Project Title

Vertical Integration of Hardware and Software Automation in Pharmacy (VIP)

Project Lead and Members

Project members: Lim Shi Zong Nigel, Norjanah Binte Alias, Norfadhilah Binte Samsuri, Chloe Chong Kai Li, Chong Zhi Yan, Menakah Alagappa, Siti Nurul Hudah Binte Salleh, Ng Mui Kiau, Lim Geok Choo, Awadah Binte Sabahrudin, Fung Kar Yen

Organisation(s) Involved

Ng Teng Fong General Hospital

Healthcare Family Group(s) Involved in this Project

Allied Health, Ancillary Care

Applicable Specialty or Discipline

Pharmacy

Project Period

Start date: January 2022

Completed date: December 2023

Aims

The first-of-its-kind in local public healthcare institutions (PHIs), Automated Code Red Alert (ACRA) system was piloted in Ng Teng Fong General Hospital (NTFGH) in 2020. This automated alert system, along with ICU Outreach nursing (ICUORN) service, improves care escalation by automating the identification of clinically deteriorating patients while in GW, and triggers notification to the appropriate clinicians, thus reducing cardiac arrests in GW and unplanned ICU admissions. The combination of ACRA triggering system and ICUORN service aims to improve compliance rate to timely and appropriate care escalation and facilitate efficient intervention during clinical deterioration in the GW.

Project Attachment

See poster appended/ below

Background

See poster appended/ below

Methods

See poster appended/ below

Results

See poster appended/ below

Lesson Learnt

Limits and boundaries are meant to be challenged in the pursuit of innovation.

While RPA has demonstrated considerable success, significant effort will still be required for RPA to become the norm, as current healthcare IT infrastructure may be outdated and incompatible with RPA. Furthermore, the concept of patient data and privacy will always be at the forefront, which may diminish the overall impact of RPA until we find a way to balance efficiency with privacy.

Lastly, while vertical integration was challenging to implement, especially since our pharmacy had to acquire non-pharmacy related skills and tools, the benefits are innumerable. We managed to equip our staff with future ready skills to tackle the challenges of tomorrow through our vertical integration efforts, completely transforming both the pharmacy and our people.

Additional Information

National Healthcare Innovation & Productivity (NHIP) 2024 – Best Practice (Workforce Transformation category)

Conclusion

See poster appended/ below

Project Category

Technology

Digital Health, Data Analytics

Workforce Transformation

Job Redesign, Digital Workforce

Keywords

OPAS, Digital Literacy, Vertical Integration

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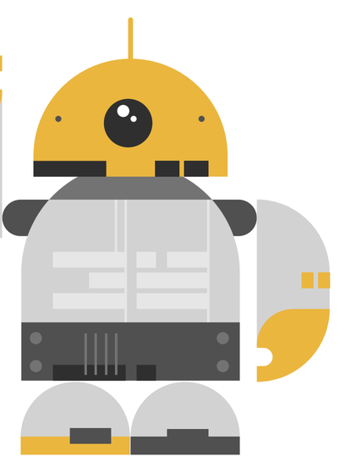
VERTICAL INTEGRATION OF HARDWARE AND SOFTWARE AUTOMATION IN PHARMACY (VIP)



[1] PROBLEM

HARDWARE AUTOMATION

The Outpatient Pharmacy Automation System (OPAS) relied heavily on our external partners to provide all forms of technical support and troubleshooting.

Rx

Ng Teng Fong General Hospital (NTFGH) Outpatient Pharmacy which serves more than 135,000 patients annually suffered from inefficiencies due to the fragmented delivery of services from our external partners.

SOFTWARE AUTOMATION

Prior attempts to outsource Robotic Process Automation (RPA) and data visualisation processes were unsuccessful due to insufficient scale or prohibitive costs.

1. **FREQUENT OPAS MACHINES RELATED ERRORS THAT WERE SLOW TO RESOLVE = LONG MEDICATION PACKING TIME**
2. **LONG BACK-AND-FORTH PROCESSES = SLOW ADOPTION OF INNOVATION**

[2] APPROACH

Rx

Adoption of the **VERTICAL INTEGRATION** approach to consolidate core hardware and software capabilities within the pharmacy.

ACQUISITION OF HARDWARE & SOFTWARE CAPABILITIES

Purchased RPA software license for in-house RPA development.

Developed advanced Excel data visualisation and dashboard skills.

