CT Whitepaper

# INSTINX, an AI-assisted workflow for enhanced efficiency:

## Coronary CT angiography experience




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## Abstract

In 2023, Canon introduced the INSTINX platform, an AI-assisted, human-centred workflow for CT imaging designed to streamline scan planning, reduce operator workload, and improve procedural consistency.
This white paper presents a controlled experiment quantifying the impact of INSTINX on coronary CT angiography (CCTA) workflow efficiency compared with a conventional (non-AI-assisted) acquisition platform. Twelve Health and Care Professions Council (HCPC) registered diagnostic radiographers from the Royal Bournemouth Hospital (UK) acquired images of an anthropomorphic body phantom using a CCTA protocol on two different CT systems with different platforms (INSTINX, and non-AI-assisted). The time and operator-computer interactions required for full image acquisition were recorded. Results demonstrate a significant reduction in the mean (± std. dev.) total acquisition time (44% ± 8%) and operator interactions (34% ± 10%) when using INSTINX compared with a non-AI-assisted platform. Therefore, these findings suggest that INSTINX has significant potential to streamline CCTA acquisition workflow, potentially lowering the burden for patients and hospital staff and reducing overall costs through increased daily examination throughput.

## Introduction

To ensure optimal diagnostic quality and patient throughput, CCTA requires precise patient preparation, accurate scan planning, and consistent execution [1,2]. While conventional CT workflows rely heavily on manual operator input [3], Canon's INSTINX workflow integrates an intuititve interface design with advanced artificial intelligence (AI) to support operators throughout the acquisition process. Among the major differences with a conventional platform, INSTINX utilizes a three-dimensional (3D) helical localiser (3D Landmark Scan), acquired with silver filtration (SilverBeam filter), which removes low-energy photons from the x-ray spectrum to achieve ultra-low-dose capabilities [4]. This ultra-low-dose scan replaces the conventional pair of two-dimensional localizers and allows the planning to be performed on a full tomographic image. Leveraging the full anatomical information provided by tomographic imaging, an AI algorithm (Anatomical Landmark Detection [ALD]) automatically detects over 100 landmarks used to perform automated scan range and Field of View (FoV) selection.

The ALD algorithm (Figure 1) was trained on a dataset of 3D Landmark Scans that includes common anatomical and positional variations. Previous studies have shown that the ALD algorithm can reduce over-scanning while keeping the full anatomy of interest. This reduces radiation exposure and may potentially improve workflow consistency [4,5].

Thanks to these technological innovations, it has previously been demonstrated that INSTINX can reduce the overall acquisition time by up to 53% and the operator interactions by up to 45% across four different CT protocols (not including CCTA) routinely used in hospitals [6]. Building upon this recent evidence, the present study focuses specifically on the CCTA workflow, where accuracy and efficiency are particularly critical to meet the technically demanding standards of this diagnostic imaging test. This study aimed to quantify the impact of the INSTINX AI-assisted workflow on total acquisition time and operator interactions compared with a conventional non-AI-assisted acquisition platform during CCTA examinations.

