Sustainable Healthcare
and our supply chain

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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.

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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.

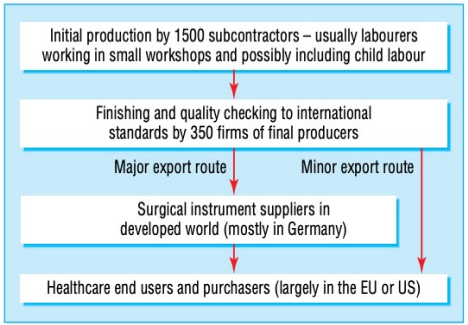


Fig 1 The manufacture and supply process of stainless steel surgical instruments from Pakistan

thebmj

Scale of the problem

Consumption of medical goods in the NHS in England

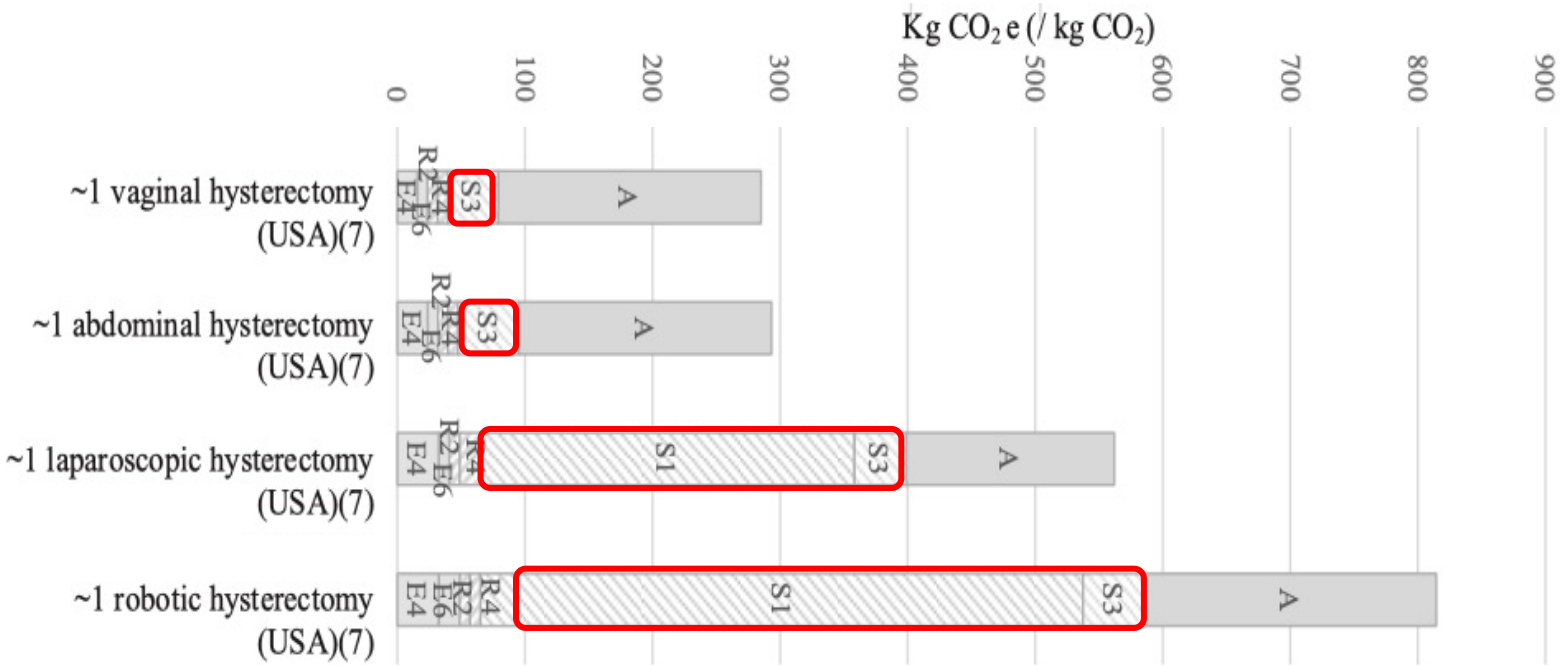
- 10% of the carbon footprint of health systems in high resource settings (0.5% of the entire carbon footpring of the nation)
- Dominated by linear consumption: 73% of products single use
- £10bn medical devices per annum, of 592,000 different product types
- 240,000 tonnes per annum of clinical waste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

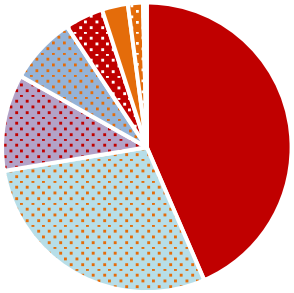
Harms from the linear economy of medical goods

