SusQI useful resources and references

University of Melbourne

Health Service Environmental Sustainability Competition (link)

Centre for Sustainable Healthcare

Step-by-step SusQI guide (link)

Department of Health and Safer Care Victoria

Department of Health | Cultural Responsiveness Framework (link)

Department of Health | Designing for Diversity Framework (link)

Safer Care Victoria | Quality Improvement Toolkit (link)

Department of Health | Partnering in Healthcare Framework (link)

Doctors for the Environment Australia

Health Professional Education Resources (link)

Hospital Sustainability Project Tracker (link)

Study the system

Rogers, P. (2023, April 10). *Identifying and Engaging Stakeholders*. Medium. https://medium.com/agile-outside-the-box/identifying-and-engaging-stakeholders-c16c6557317d

Behaviour change

Anja Kollmuss & Julian Agyeman (2002) Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior?, Environmental Education Research, 8:3, 239-260, DOI: 10.1080/13504620220145401 https://www.tandfonline.com/doi/abs/10.1080/13504620220145401

Davies JF, McGain F, Francis JJ. Consensus on Prioritisation of Actions for Reducing the Environmental Impact of a Large Tertiary Hospital: Application of the Nominal Group Technique. International Journal of Environmental Research and Public Health. 2023 Feb 23;20(5):3978. https://www.mdpi.com/1660-4601/20/5/3978

Davies JF, McGain F, Sloan E, Francis J, Best S. A qualitative exploration of barriers, enablers, and implementation strategies to replace disposable medical devices with reusable alternatives. The Lancet Planetary Health. 2024 Nov 1;8(11):e937-45. https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(24)00241-9/fulltext

Howard C, MacNeill AJ, Hughes F, Alqodmani L, Charlesworth K, de Almeida R, Harris R, Jochum B, Maibach E, Maki L, McGain F. Learning to treat the climate emergency together: social tipping interventions by the health community. The Lancet Planetary Health. 2023 Mar 1;7(3):e251-64. https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(23)00022-0/fulltext

Presseau, J., McCleary, N., Lorencatto, F., Patey, A. M., Grimshaw, J. M., & Francis, J. J. (2019). Action, actor, context, target, time (AACTT): A framework for specifying behaviour. *Implementation Science*, *14*(1), 102. https://doi.org/10.1186/s13012-019-0951-x

Scott, Ian A., et al. "Countering cognitive biases in minimising low value care." *Medical Journal of Australia* 206.9 (2017): 407-411. https://www.mja.com.au/journal/2017/206/9/countering-cognitive-biases-minimising-low-value-care

The Behaviour Change Wheel from Michie et al. Implementation Science 2011, 6:42 http://www.implementationscience.com/content/6/1/42

IHI Psychology of Change Framework https://qi.elft.nhs.uk/wp-content/uploads/2019/10/IHIPsychologyofChangeFrameworkWhitePaper-1.pdf

Design your improvement

Cafazzo JA, St-Cyr O. From discovery to design: the evolution of human factors in healthcare. *Healthcare Quarterly.* 2012;15 Spec No:24-9. doi: 10.12927/hcq.2012.22845. https://pubmed.ncbi.nlm.nih.gov/22874443/

Canadian Medical Protective Association. (2021, May). *Human factors.* https://www.cmpa-acpm.ca/en/education-events/good-practices/the-healthcare-system/human-factors?panel=human-characteristics-cognitive-and-affective-biases

Project Planner

Define your problem & set SMART goals – What/Where/By how much/By when/For whom/Why? SMART goal – Specific, Measurable, Achievable, Realistic, Time-bound
Study the system Study the system – What baseline data do you need? Are there clinical guidelines that are appropriate? Who are your stakeholders? What are the contributors to the problem? Where are resources being used? What tools can you use to study the system – process maps, cause and effect diagrams, 5 whys?
Design your improvement(s) – What tools can you use to generate improvement ideas? How will you rank their likely effectiveness? What types of solutions will you consider?
Measure Your Impact – Consider clinical/financial/environmental/social outcomes and include outcome, process and balancing measures. Consider what data you will need, how to collect it, and who is responsible for doing so.

