LEVERAGING ROBOTIC PROCESS AUTOMATION TO IMPROVE WORKPLACE EFFICIENCY THROUGH IDENTIFICATION OF DUPLICATE SCANS

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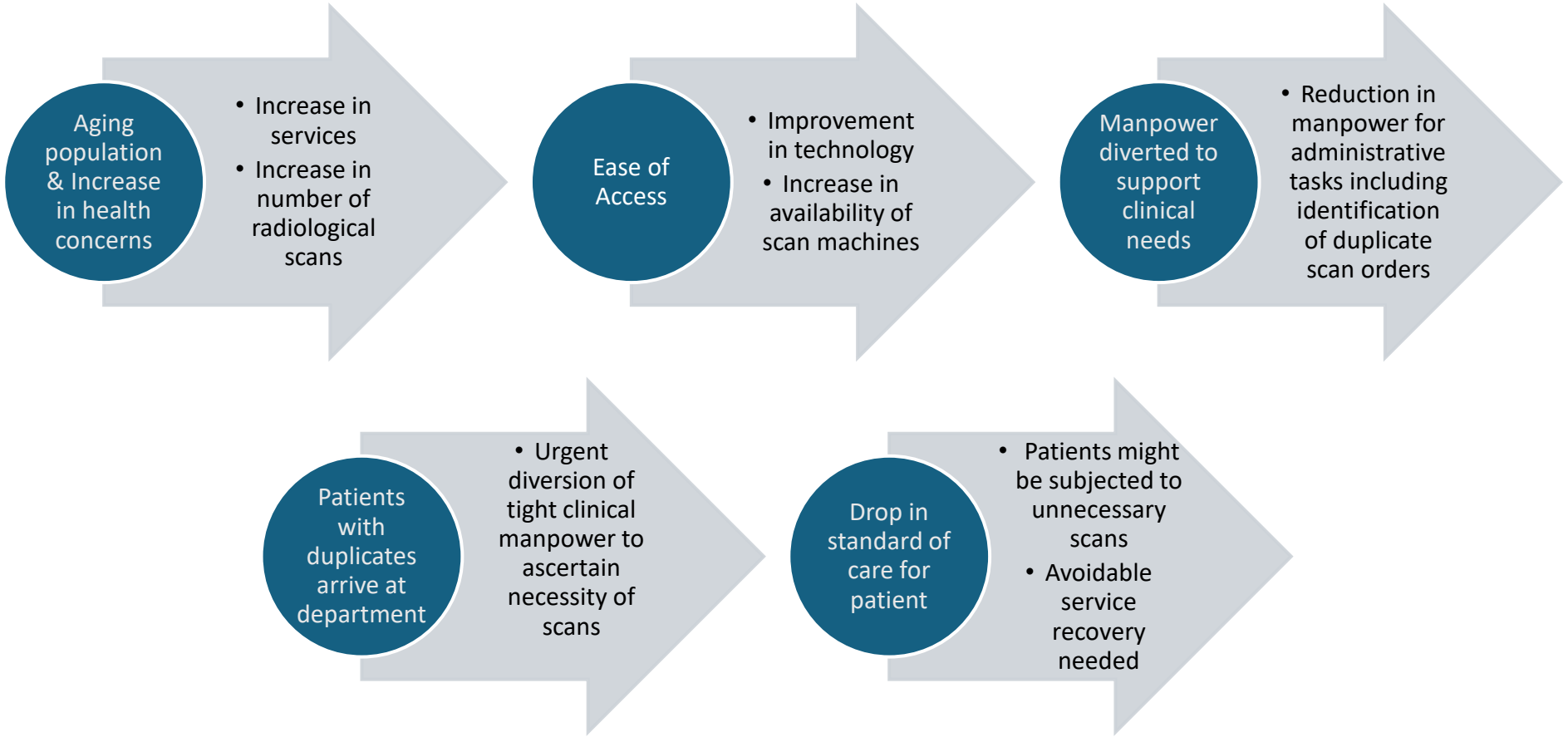
Background


Aging population & Increase in health concerns
• Increase in services
• Increase in number of radiological scans
Ease of Access
• Improvement in technology
• Increase in availability of scan machines
Manpower diverted to support clinical needs
• Reduction in manpower for administrative tasks including identification of duplicate scan orders
Patients with duplicates arrive at department
• Urgent diversion of tight clinical manpower to ascertain necessity of scans
Drop in standard of care for patient
• Patients might be subjected to unnecessary scans
• Avoidable service recovery needed

