

From incident learning to safer treatment planning: reducing incidents using automated plan checking

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Background

- Radiotherapy treatment planning is a complex multi-step process.
- Errors during planning can lead to workflow interruptions and treatment delays.
- Incident learning systems provide a mechanism for identifying recurring problems.
- Analysis of incident trends can guide targeted quality improvement initiatives.

Why automate?

- Many planning incidents arise from:
 - Naming inconsistencies
 - Incorrect machine selection
 - Laterality errors
 - Approval status issues
- These are potentially detectable before plan approval.

Aim

- To investigate whether introducing an automated plan checking script within the ARIA-Eclipse workflow reduced treatment planning incidents.

Objectives

1. Identify recurrent planning-related incidents.
2. Develop automated checks to target these issues.
3. Compare incident rates before and after implementation.

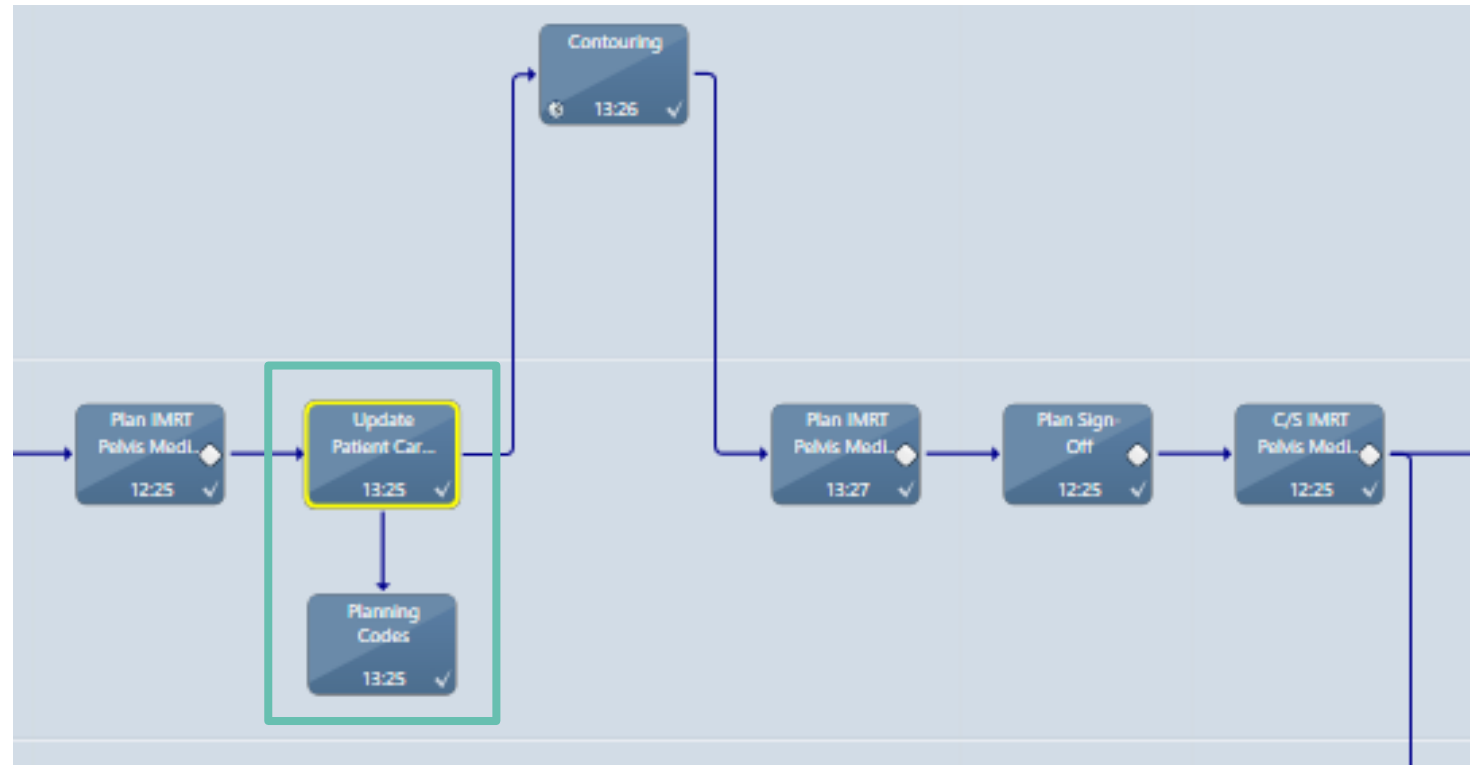
Methods: Incident Data

Data Source

- ARIA electronic Care Path tasks
 - Workflow pause
 - Plan modification
 - New tasks added

