



Association of collimation training with radiation dose in adult chest radiography: a real-world retrospective before-and-after study

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PURPOSE

To evaluate changes in patient radiation dose following a targeted collimation training program for radiographers during routine adult chest radiography.

METHODS

This single-center retrospective before-and-after study included adult chest radiographs acquired on a single digital radiography system during two consecutive 3-month periods: pre-training (May–July 2025) and post-training (August–October 2025). A structured collimation training session emphasizing anatomical boundaries and the limitations of digital cropping was implemented on August 1, 2025. Dose area product (DAP) values were extracted from Digital Imaging and Communications in Medicine (DICOM) metadata. Group comparisons were performed using the Mann–Whitney U test and paired analysis using the Wilcoxon signed-rank test. Age-adjusted regression with robust standard errors was used to assess the independent association between the intervention and radiation dose.

RESULTS

A total of 3,583 adult chest radiographs (1,792 pre-training and 1,791 post-training) were analyzed. The DAP values demonstrated a markedly non-normal, positively skewed distribution in both periods. Median DAP decreased from 143.7 to 130.3 mGy-cm, representing a 9.3% reduction ($P < 0.001$). Mean DAP decreased from 173.0 ± 103.6 to 155.2 ± 98.2 mGy-cm. In the paired-patient analysis ($n = 64$), median DAP decreased from 139.8 to 128.9 mGy-cm, corresponding to a 7.8% reduction; however, this difference did not reach statistical significance on Wilcoxon signed-rank testing ($P = 0.059$). Following adjustment for age, examinations performed during the post-training period remained independently associated with an 11.7% lower DAP (95% confidence interval, 9.0%–14.4% lower; $P < 0.001$).

CONCLUSION

Targeted collimation training was associated with a significant reduction in radiation dose in chest radiography. Structured training represents a simple and effective strategy for dose optimization in routine clinical practice.

CLINICAL SIGNIFICANCE

In digital radiography, electronic cropping may mask inadequate collimation and lead to unrecognized unnecessary radiation exposure. Effective pre-exposure collimation, by limiting the irradiated field to the area of clinical interest, plays a key role in reducing patient dose and improving radiation safety in routine practice.

KEYWORDS

Chest radiography, dose area product, radiation protection, radiation dosage, quality improvement

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Chest radiography is one of the most commonly used imaging methods in daily radiology practice.^{1,2} Because of its low cost, rapid acquisition, and wide availability, it often serves as the first step in imaging algorithms across a broad range of clinical settings.³ Nevertheless, one of the basic principles of radiation safety in chest radiography is to irradiate only the anatomical region of interest and to appropriately restrict the X-ray field. This approach is consistent with the principle of “as low as reasonably achievable” (ALARA). Proper collimation not only reduces unnecessary radiation exposure to the patient but also improves image contrast and overall image quality by decreasing scattered radiation.⁴

Within this framework, according to the radiation protection principles of the International Commission on Radiological Protection (ICRP) and the International Atomic Energy Agency, optimization aims to achieve the required diagnostic image quality with the lowest reasonable radiation dose. Diagnostic reference levels (DRLs) are an important optimization tool used to monitor and improve radiation practices. As this was a single-center study, the reported dose metrics are considered facility-specific typical values rather than DRLs, in accordance with ICRP Publication 135.^{5,6} Although digital radiography enables post-acquisition image cropping, it cannot compensate for inadequate pre-exposure collimation. This may contribute to “collimation creep,” whereby unnecessarily large irradiation fields are exposed and later electronically cropped. Consequently, patients may be exposed to radiation outside the area of clinical interest, even though the excess field is not visible on the final image

stored in picture archiving and communication systems (PACSs).⁷⁻⁹

This problem may become more pronounced in high-volume centers. Workload, time pressure, large detector sizes, and the tolerance of digital systems may all facilitate neglect of pre-exposure collimation.⁷ Because the final image transferred to PACS reflects only the cropped field, improper collimation becomes less visible and may go unnoticed during routine reporting and quality-control processes. For this reason, monitoring collimation practices in digital radiography and evaluating targeted training interventions for radiographers are important.⁷⁻¹⁰ The aim of this study was to evaluate the effect of collimation training provided to radiographers on radiation doses. To this end, dose data obtained before and after the training period were compared. In addition, paired analyses in the same patients and age-adjusted models were used to examine whether the observed effect remained significant after accounting for these factors. Unlike previous studies that estimated avoidable radiation exposure by retrospectively measuring unnecessarily irradiated areas, this study evaluated the real-world impact of a structured educational intervention. We investigated whether targeted collimation training translated into measurable reductions in examination-level dose area product (DAP) during routine clinical practice.

