CHI Innovate 05 July 2024

ENVIRONMENTAL SUSTAINABILITY

Environmental Sustainability In SingHealth Operating Theatres

Clinical Professor Benita Tan,
Co-chair, SingHealth's Committee on Sustainability

Sustainability as SingHealth's way of life

SingHealth DukeNUS ACADEMIC MEDICAL CENTRE

PATIENTS. AT THE HEART OF ALL WE DO.®

Singapore General Hospital | Changi General Hospital | Sengkang General Hospital | KK Women's and Children's Hospital | National Cancer Centre Singapore | National Dental Centre Singapore | National Heart Centre Singapore | National Neuroscience Institute | Singapore National Eye Centre | SingHealth Community Hospitals | Polyclinics SingHealth

Committee On Sustainability

Elevating the Sustainability Agenda in SingHealth

A/Prof Benita Tan
Co-chair

Tan Tai Kiat
Co-chair

Cluster Decarbonization Plan

Work with **Institutions and Shared Services** to develop and implement initiatives to **reduce carbon emissions and enhance energy efficiency**

5Rs & more

(Refuse, Reduce, Reuse, Repurpose, Recycle, Rethink, Re-educate)

Partner **Clinical Champions** from each institution **to identify clinical waste** for 5Rs

Develop **guides for different clinical areas including OT, inpatient, outpatient/ clinics** to encourage faster adoption within SingHealth

Campaigns to Raise Awareness and Drive Culture Change

Push for adoption of **Environmentally Friendly Events**

Support teams to **implement the 15 ideas from Hackathon**

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ENVIRONMENTAL SUSTAINABILITY DECARBONIZATION PLANS

01

Health Care Delivery

TARGET ZERO HARM — Good Clinical Practice

- Green Building and Innovation
- Renewable Energy
- Waste Management
- Sustainable Transportation
- Reducing Desflurane Use
- Water Efficiency

02

Health Care Supply Chain

- Sustainable Procurement

03

Build the Culture of Sustainability

SingHealth

What is the Impact of Surgery

My Perspective as a Surgeon

Refuse, Reduce, Reuse, Repurpose, Recycle, Rethink, Research and Re-educate

- Surgery is the most energy-intensive practice, directly contributing to climate change.
- Complications worsens it
- Surgical pathways for best outcomes in an environmentally friendly way.
- Need a **multidisciplinary** perspective: health professionals, patients, companies, health-care managers and governments.
- The '**5Rs plus 3**' principle

What is the Impact of Surgery

Cost of Surgery to the Environment

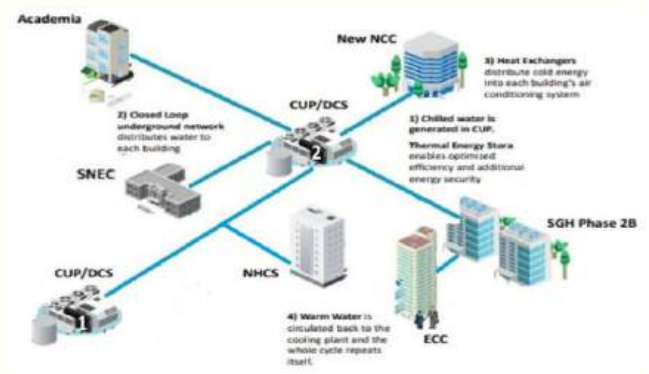
- Operating theatres represent a small area in the hospital
- More energy intensive than clinical wards
- Generate 50–70% of total hospital clinical waste