Methodology and Choice

- Computed Tomography (CT) scan orders were selected for initial analysis.
  - Duplicates = unnecessary radiation to patient
- 41 020 CT scans were performed in Year 2022. 407 scans (performed and unperformed) were identified as duplicates.
- Plan-Do-Study-Act (PDSA) cycle was introduced.
  - In-service talks were held for clinicians to emphasise on the importance of ordering radiological scans appropriately and cancelling unrequired scan orders.
- PDSA cycle was unsuccessful.
  - Monthly average number of duplicate scan orders remained consistent.
  - Frequent inter-hospital rotation of clinicians was identified as the cause.

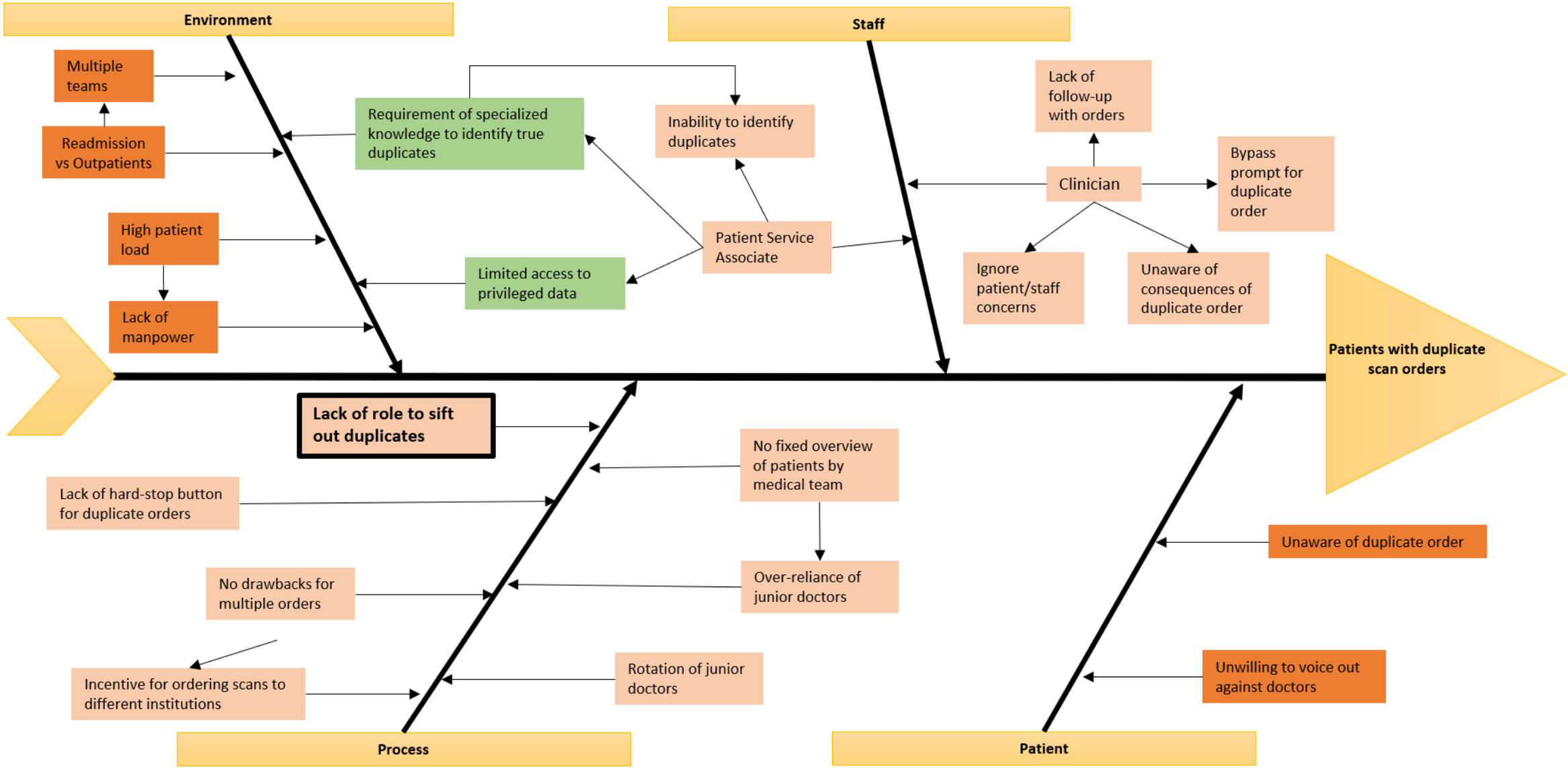


Figure 1.1: Root Cause Analysis for patients with duplicate scan orders

Methodology and Choice

- Figure 1.1 highlighted a lack of manpower to identify duplicate scan orders early.
- Workflow process was studied and refined.
- Robotic Process Automation (RPA) was deemed suitable to enhance workflow process, identifying duplicate scan orders.
- Figure 1.2 demonstrates the identification of duplicate scan orders with the use of RPA.

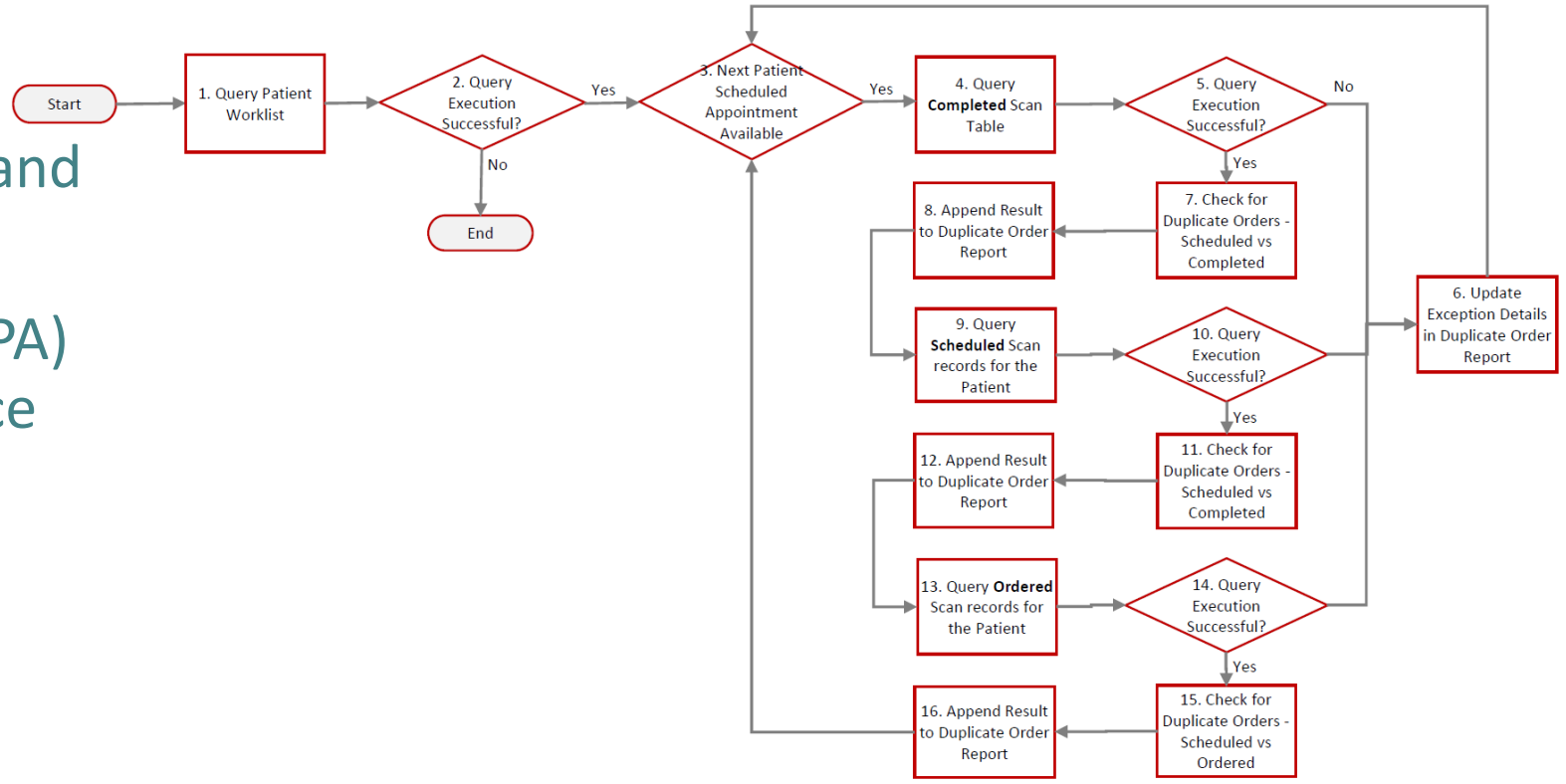


Figure 1.2: Workflow pathway for duplicate detection via Robot Process Automation