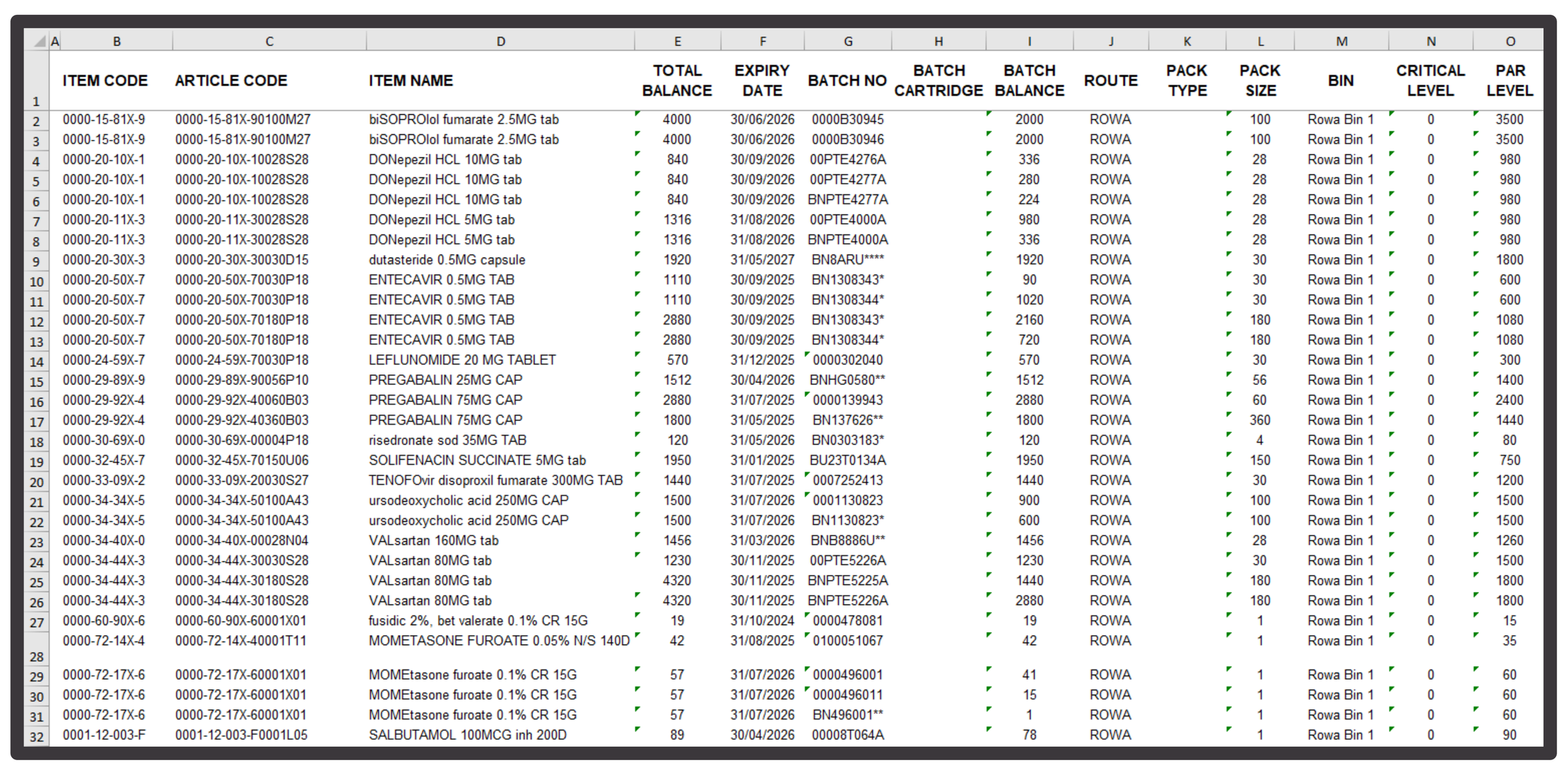
Acquired the necessary hardware and skills for machine modifications.

