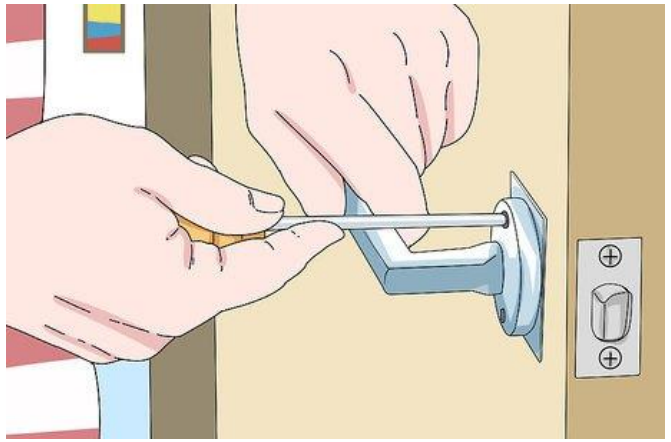
Infection risk from skin contact

- Single use tourniquets, blood pressure cuffs (common in UK)
- Single use pulse oximeters (USA)

- Single use door handles







PLoS One. 2012;7(10):e40171

Infection risk through the air

- Single use surgical wound spray (hospital in UK Midlands)

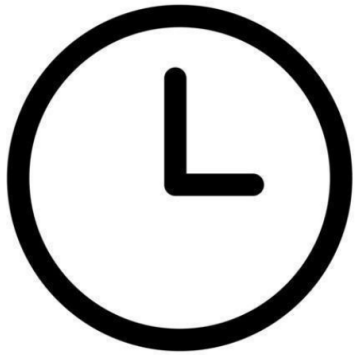
- Plastic covers for unoccupied beds (central Denmark)

Economic/regulatory drivers

Purchasing models

- Fragmentation of costs by place & time risking false accounting

- Purchasing mo

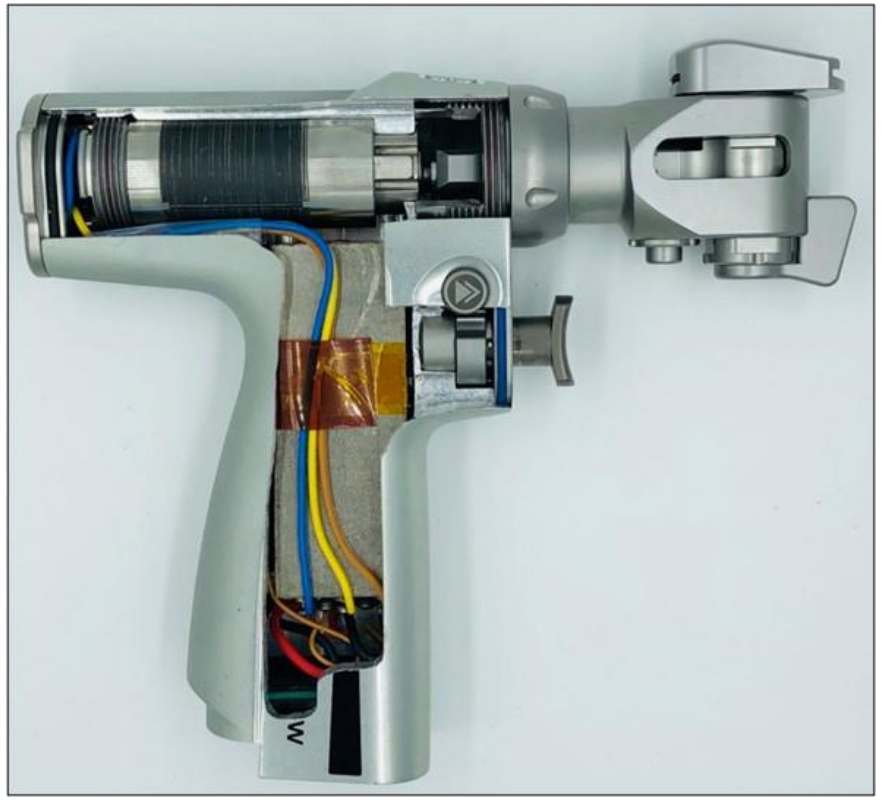


Green saves money

- In a review of 142 case studies of green strategies in surgical care, all saved money
  - But…. non-standard methodology, reporting bias?