CO_2 of different approaches to hysterectomy

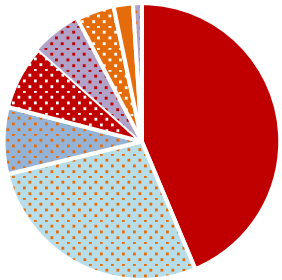


Rizan C et al. Annals Surgery 2020; 272(6): 986-995

Contribution to CO_2 from goods in the operating theatre

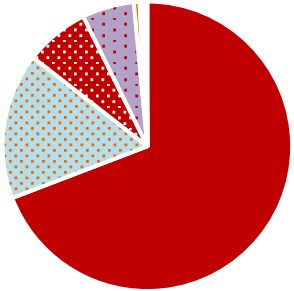


Tonsillectomy

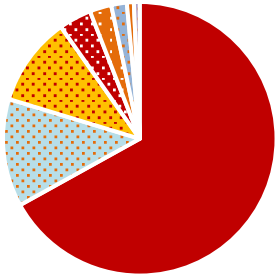


Laparoscopic cholecystectomy

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

CO_2 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

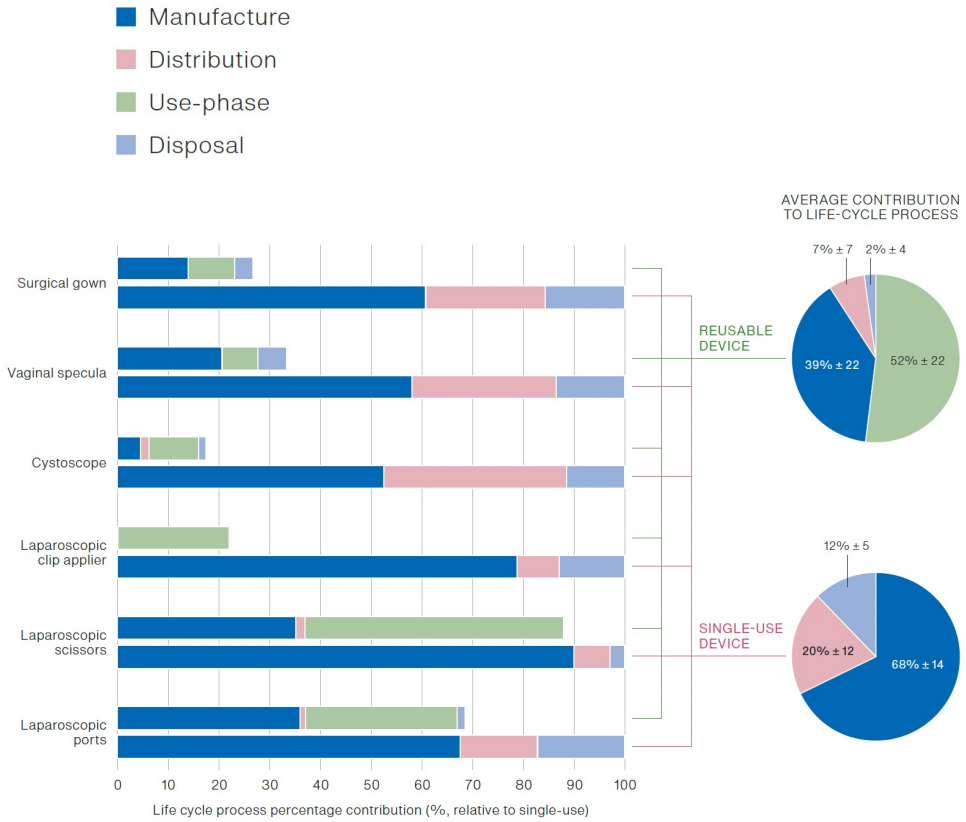
POLICY BRIEF

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

APRIL 2024

brighton and sussex medical school

UNIVERSITY OF SUSSEX



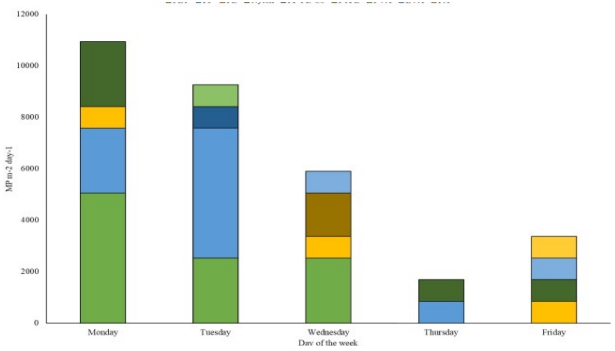
Lack of resilience

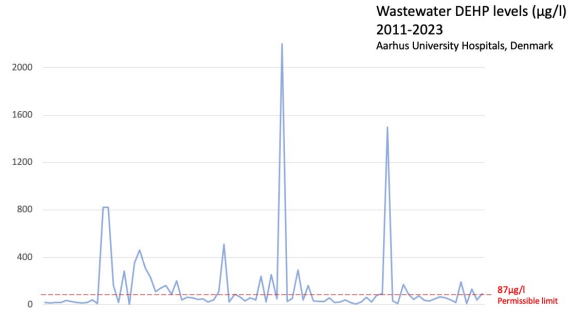
- 19% of operations have issues with availability of equipment
- NHS Supplies have become disrupted

NHS Supply Chain

Hospital toxins from medical materials

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

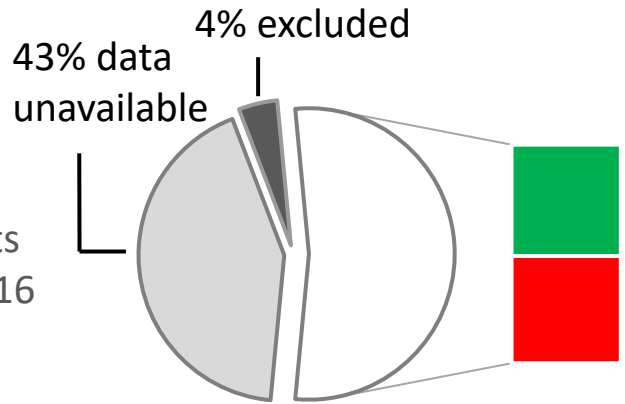
Free market economics and labour risk

Country of origin

ITUC ranking ≥4

SYKEHUSPARTNER

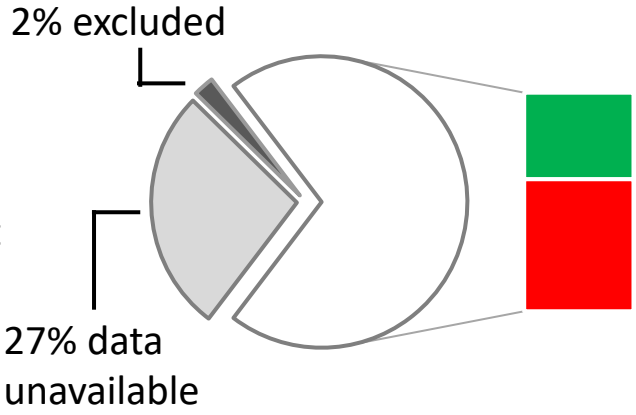
All health contracts
SE Norway: 2015-16
(>29,000 items)



