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# Reconfiguration of the Anaesthesia Medication Trolley Layout to Reduce Drug Administration Errors

Ching Ser Ting<sup>1</sup>, Dr Leonard Loh<sup>2</sup>, Loy Ying Hao<sup>1</sup>,  
Tan Gui Yu<sup>1</sup>, Sng Hoon Ngoh<sup>1</sup>, Kuang Seik Ying<sup>1</sup>

<sup>1</sup>Operating Theatre, Sengkang General Hospital  
<sup>2</sup>Department of Anaesthesiology, Sengkang General Hospital

## Background

Medication errors are among the most frequently occurring adverse events in healthcare. During anaesthesia care in the operating theatre (OT), there have been instances and near-misses of medication errors during the use of medications from the anaesthesia medication trolley, which can lead to adverse outcomes.

The OT anaesthesia medication trolley configuration should be optimised to enable clinicians to access drugs efficiently while minimising medication errors.

## Contributing Factors

Some factors for these medication errors include medication ampoules with similar appearance and packaging, ambiguous layout of trolley, clinician inattention, ineffective communication, fatigue and haste. Clinicians rotating between the OTs of SGH and SKH may also make errors when the medication trolley's layout is different between hospitals.

### SKH OT Medication Trolley (Pre-Intervention)



## Goals and Mission Statement

The aim of this project is to reduce the incidence of drug administration-related errors by 30% over 10 months, through optimising the layout of the anaesthesia medication trolley based on human factors engineering principles.

We also aimed to standardise the layout of the SGH and SKH anaesthesia medication trolleys.

## Interventions

We reorganised the medication trolley configuration with these interventions in February 2021:

- Each drug is assigned a compartment within the medication trolley.
- Each drug compartment's floor and wall were labelled with drug labels.
- The labels were printed in large font sizes for easier viewing.
- Each compartment's drug label was colour coded with a colour that represents its drug class. The colours were also selected to be visible for staff with colour blindness.
- Drugs of the same class were kept in the same column.
- Drugs with similar looking packaging appearance were differentiated by being kept in secondary containers.
- The layout of the OT medication trolleys was standardised across SGH and SKH.

### New Standardized SKH OT Medication Trolley

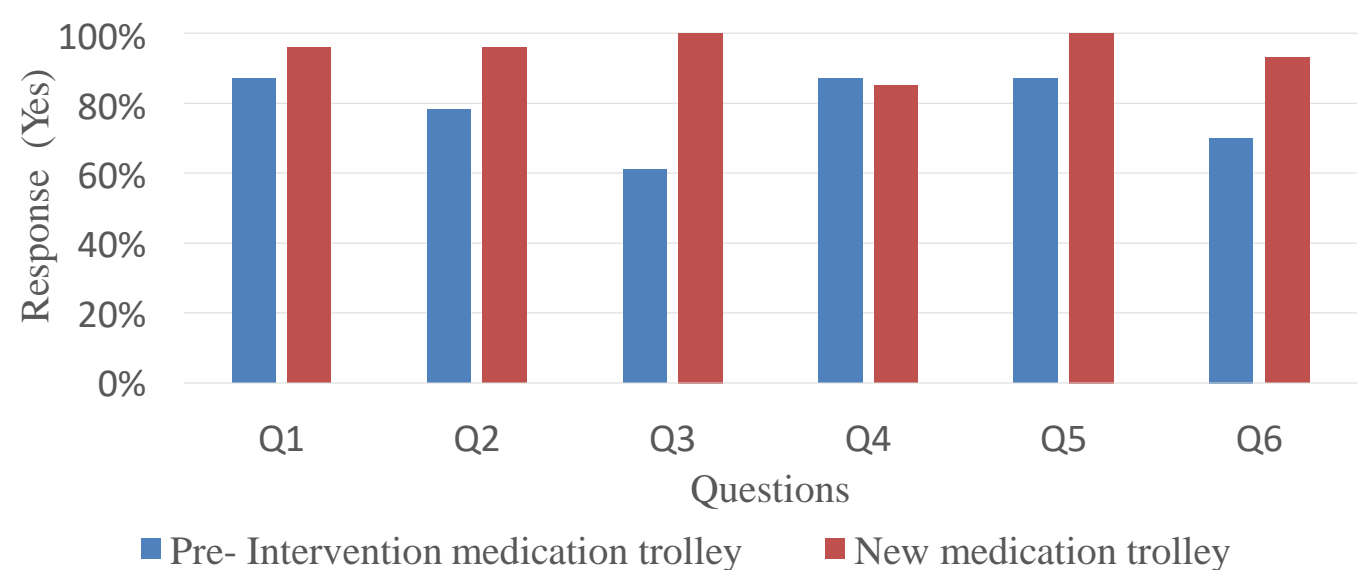


## Results

We surveyed 30 anaesthesiologists and Anaesthesia nurses on the changes in the medication trolley. **>90% of respondents** found the new trolley layout easy to use and helps to reduce medication errors.