Methods

Ethical considerations

The study protocol was approved by the Koç University Institutional Review Board (decision number: 2026.203.IRB2.113, approval date: April 7, 2026). The study was conducted in accordance with the principles of the Declaration of Helsinki. The requirement for informed consent was waived because of the retrospective design of the study and the use of anonymized data.

Study design and patient selection

This single-center retrospective before-and-after (quasi-experimental) study was designed to evaluate the effect of collimation training on radiation dose in chest radiography. All examinations were performed using the same digital radiography system (Siemens MULTIX Fusion, Siemens Healthineers, Erlangen, Germany), equipped with a flat-panel detector with an active area of approximately 35 × 43 cm.

Chest radiographs acquired during two consecutive periods were evaluated: the pre-training period (May–July 2025) and the post-training period (August–October 2025). Collimation training was provided to all radiographers working in the department on August 1, 2025.

All chest radiographs acquired on the specified device during the study periods were screened for eligibility. Adult (≥ 18 years of age) patients undergoing routine chest radiography were eligible for inclusion.

Supine radiographs and portable examinations were excluded because appropriate collimation is inherently more difficult in these settings and may introduce additional variability unrelated to routine radiographer practice. Combined radiographs sharing a single DAP value were excluded because the DAP attributable to the chest radiograph alone could not be evaluated independently. The median DAP values reported in this study are presented as facility-specific typical values. Examinations with missing DAP values were excluded from dose-based analyses. For the overall analysis, each follow-up examination from the same patient was counted as a separate examination. Additionally, patients who underwent chest radiography on the same device in both the pre-training and post-training periods were identified and included in paired subgroup analysis.

No formal sample size calculation was performed; all eligible examinations acquired on the study device during the predefined study periods were included. Figure 1 shows a flowchart that summarizes the process of selecting studies.

Imaging protocol and technical parameters

All examinations were performed using a standardized chest radiography protocol. A high tube voltage technique (110–125 kVp) was consistently used for all acquisitions. Automatic exposure control (AEC) was applied in all examinations.

A focused anti-scatter grid, optimized for long source-to-image distance, was used routinely during all chest radiographs. The grid type and focal distance were constant throughout the study period, ensuring consistency of scatter reduction and image contrast.

All radiographs were taken using the same detector, generator, and processing software. Moreover, the imaging protocols, hardware, and software were kept the same throughout the study.

Main points

- Digital radiography systems allow electronic cropping after acquisition, which may hide inadequate collimation and lead to unrecognized unnecessary radiation exposure in routine practice.
- Proper pre-exposure collimation limits the irradiated field to the area of clinical interest and plays a key role in reducing the patient radiation dose.
- In this study, improved collimation practices were associated with a measurable reduction in dose area product across a large number of chest radiographs.
- These findings highlight that optimizing collimation alone can contribute significantly to radiation safety without requiring changes in imaging equipment or protocols.

Collimation training

A structured collimation training session was delivered by an experienced thoracic radiologist and attended by all 18 radiography technologists who routinely performed adult chest radiography on the study system. The session focused on the importance of proper collimation in chest radiography, reviewed the recommended collimation boundaries, and discussed the main problems associated with digital cropping. During the training, radiographers were reminded that optimal collimation for chest radiography should extend approximately 5 cm above the shoulder joints superiorly, to the skin margins or acromioclavicular joints laterally, and to the inferior border of the 12th ribs or approximately 2.5–5 cm below the inferior costophrenic angles inferiorly. It was emphasized that post-acquisition electronic cropping does not replace proper pre-exposure collimation because it cannot undo unnecessary irradiation that has already occurred. The educational session also emphasized the preservation of visible collimation borders (“silver lining”) on the final radiograph as a simple vi-

sual quality-control indicator of appropriate pre-exposure collimation and to discourage reliance on post-processing digital cropping. Radiographers were also informed that unnecessarily wide irradiation may increase the radiation dose and reduce image quality by increasing scatter radiation (Figure 2).