QI Team Member Matrix

1. Write the names of your team members in the left column.
2. Check off the boxes below to reflect the expertise they bring or perspective they are representing *(team members may fill more than 1 role)*

Project:

NAME / ROLE	PROJECT LEAD	PROJECT SPONSOR	SUBJECT MATTER EXPERTISE	CONSUMER/ LIVED EXPERIENCE	QUALITY IMPROVEMENT EXPERTISE	SYSTEM/ PROCESS EXPERTISE	OTHER:

2x2 Stakeholder Matrix

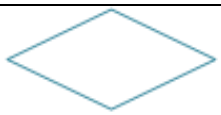
Adapted from Rogers, 2023

Process mapping

Process mapping is a visual tool which describes the flow of people or resources through a system to achieve a particular goal or outcome. In healthcare this could include admitting a patient or undertaking a procedure.

Process mapping can be a useful way to help a team develop a shared view of a system, and identify bottlenecks, waste, errors, and unnecessary variations which are often overlooked.

Each process map has a defined start and end point and uses standard symbols to describe different elements.

Symbol	Name	Description
	Start-End symbol	Indicates the beginning and end of the process
	Process step	Indicates each activity or step in the process
	Question / decision	A point at which a decision needs to be made
	Flow direction	Indicates the direction of process flow and can only point in one direction
	Environmental resources	Indicates use of an environmental resource
	Social resources	Indicates social impact
	Financial resources	Indicates financial cost

Adapted from Centre for Sustainable Healthcare, n.d.

How to create a process map

The steps involved in creating a process map are outlined below (Safer Care Victoria, 2024).

1. Define the process to be visualised.
2. Invite key stakeholders to participate in the process mapping exercise.
3. Consult with process participants and/or conduct observations of the process.
4. Define the scope and boundaries.
5. Identify and arrange the activities in proper sequence from first to last.
6. Draw arrows to show the flow of the process.
7. Identify the environmental, social and financial resources and impact at each step. Examples of these resources are included in the 'Understanding resource use' in the next section.
8. Review the process map with others involved in the process.
9. Discuss the different experiences of the process to help identify areas for improvement.
10. Identify any problem areas (e.g. bottlenecks) for improvement and change ideas

Understanding resource use

Once the steps within a process map have been agreed upon, environmental, social and financial resources can be assigned to each relevant step. The allocation of environmental resources is a powerful way to signpost 'carbon hotspots' in a system

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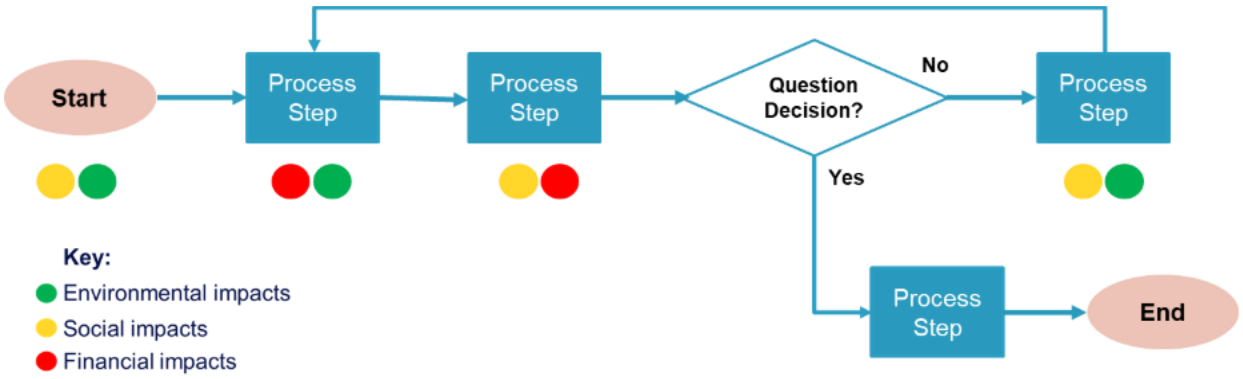


Basic process map with environmental, social and financial resources. Adapted from Centre for Sustainable Healthcare, 2021

Identifying resource use

You can use this table to identify where different categories of resource use or impacts are found in your system – and to consider opportunities to reduce these.