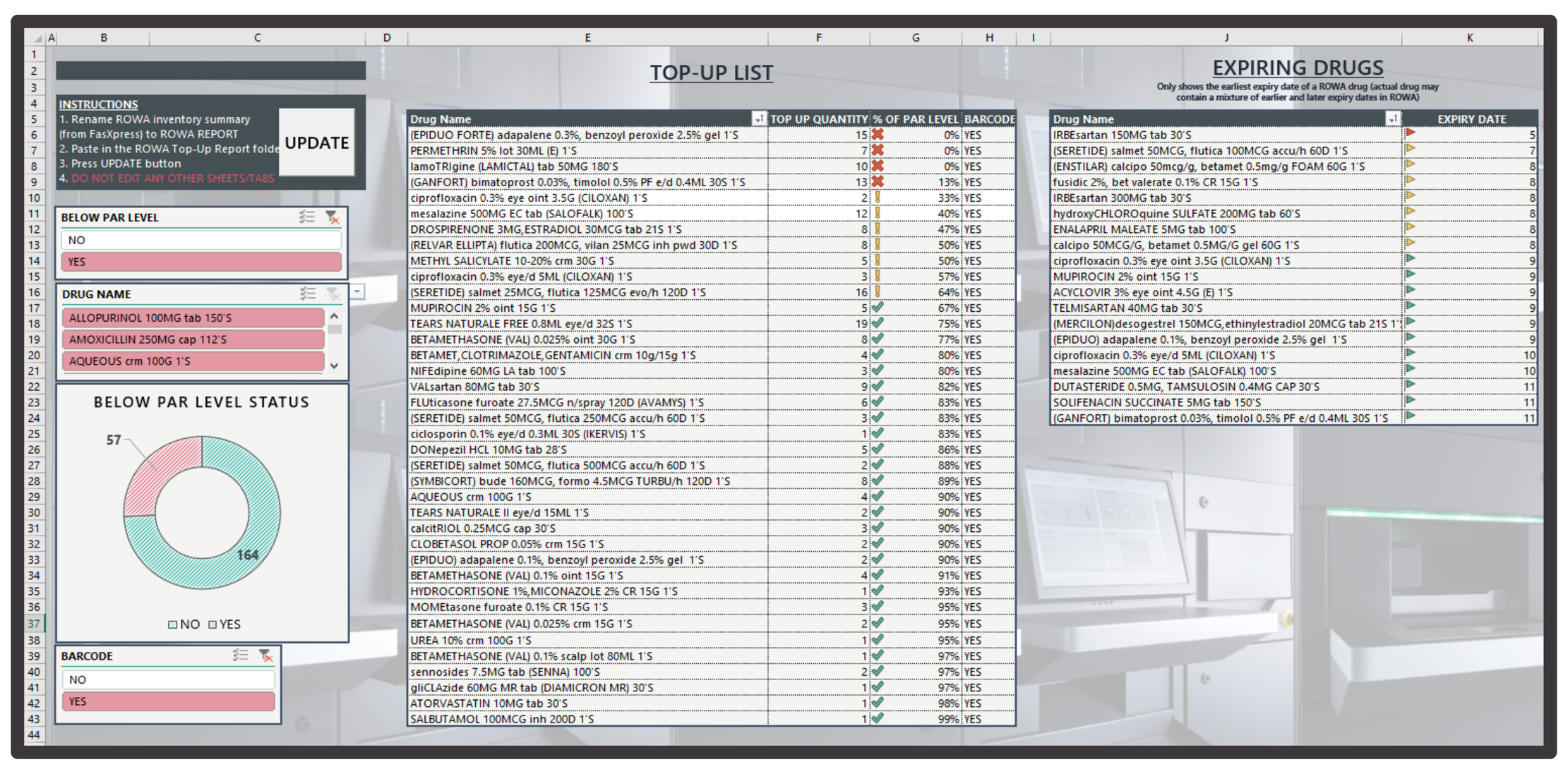
WORKFORCE TRANSFORMATION

Training of pharmacy users with future-ready skills such as RPA, data visualisation, and project management skills.

Retained as many aspects of production as possible within the department, from OPAS medication repackaging, to software development, which required training of staff to serve as domain experts.