Following implementation of the training program, feedback discussions were held with radiographers regarding practical application of the recommended collimation boundaries. Particular emphasis was placed on avoiding excessive collimation that could result in the exclusion of clinically relevant anatomy and unnecessary repeat examinations. Radiographers were advised to balance dose optimization with the maintenance of diagnostic image quality and to avoid overly restrictive collimation in patients with poor cooperation, limited inspiratory capacity, positioning difficulties, or complex clinical conditions.

Data collection

For each radiograph, patient age, sex, examination date, and DAP (mGy·cm) were

collected. DAP values were obtained from an integrated dose monitoring system (KermaX DAPmeter, IBA Dosimetry, Schwarzenbruck, Germany), which automatically records DAP values and stores them within the examination metadata, and extracted from Digital Imaging and Communications in Medicine (DICOM) metadata archived in the institutional Sectra PACS IDS7 version 26.2 (Sectra AB, Linköping, Sweden), which stores dose information transmitted automatically by the digital radiography system.

To verify protocol consistency across the study periods, technical parameters such as tube voltage and detector characteristics were extracted from the DICOM metadata.

Study outcomes

The main goal of the study was to compare the radiation dose, measured by DAP, between the pre-training and post-training periods. Secondary outcomes included a comparison of DAP values within the same patients who underwent examinations in both periods (paired analysis), evaluation of the relationship between patient age and radiation dose, and the potential modifying effect of age on dose reduction following collimation training.

Age-stratified analyses were performed because patient-related factors that may influence radiation dose, including body size, thoracic dimensions, cooperation, inspiratory effort, and positioning, may vary across age groups and potentially affect DAP values independently of collimation practice.

Statistical analysis

Statistical analyses were performed using appropriate statistical software. The continuous variables were summarized using either the mean ± standard deviation or the median with interquartile range (IQR), depending on their distribution. Categorical variables were presented as counts and percentages.

The Shapiro–Wilk test was used to assess the distribution of DAP values, and the results showed that the data did not follow a normal distribution. Accordingly, comparisons of DAP values between the pre-training and post-training periods for independent examinations were performed using the Mann–Whitney U test. For patients who had chest radiographs acquired in both periods, patient-level mean DAP values were compared using the Wilcoxon signed-rank test.

