Moving Towards More Efficient And Safer Radiation Treatment Plan Processing

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Background

Division of Radiation Oncology operates in two locations (SGH & NCCS) concurrently, thus the radiation oncologists (ROs) have to commute from one site to another in order to approve the radiotherapy treatment plans.

The approval process includes (Figure 1):
1. Viewing the plan on the Eclipse Treatment Planning System (TPS)
2. Signing off on the printed paper plan (Figure 2)
3. Digital approval on the Record & Verify System (Mosaiq)

However, the manual entry of TPS's planning prescription on to the paper plan poses a problem when it is not prescribed as per planned prescription or with incomplete entries as well as illegible handwriting. These will cause a delay in plan checks which will also affect the timely delivery of the plans to Quality Improvement (QI) team which is benchmarked at 24 hours before treatment starts. Hence, this may compromise patients' safety as QI checks are conducted in a rush manner and thus, inducing stress on the dosimetrists (Dosi), physicists, QI and radiation therapists.
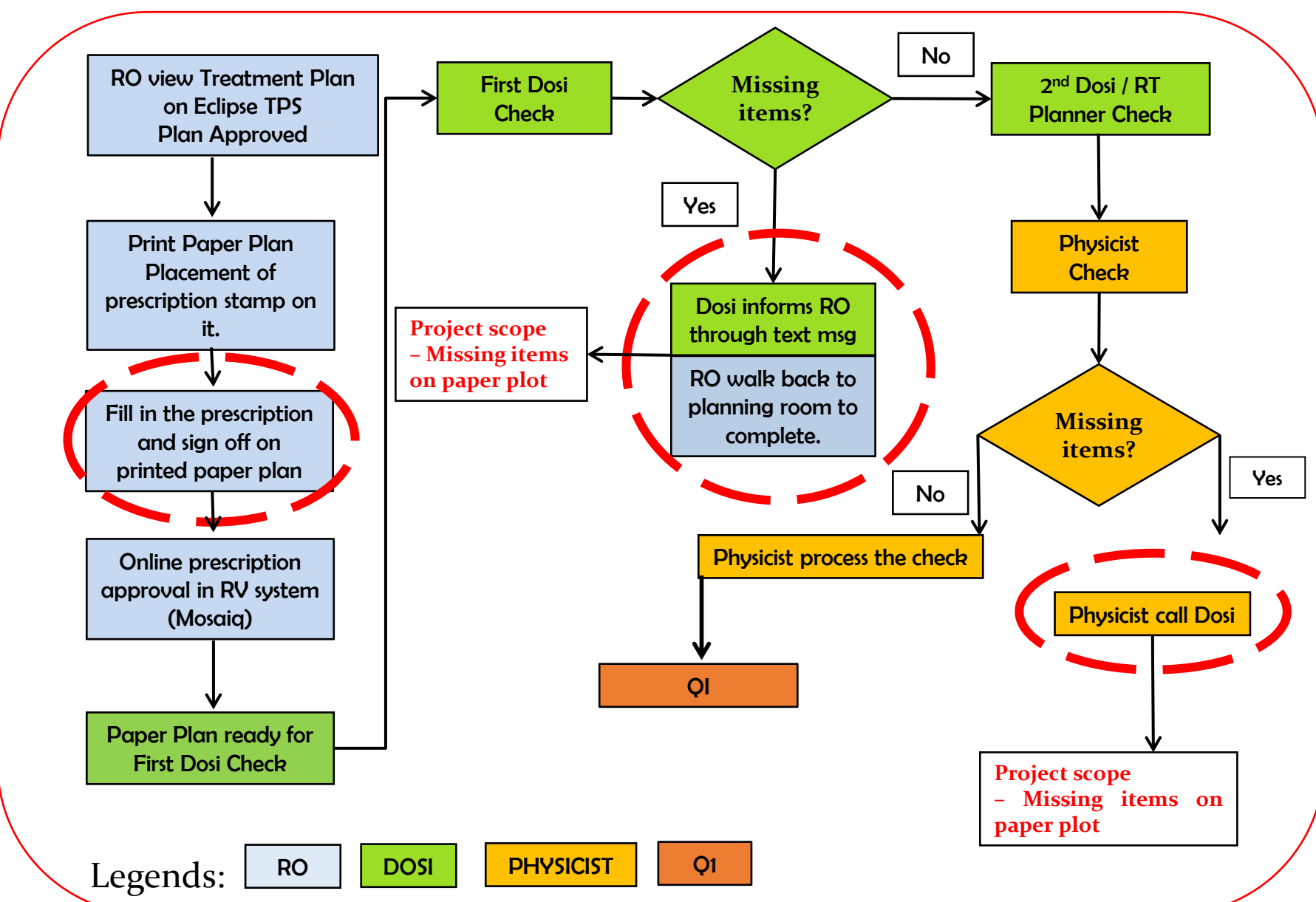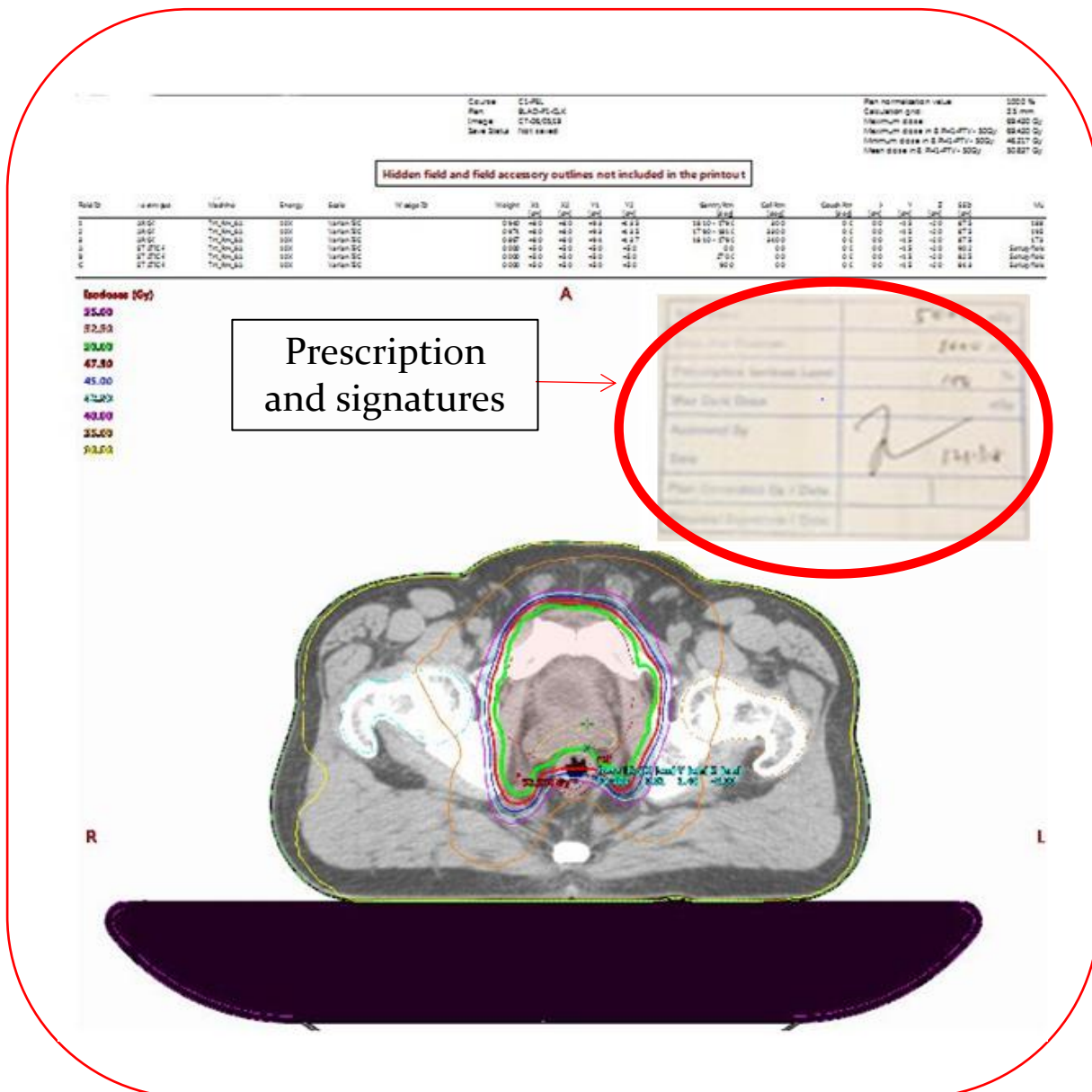