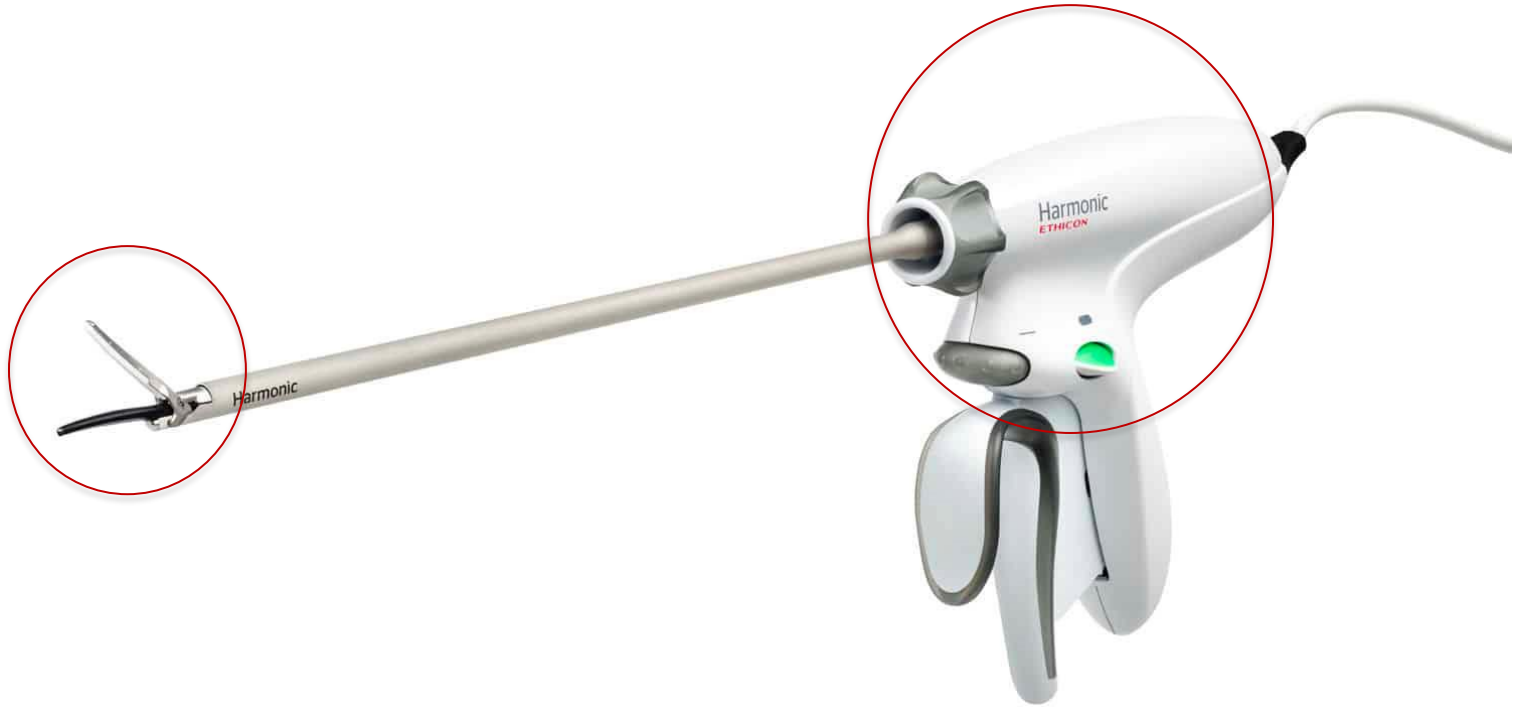
Planned obsolescence

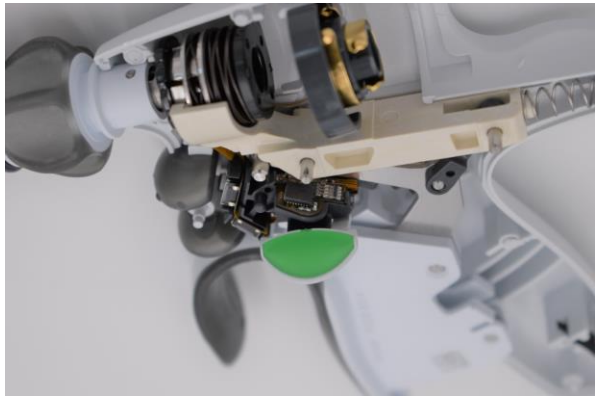
System 7

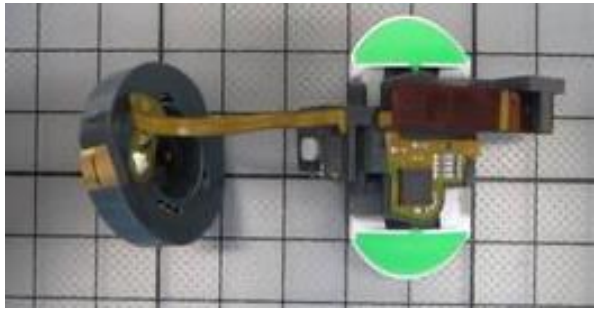


System 8

Planned obsolescence