Results: Total no. of scans and duplicate flags (CT) in 3 months

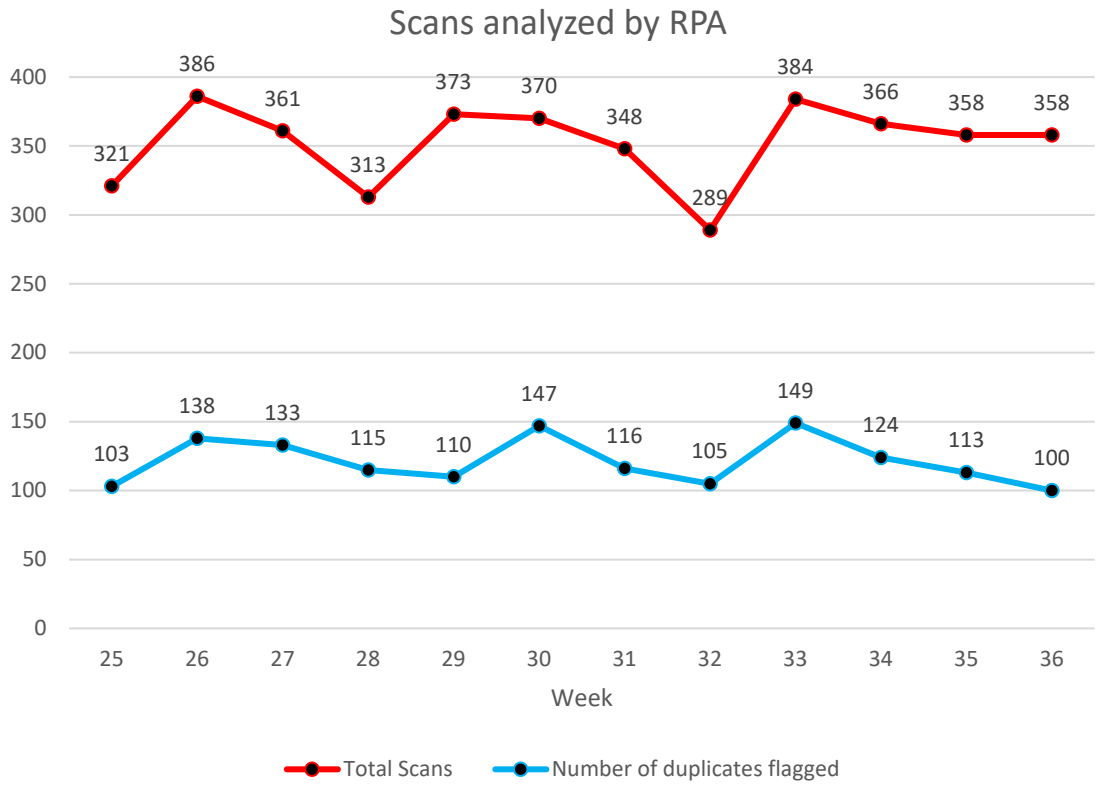


Table 1.1: Scans analyzed by RPA

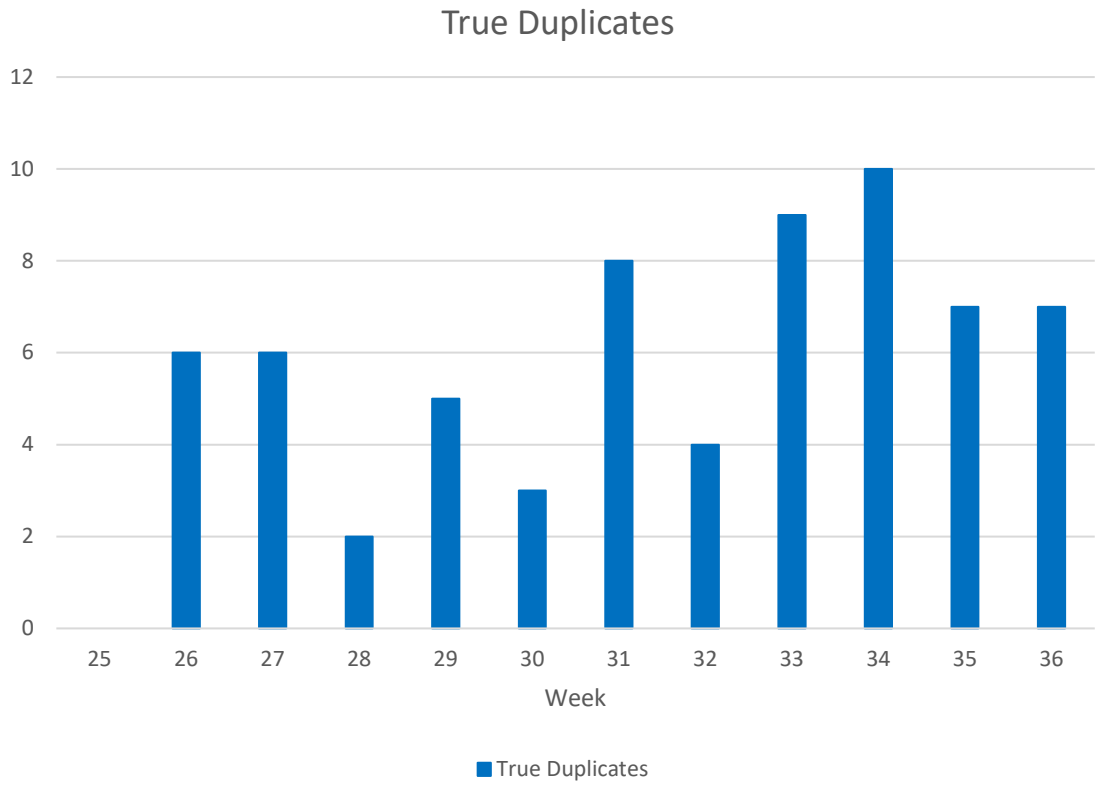


Table 1.2: Scans determined to be true duplicates after identification by radiographer

