SKH CSSU Automated Storage and Retrieval System (ASRS)

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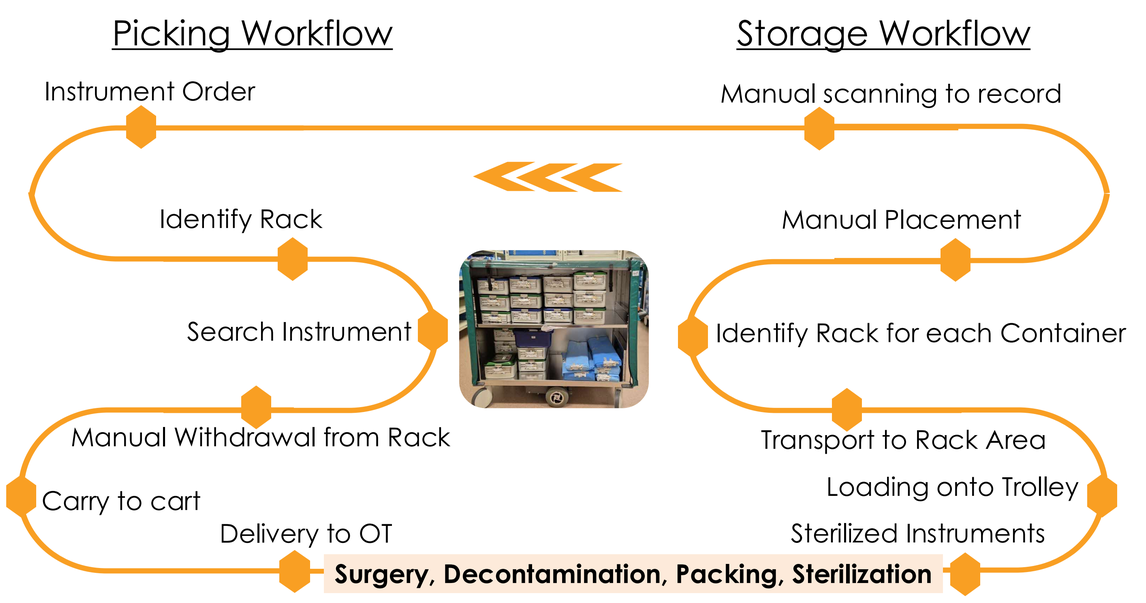
Project Background

1. Automate laborious routine task (Figure 1).
2. Maximise storage space in CSSU.
3. Free up CSSU Staffs' time to prioritise clinical checks and safety related matters.
4. Allow just-in-time instrument set delivery

First ASRS implementation within CSSU in Singapore.

Old Workflow



(Figure 1)

Aim

Efficiency, timeliness and workflow enhancement

Methodology

Initiated in 2021, it includes a 3-Arm Automated Storage and Retrieval System (ASRS) (Figure 2), , 4 Vertical Carousels (VCR) (Figure 4), an automatic robotic loader, and a Warehouse Management System (WMS) (Figure 3) interfacing with Total Documentation (T-Doc) (Figure 5).

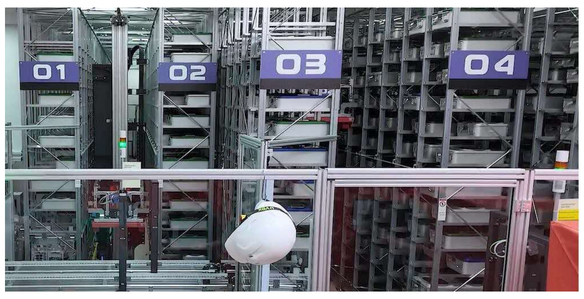


Figure 2: ASRS

Figure 3: Warehouse Management System (WMS) interfacing with Total Documentation (T-Doc))

