



Final Project Submission Form

Health Service: The Royal Melbourne Hospital

Title of project: IV Fluid Reduction Strategies Reduce Overall Carbon Footprint

Department: Pharmacy

Introduction

Provide a short introduction about yourself, your project, and why you were inspired to create sustainable environmental change in your department.

An Asia-Pacific-wide IV fluid shortage prompted hospital organisations across this region to rapidly review IV fluid use and conserve / reduce usage where possible.

The Pharmacy Department at The Royal Melbourne Hospital identified a number of outdated practices that were contributing to both unnecessary use and a larger than necessary associated carbon footprint.

What was the problem you tackled?

Pharmacists identified several opportunities for change:

1. Many medications were being diluted Sodium Chloride 0.9% or Glucose 5% IV fluid bags which could alternatively be reconstituted with a small volume and administered as an IV push / bolus;
2. IV fluid bags being used to flush IV lines after medication administration (rather than 10mL or 20mL ampoules);
3. Many larger volume bags were being used for dilution when a smaller volume was adequate;
4. Opportunities for earlier change from IV to oral medication;
5. Consideration of alternative routes of fluid replacement (e.g. oral, nasogastric, etc)
6. Opportunities for earlier change from IV to oral fluids before and after procedure

What was your SMART Goal?

To reduce (conserve) organisational IV fluid bag usage by eliminating outdated and unnecessary practices and replacing with more modern solutions.

What system factors contributed to the problem?

1. Outdated guidelines and policies;
2. A lack of routine and systematic review of associated practices



3. Staff perceptions of convenience / time

Who were the key stakeholders?

1. Nursing staff
2. Medical staff
3. Pharmacy staff

What was the intervention?

1. Modification of diluent volume to smallest volume if IV infusion was the only option
2. Modification of route of administration i.e. change from IV infusion to IV push / bolus to remove the need for an IV fluid bag altogether
3. Promotion of use of burette's where above not appropriate
4. Utilisation of the organisation's electronic medical record to facilitate the agreed changes (e.g. medication order to have diluent volume pre-specified)
5. Education for key stakeholders
6. Sip till send promotion via anaesthetics and surgical wards (i.e. sip of water until sent for procedure rather than using 1L IV fluid bags).

What impacts/outcomes were measured? How did you measure them?

The Pharmacy data warehouse (SQL-based hospital pharmacy medication transaction data) was utilised to collect the relevant data. All volume of Sodium Chloride 0.9%, Glucose 5% and Compound Sodium Lactate (Hartmann's) IV fluid bag usage was analysed for the periods:

- July to December 2024 (post-intervention period)
- January to June 2024 (comparative pre-intervention period 1)
- July 2023 to December 2024 (comparative pre-intervention period 2)

Two comparative pre-intervention comparative periods were analysed to account for any seasonal peaks and lulls in IV fluid bag usage.

Data collected against each type and volume of IV fluid bag included:

- Total number used
- Cost
- Associated carbon footprint

Similar data was collected from the RMH Procurement team databases regarding associated consumables such as IV giving sets and burettes.

What challenges did you face? What enablers facilitated the change? What were the learning points?

- Retraining of nursing staff on:
 - Use of IV infusion or IV bolus for different medications
 - Oral vs IV fluid maintenance for fasting and post-procedural patients
 - Prompt medical staff to review IV fluid orders if patient is taking medications orally
- Educating medical staff to:
 - Review patients' IV infusions daily and switch to alternative routes as soon as clinically feasible
 - Consider alternative routes for fluid replacement
- EMR build to support changes to practice
- Design and build of IV fluid usage and stock on hand (days) dashboard to monitor changes and ensure adequate supply to patient areas

What are the next steps with this project?

- A 6 month evaluation with refresher for all areas to ensure reductions are maintained regardless of normalisation of supply chain
- Review of further areas for reduction in use

Points will be awarded in the following categories:

Environmental sustainability: What were the carbon savings from your project? (Please include your raw data and calculations)

In the first 6 months post-implementation:

- ➔ 68,194 unit reduction in IV fluid bag usage
- ➔ 12,730 kg CO₂e reduction

This would result in annual CO₂ savings of 25,460 kg CO₂e from IV fluid bags alone.

There was also a reduction in IV giving sets used in the same time period.

There were 1537 fewer giving sets used in the second half of 2024.

This would result in a carbon saving of 525.6 kg CO₂e in the 6 month period or 1051.3 annually.

The total carbon savings annually is 26,511 kg CO₂e.

Screenshots of raw data included at bottom of entry

References

Carbon footprint of various size bags of IV fluid.

50 ml 0.13 kg

100ml 0.15 kg



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250ml 0.26 kg

500ml 0.39 kg

1L 0.58 kg

<https://doi.org/10.1007/s00134-023-07240-3>

Carbon footprint of giving set etc – 0.342 kg CO₂e

<https://www.sciencedirect.com/science/article/pii/S0007091223007250#sec2>

Environmental sustainability: What were the waste reductions? (If possible, please specify what waste stream – reduced clinical waste by diverting to recycling, reduced clinical waste by using reusable equipment etc.)

The majority of IV fluid bags are made from PVC. However, due to space limitations in most clinical areas, PVC recycling is minimal at RMH. Subsequently the majority of the 136,000 IV fluid bag units saved annually would have ended up in landfill along with the giving sets.

Clinical outcomes: How did your project improve patient care? (include outcome data)

Increased timeliness of full dose for those medications administered via push (instead of infusion + line flush (20mL in line often delayed flushing)).

Less likelihood of IV cannula infections as each 'handling' of a line increases risk of infection

Shorter duration of IV cannulation – lower risk of infection

Financial sustainability: Have there been any financial savings? (please include your calculations)

- ➔ \$86,000 saved the first 6 months post-implementation on IV fluids alone
- ➔ \$149,101 saved in the first 6 months on giving sets
- ➔ A total annualised saving of \$470,202 from this project was realised

Social sustainability: How did your project socially benefit patients, staff, or wider community?

