

# Establishing Nurse-Led Intraoperative Cell Salvage Service in SGH Major Operating Theatre



Singapore General Hospital  
SingHealth

Dr Tan Yan Ru<sup>1</sup>, Dr He Yingke<sup>1</sup>, Ms Fu Jing<sup>2</sup>, A/Prof Ang Ai Leen<sup>3</sup>, A/Prof Tien Sim Leng<sup>3</sup>, Ms Goh Meh Meh<sup>2</sup>, Ms Teng Chai Lian<sup>2</sup>, Dr Jiang Lei<sup>4</sup>, Dr Pang Hee Nee<sup>4</sup>, Dr Eric Liu Xuan<sup>4</sup>, Dr Shaun Lee Qingwei<sup>5</sup>, Dr Yong Tze Tein<sup>6</sup>, Ms Teng Siew Yan<sup>7</sup>, Ms Elisabeth Angelina<sup>8</sup>, Ms Esther Chng Xin Yu<sup>8</sup>, Mr Bryan Boey<sup>9</sup>, A/Prof Hairil Rizal Abdullah<sup>1,8</sup>

<sup>1</sup>Department of Anaesthesia, Singapore General Hospital (SGH); <sup>2</sup>Division of Nursing, SGH; <sup>3</sup>Department of Haematology, SGH; <sup>4</sup>Department of Orthopaedic Surgery, SGH; <sup>5</sup>Department of Vascular Surgery, SGH; <sup>6</sup>Department of Obstetrics & Gynaecology Surgery, SGH; <sup>7</sup>Department of Perfusion, National Heart Centre Singapore (NHCS); <sup>8</sup>Office of Value Based Healthcare, SGH; <sup>9</sup>Process Transformation & Improvement, SGH

## BACKGROUND & AIMS

### What is Intraoperative Cell Salvage (ICS)?

- ICS is the process where patient's blood is collected, washed and processed for reinfusion in surgeries
- This is an important component of perioperative blood conservation to reduce allogeneic blood transfusion and its associated complications, in turn improving patient outcomes and optimising national health care resources with finance cost savings

### Impetus for Change in SGH

#### NHCS PERFUSIONIST AND EXTERNAL VENDOR LED ICS (OLD PROCESS)



- ICS service can only be used for elective surgery, as pre-arrangement is required
- ICS service availability depends on perfusionist's and vendor's availabilities
- External vendor is not medically trained and is not under governance and regulation of the hospital