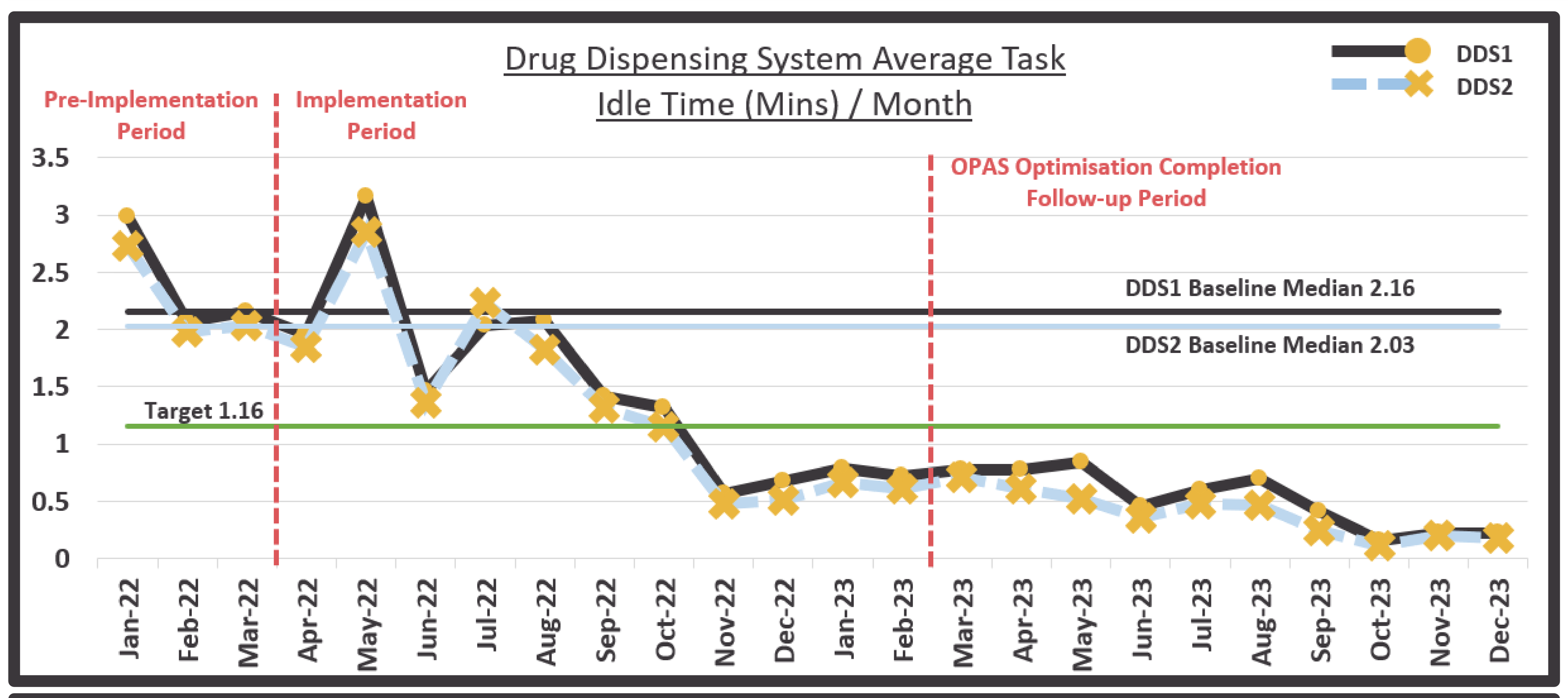
[3] OUTCOMES

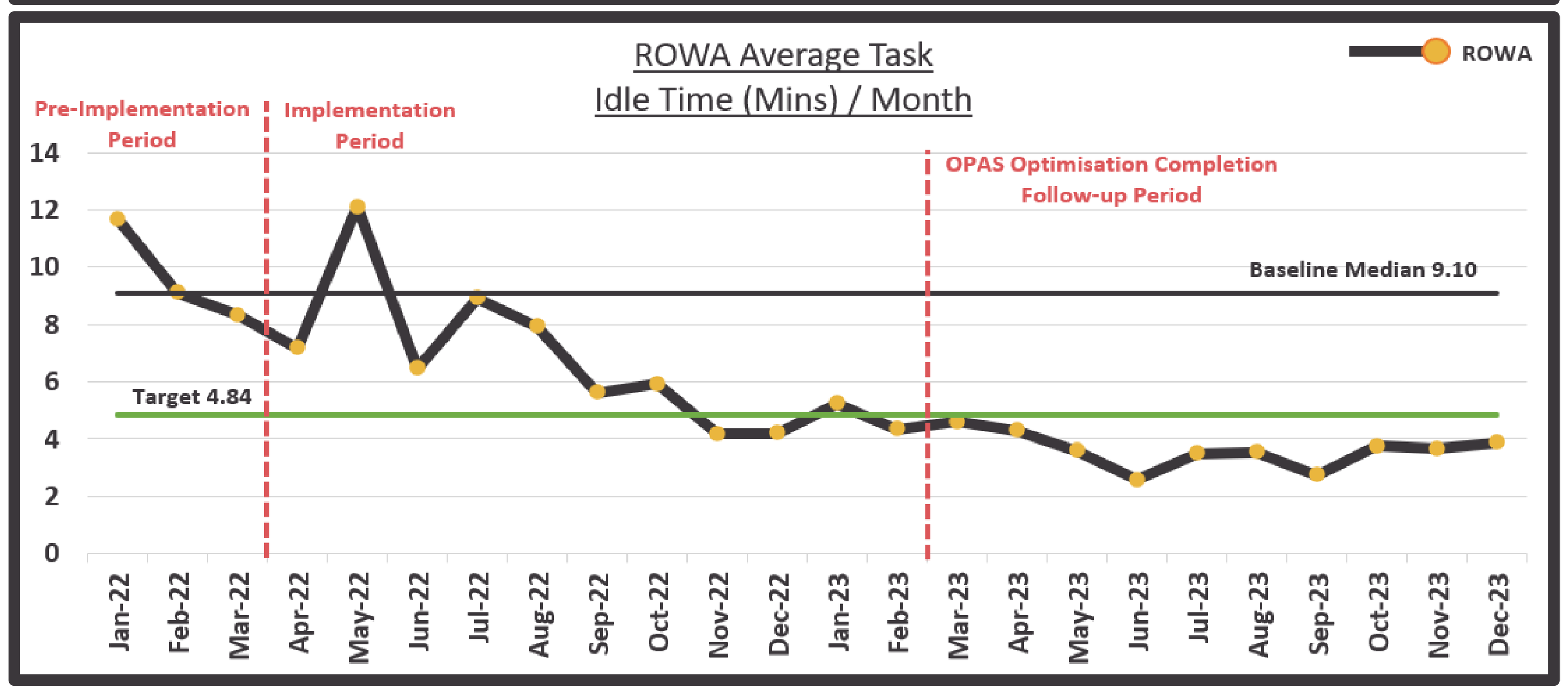




BUSINESS INTELLIGENCE

Transformation of medication inventory data using data visualisation dashboards (developed in-house) The transformed data are highly communicative and reduce inter-individual variability, allowing for greater **ACCURACY** and **CONSISTENCY** in medication inventory management.





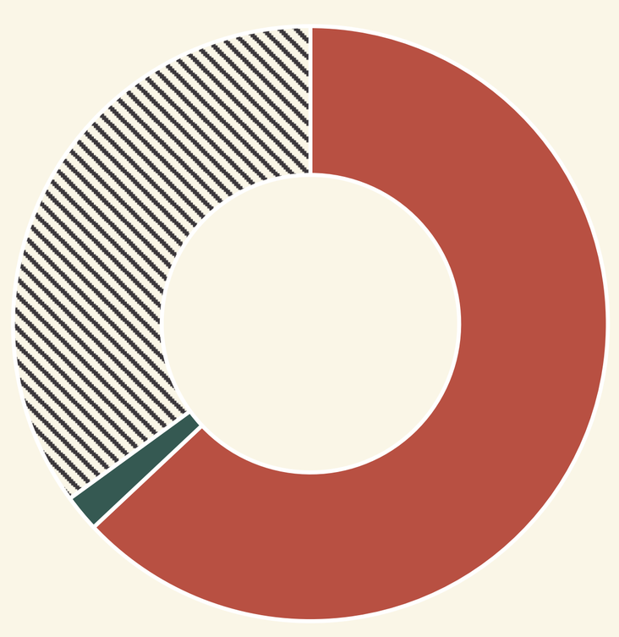
EFFICIENCY GAINS

Sustained reduction in the average machine idle time

PRE	2.4 Minutes	
POST		**92%** reduction for OPAS DDS machine
PRE	9.7 Minutes	
POST	3.75 Minutes	**61%** reduction for OPAS ROWA machine

5.5% ⬆ in patient load (n = 651)*

2% improvement in queue time for patients who waited < 30 minutes*



*Comparing between the average monthly patient load for 2022 and 2023

SAFETY FIRST

0 OPAS-related medication errors (more than 330,000 medications packed over 2 years)

THE TEAM

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Ng Teng Fong General Hospital

Jurong Community Hospital

UPSKILLING

Pharmacy assistants who were previously performing low-value manual work are now upskilled to independently handle complex automation and IT-related tasks

TIME-SAVINGS

Preliminary RPA processes generated 585h of annual time savings in terms of manpower