49%

NHS
Cambridge University Hospitals
NHS Foundation Trust

100 items highest spend: 2018-19



59%

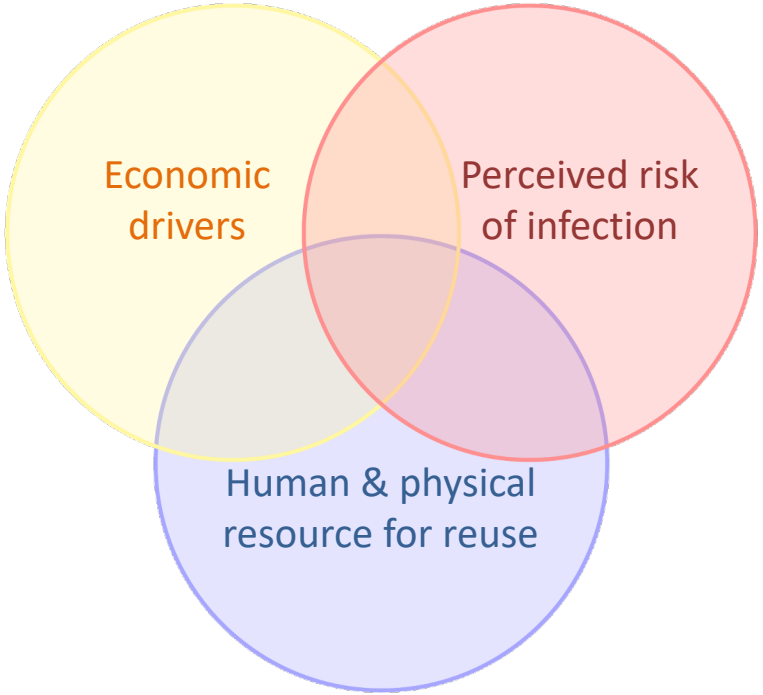
5+	No guarantee of rights due to the breakdown of the rule of law
5	No guarantee of rights
4	Systematic violations of rights
3	Regular violations of rights
2	Repeated violations of rights
1	Sporadic violations of rights

ITUC CSI IGB
International Trade Union Confederation

Abbott et al. Cureus 2024;16:e54258

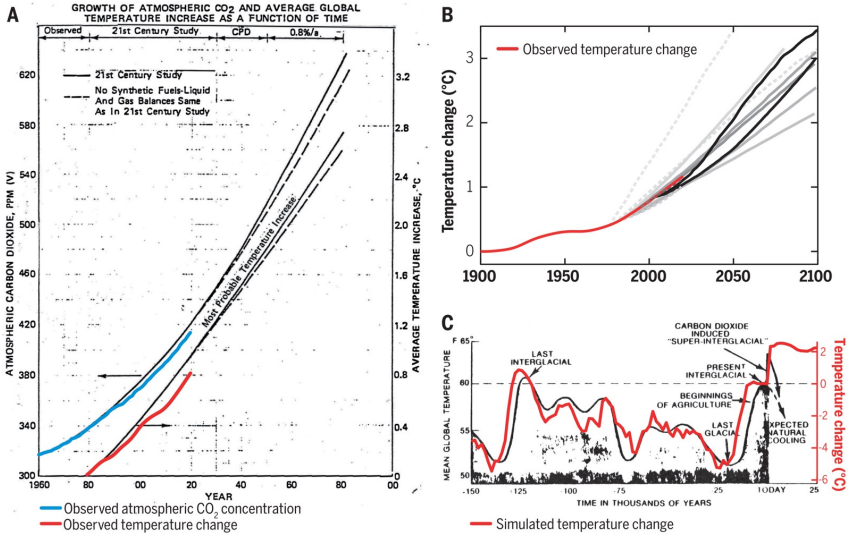
Incentives and barriers

Incentives and barriers



“Washing”

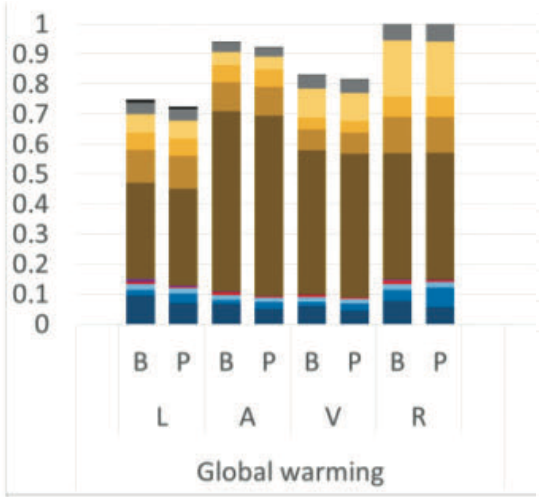
- Whitewash



ExxonMobil

“Washing”

- Whitewash
- Greenwash



“Washing”