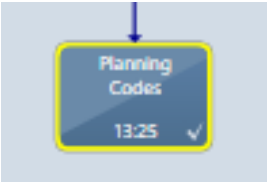
Methods: Incident Data

Data Source



Methods: Incident Data

Data Source



Additional Activity Attributes

RI: Replan due to inc... 11i: Target and O... 11i: Target and OAR delination 11m: Recording of definitive treatment prescription 11n: Recording of patient specific instructions	RQd: Replan due to ...	RQc: Replan due to ...	RPx: Replan due to P...	RAAd: Adaptive replan	Non-conformance n...
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Methods: Incident Data

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Classification System

- Towards Safer Radiotherapy taxonomy (2008)

Methods: Incident Data

- 11e Choice of data
- 11f Choice of dose and fractionation inputs
- 11g Availability of source data
- 11h Choice of technique
- 11i Target and organ at risk delineation
- 11j Generation of plan for approval (to include DVH etc as app.)
- 11k Authorisation of plan
- 11l Verification of plan/identification of responsible staff
- 11m Recording of definitive treatment prescription
- 11n Recording of patient-specific instructions

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Radiotherapy taxonomy
(2008)

Audit Scope

- Category 11: Pretreatment Planning Process
 - 11e
 - 11f
 - 11h
 - 11i
 - 11j
 - 11l
 - 11m
 - 11n

Methods: Incident Data

<u>11e</u>	<u>Choice of data</u>
11f	Choice of dose and fractionation inputs
11g	Availability of source data
<u>11h</u>	<u>Choice of technique</u>
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Intervention

August 2024

An in-house automated plan checking script (ESAPI) was introduced within Eclipse.

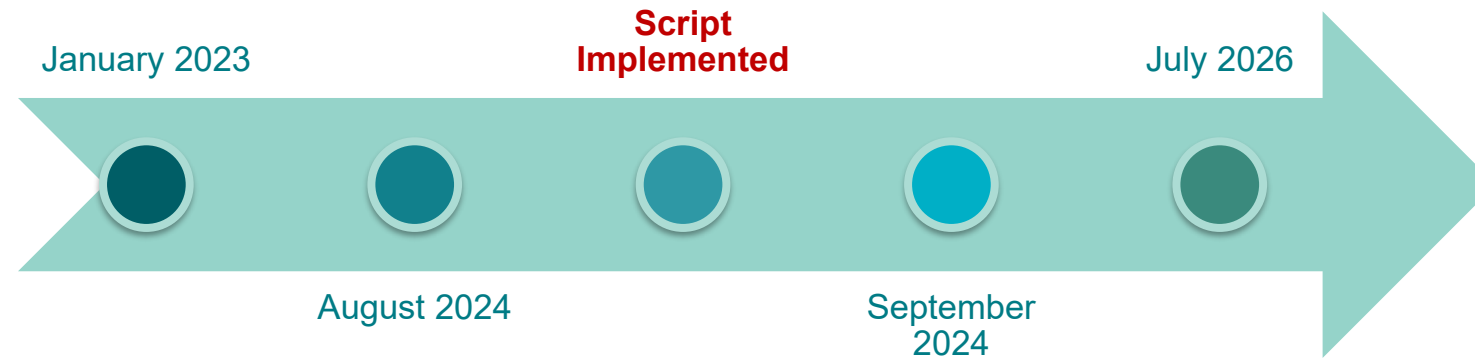
Example of Checks Performed

- Plan naming compliance
- Structure naming compliance
- Couch shifts
- Structure laterality
- Machine identification
- Approval status

Rationale

Checks were developed directly from recurring issues previously identified through the incident learning system.