Results: Total no. of scans and duplicate flags (MRI) in 3 months

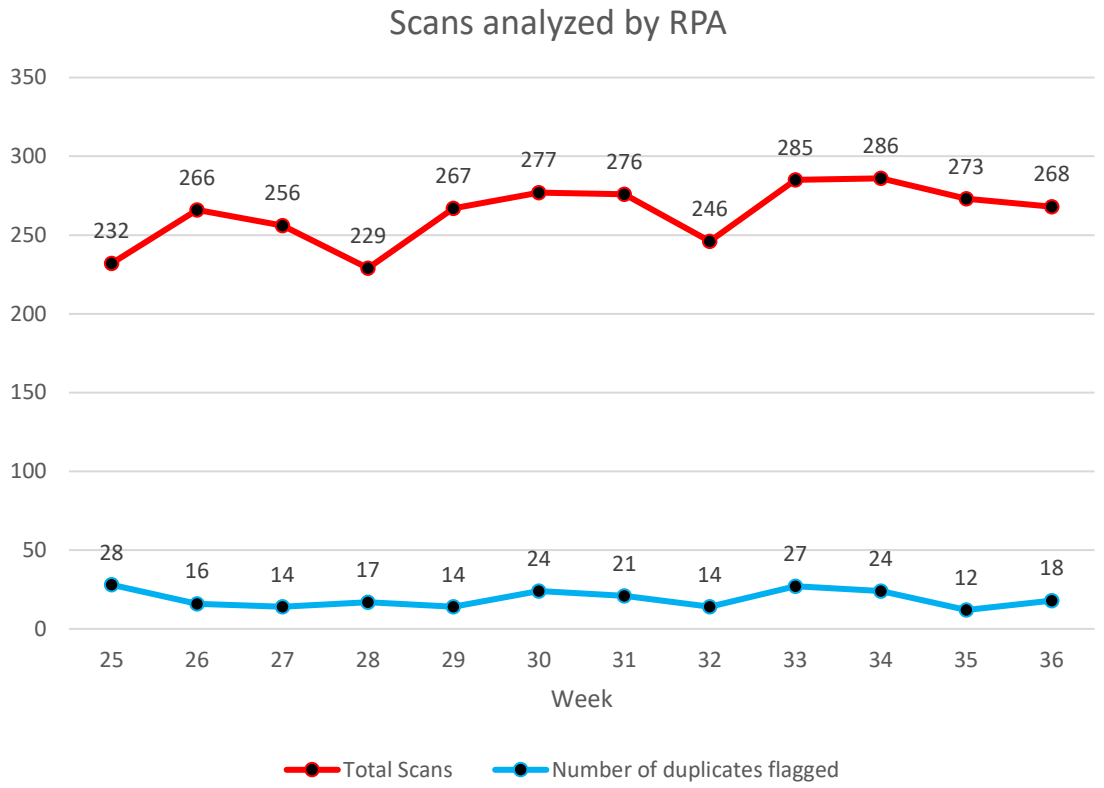


Table 2.1: Scans analyzed by RPA