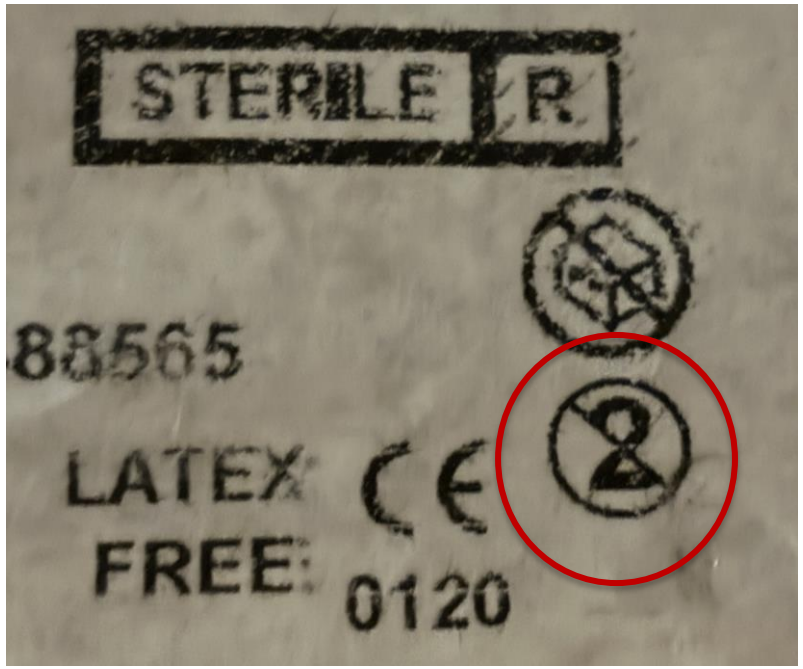






48m electrosurgical products

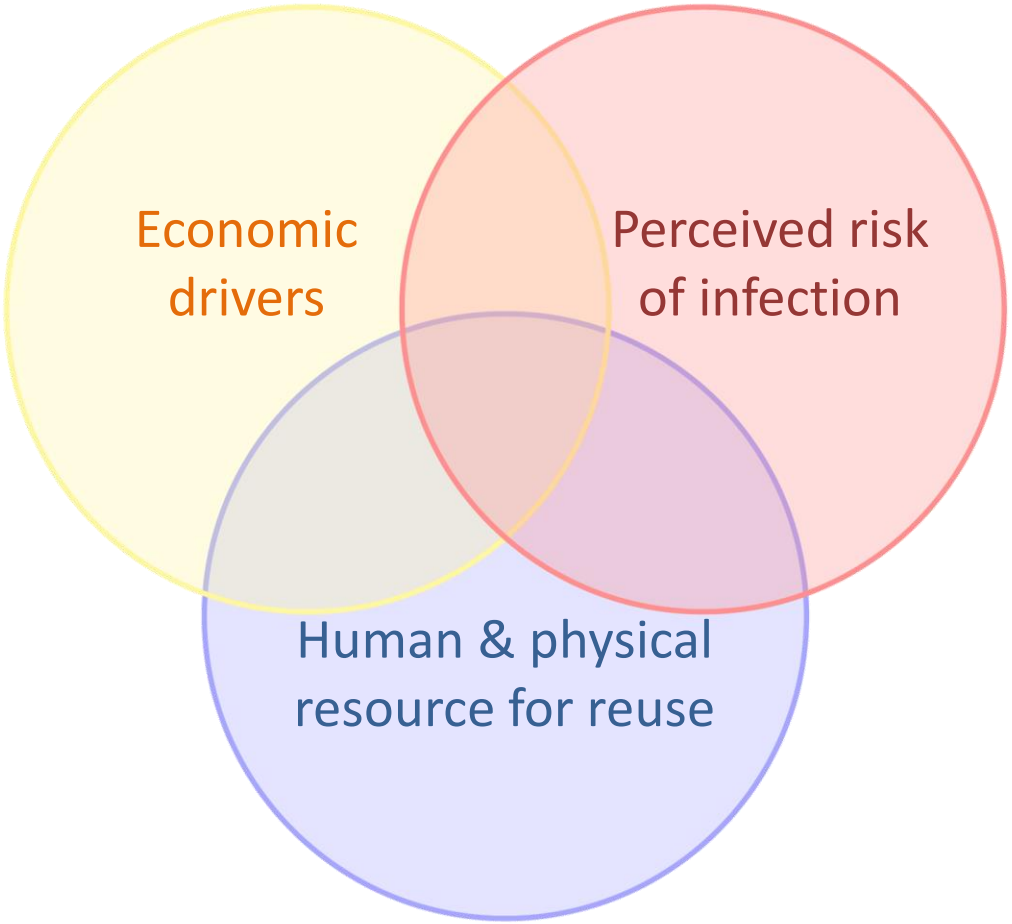
AMDR
ASSOCIATION OF MEDICAL DEVICE REPROCESSORS