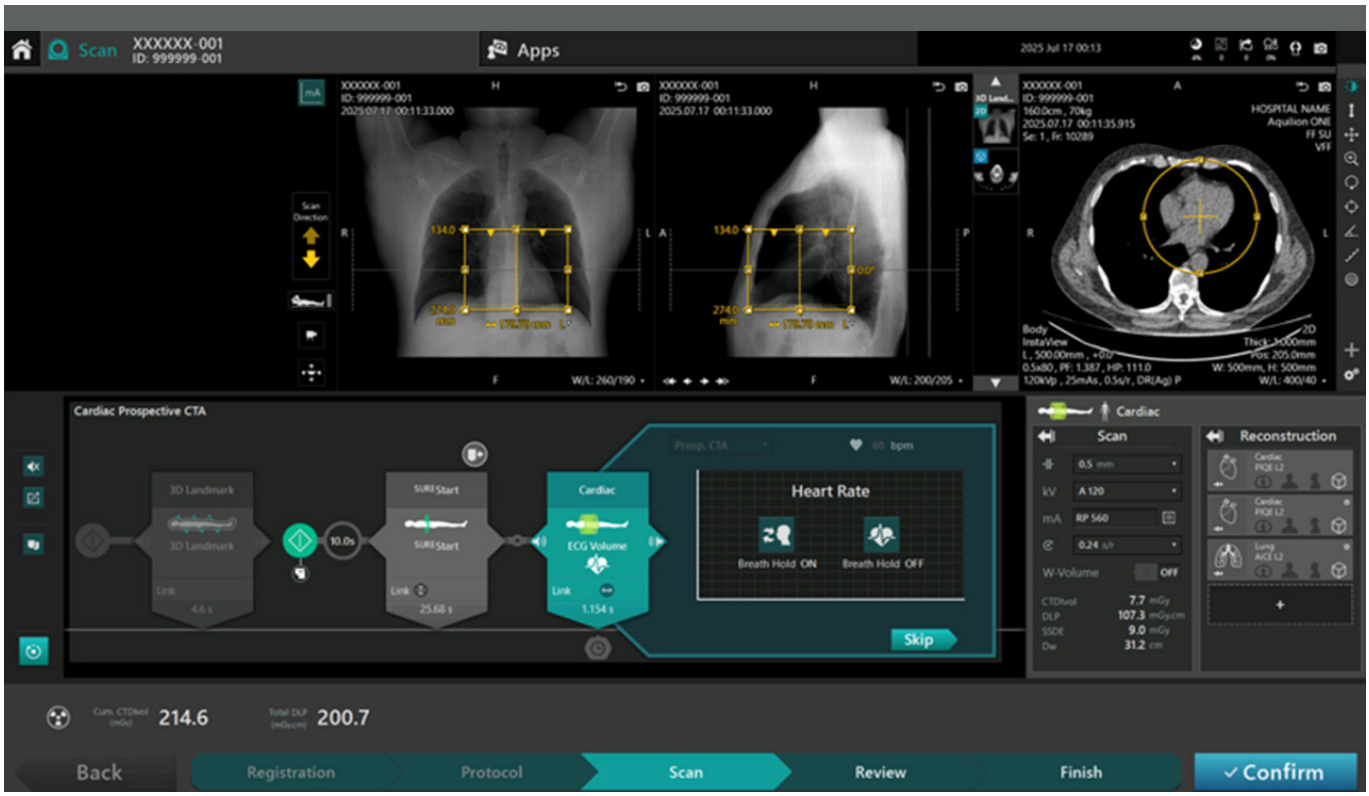


Figure 1. Anatomical Landmark Detection (ALD) planning on the INSTINX interface of a CCTA examination. The 3D Landmark Scan is shown in the box at the top right of the screen with a generated anteroposterior and lateral image shown in the boxes to the left. The scan range and field of view calculated by the ALD are shown in yellow.

## Methods

The study was conducted at the Royal Bournemouth Hospital (Dorset, UK). The site installed the first INSTINX-equipped CT system in the UK in 2023 and had over two years of operational experience at the time of the study. Two CT systems were evaluated during this study: the Aquilion ONE / GENESIS Edition, with a conventional, non-AI-assisted platform (A Series, V.8.9) and the Aquilion ONE / INSIGHT Edition, with an AI-assisted platform (INSTINX, V1.7).

An anthropomorphic CT torso phantom (Kyoto Kagaku CTU 41) was used for all acquisitions. An ECG simulator was configured at 65 BPM to standardize cardiac motion.

Twelve HCPC-registered diagnostic radiographers performed the CCTA examinations separately, using the phantom on both systems. Each radiographer was asked to repeat the protocol three times to limit potential biases derived from single measurements. Radiographers were instructed to execute the protocol as they would in routine clinical practice. Although contrast is typically administered clinically, no contrast was able to be used given the nature of this phantom study. Therefore, radiographers were instructed to perform bolus tracking and to manually advance the workflow after one tube rotation. All sessions were video recorded, capturing the full operator interface and control panel. From each recording, timings and operator interactions were extracted, and the average values, per radiographer, across the three acquisitions were used.

The two primary variables analyzed were the total acquisition time (from protocol selection to the end of the image review) and the number of operator interactions required to complete the scan protocol. An operator interaction was defined as any deliberate action required to initiate or modify a function. Examples include a mouse click to drag and drop a protocol, a hard button press to initiate an exposure, a mouse click and move to set up the top or bottom of the scan range, or a mouse move and click to close an instruction box.

The secondary variables were subsets of the total acquisition time and included the time taken for protocol selection, localizer acquisition, scan range and FoV planning, image acquisition, and image review.

The normality of each variable's distribution was assessed using the one-sample Kolmogorov–Smirnov test. As no variable followed a normal distribution, the Mann–Whitney U test was used to compare all variable distributions between the two platforms. P values were adjusted for multiple comparisons with the Bonferroni method (correction factor: 7). Differences in variables between the two platforms were expressed with mean percentage differences.