- Whitewash
- Greenwash
- Bluewash

TOP GLOVE FOUNDATION

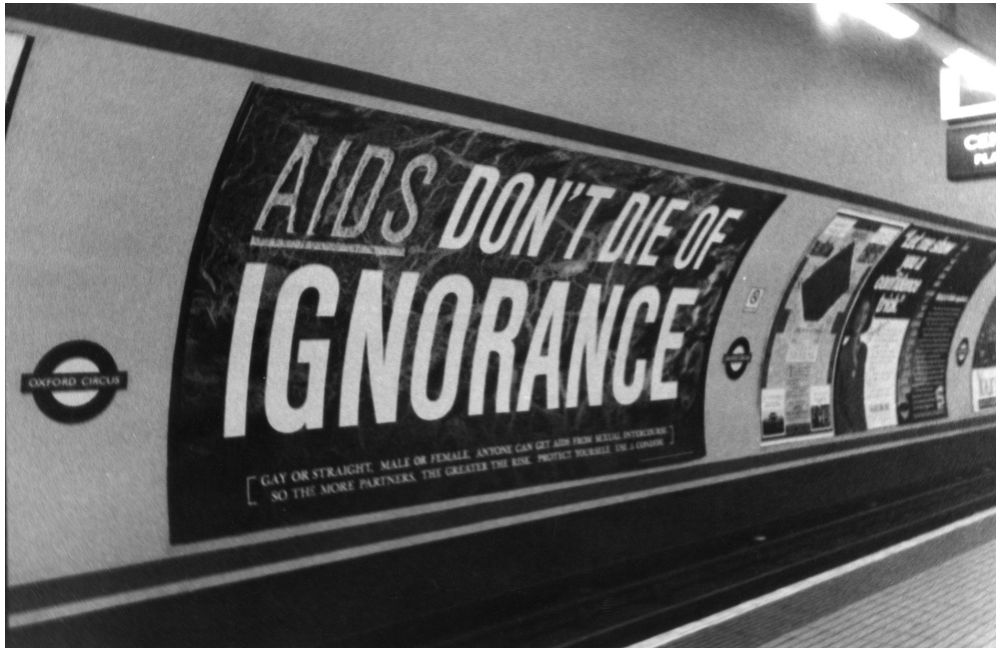
TOP QUALITY, TOP EFFICIENCY

“Washing”

- Whitewash
- Greenwash
- Bluewash
- Yellow-wash

PPE

Gloves


AIDS DON'T DIE OF
IGNORANCE
OXFORD CIRCUS

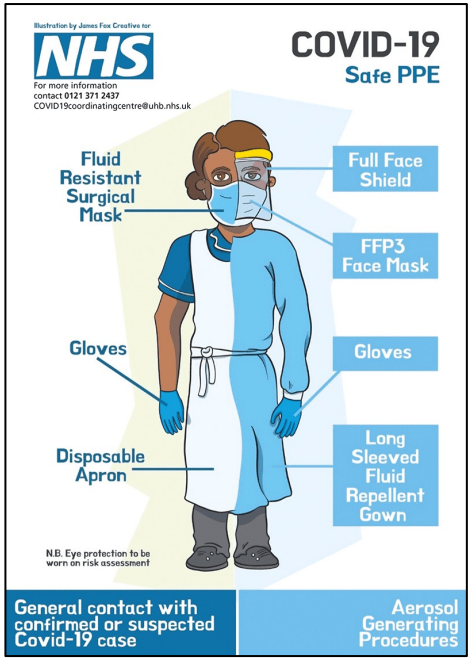


Illustration by James Fox Creative for
NHS
For more information
contact 0121 371 2437
COVID19coordinatingcentre@uhb.nhs.uk
COVID-19
Safe PPE
Fluid Resistant Surgical Mask
Full Face Shield
FFP3 Face Mask
Gloves
Gloves
Disposable Apron
Long Sleeved Fluid Repellent Gown
N.B. Eye protection to be worn on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

PPE

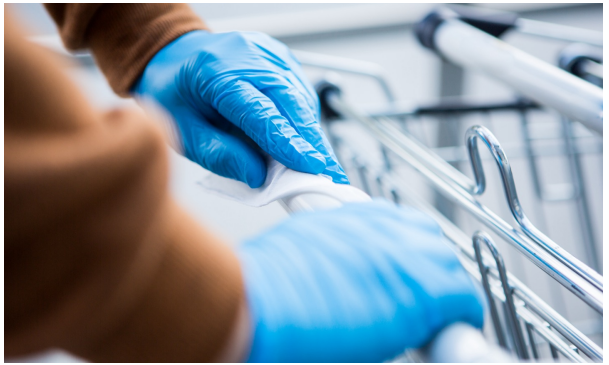
- PPE increase during pandemic
  - 200% gloves, 650% aprons, 4700% gowns, 6500% masks, 21,000% eye protectors
- Glove volumes prior to pandemic
  - >1.7 billion/annum in NHS prior to the pandemic
  - If placed end to end would almost stretch to the moon
  - Carbon equivalent to driving a petrol car around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

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

SUPERMAX
Healthcare Limited

KOSSAN

Central Medicare

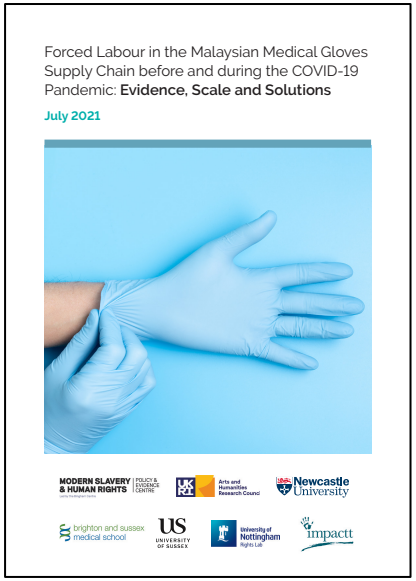
ssn medical products

Hartalega

SMART GLOVE™
International

YTY

Ansell




We feel it is worse than slavery.
Slaves work for free but we pay
money to work
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