5.9m scissors

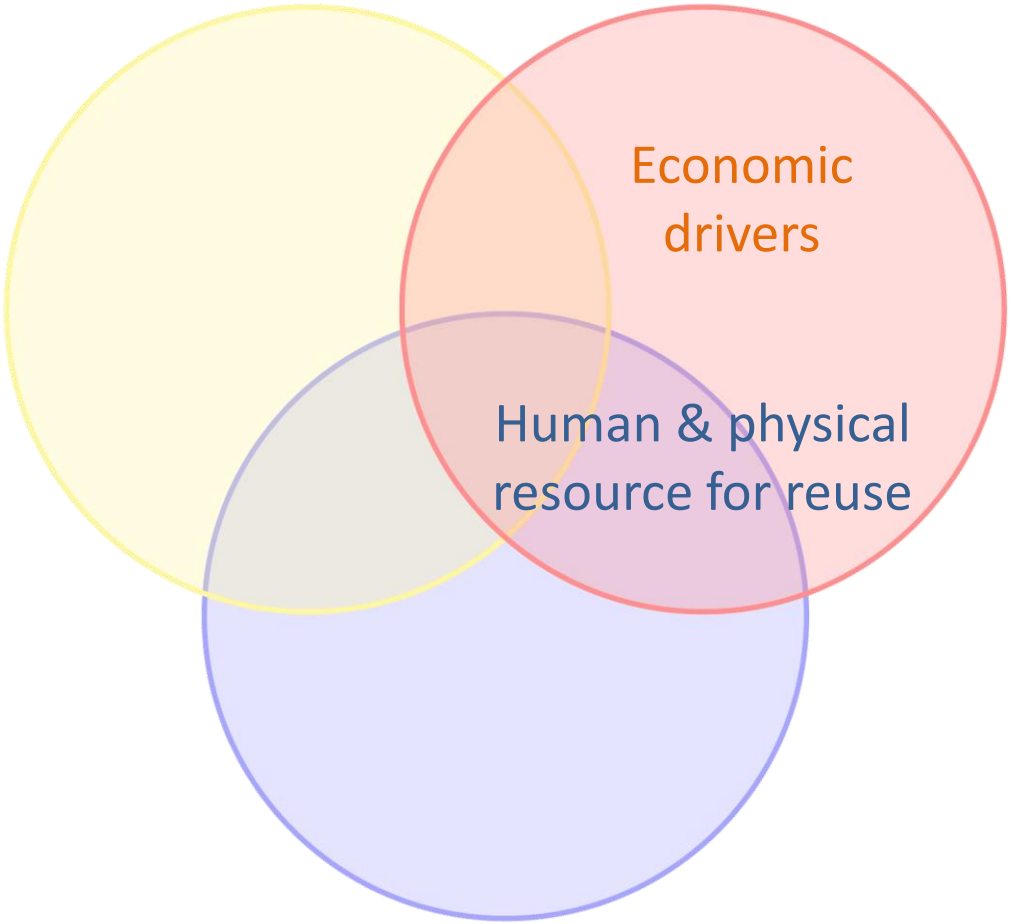
Solutions

Changing incentives and barriers



National / international guidance on infection risk

Changing incentives and barriers



Whole system finance (and costs savings)

Economic servitization

Expand national infrastructure for textiles and equipment

Explore other methods for sterilization and decontamination

Aston University
BIRMINGHAM UK

Multiple levels

government

institution

individual

Government

- Problem
  - Fragmented systems with multiple actors
- Solution
  - Provide national guidance, policy and infrastructure to support reuse
  - Explore different models of purchase including servitization