Figure 1: Plan approval & processing flowchart
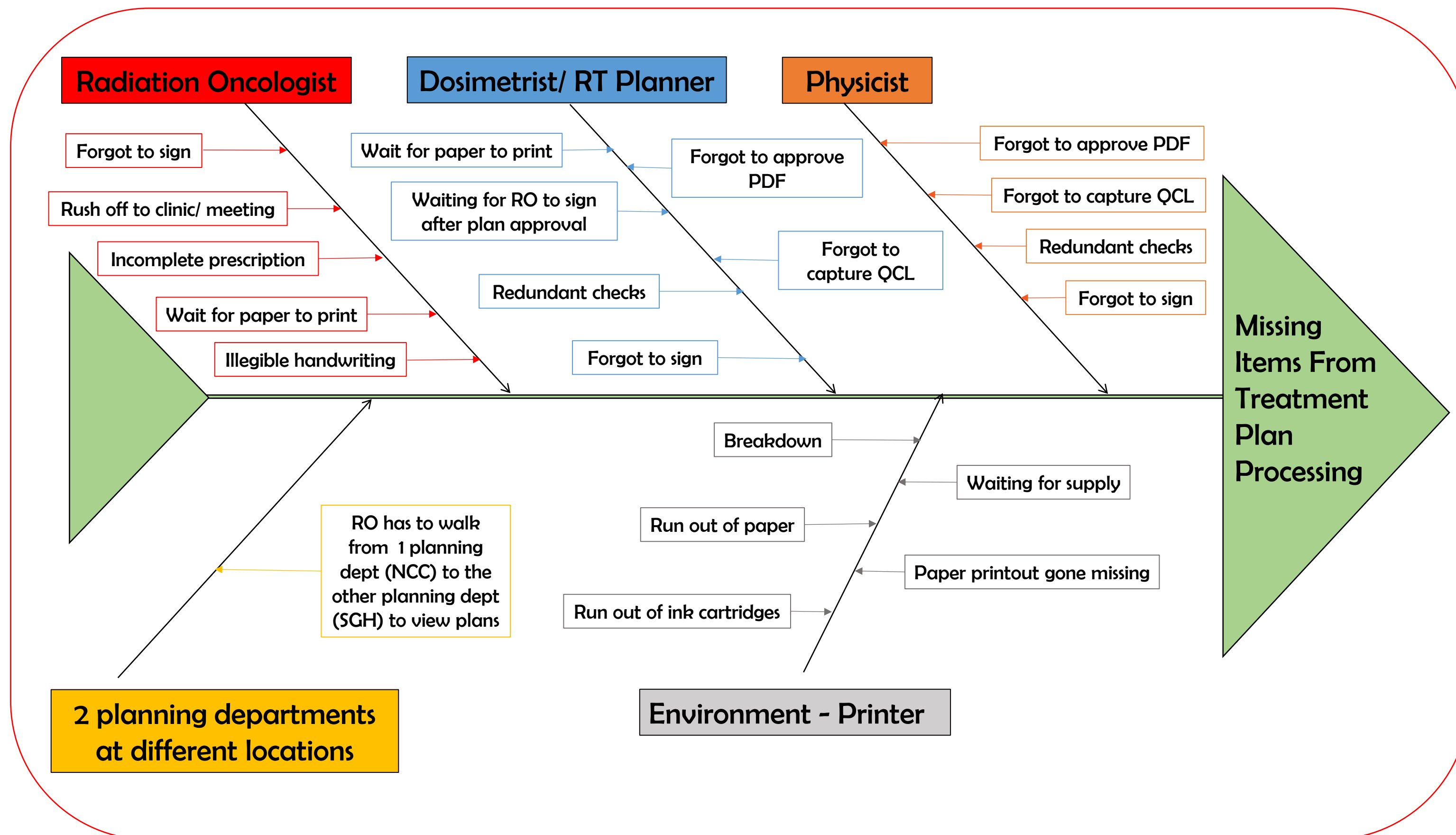

Figure 2: Treatment prescription on paper plot

Mission Statement

To reduce the rate of missing items encountered with radiotherapy treatment plan processing from 35% to 5% by planning team in 6 months.