#### ANAESTHETIC UNIT (AU) NURSE-LED ICS (NEW PROCESS)

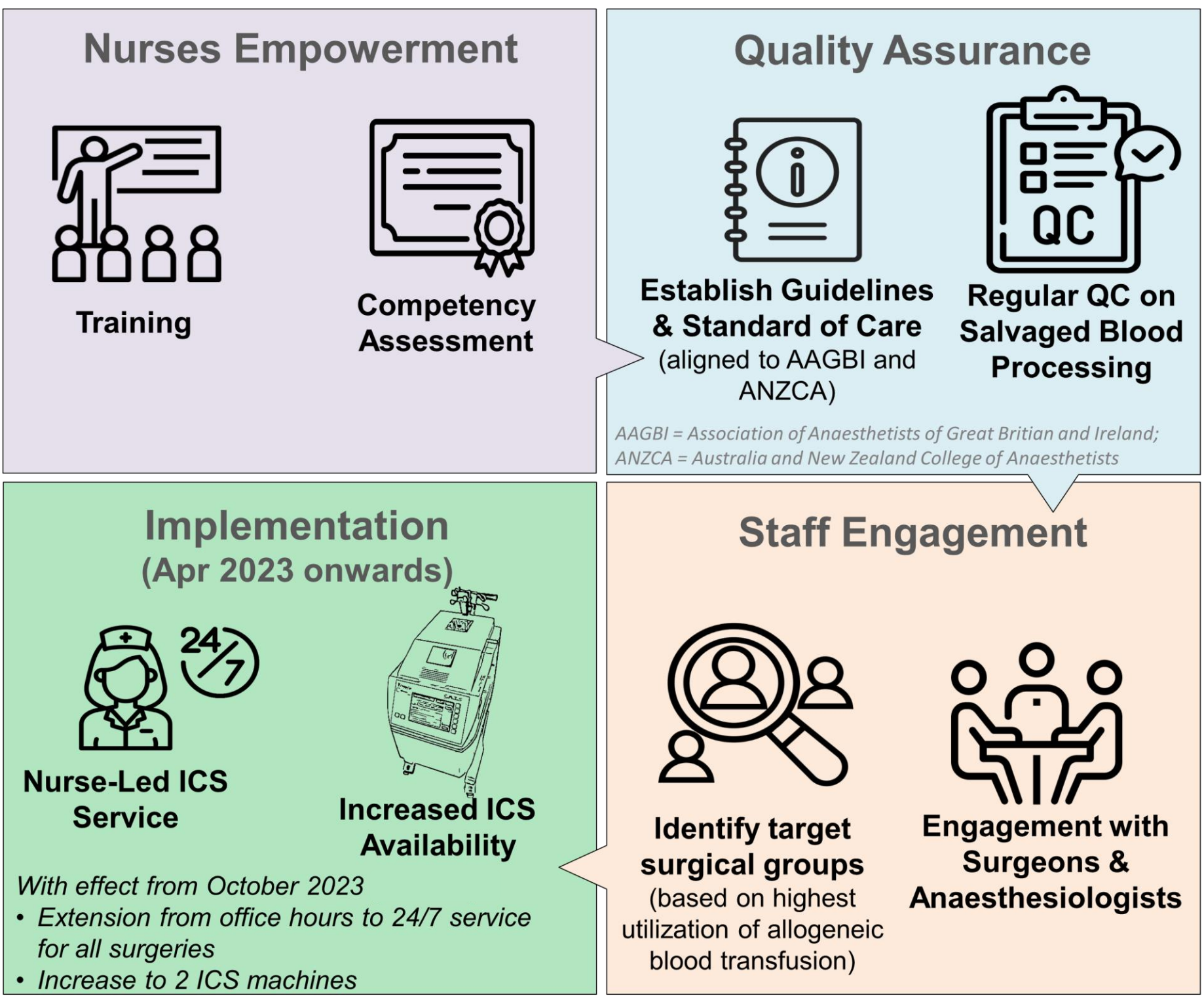


SGH Anaesthetic Unit Nurse

- Job re-engineering for AU nurses
- ICS service is made available **24/7** to all elective and emergency major surgeries in SGH MOT
- Improved patient safety and care quality with formalised staff training, standardisation, protocols and audit