Evaluation

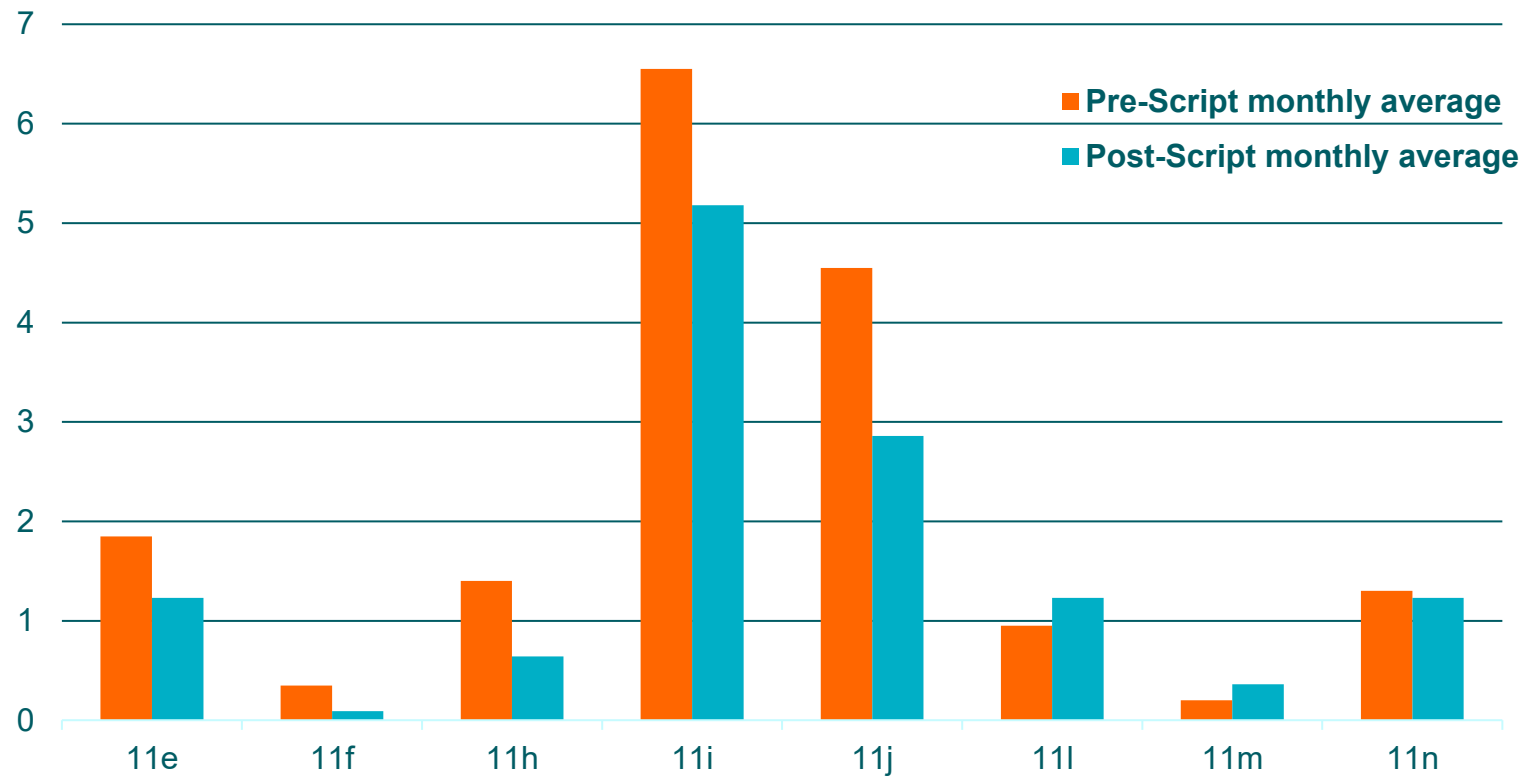


Outcome Measure: Mean number of planning incidents per month

Results

Period	Total Incidents	Mean Incidents/Month
Pre-implementation	343	17.2
Post-implementation	282	12.8

↓ **25.3% Reduction**



Conclusion and Discussion

- **Key Findings:**

- Automated script integration was associated with a measurable **25.3% reduction** in treatment planning incidents per month
- Integrating ESAPI tools into Eclipse improves consistency and safety
- Implementation of the Update Carepath task has enabled us to identify the most common incidents
- Because we report far more incidents now, the actual reduction in clinical errors is likely larger
- Some errors are caught and corrected prior to triggering a Care Path task, meaning further safety gains exist outside this dataset

- **Takeaway:**

- These findings demonstrate the power of closing the loop: using incident learning to inform targeted software automation for continuous quality improvement

PhotonPlanChecker v4.0.0.8

zzz_CSI_VMAT_Adult1 zzz_CSI_VMAT_Adult1 (zzz_CSI_VMAT_Adult1)

Course: ClinicalPlan Plan: 1 CSI BRAIN

Study ID: S Series ID: Series Structure Set ID: CSI 020925

7 fails



11 checks



17 passes



Script html template provided to UCLH by Christie NHS FT

7 fails	▲
☐ Imaging device and HU calibration curve No imaging device (HU calibration curve) has been selected for the CT series.	
☐ Plan Approval Status Plan is set to ExternallyApproved.	
☐ Course ID The Course ID is "ClinicalPlan" but should be an integer number.	
☐ Plan Normalization Plan is not normalized.	
☐ Couch Configuration Abnormal Couch Structure Configuration - Check couch structures.	
☐ Arc Name Check The format of the following arc(s) is incorrect: 1 BRAIN CW1, 1 BRAIN CCW1. The format should be e.g., "ARC1 CCW", "ARC2 CW", etc.	
☐ Prescription Check There is no linked RT Prescription for this plan.	
11 checks	▼
17 passes	▼

Script html template provided to UCLH by Christie NHS FT