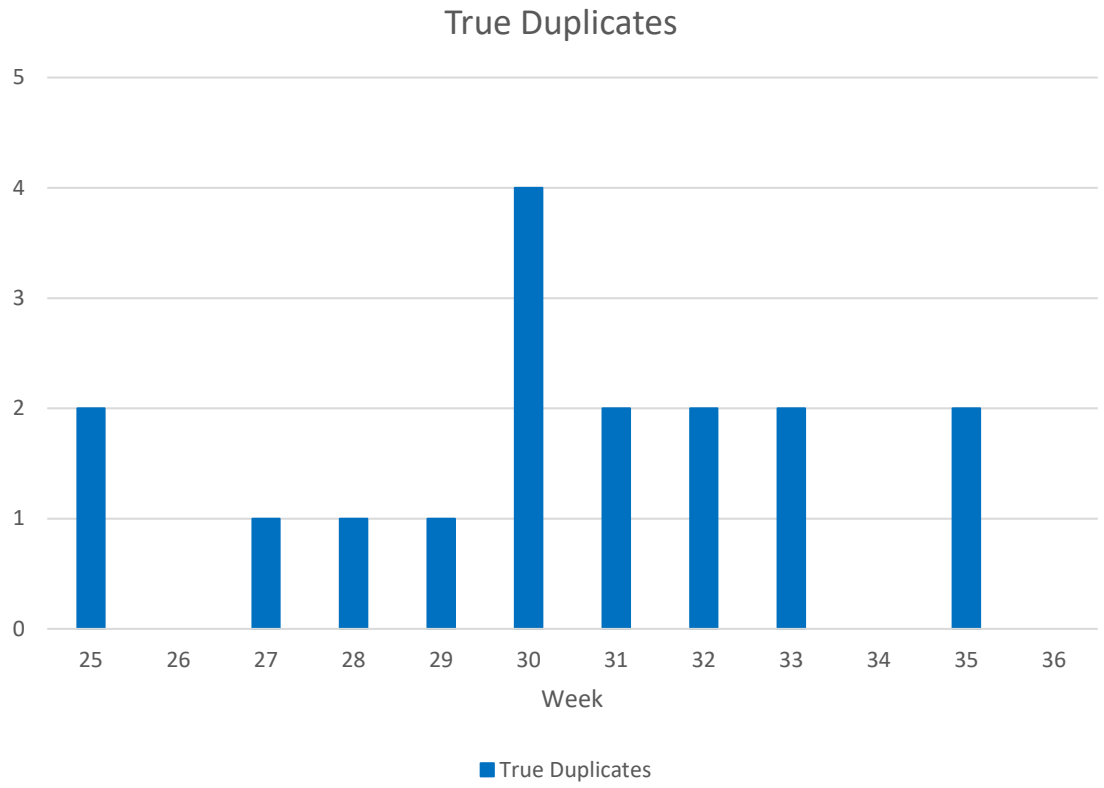


Table 2.2: Scans determined to be true duplicates after identification by radiographer