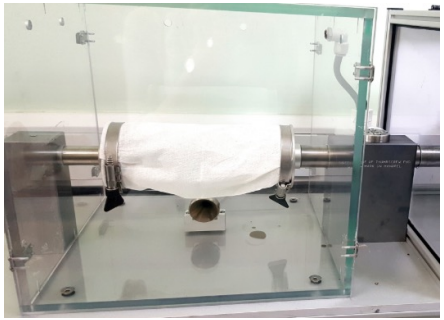
Microbial penetration

Textile performance: single use vs reusable

ETSA
EUROPEAN TEXTILE SERVICES ASSOCIATION

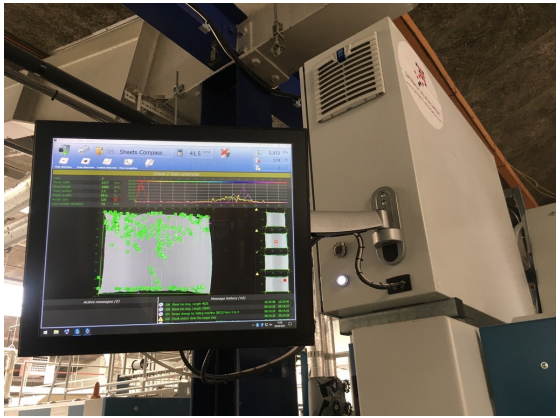
Tensile strength
4x higher with reusable
10x higher if wet

Burst
10x lower with reusable



Linting (particle release)
8x lower with reusable

Textile laundry and sterilisation standards



Robust decontamination & sterilisation

HTM 0104

Standards and quality assurance

Microbiological monitoring

Bioburden testing on final products

Processing ref: TM-SP-1

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

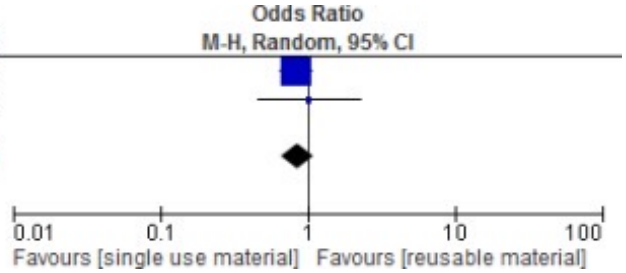
	Sample Description/ Alert criteria reference TM-QA-08	~Aerobic Colony Count (ACC) TM-AM-1	Coliforms● (Presumptive) TM-AM-2	*Escherichia coli* TM-AM-2	Faecal enterococci TM –AM-3	*Staphylococcus aureus* TM-AM-4	Fungi (Presumptive) TM-AM-8	*Clostridium difficile* TM-AM-6	Overall alert status
		≤300	≤5	≤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

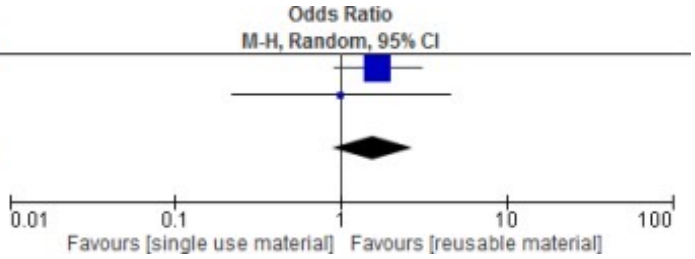
Study or Subgroup	single use material Events	Total	reusable material Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Belkin 1998	108	2139	133	2223	90.5%	0.84 [0.64, 1.08]
Bellchambers 1999	13	250	12	236	9.5%	1.02 [0.46, 2.29]
Total (95% CI)		**2389**		**2459**	**100.0%**	**0.85 [0.66, 1.09]**
Total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