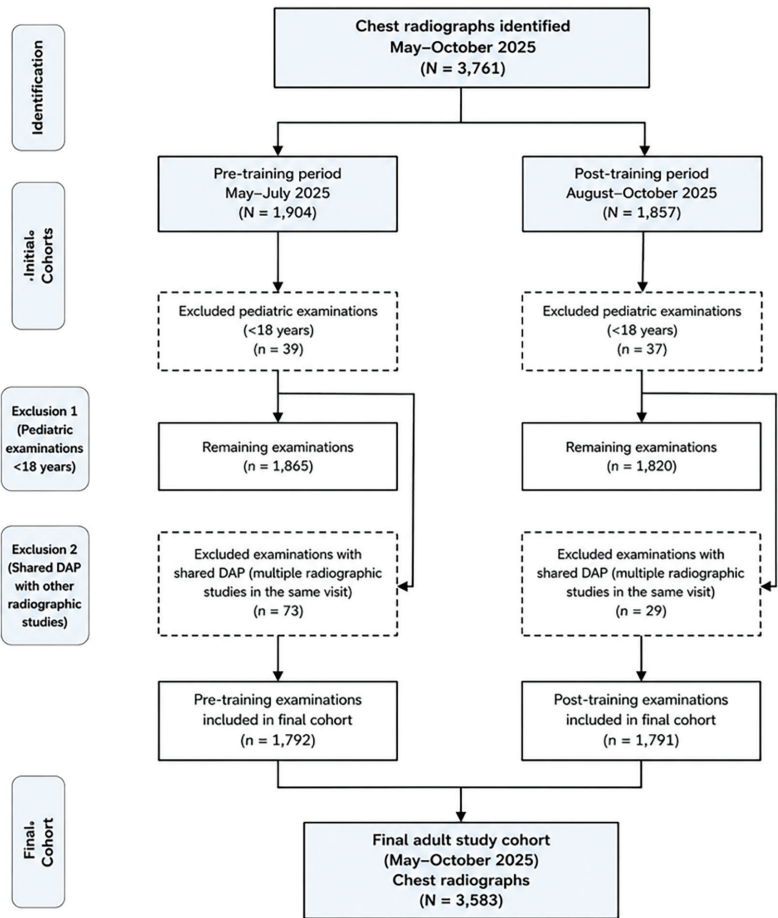


Figure 1. Flowchart of study selection. Examinations with shared dose area product values from simultaneous chest and other radiographic studies were excluded. DAP, dose area product.

Differences in sex distribution between the pre-training and post-training periods were evaluated using the chi-square test. In subgroup analyses based on the direction of dose change, age comparisons were performed using the Mann–Whitney U test because of the non-normal distribution of age within these subgroups. For age-stratified analyses, examinations were categorized into four predefined adult age groups: 18–39, 40–59, 60–79, and ≥ 80 years.

To account for the potential influence of age, a regression analysis was conducted using the log-transformed DAP values as the dependent variable. The study period (pre-training vs. post-training) was included as the primary independent variable, with age entered as a covariate. Because multiple examinations could be obtained from the same patient, intra-patient correlation was addressed by applying cluster-robust standard errors at the patient level. Regression coefficients were interpreted as percentage changes in DAP.

Model assumptions were assessed by the visual inspection of residual plots. Residual diagnostics did not demonstrate substantial violations of model assumptions.

Because the DAP values demonstrated substantial right skewness, effect estimation focused on non-parametric measures, including Hodges–Lehmann median differences and regression coefficients obtained from log-transformed DAP models. All statistical tests were two sided, and a P value < 0.05 was considered statistically significant.

Results

Study population

Between May and October 2025, a total of 3,761 chest radiographs were initially identified. Of these, 1,904 examinations were performed during the pre-training period (May–July 2025) and 1,857 during the post-training period (August–October 2025).

Pediatric examinations (< 18 years of age) were excluded because acquisition techniques and positioning may differ from those used in standardized adult chest radiography. Based on this criterion, 39 examinations from the pre-training period and 37 examinations from the post-training period were excluded.

To avoid contamination by examinations in which chest radiographs were obtained together with other radiographic studies and assigned a shared DAP value (e.g., abdominal radiography, vertebral radiography, or other multiple examinations performed during the same visit), 73 examinations from the pre-training period and 29 examinations from the post-training period were excluded.

After these exclusions, the final study cohort consisted of 3,583 chest radiographs, including 1,792 pre-training examinations and 1,791 post-training examinations. The mean age of the patients was 57.4 ± 17.7 years in the pre-training period and 56.1 ± 17.6 years in the post-training period. The median age was 61 years (IQR, 45–71) before training and 58 years (IQR, 43–70) after training (Table 1).

Sex distribution was comparable between periods, with no significant difference observed ($P = 0.452$) (Table 2).

Overall radiation dose comparison

DAP values demonstrated a non-normal, right-skewed distribution in both periods. Normality testing confirmed significant deviation from a Gaussian distribution in both groups (both $P < 0.001$). Therefore, median values and IQRs were considered the primary measures of central tendency. After collimation training, a significant decrease in radiation dose was observed. Median DAP values decreased from 143.7 to 130.3 mGy-cm, corresponding to a relative reduction of 9.3% ($P < 0.001$) (Figure 3). Mean DAP values decreased from 173.0 ± 103.6 to 155.2 ± 98.2 mGy-cm, representing a 10.3% reduction.