Discussion

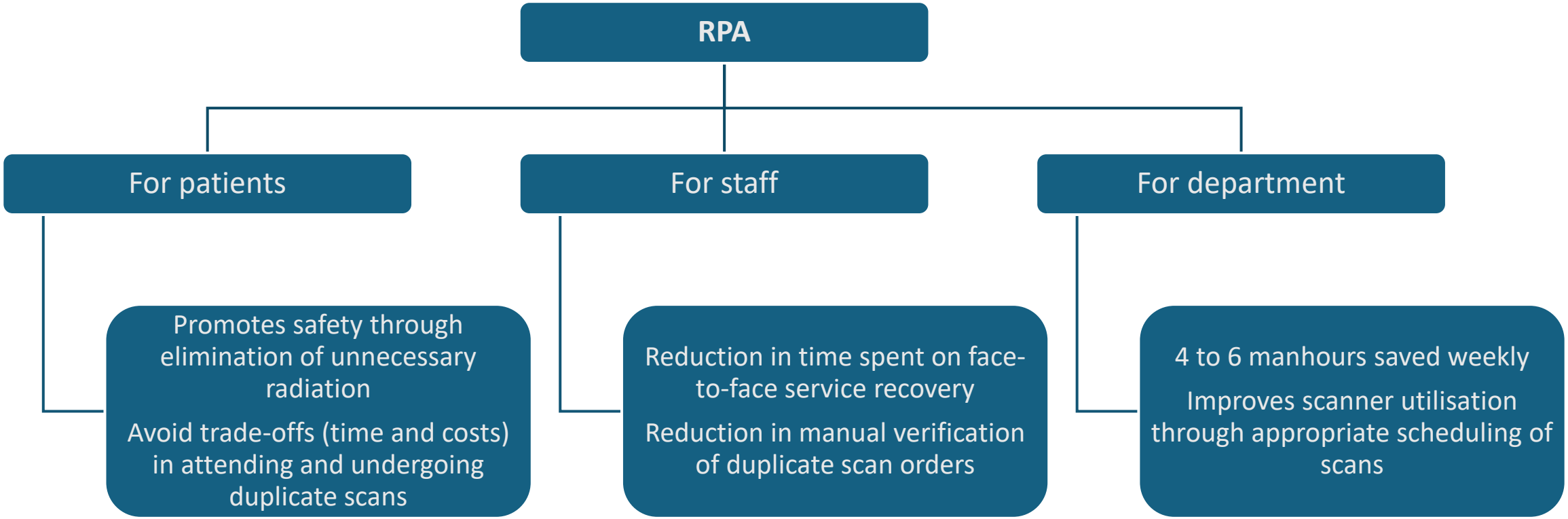
- RPA was expanded to identify duplicate Magnetic Resonance Imaging (MRI) scan orders.
- 3-month effectiveness study was conducted.
- Duplicates are presented in an easy-to-read Excel spreadsheet with all necessary clinical information.
- Number of duplicate CT scan orders flagged by RPA was relatively high.

	CT	MRI
Average weekly scan numbers	353	264
Average reduction in scans to verify	65.6%	92.7%
Average weekly duplicates flagged	121	19
Average true duplicates flagged by radiographers	6	2
Average time taken to look through RPA document	10 to 30 minutes	
Average time to look through weekly scheduled list (Assumption: 1 minute required to verify each scheduled scan)	353 minutes (approximately 6 manhours)	264 minutes (approximately 4 manhours)
Average weekly machine hours saved	1 hour	1 hour

Future Plans

Live in-built RPA model	• Integration of RPA within Radiology Information System (RIS) • Allows for usage of “live” data • One-step process to identify and remove duplicates
Additional RPA Functionality	• Run RPA on produced duplicate document to isolate various key factors to further reduce the number of duplicates radiographers have to verify • Flag out key identifiers and remove entries from duplicates list • Reduce amount of scan orders to verify
Standardised Ordering Guideline	• Reduce free text ordering for clinicians – ordering of certain scans based on various SNOMED ordering guidelines
Deep Learning AI	• Identify trends within scan ordering system such as common duplicate scan orders - pre-emptively flag out potential duplicates
Large Language Model AI	• Using keywords to identify duplicates through analysis of clinical information • Identify duplicates using order date and previous scan dates

Conclusion


RPA
For patients
For staff
For department
Promotes safety through elimination of unnecessary radiation
Avoid trade-offs (time and costs) in attending and undergoing duplicate scans
Reduction in time spent on face-to-face service recovery
Reduction in manual verification of duplicate scan orders
4 to 6 manhours saved weekly
Improves scanner utilisation through appropriate scheduling of scans