	Resource	Examples	Which steps in your process use these resources?	Could any of this resource use be avoided/improved?
1	Travel cost	Staff, patient and carer travel		
2	Staff wages	Staff wages		
3	Consumable costs	Medications Anaesthetic gases/nitrous oxide Dressings Energy use Water use Linen Meals		
4	Equipment costs	Laboratory services Diagnostic imaging Radiotherapy Ward equipment Surgical/procedural equipment		
5	Waste costs	Waste disposal		
1	Patient/carer time, movement	Travel Time spent waiting		

		All points of patient contact		
2	Staff time, movement	Points of patient contact Interpretation of results Documentation		
3	Staff skills, knowledge	Patient assessment Procedures Ordering/Interpretation of results		
4	Risk of harm	Procedures Administration of medication Interpretation of results		
5	Staff relationships, culture	Culture, social capital, goodwill		
1	Patient/carer travel	Emissions produced by patient/carer travel		
2	Staff travel	Emissions produced by staff travel		
3	Energy use	Emissions produced through electricity use, heating		
4	Consumable use (medical)	Emissions produced in the production of medical consumables		
5	Pharmaceutical use	Production, use and disposal of pharmaceuticals		
6	Consumable use (non-medical)	Emissions produced in the production of non-medical consumables		
7	Waste generation	Emissions from disposal of medical and non-medical waste		

Adapted from Centre for Sustainable Healthcare, n.d.

The 5 Whys analysis template

Problem:

WHY?

Cause:

WHY?

Cause:

WHY?

Cause:

WHY?

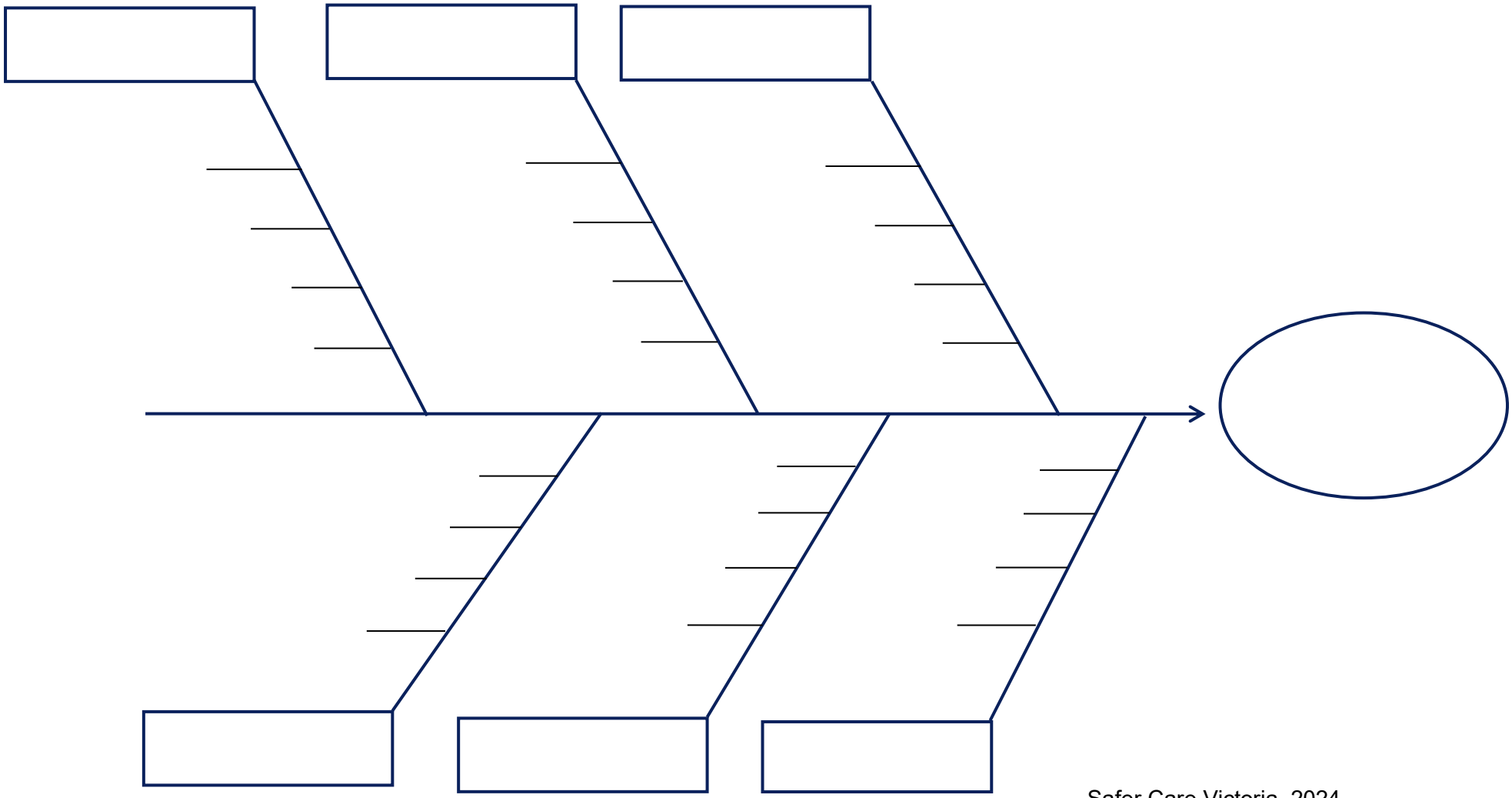
Cause:

WHY?

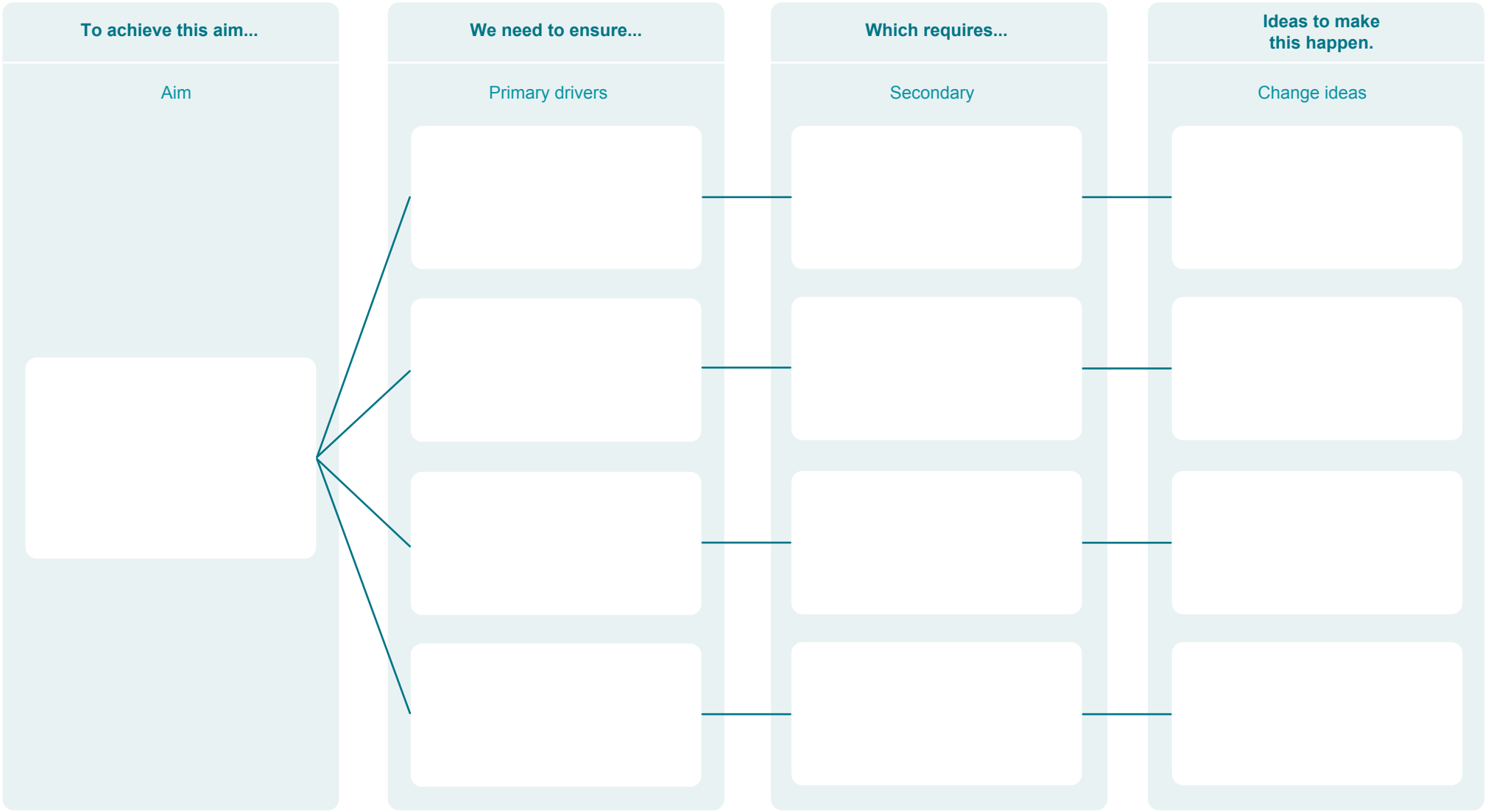
Root Cause:

Safer Care Victoria, 2024

Cause and Effect (Fishbone) Diagram



Driver Diagram



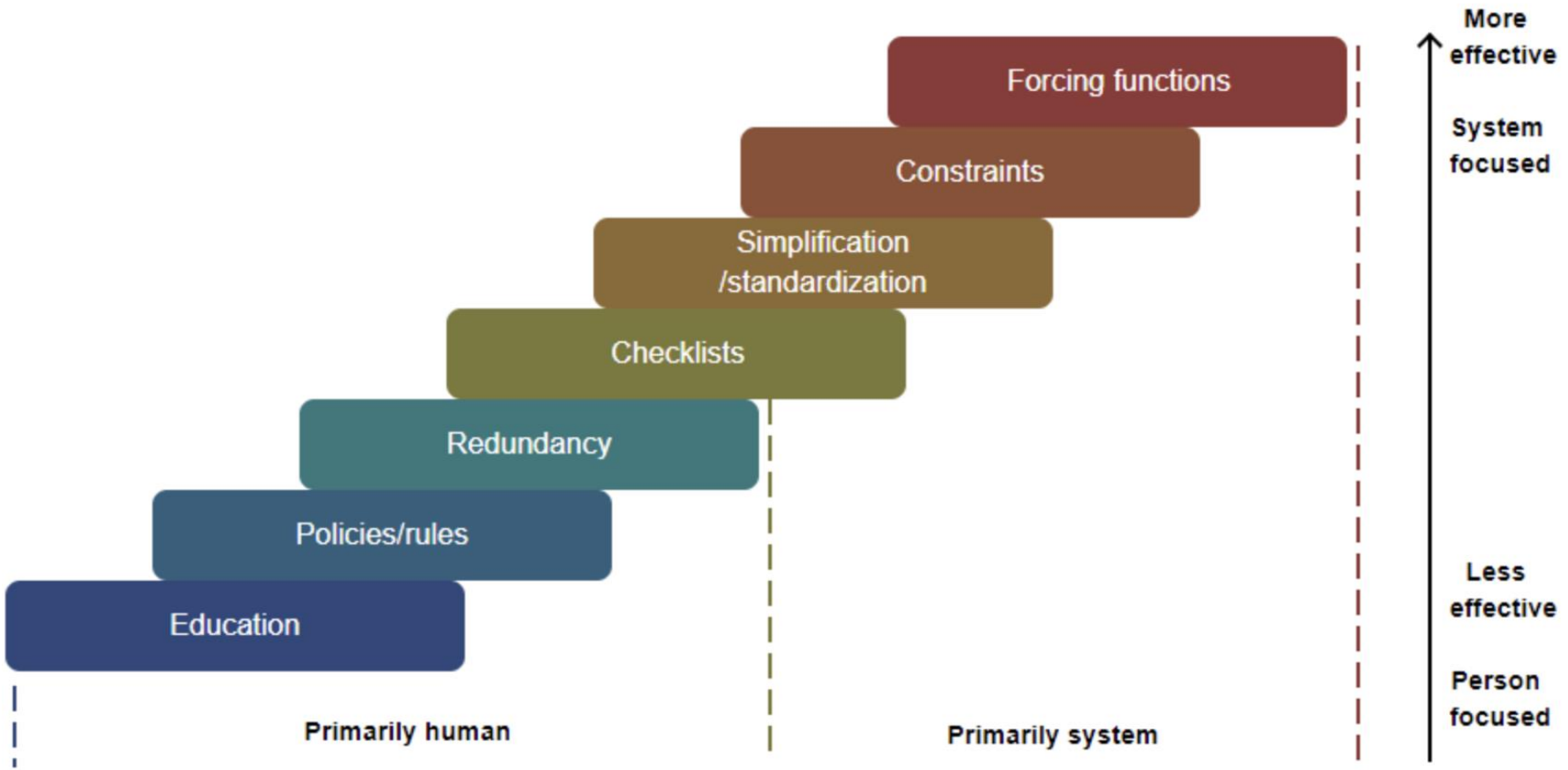
Safer Care Victoria, 2024

COM-B Model for Behaviour Change

	Capability Physical i.e. knowledge	**Capability Psychological** i.e. skills	**Motivation Reflective** i.e. intentions or beliefs	**Motivation Automatic** i.e. emotion	**Opportunity Physical** i.e. environmental resources	**Opportunity Social** i.e. societal influences
Education						
Persuasion						
Incentivisation						
Coercion						
Training						
Restriction						
Environmental restructuring						
Modelling						
Enablement						

WHO needs to do WHAT, WHEN and for WHOM, WHERE? (Actor, action, context, timing, target)

Hierarchy of intervention effectiveness



Adapted by the Canadian Medical Protective Association, 2021 from Cafazzo JA, St-Cyr zO, 2012

Effort-Impact Matrix

Project:

Date:

Safer Care Victoria, 2024

Carbon footprinting data for common healthcare activities

Test name	Carbon impacts/test (gCO_2e)	Source data
Arterial blood gases	49	McAlister S, Barratt AL, Bell KJ, McGain F. The carbon footprint of pathology testing. Medical Journal of Australia 2020; 212: 377–82
Venous blood gases	49	McAlister S, Barratt AL, Bell KJ, McGain F. The carbon footprint of pathology testing. Medical Journal of Australia 2020; 212: 377–83
Coagulation studies	82	McAlister S, Barratt AL, Bell KJ, McGain F. The carbon footprint of pathology testing. Medical Journal of Australia 2020; 212: 377–84
CT-KUB	1090	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
Peripheral intravenous catheter (PIVC)	450	UoM Healthcare Carbon Lab (unpublished)
CT Pulmonary Angiogram (CTPA)	1090	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
CT Cervical Spine	1090	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
CT lumbar-sacral spine	1090	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
CT Brain	1090	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
CT Brain (non-contrast)	1090	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in

		Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
CT Abdomen	1090	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
CT Pan Scan with contrast/Trauma	3270	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
CT Aortogram	1090	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
Abdominal X-ray (AXR)	580	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
Lumbar spine X-ray	580	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
Chest X-ray	580	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
Ultrasound for DVT	90	McAlister S, McGain F, Breth-Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. The Lancet Regional Health–Western Pacific. 2022 Jul 1;24.
Full Blood examination (FBE)	116	McAlister S, Barratt AL, Bell KJ, McGain F. The carbon footprint of pathology testing. Medical Journal of Australia 2020; 212: 377–82
Urea Electrolytes and Creatinine (UEC)	99	McAlister S, Barratt AL, Bell KJ, McGain F. The carbon footprint of pathology testing. Medical Journal of Australia 2020; 212: 377–82

Liver function tests (LFT)	99	McAlister S, Barratt AL, Bell KJ, McGain F. The carbon footprint of pathology testing. Medical Journal of Australia 2020; 212: 377–82
Urine microscopy, culture, sensitivity (MCS)	538	McAlister, S., Grant, T. & McGain, F. An LCA of hospital pathology testing. Int J Life Cycle Assess 26, 1753–1763 (2021)
C-reactive protein (CRP)	0.5	McAlister S, Barratt AL, Bell KJ, McGain F. The carbon footprint of pathology testing. Medical Journal of Australia 2020; 212: 377–82
Calcium, magnesium, phosphate (CMP)	99	McAlister S, Barratt AL, Bell KJ, McGain F. The carbon footprint of pathology testing. Medical Journal of Australia 2020; 212: 377–82
PPE Item	gCO_2e/item	Source
Single glove	26	Rizan C, Reed M, Bhutta M. Environmental impact of Personal Protective Equipment supplied to health and social care services in England in the first six months of the COVID-19 pandemic. Journal of the Royal Society of Medicine; 0(0) 1–14.
Cup fit FFP respirator	125	Rizan et al. JRSM (2021)
Duckbill FFP respirator	76	Rizan et al. JRSM (2021)
Type IIR surgical mask	20	Rizan et al. JRSM (2021)
Type II surgical mask	13	Rizan et al. JRSM (2021)
Face shield	231	Rizan et al. JRSM (2021)
Apron	65	Rizan et al. JRSM (2021)
Single-use gown	905	Rizan et al. JRSM (2021)
Waste Stream	gCO_2e/kg waste	Source
Recycling (general)	21	Rizan C, Bhutta M, Reed M, Lillywhite R. The carbon footprint of waste streams in a UK hospital. Journal of Cleaner Production 286 (2021) 125446. Australian National Greenhouse Accounts Factors, Australian Government Department of Climate Change, Energy, the Environment and Water

Recycling reusable instruments	21	Rizan et al. J Clean Prod (2021)
Recycling reusable surgical linens	21	Rizan et al. J Clean Prod (2021)
Recycling batteries	65	Rizan et al. J Clean Prod (2021)
Low-temp incineration w/ energy – dry mixed/domestic waste	172	Rizan et al. J Clean Prod (2021)
Low-temp incineration w/ energy – non-infectious offensive waste	249	Rizan et al. J Clean Prod (2021)
Autoclave + low-temp incineration w/ energy – infectious waste	569	Rizan et al. J Clean Prod (2021)
High-temp incineration – clinical/anatomical/sharps/medicinal waste	1074	Rizan et al. J Clean Prod (2021)
Food waste (NGERS)	2100	ANGAF, DCCEEW (2023)

Measuring social impact

To scan for social impacts, follow the following process:

1. Identify groups affected by your service including staff, carers, community members, supply chain workers and patients. Use the Social Impacts Table and social determinants of health to note potential impacts such as how hospital visits affect employment. Highlight the most significant impacts.
2. Determine which impacts matter most to these groups. For example, carers may prioritise challenges like taking time off work for hospital visits. Validate assumptions using surveys or focus groups, as their concerns may differ (Centre for Sustainable Healthcare, n.d.).

Identify some positive or negative impacts from the existing system on the groups below.

Population group	Potential impacts	Data source
Patients		
Employees		
Local community		
Broader community (e.g. supply chain)		
Target populations • Unemployed / underemployed • Carers • People with disabilities • Older people • Culturally and linguistically diverse people • Homeless / housing stress • Refugees, asylum seekers • Aboriginal and Torres Strait Islander people		