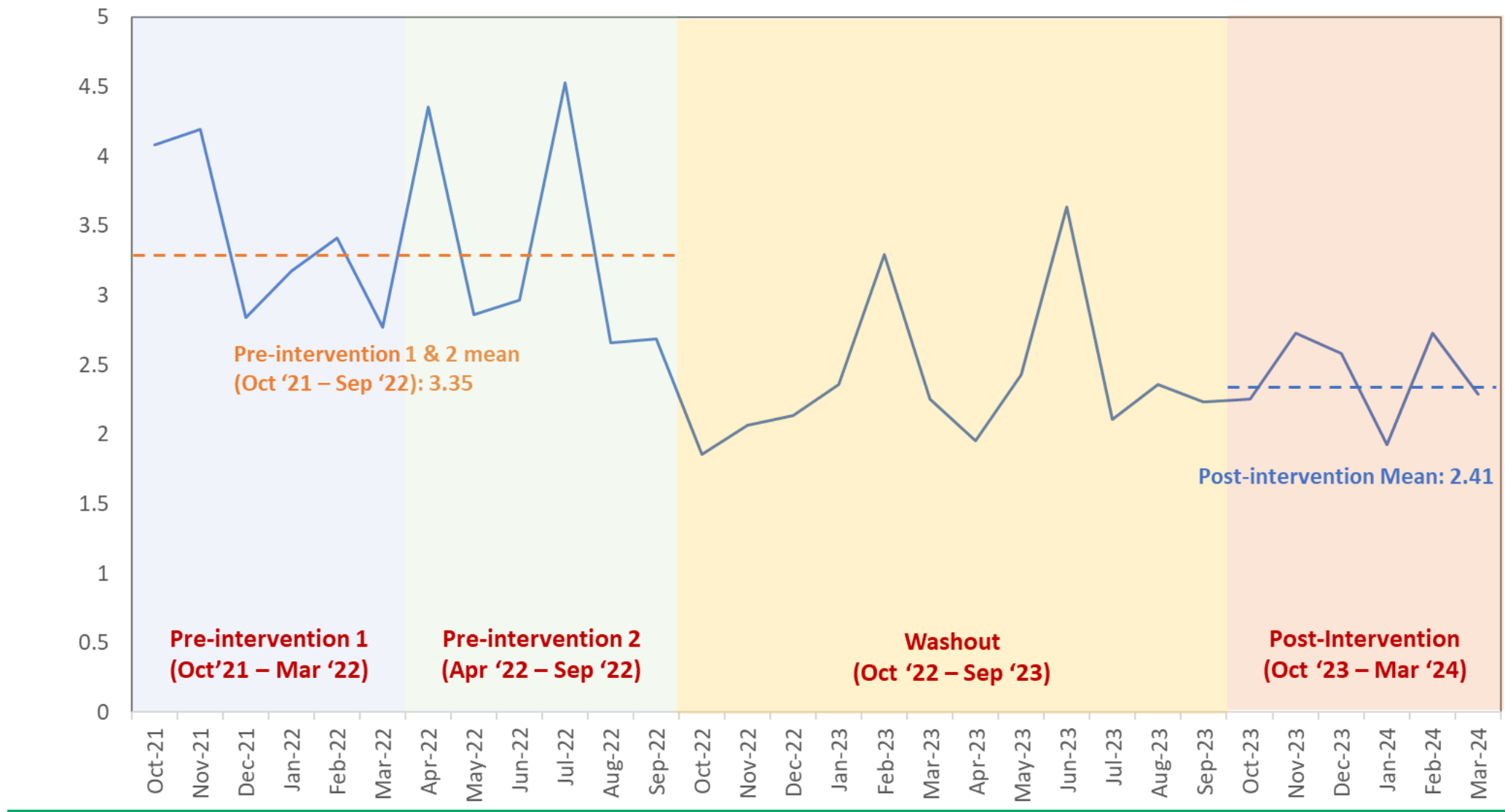
## METHODOLOGY

- Below were the steps done to standardise the process, increase availability and increase awareness on importance of blood conservation and promote use of ICS in major surgeries (blood loss  $\geq 500$  ml).
- This is led by a multidisciplinary team of nurses, anaesthesiologists, surgeons and haematologists.



## ANALYSIS & RESULTS

Mean Number of Red Blood Cell (RBC) Bags Transfused per Patient with Blood Loss of  $\geq 500$  mL



Period*	Number of Cases	Mean Number of RBC bags transfused per patient
Period 1 (October '21 to Mar '22): Pre-intervention (1st-pretest)	763	3.40
Period 2 (April '22 to September '22): Pre-intervention (2nd-pretest)	785	3.31
Period 3 (October '23 to March '24): Post-intervention	673	2.41

\*The washout period, from October 2022 to September 2023, represents the active trial phase of the ICS machine and the ramping up of its use in all surgeries.

- We employed a quasi-experimental retrospective study design with double pretest approach to evaluate the average number of RBC bags transfused per patient with blood loss of  $\geq 500$ ml.
- Changes in the ratio of RBC bags transfused were analysed using one-way ANOVA which indicated a statistically significant difference in the ratio of RBC bags transfused per patient across the three periods. On further analysis, there was no significant change in the ratio of RBC bags transfused per patient between the two pre-intervention periods. However, significant changes were observed when comparing the pre-intervention periods to the post-intervention period.
- No 30-day transfusion-related complications were recorded during the study periods.
- The ICS uptake increased from 1.4% in the pre-intervention phase to 12.3% in the post-intervention phase.
- With reduction of cost of ICS service by SGD\$2,614 per case, estimated 1,500 surgeries with clinical indications for ICS, and ICS adoption rate of 12.3% (185 surgeries), the initiative would provide an estimated annual cost avoidance of SGD483,590. Additionally, with reduction of RBC transfused (mean 3.35 pre-intervention to mean 2.41 post intervention) at SGD\$258 per pack, approximately SGD45,094 would be avoided.

## CONCLUSION

- The nurse-led ICS service had a positive impact in reducing RBC transfusions with annual cost avoidance of ~SGD500,000.
- Change management strategies such as robust training programmes, effective communication channels and support systems are integral to the success of the project. Job-re-engineering can help improve work efficiency, patient safety and reduce cost.