Figure 4: Vertical Carousel 1

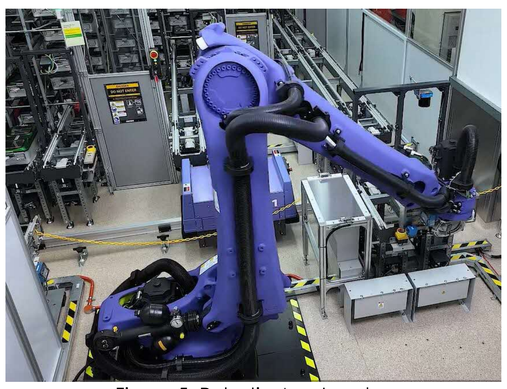


Figure 5: Robotic Arm Loader

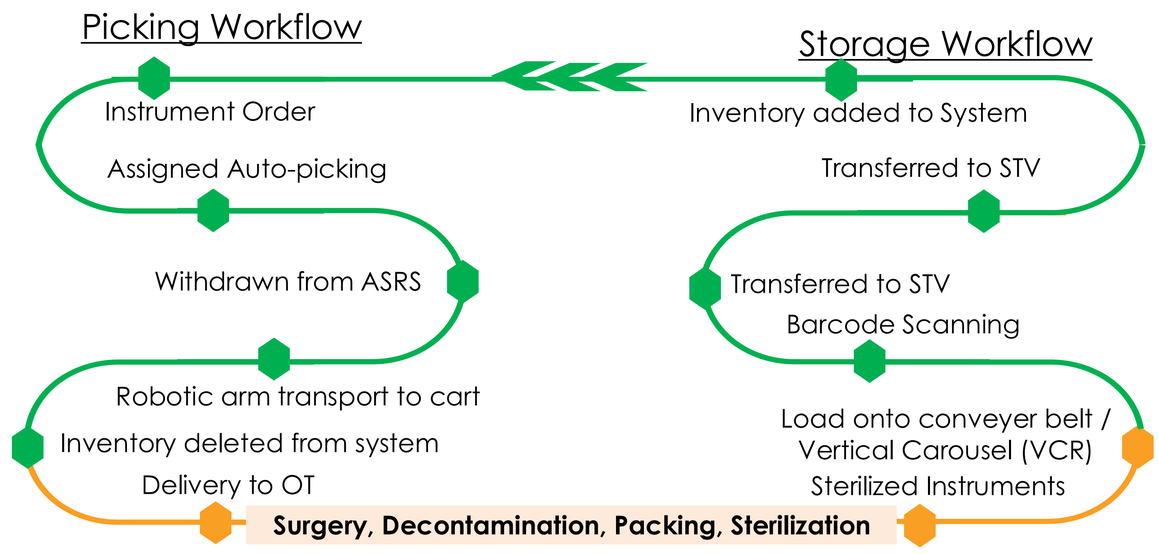
Conclusion

ASRS implementation achieved significant manpower saving by reducing the time needed for storing & retrieval of instrument sets while maintaining end to end sterility integrity. This implementation also increased the storage capacity, eliminating the need for set stacking which ensure compliance to First-In First Out (FIFO) of instrument sets.

Result

The project benefited all 35 staffs working in CSSU. This implementation enhanced SKH CSSU's instrument set picking and storing efficiency (Figure 6).

New Workflow



(Figure 6)

Storage & Retrieval of Sets

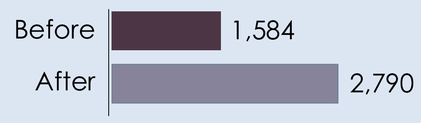
50% reduction

Before: 9 to 10 mins per operation. ~ 7 units needed per case.

Now: ~4 mins for 7 units.

Storage Capacity

75% increase in storage capacity from 1,584 slots to 2,790 slots.



Instrument Sterility Integrity

End-End sterility integrity achieved

Before: Reprocessing ($25/unit) required for incorrect sterility status (up to $36,500/year).

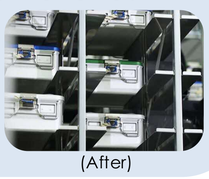
After: **100%** reduction in reprocessing with real-time validation.

Accessibility of sets

Before: Sets stacked on each other.

Now: **Individual slots.**

(Before)



(After)

Weekly Inventory Stock Checks

80% Saving

Before: 3 staff, full day to complete checks.

After: 1 staff, 1/2 day to complete checks.

First-In-First-Out

First-In-First-Out (FIFO) retrieval of sets **achieved**

Picking of instrument container

Before: 4 staffs – 2 picking, 2 FIFO adjustment.

After: 1 staff – 1 picking.

Moving Forward…

To enhance the workflow and minimize manual handling, the ASRS will support the newly implemented AMR in performing end-to-end delivery of instruments sets. This integration will enable full automation, addressing the current workflow gaps that still require manual intervention.

Additionally, CSSU is ***exploring further enhancements***, such as:

1. Packing Area & Post-Sterilization Instrument Container Picker
2. Video Analytics: For easy identification and verification of instruments at the Decontamination and Packing areas.