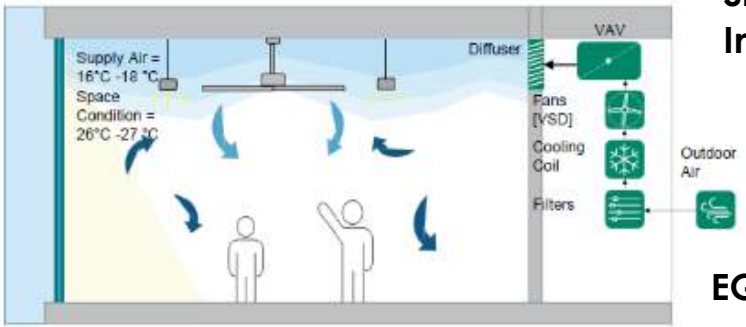
Importance of Good Clinical Practice

- Patient complications and outcomes
- Cost of treatment to the patient
- Cost to the healthcare system in providing the treatment
- Loss of productivity and impacts to the economy

01 Green Building Design and Innovation & Renewable Energy

SGH Campus District Cooling System





Solar Photovoltaic (PV) system for SingHealth Institutions

Air-recirculation Pilot

Pilot Study Utilizing recirculation air during non-operational hours for Operating Theaters (30 OTs)

From **8pm to 6am** and **24 hours**

Potential Energy savings

~ **4.5 / 11.25** GWh yearly

CO_2 emission savings[1]

~ **2,363 / 5,906** tonnes CO_2 yearly

Mature rain trees required to offset CO_2 impact[2]

~ **118K / 295K** trees yearly

EGH Campus Hybrid Cooling System

01

Healthcare Delivery: Good Clinical Practice

TARGET ZERO HARM

Sustainable clinical practice is KEY

- ❑ Avoid unnecessary surgery
- ❑ Sub-cutaneous medications
- ❑ Teleconsultation for PEC to reduce travel
- ❑ Disease prevention: vaccination, alcohol, smoking, weight management
- ❑ Prevent complications:
  - Optimisation of chronic illness
  - Appropriate antibiotic prophylaxis
  - Good surgery preparation and systems and care pathways
  - Expertise and training
  - Good post-surgery care and rehabilitation
- ❑ Sub-cutaneous medications, Teleconsultation for PEC to reduce travel

Practices in OT

→ Preparation

→ Procedure

→ Equipment and solid waste

→ Waste management

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01 Waste Reduction

Preparation for Surgery

- ❑ Paperless OT: listing to surgery
- ❑ Review of surgical sets to remove unnecessary instruments
- ❑ Avoid unnecessary interventions: non-indicated antibiotics, catheterization by going to toilet before surgery, histology
- ❑ Open gowns and gloves for right number of people

Saves water and hand towel

Reduction of waste by repairing damaged linen

Linen with small tears in them are repaired by stitching embroidery pieces over the holes; or converted into smaller pieces of linen.

- ➢ Reuse approximately 30% of the damaged linen
- ➢ Reduce about 1.25 tonnes of waste
- ➢ Save estimated $47,000 annually.

01

Reducing Desflurane Use (Medical Gases) and Others

- Anaesthetic gases used in Operating Theatres (OTs) are potent greenhouse gases – with global warming potential (GWP) of Desflurane at approximately 40-50x that of sevoflurane
- However, desflurane still has its clinical relevance

Initiative in CGH in 2020 to 2024

87% reduction in Desflurane from 2020 to 2024

- Cost savings of **$154,000**
- **1,035 tonnes of CO2** equivalent emissions over 3 years

Ongoing QI project in SKH since 2021

Reduce use of Desflurane

- **50% reduction** in Desflurane usage over 1.5 years
- **45% reduction in carbon emissions**

Pilot in KKH in 2023

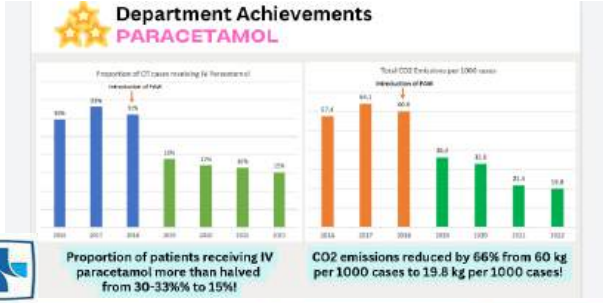
Reduce Desflurane use in OTs through education and awareness, unplugging desflurane vaporisers from anaesthesia machines and audits