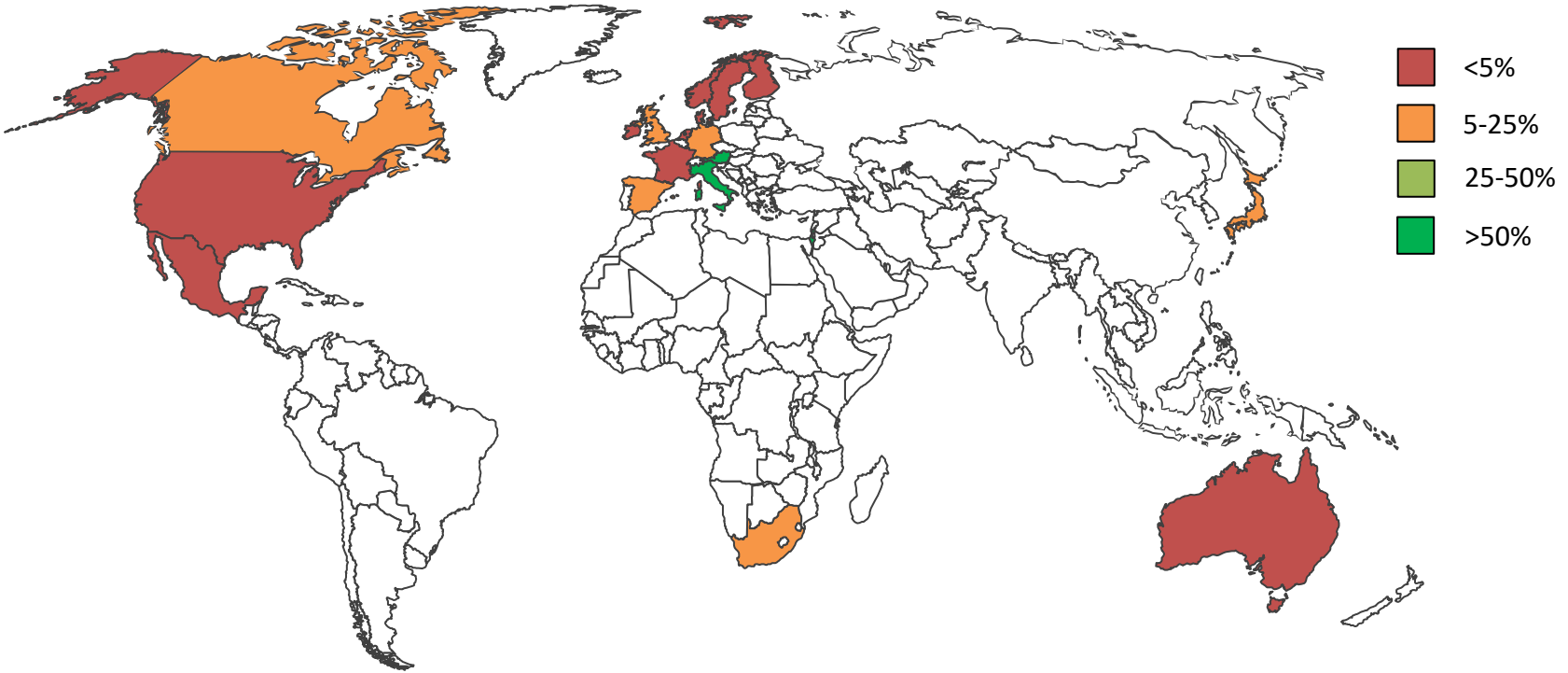


Study or Subgroup	single use material Events	Total	reusable material Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Castro Ferrer 2004	31	421	18	396	86.5%	1.67 [0.92, 3.03]
Treggiari 1992	4	25	4	25	13.5%	1.00 [0.22, 4.54]
Total (95% CI)		**446**		**421**	**100.0%**	**1.56 [0.89, 2.72]**
Total events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

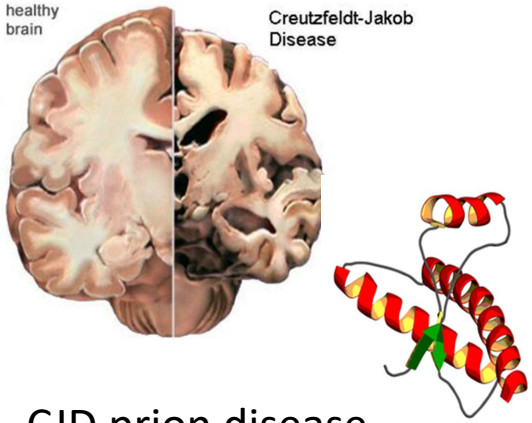
Metal instruments

- 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

Robust decontamination & sterilisation

HTM 0101

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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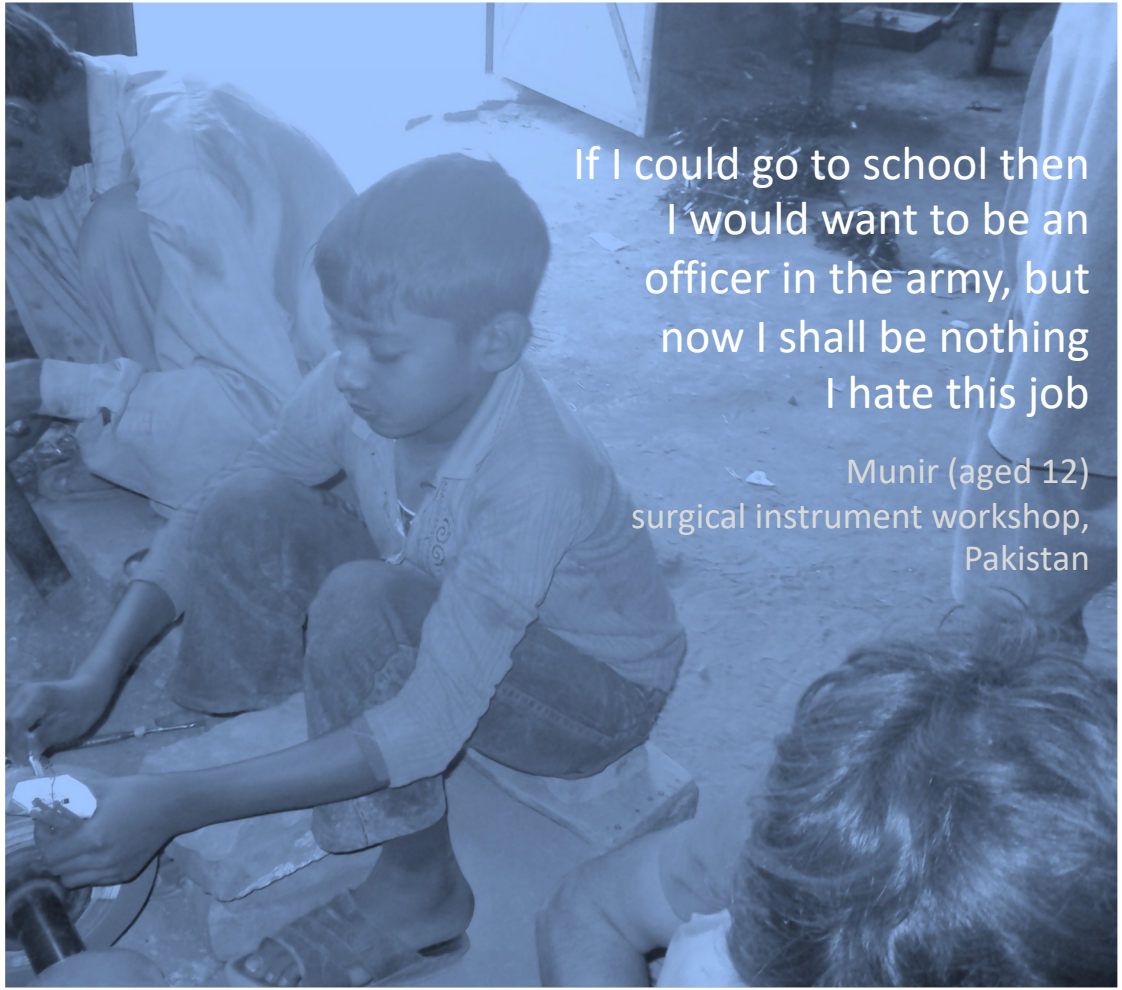
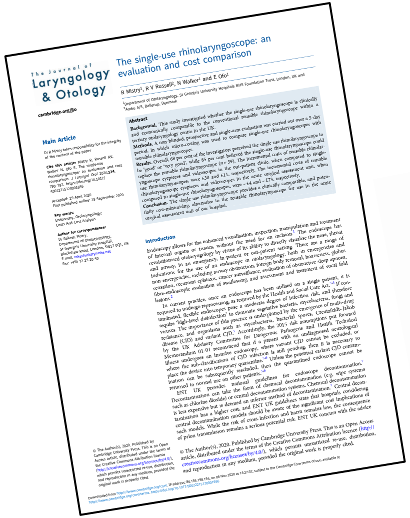
International
Labour
Organization