Less workload for nursing staff

Fewer cannulae is always preferred by patients

Generalisability: Could this project be replicated in other areas of the hospital?

Yes



Environmental Sustainability Competition 2024-2025



Month	(Multiple Items)			
JANUARY - JUNE 2024				
Row Labels	Item Description	UOM	Sum of QTY	Sum of Total
97270896	ADMINISTRATION SET IV BLOOD COMES WITH FILTER LATEX-FREE STERILE (ALARIS) 2477-0007	CARTON 10	759	\$79,695.00
97270903	ADMINISTRATION SET IV LOW-SORBING LENGTH 2.87m PRIME 23mL PUMP VENTED STERILE (ALARIS) 2260-0006	CARTON 20	14	\$3,122.00
97270906	ADMINISTRATION SET IV Y PORT LENGTH 2.74m STERILE (ALARIS) 2401-0004	CARTON 20	1134	\$112,266.00
97270908	ADMINISTRATION SET IV NO INJECTION PORTS LENGTH 2.72m STERILE (GEMINI) 2200-0006	CARTON 20	2149	\$211,761.00
97287003	INFUSION SET ADMINISTRATION PUMP IV LOW-SORBING 2.9m FILTER 0.2 MICRON POLYETHYLENE LINED STERILE (ALARIS) 10010454-0006	CARTON 20	10	\$3,190.00
97343748	ADMINISTRATION SET IV LENGTH 2.97m PRIME 25mL 2-PORT STERILE (ALARIS) 2420-0007	CARTON 20	1134	\$112,266.00
Grand Total			5200	\$522,300.00
JULY - DECEMBER 2024				
Row Labels	Item Description	UOM	Sum of QTY	Sum of Total
97270896	ADMINISTRATION SET IV BLOOD COMES WITH FILTER LATEX-FREE STERILE (ALARIS) 2477-0007	CARTON 10	736	\$77,280.00
97270903	ADMINISTRATION SET IV LOW-SORBING LENGTH 2.87m PRIME 23mL PUMP VENTED STERILE (ALARIS) 2260-0006	CARTON 20	21	\$4,683.00
97270906	ADMINISTRATION SET IV Y PORT LENGTH 2.74m STERILE (ALARIS) 2401-0004	CARTON 20	891	\$88,209.00
97270908	ADMINISTRATION SET IV NO INJECTION PORTS LENGTH 2.72m STERILE (GEMINI) 2200-0006	CARTON 20	1147	\$113,454.00
97287003	INFUSION SET ADMINISTRATION PUMP IV LOW-SORBING 2.9m FILTER 0.2 MICRON POLYETHYLENE LINED STERILE (ALARIS) 10010454-0006	CARTON 20	18	\$5,423.00
97343748	ADMINISTRATION SET IV LENGTH 2.97m PRIME 25mL 2-PORT STERILE (ALARIS) 2420-0007	CARTON 20	850	\$84,150.00
Grand Total			3663	\$373,199.00

IV FLUID BAG	USAGE (Units)					CO2 kg		COST (\$)		
	Jan 23 - Jun 23	Jul 23 - Dec 23	Jan 24 - Jun 24	Jul 24 - Dec 24	H1 24 vs H2 24	H1 24 vs H2 24	Jan 24 - Jun 24	Jul 24 - Dec 24	H1 24 vs H2 24	
GLUCOSE 5% (1L)	2001	1900	1782	2183	401	0.58	232.58	\$2,576	\$3,403	\$827
GLUCOSE 5% (500mL)	700	816	614	725	111	0.39	43.29	\$771	\$935	\$164
GLUCOSE 5% (50mL)	1020	1140	1084	1283	199	0.13	25.87	\$10,786	\$13,121	\$2,335
GLUCOSE 5% (100mL)	7111	6917	7492	16087	8595	0.15	1289.25	\$11,318	\$24,422	\$13,104
GLUCOSE 5% (250mL)	1997	1662	1835	1944	109	0.26	28.34	\$3,054	\$3,305	\$251
SODIUM CHLORIDE 0.9% (250mL)	14209	14216	14804	15504	700	0.26	182	\$23,370	\$24,651	\$1,281
SODIUM CHLORIDE 0.9% (500mL)	19442	17820	16877	14778	-2099	0.39	-818.61	\$19,537	\$17,734	-\$1,803
SODIUM CHLORIDE 0.9% (50mL)	52824	58750	72770	51140	-21630	0.13	-2811.9	\$102,277	\$71,641	-\$30,636
SODIUM CHLORIDE 0.9% (1L)	27111	28286	27532	23859	-3673	0.58	-2130.34	\$33,162	\$29,657	-\$3,505
SODIUM CHLORIDE 0.9% (1L) (PVC FREE)	146	158	163	200	37	0.58	21.46	\$384	\$701	\$317
SODIUM CHLORIDE 0.9% (100mL) (PVC FREE)	161	54	2	2	0	0.15	0	\$3	\$3	\$0
SODIUM CHLORIDE 0.9% (100mL)	123806	114437	110032	61765	-48267	0.15	-7240.05	\$152,944	\$85,853	-\$67,091
SODIUM CHLORIDE CO (Ringers) (1L)	804	996	840	756	-84	0.58	-48.72	\$5,578	\$5,051	-\$527
COMPOUND SODIUM LACTATE (1L)	27773	28580	28656	26063	-2593	0.58	-1503.94	\$34,516	\$33,164	-\$1,351
	290185	286823	297060	229349	-68194		-12730.77	\$400,275	\$313,642	-\$86,633