- Cost savings of **42% in medical gases** in OT operations
- **80% reduction in CO2** equivalent emissions over 10 weeks

~75% of anaesthetists polled agreed with **removing the Desflurane vaporiser** totally from the anaesthesia machine

Oral vs IV preparations

Oral paracetamol premedication instituted for all elective surgical patients. Reduces IV paracetamol which is more costly, higher environmental impact and not better clinically. 50% reduction achieved. Accepted to BJA for publication



01 Waste Reduction

Intraoperative Equipment

- ❑ Surgeon preference list for each surgery with frequent updates
- ❑ Separate essential and optional items
- ❑ Open sets and equipment: open when needed
- ❑ Opt for Reusable instead of single use
- ❑ Sutures instead of clips

***"Don't open it unless you need it!"* principle**

Pour only sufficient lotion for skin cleansing preparation

Keep within shelf life of 7 days

01

Waste Reduction

F&B in OT

- ❑ Buffet with reusable utensils
- ❑ Request desired amount
- ❑ Only 1 waste bin required

Reusable Lacquer Bento Boxes

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01 REPURPOSE

OT Scrub Brushes Recycling Project

- Implemented on 28 Aug 19
- Located at MC L8, 9, 10 Collaboration Space

Recycled container placed at each scrub sink for disposal of used brush

OTCT transfers and collate all brushes into a main recycled container

At the end of the day, OTCT collects and brings to ES

Used brushes are dried in a laundry bag in the dryer weekly/once bag is full

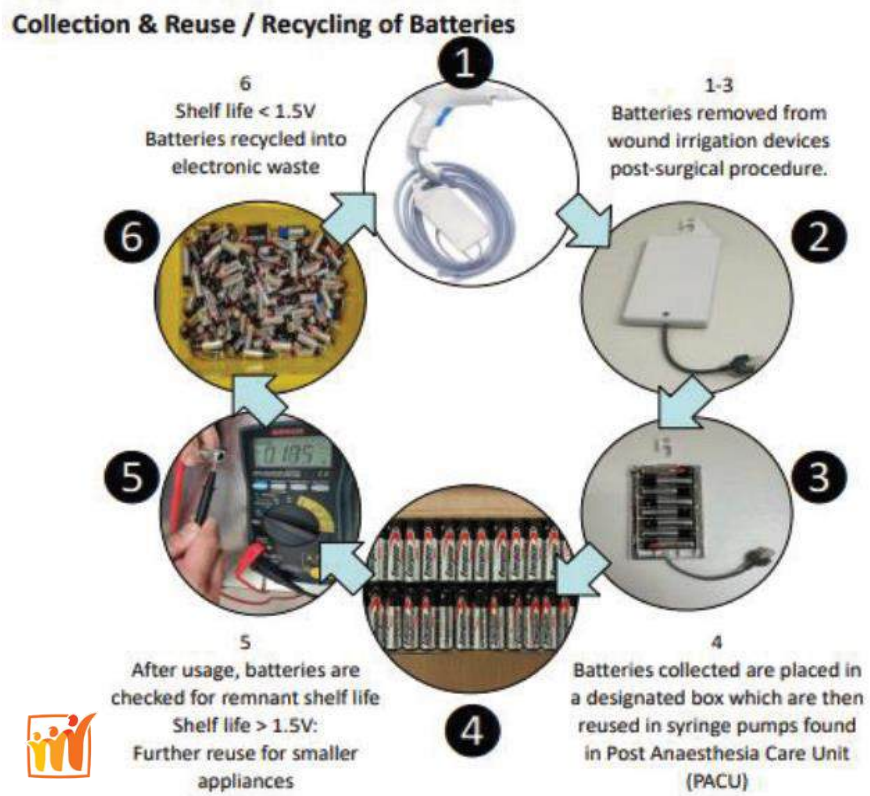
Dried brushes are stacked into recycled container