This project is of great importance to:

- Maintain high level of radiation and patient safety.
- In alignment with the NCCS core service quality values: Safety comes first.
- Reduce redundancy in duplicating the treatment plan parameters on paper.
- Reduce redundancy check on paper, TPS and Mosaiq.
- Increase the efficiency and productivity of Planning section.
- Smoothen workflow and streamline processes.
- Increase staff job satisfaction.
- Saving cost on paper and ink cartridges.
- Reduce storage space and archiving for the paper print out.

Data Collection

Baseline data was collected weekly over a period of 8 weeks (Nov-Dec 2017) on problems encountered during treatment plan processing. The printed paper plan encountered an average of 35% of missing items weekly from the plan processing.
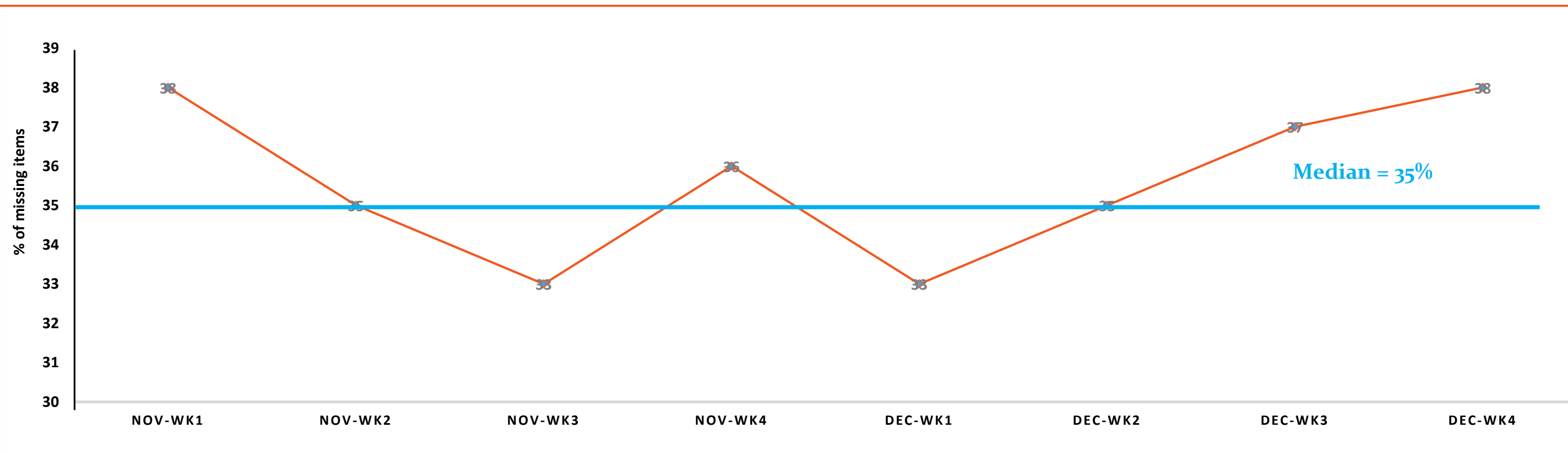

Chart 1: Baseline [% of Missing items during treatment plan processing (Nov-Dec-2017)]

The top three incidences of missing items were identified with reference to the usage of printed paper radiotherapy plans being the main contributor of the problems (Table 1).

Types of Missing items / incidences	RO	Dosi 1st	Dosi 2nd	Physicist	8 weeks	1 week
Missing signatures on paper plan	4	12	10	10	36	4.5
Incomplete / unmatched prescriptions on paper plan	28				28	3.5
Awaiting Dr to sign on paper plan (post plan approval)	24				24	3
Incomplete QCL capture in MOSAIQ		7	7	6	20	2.5
Incomplete PDF approval in MOSAIQ		8	6	6	20	2.5
Illegible handwriting	12				12	1.5
Total incidences					140	17.5
Total incidences per week [n=50] (%)						35%

Table 1: Type of missing items and incidences on treatment plan processing (Nov-Dec 2017)

Analysis

Figure 3: Ishikawa diagrams showing causes of missing items during the plan processing

Intervention

PDSA 1:
Dosi and physicists were briefed and familiarised with the new workflow. Dosi trained and guided the ROs on the approval process. Quick reference guide on the approval process was put up to facilitate learning and success of the project.

Prostate Volumetric Modulated Arc Therapy (VMAT) plans were selected to pilot the implementation of electronic approval, as this site was less complex and the ROs were more compliant to support the change. Physicist and IT updated the ROs' login and password in TPS and Mosaiq to facilitate the electronic approvals.