POLICY BRIEF

Reducing the environmental impact of medical devices adopted for use in the NHS

APRIL 2024

brighton and sussex medical school

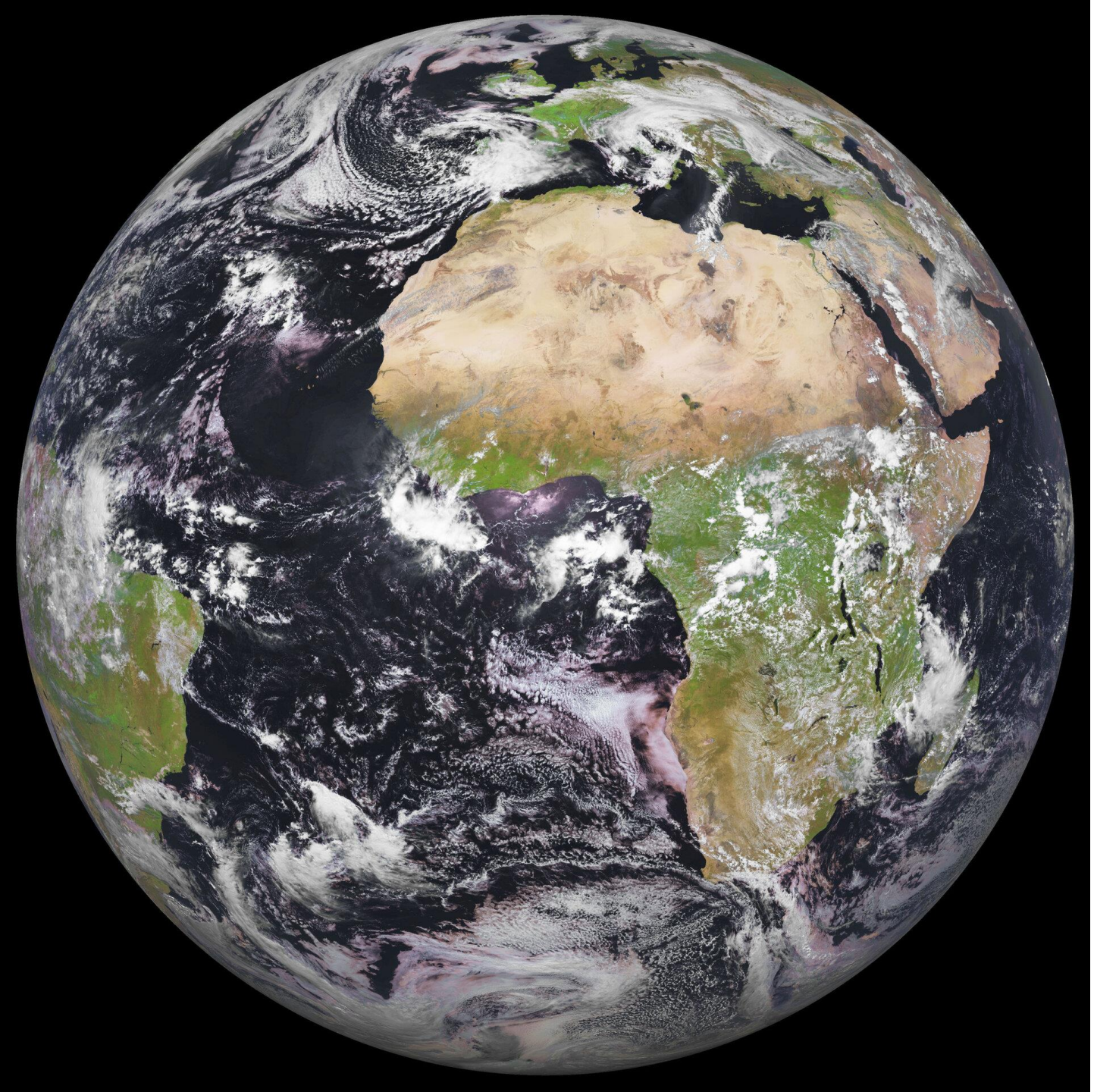
UNIVERSITY OF SUSSEX

Institutions

- Problem
  - No clear direction or metrics
    - 84% of NHS Trusts (n=188) have policy on sustainable medical procurement, but in only 27% is this SMART, and little evidence of progress to date
- Solution
  - Collate evidence on where equipment should be reusable
    - Safe / definite environmental benefit
  - Score/rank hospitals on these metrics
  - Circular Healthcare Alliance to pioneer change
    - five large UK hospitals, launched July 2024

Individuals

- Problem
  - Lack of understanding or sense of responsibility
- Solution
  - Educate yourself and lead the change
    - For glove use change is through modelling of behaviour
  - Develop local networks to support change



www.bsms.ac.uk/about/sustainability.aspx

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