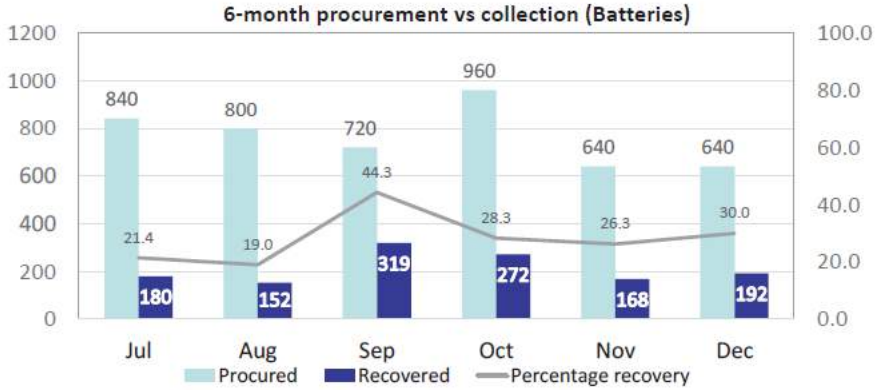
Uses

1. Self collection by staff for personal use
2. Acupuncture clinic for safety measures:

- Count
- Injury

01 REPURPOSE





No. of batteries recovered from recycling 1283 ÷ No. of batteries procured 4600 x 100% = **27.89%**

With this initiative, OT is buying lesser batteries. **Cost savings in 6 months is $769.80**

01 REPURPOSE

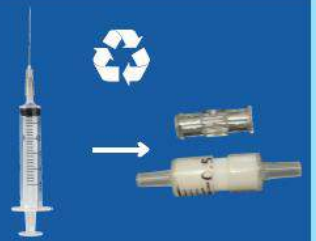
Why Vi-Cap?

Capnography systems pose the threat of cross contamination between patients.

American Society of Anaesthesiologists (Patient Monitoring Safety Standards)* requires clinicians to monitor capnography waveform to ensure proper and adequate ventilation of patient undergoing anaesthesia and sedation.

The capnography sampling line should include an anti-microbial filter to prevent cross infection between patients and not contaminating the capnography system.

* when a capnography system is available.



As advocates of sustainability, N&E has created Vi-Cap by upcycling syringes collected from hospitals in Singapore, thus supporting circular economy.

What is unique about Vi-Cap?

Vi-Cap represents an advancement in the safe use of the capnography system.

Vi-Cap is a first-in-the-world, standalone, sterile, non-invasive, single use anti-bacterial/viral (N95) filter attached to the side stream monitoring line of the capnography system to reduce cross-contamination between patients, as the capnography system is not routinely changed between cases.

What are the benefits?:

1. Easily attachable to side stream monitoring system.

2. Prevents cross -contamination between patients.

Components

N95 Filter, Vikang99, Barrel, Teflon Holder

Indications for use

To be used on patients who benefit from capnography monitoring.

All patients undergoing surgical procedures with monitored anaesthesia care, and especially when sedative, anxiolytic, or analgesic medications are administered for patients' safety and comfort.

Duration of effectiveness:

24 hours; One-time use.

Certifications:

1) Microbial Cleanliness Test (Bioburden) (BS EN 14683:2019 /ISO 11737-1:2018)

2) Sub-micron Particulate Filtration Efficiency (PFE) at 0.1 Micron

3) SARS Cov-2 Antiviral Activity (ISO 18184:2019)

4) Proven Antibacterial Activity (EN 1276:2009) against *Staphylococcus aureus* ATCC 6538, *Escherichia coli* ATCC 10536, *Pseudomonas aeruginosa* ATCC 15442, *Enterococcus faecium* ATCC 6057, *Salmonella typhimurium* ATCC 13311 with more than 5 log reduction

Refer to www.vikang.com for more tests.

HSA Risk Classification:

Class A

Wholesale Manufacturer:

N&E Innovations Pte Ltd, Singapore

01 REPURPOSE

Repurpose the gowns wrappers to line the “Kick about Basin” and the Swab

Recycled disposable diathermy quiver used to contain ampoules and act as cushion to deliver the ampoules from Pharmacy to OT and vice versa via pneumatic tube.