PDSA 2:
Implementation of electronic approval for Head and Neck VMAT plans.

PDSA 3:
Implementation of electronic approval for all VMAT plans.

PDSA 4:
Implementation of electronic approval for all conventional Three Dimensional plans.

Results

After PDSA 1 to 4, the percentage of missing items have reduced from 35% to 3% which had exceeded the plan goals.
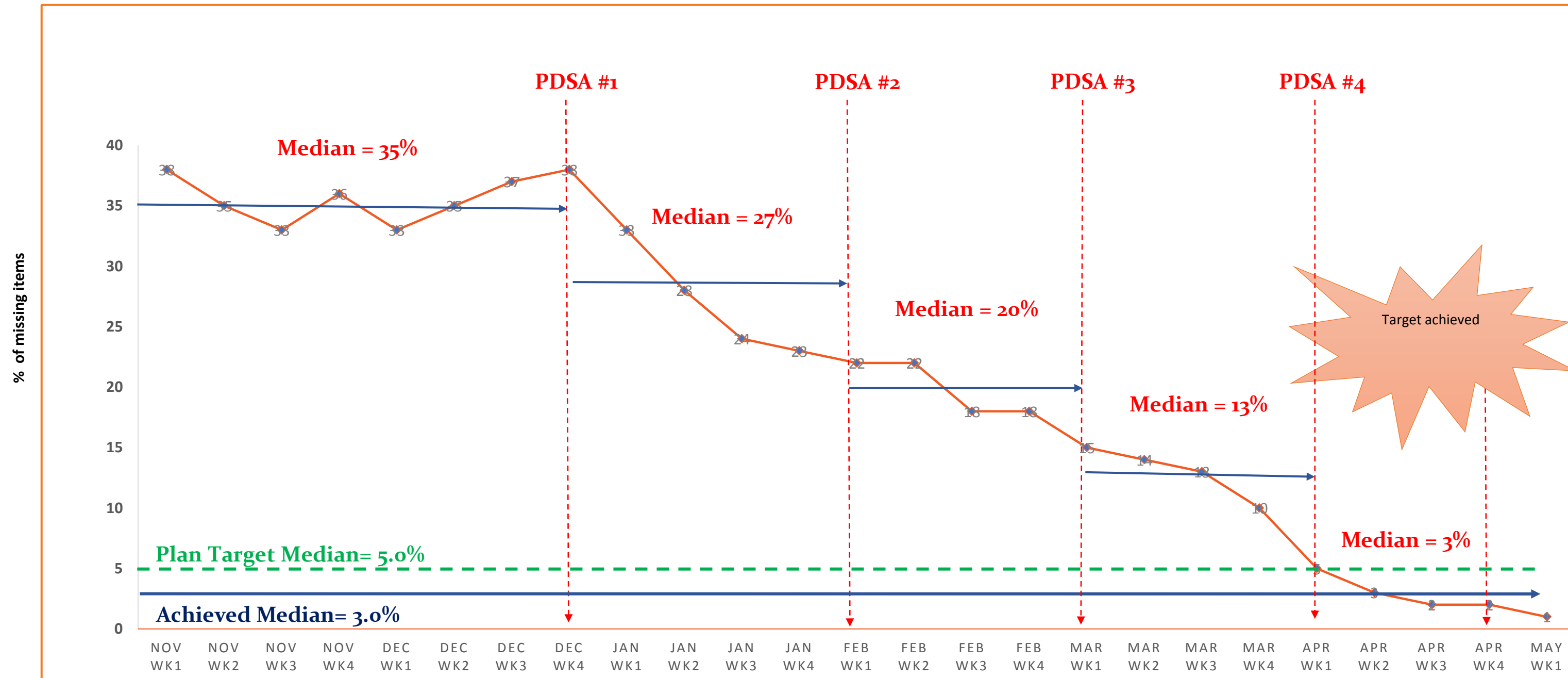

Chart 2: PDSA (1-4) - % of Missing items on treatment plan processing

Conclusions

With electronic approvals, staff was less stressed as plans were delivered timely to QI for safety checks and treatment preparation. This is due to the application of technology (electronic approval) to streamline work processes by cutting down the redundancy of the paper plan and improve ROs plan approval efficiency at any of the two locations.

In addition, this paperless interventions had improved job satisfaction and also resulted in a cost saving of about $22,200 per year on ink cartridges and paper.