Survey on the reconfiguration of the anaesthesia medication trolley layout:

Comparing the old and new medication trolley



n= 30 Anaesthesiologists and Anaesthesia nurses

#### Legend:

Q1: Is the wording of the medication trolley drug labels clear and visible?

Q2: Is the colour coding of the drug labels (organized by drug classes) clear?

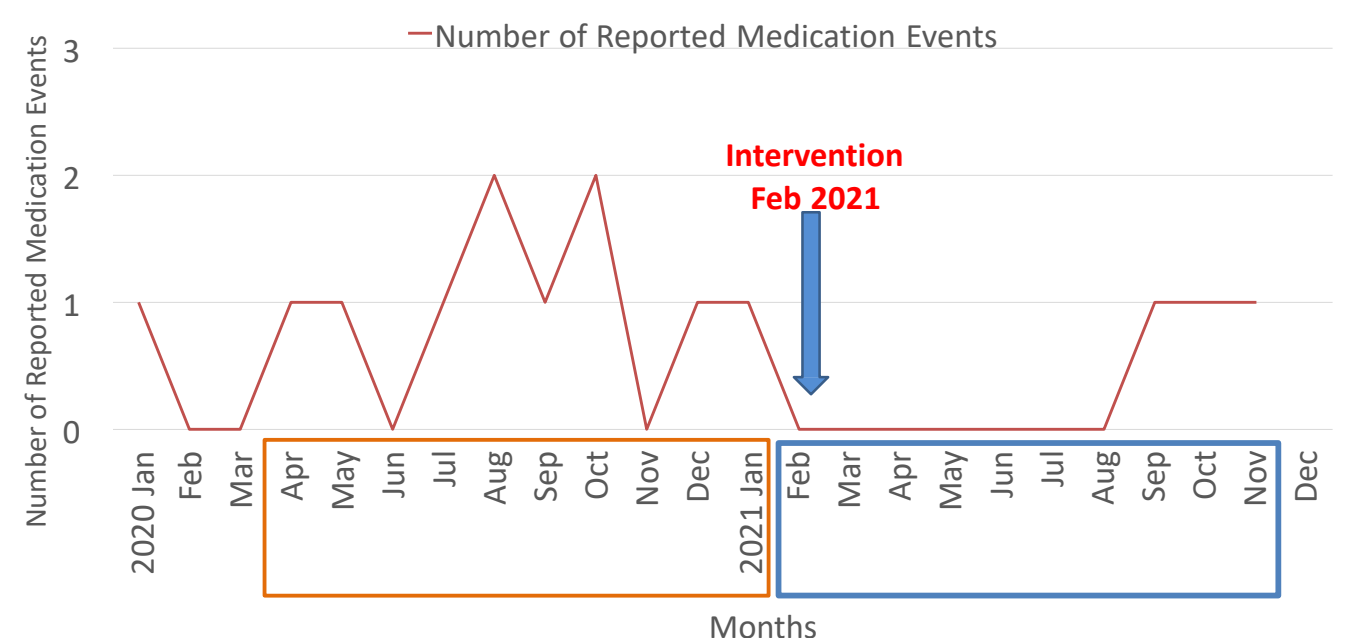
Q3: Is the grouping of drugs of the same class into columns clear?

Q4: Does placing a look alike medication (such as Ephedrine and Atracurium) in a secondary container help to prevent medication error?

Q5: Is this medication trolley layout easy to use?

Q6: Overall, does this medication trolley layout help to reduce medication error?

After the interventions in February 2021, the incidence of drug administration-related errors in OT has reduced by 70% over 10 months (3 reports), compared to the preceding 10 months (10 reports).



## Conclusion

The adoption of human factors engineering<sup>1</sup> in the standardisation of the anaesthesia medication trolleys layout in SGH and SKH has reduced the incidence of OT drug administration-related errors in SKH by 70% over 10 months.

This has enhanced patient safety as harm from medication errors such as double-dosing or by the wrong drug being given, are minimised. It is estimated that the cost of a preventable adverse drug event from injectable medications per hospitalization is US\$3100.<sup>2</sup> Also, cost savings are found in the reduction of staff time and resources from investigating medication errors.

The new trolleys have been in operational use over this year in both hospitals and survey results from users indicate satisfaction with the new layout. This makes the changes sustainable. The principles of the trolley reconfiguration can be applied to similar medication trolleys in the hospital.

## References

- Gosbee, John. "Human factors engineering and patient safety." *Quality and safety in health care* 11.4 (2002): 352-354.
- Lahue BJ, Pyenson B, Iwasaki K, Blumen HE, Forray S, Rothschild JM. National burden of preventable adverse drug events associated with inpatient injectable medications: healthcare and medical professional liability costs. *Am Health Drug Benefits*. 2012;5(7):1-10.