Repurpose instrument packaging trays as anaesthetic trays

To prevent staff from getting injured by the POP Saw Blade.

Empty Mikrozid wipes container is used to cover the POP Saw Blade

01 REPURPOSE

Reusing Ophthalmic Pack's Packaging for patients to store their shoes and clothes.

Plastic covers from Basin set are repurposed for storing documents.

Repurpose OT waste to Good Use

01 REPURPOSE

Gift Wrappers & Christmas Decorations

Promoting Upcycling Through Competitions
Nurses Day Decorations

Joy @ Work Activities – Bingo Game 2021

01

RECYCLING: Waste Segregation

Make Recycling Accessible

Recycling bins in all pantries

Plastic wrappers | Plastic bottles | Cardboard / Paper

Previously, there was only 1 set of recycling bins for the entire OT floor (very long corridor)

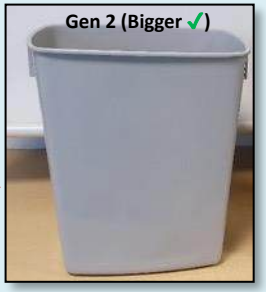
OTS worked with the ES department to create 2 collection points along OT corridor

Previously, there was only one recycling bin to the left of Anaesthetic workstation, which filled up quickly.

OTS worked with the ES department to provide larger bins, reducing trips to empty the bin

Gen 1 (Too Small)

Gen 2 (Bigger ✓)



Place a bin on the left side of the Anaesthetic workstation

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RECYCLING: Waste Segregation

Make Recycling Easy with Guide

Reduction of Biohazard waste by 23%

We have the bins, but we need to be disciplined and USE them appropriately

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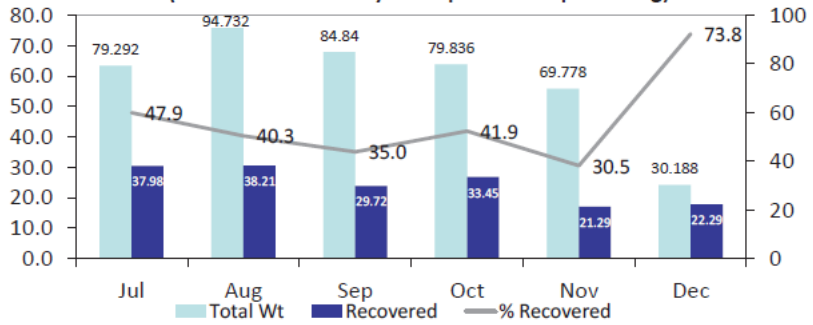
01 RECYCLING

6-month procurement vs recovery of cables
(Wt of electrocautery hand pieces and pads in kg)



6-month collection (Qty of electrocautery hand pieces 44g/pc and pads 38g/pc)

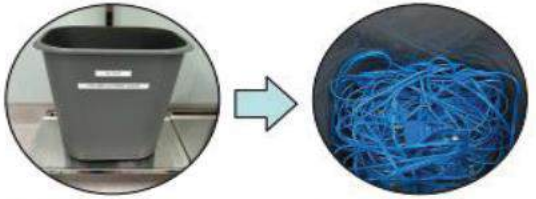
Month	Jul	Aug	Sep	Oct	Nov	Dec	Total
Hand Piece (in pieces)	935	1165	1030	975	578	104	935
Pad (in pieces)	1004	1144	1040	972	1167	674	1004

Total weight of cables from electrocautery hand pieces and pads: **438.666kg**

Wt. of electrocautery cables recovered from recycling 182.94 ÷ Wt. of electrocautery cables procured 438.67 x 100% = **41.70%**

- Recovered cables will be processed to extract the copper for recycling. Copper can be melted into new copper for various applications such as wires, printed circuit boards (PCB) and copperwares.

Collection & Recycling of Electrocautery Cables



Electrocautery cables are cut and removed from the hand-pieces and pads respectively, wiped down and placed into the allocated bins before sending to vendor for recycling.