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

cambridge.org/jlo

Main Article

The single-use rhinolaryngoscope: an evaluation and cost comparison

R Mistry, R V Russell, N Walker and E Ofo

"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

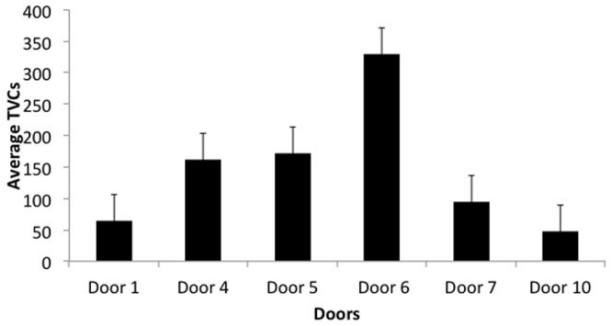
- >330,000 procedures performed in England per annum (HES data)
- Large variation in practice in the equipment used

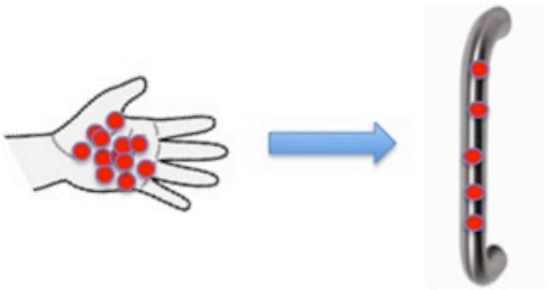
Equipment	Use routinely	Carbon footprint (g CO_{2e})
Single use sucker	100% (n=18)	3.6
Gloves	83% (n=15)	25
Apron	16% (n=3)	65
Gauze to clean sucker	66% (n=12)	2.1
Plastic tubing	28% (n=5)	130
Suction canister lining	6% (n=1)	78

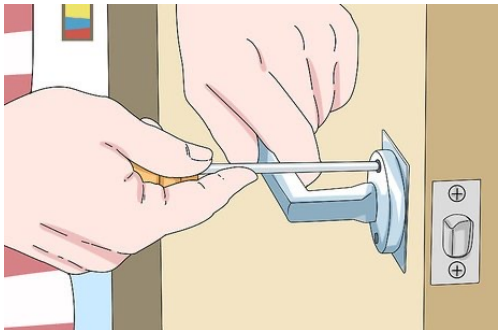
85 fold increase in carbon

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)

Financial costs

Purchasing models

- Fragmentation of costs by place & time risking false accounting

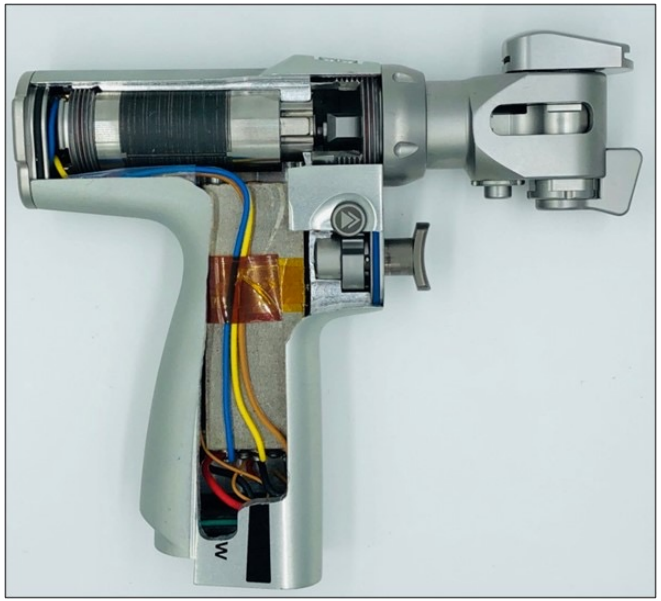
- Purchasing models build on the paradigm of buying “things”

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?