## Results

The total acquisition time and number of operator interactions are shown for both platforms and for each radiographer in Figures 2 and 3.

The total acquisition time was found to be significantly lower (P = 0.0003) on the INSTINX platform. The average (standard deviation) time reduction of INSTINX compared to the non-AI-assisted platform was 43.5% (7.6%). In absolute values, the median (range) total acquisition time decreased from 223.3 s (202.4 s - 250.2 s) (Non-AI-assisted platform) to 126.95 s (111.9 s -144.3 s) (INSTINX). Similar results were found for the number of operator interactions, which was also significantly lower (P = 0.0003) for the INSTINX platform, with an average (standard deviation) operator interactions reduction compared to the non-AI-assisted platform of 34.2% (10.3%). In absolute values, the median (range) total number of operator interactions decreased from 29 (26-35) (Non-AI-assisted platform) to 19 (18-22) (INSTINX).

Regarding the secondary variables, protocol selection, localiser acquisition, scan acquisition range and FoV selection, and image review times were all significantly lower on the INSTINX platform (P < 0.01). The difference in time for image acquisition was found to be similar between the two platforms (P = 1.9).

The full results for each variable are shown in Table 1.

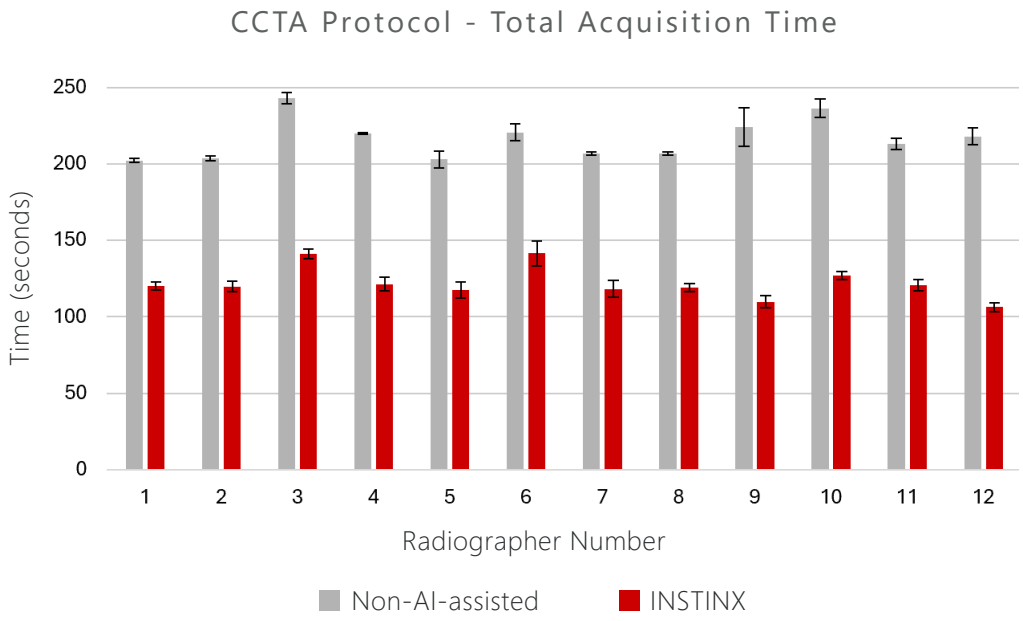


Figure 2. Cluster bar chart showing the average and standard error of the total scan acquisition time for each radiographer involved in this study, per platform.