01 RECYCLING

Disinfected disposable instruments and sold to vendor for recycling since 2019.

Melted metal to make pots and pans.

Done it 4 times

Total weight of 1,200kg

Proceeds go to SKH Patient Needy Fund

SGH now collects, on the average, about 600 kg of single-use steel instruments per month, following repeated publicity to create awareness among the staff from different departments that use disposable steel instruments for their work.

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01 RECYCLING

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02 Health Care Supply Chain

- **Green Procurement** is the practice of procuring goods and services that cause minimal adverse impact environmental impact (Scope 3).
- **Principal Considerations for Green Products / Services:**
  1. Resource (e.g. energy / water) efficient
  2. Made from raw materials obtained in an environmentally sound, sustainable manner
  3. Manufactured in environmentally-friendly production
  4. Respects the environment with appropriate 3R plan and implementation
  5. Distributed with minimal packaging (consistent with care of the product), preferably made of recycled and/or recyclable materials
  6. Certified by recognised international and/ local organisations like Energy Star, Forest Stewardship Council (FSC), Green Seal, Ecologo, Singapore Environmental Council (SEC) etc.

Moving Forward

ALPS will lead the effort to championing environmental stewardship in our sourcing efforts by including green requirements & evaluation criteria in all RFPs, where applicable, including providing choices/ options in RFP:

i. **Business As Usual - Normal Options**

ii. **Green Options** (with Accreditations or without Accreditations, but supported with proof of evidence)

- Incorporate the **Price-Quality-Environmental (PQE) ratio** in evaluating proposal
- ALPS will be working with vendors to identify and increase opportunities to **reduce, reuse and recycle** – e.gs:
  - Reduce use of plastic packaging e.g. during issuance of uniform, etc
  - Collect back carton boxes for reuse
  - Move potential food supplies to local source

03

Building a Culture of Sustainability

- Cluster level – e.g. by Committee on Sustainability and Shared Services, Group Allied Health, etc
- Institutional level – e.g. Green Committees, and departmental level

Sustainability as SingHealth's way of life

Annual Clean & Green Event

Celebrate impact and raise awareness

Awareness and Education

E.gs. Hackathons, talks and workshops, EDMs, quizzes, etc

Green Activities

E.gs. tree-planting, Earth Day, recycling collections, clean-up events, talks/ symposiums, and workshops, etc

Green Audits

E.gs. Employee-engagement audits to assess staff's involvement and awareness about sustainability, green event checklist audits, recycling audit, green-building audit

Green Champions!

Identify, recognise and celebrate staff who advocate for the cause

Green Spaces

Create green spaces within the hospitals e.gs. Green Corridor at SGH, locations of recycling bins, gardens, etc

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Building a Culture of Sustainability

Environmental Sustainability Retreat – 9 May 2024

- Around 60 participants from different domains including Medical, Nursing, Finance, Communications, Operations, and strategic partners from SIT, UEMS and ISS

03 Building a Culture of Sustainability

Environmental Shared Service

SingHealth Polyclinic

Environmental Shared Service

SingHealth Community Hospitals

03 Building a Culture of Sustainability


External Speakers


KKH Colleagues


Pledging to do our part on the Pledge Tree


Food waste composting / education


Upcycling / Social Enterprise


KKH Colleagues supporting the event

EDMs to highlight the upcoming event and rally support from colleagues

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03

Building a Culture of Sustainability

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03 Building a Culture of Sustainability

- Bulletin Board

- Display Cabinet
  - Upcycled items

- Conducting of Workshops
- Recycling Corner
  - Various receptacles for recycling

- Shelving with labels for Donation/ Exchange of pre-loved, unwanted items
  E.g. Stationaries, Books, Crockery

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03 Building a Culture of Sustainability

SingHealth Hackathon 2023

24-25 March 2023

15 teams, 69 participants

3 Challenge Statements

15 Great Ideas

4 Wining Teams

Think Green, Define Sustainability

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