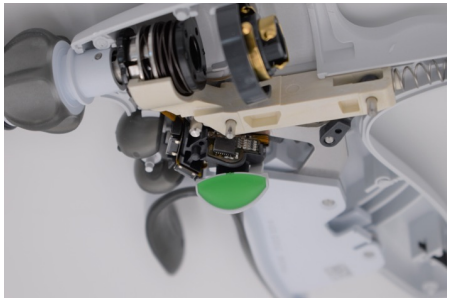
Planned obsolescence

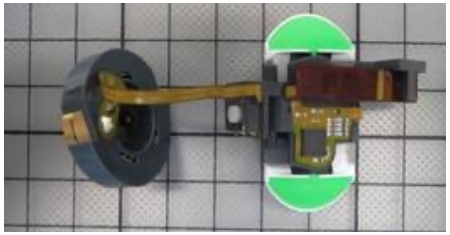
System 7



System 8

Planned obsolescence

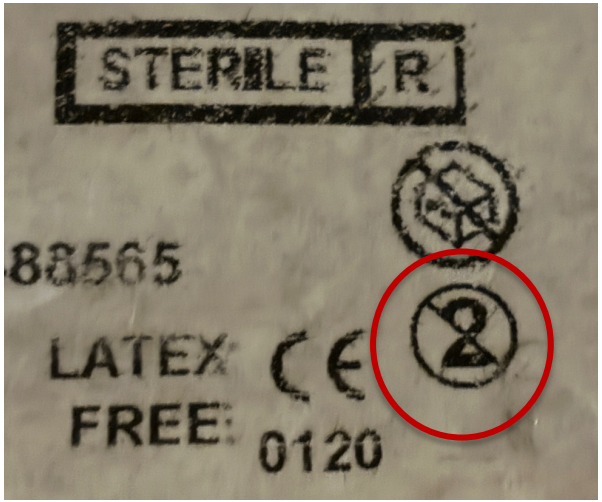




48m electrosurgical products

AMDR
ASSOCIATION OF MEDICAL DEVICE REPROCESSORS

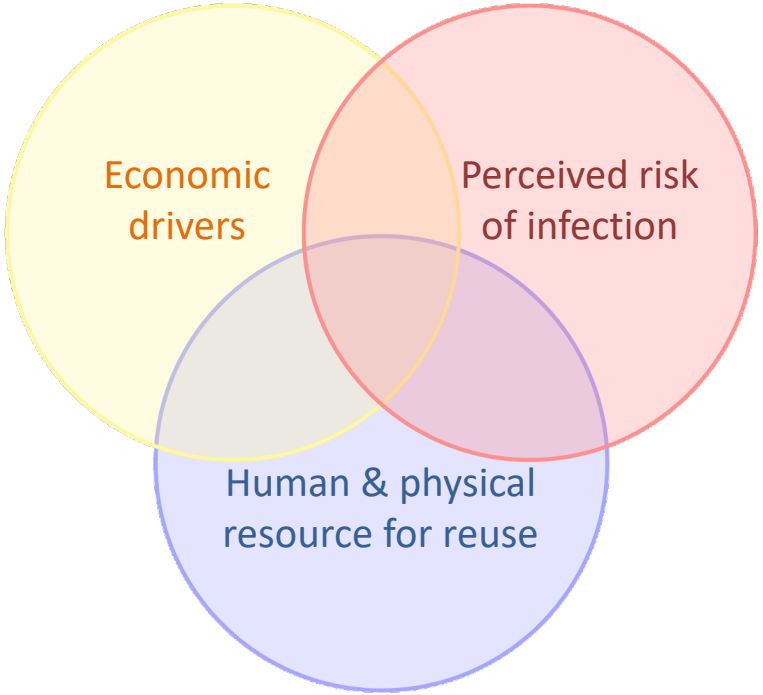
Planned obsolescence



5.9m scissors

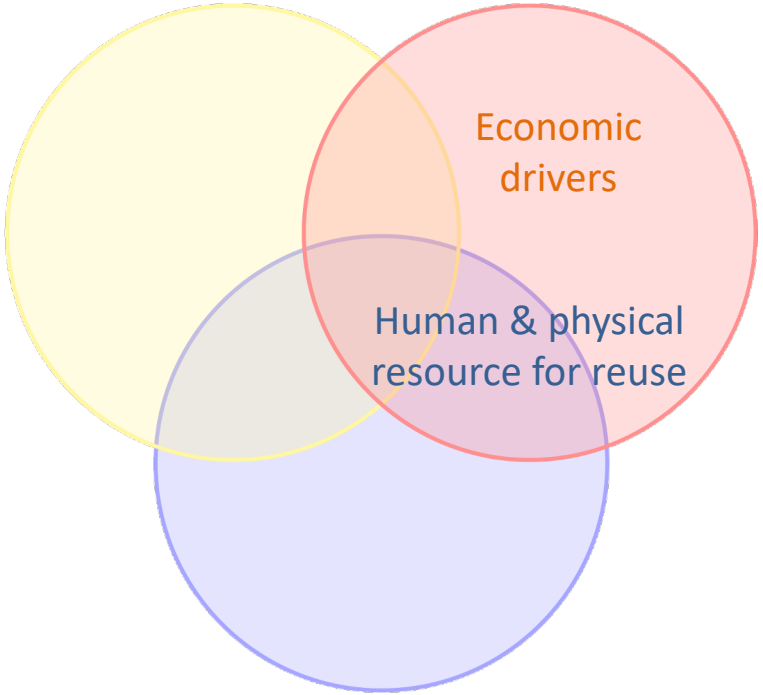
Solutions

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

Change at multiple levels

- Government
  - Provide national guidance and infrastructure to support reuse
  - Explore different models of purchase including servitization
- Health Institutions
  - e.g. ENT-UK / Infection Prevention Society to release guidance to support equipment reduce/reuse of instruments and endoscopes
  - Circular Healthcare Alliance launched July 2024 (five large UK hospitals)
- Individuals
  - Reduce (e.g. inappropriate glove use, overage) and support reuse

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

brighton and sussex
medical school

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