Upper-tail dose distribution

To determine how higher-dose radiographs were affected by the training intervention, upper percentiles of the DAP distribution were analyzed. Compared with the pre-training period, post-training values showed a marked decrease across the upper tail of the distribution. Specifically, DAP decreased from 195.6 to 182.8 mGy-cm at the 75th percentile, from 279.3 to 260.5 mGy-cm at the 90th percentile, and from 356.7 to 329.8 mGy-cm at the 95th percentile. These changes corresponded to relative reductions of 6.5%, 6.7%, and 7.5%, respectively. The findings indicate that a dose reduction after training was observed throughout the upper portion of the dose distribution, including examinations associated with relatively high radiation exposure (Table 3).

Patient-level paired analysis

A paired-patient analysis was performed in 64 patients who underwent chest radiography during both the pre-training and post-training periods. Median DAP decreased from 139.8 to 128.9 mGy-cm, corresponding to a relative reduction of 7.8%. The mean DAP values decreased from 158.6 ± 68.5 mGy-cm before training to 141.2 ± 62.6 mGy-cm after training. The median paired difference was -1.81 mGy-cm. DAP decreased in 42/64 patients (65.6%), whereas 22 patients (34.4%) demonstrated higher DAP values during the post-training period. Although the overall trend favored dose reduction, the difference did not reach conventional statistical significance on Wilcoxon signed-rank testing ($P = 0.059$).

Median DAP decreased across all adult age groups after training. The relative reductions were 9.6% in patients aged 18–39 years, 10.8% in those aged 40–59 years, 7.9% in those aged 60–79 years, and 14.0% in pa-

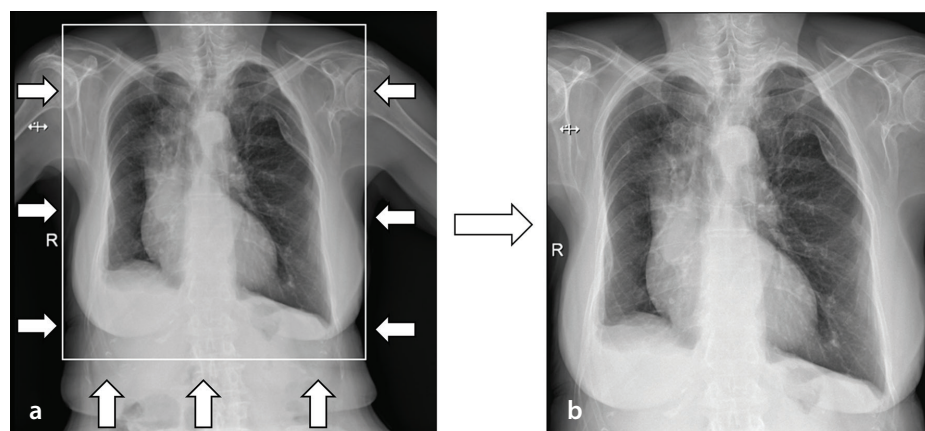


Figure 2. Example of manual digital cropping in posteroanterior chest radiography. (a) Original acquisition showing the entire irradiated field and the area selected for cropping (white rectangle). Arrows indicate irradiated areas outside the subsequently selected crop field. (b) Final image transmitted to the Picture Archiving and Communication System after digital cropping, illustrating how post-acquisition cropping may obscure suboptimal pre-exposure collimation.

tients aged ≥ 80 years. The corresponding Hodges–Lehmann absolute differences were -10.3 , -17.2 , -15.7 , and -20.0 mGy·cm², respectively (Table 4).

To account for the potential confounding effect of age, a regression model was fitted using log-transformed DAP as the dependent variable. After adjustment for

age and accounting for intra-patient correlation using cluster-robust standard errors, the post-training period remained independently associated with a significant dose reduction. According to the model, the DAP values in the post-training period were approximately 11.7% lower than in the pre-training period [95% confidence interval

(CI), 9.0%–14.4% lower; $P < 0.001$], indicating that the observed dose reduction was not attributable to differences in age distribution between periods.

Discussion

Appropriate collimation is an important part of radiographic practice. Limiting the X-ray beam to the area of interest reduces unnecessary radiation exposure to nearby tissues.^{11–13} This approach can also improve image quality by reducing scattered radiation.⁸ This is especially important in digital radiography, where electronic cropping can hide a large radiation field in the final image even when the patient is still exposed.^{14,15}

In this study, we demonstrated that collimation training provided to radiographers using a digital radiography system was associated with a reduction in radiation dose in chest radiographs. A significant decrease in DAP values was observed across all examinations. The paired analysis demonstrated a similar trend toward dose reduction, although it did not reach statistical significance.