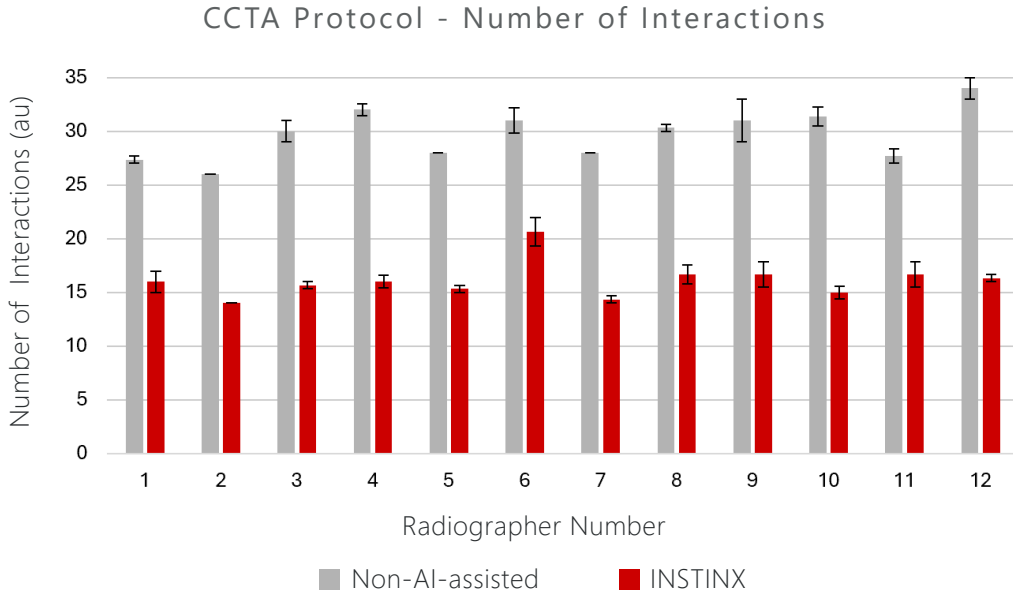


Figure 3. Cluster bar chart showing the average and standard error of the number of operator interactions for each radiographer involved in this study, per platform.

Table 1. Median value (for both platforms) for all the variables investigated in this study, their percentage differences between the two platforms, and the associated P values. All P values were adjusted for multiple comparison accounting for all the variables evaluated (correction factor: 7).

| | | Total acquisition [s] | Protocol selection [s] | Localiser acquisition [s] | Scan range and FoV [s] | Image acquisition [s] | Image review [s] | Operator Interactions [au] |
|---|---|---|---|---|---|---|---|---|
| Coronary CT Angiography Protocol | Non-AI-assisted: Median [range] | 223.3 [202.4, 250.2] | 19.0 [13.6, 20.4] | 31.9 [29.1, 35.2] | 110.4 [100.7, 146.2] | 10.1 [9.0, 11.4] | 44.0 [39.0, 49.4] | 29 [26, 35] |
| | INSTINX: median [range] | 126.95 [111.9, 144.3] | 14.25 [12.2, 17.3] | 9.85 [8.2, 11.2] | 74.9 [61.6, 86.8] | 9.5 [8.0, 11.1] | 18.7 [14.2, 24.2] | 19.5 [18, 22] |
| | Percentage difference: mean (st. dev.) | 43.5% (7.6%) | 21.2% (9.2%) | 68.2% (4.5%) | 38.8% (16.5%) | 10.6% (6.5%) | 54.9% (9.9%) | 34.2% (10.3%) |
| | P value (adjusted) | 0.0003 | 0.006 | 0.0003 | 0.0003 | 1.89 | 0.0003 | 0.0003 |

## Conclusion

This study demonstrates that the INSTINX AI-assisted platform significantly improves the efficiency of CCTA examinations by reducing both the scan acquisition time and the number of required operator interactions. The greatest time savings were observed in tasks that traditionally depend on manual input, including localiser acquisition, scan range definition, and FoV optimization. Together, these improvements highlight the substantial impact of INSTINX on the overall workflow performance.

These findings are consistent with our previous work evaluating four routine CT protocols (non-contrast chest, non-contrast brain, portal venous phase abdomen & pelvis, and arterial chest and portal venous phase abdomen & pelvis), which similarly demonstrated substantial and significant reductions in acquisition time and operator workload [6]. This indicates that the efficiency gains associated with INSTINX are unlikely to be protocol-specific and instead likely reflect a broader, generalizable enhancement of CT workflow.

Furthermore, prior investigations of 3D landmark–based scanning have demonstrated reductions in over-range acquisition, contributing to lower patient dose and greater consistency in scan planning [4,5,7]. Collectively, improvements in workflow efficiency, dose optimization, and planning reproducibility have important downstream benefits for both staff and patients, particularly through simplification of operator tasks. In line with this, the reduction in operator interactions observed with INSTINX suggests a simplified workflow and lower cognitive demand, which may, in turn, facilitate faster training and adoption among new staff. Further research should explore this potential benefit of AI-enhanced acquisition.

In conclusion, the INSTINX platform achieved significant reductions in overall acquisition time and operator input. With confirmation in future multicentre investigations with large patient cohorts, these improvements may translate into meaningful real-world gains in radiographer workload reduction, efficiency, and departmental throughput.

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