During informal feedback after training, radiographers reported occasional repeat examinations caused by overly restrictive collimation, primarily during the initial adaptation period. These became less frequent as the recommended collimation practices were incorporated into routine workflows. Because these events were not systematically recorded, repeat examination rates could not be quantified. Although such repeats may have increased radiation exposure in individual cases, the overall reduction in DAP suggests a net population-level dose reduction. These findings emphasize that, consistent with the ALARA principle, dose optimization requires radiation reduction to be balanced with the preservation of diagnostic image quality.

Collimation performance was assessed using DAP as a surrogate measure because digital cropping was performed at the acquisition workstation and only the cropped images were transferred to PACS. Consequently, the original uncropped images were not available in the PACS archive, precluding retrospective measurement of the irradiated field size or cropping ratio. As DAP is influenced not only by beam collimation but also by patient positioning, body habitus, and AEC, the observed reduction should be interpreted as reflecting overall examination practice rather than changes in field size alone.

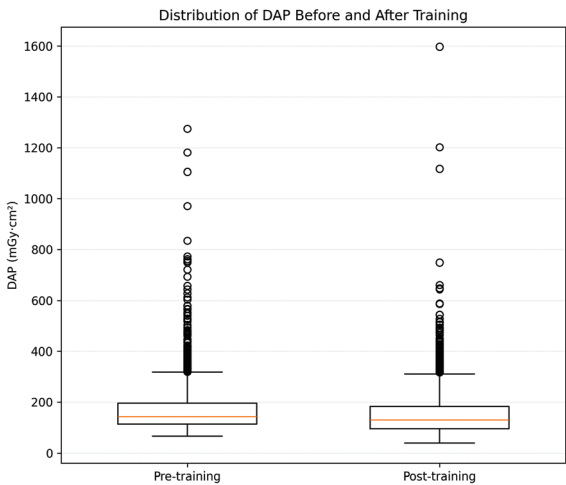


Figure 3. Box-and-whisker plots of dose area product (DAP) before (May–July 2025) and after (August–October 2025) collimation training. Boxes represent the interquartile range (IQR), horizontal lines the median, whisker values within $1.5 \times$ IQR, and point outliers. Median DAP and upper outliers decreased after training.

Table 1. Baseline demographic characteristics and dose area product values in mGy·cm of chest radiographs obtained before (May–July 2025) and after (August–October 2025) collimation training. Continuous variables are presented as median (interquartile range) or mean $\pm$ standard deviation, as appropriate			
Variable	Pre-training	Post-training	<i>P</i> value
Valid examinations	1,792	1,791	—
Age, median (IQR)	61 (45–71)	58 (43–70)	0.014
Age, mean $\pm$ SD	57.4 $\pm$ 17.7	56.1 $\pm$ 17.6	—
DAP, median (IQR)	143.7 (113.9–195.6)	130.3 (96.1–182.8)	< 0.001
DAP, mean $\pm$ SD	173.0 $\pm$ 103.6	155.2 $\pm$ 98.2	—
DAP, dose area product; IQR, interquartile range; SD, standard deviation.			

Table 2. Sex distribution of patients undergoing chest radiography before and after collimation training			
Sex	Pre-training	Post-training	<i>P</i> value
Women	822 (45.9%)	845 (47.2%)	0.452
Men	970 (54.1%)	946 (52.8%)	
Total	1,792 (100%)	1,791 (100%)	

Table 3. Changes in upper percentiles of dose area product (mGy·cm) before and after collimation training			
Percentile	DAP, pre-training	DAP, post-training	% change
P75	195.6	182.8	–6.5%
P90	279.3	260.5	–6.7%
P95	356.7	329.8	–7.5%
DAP, dose area product; P75, 75 th percentile; P90, 90 th percentile; P95, 95 th percentile.			

Table 4. Median dose area product values and relative changes before and after collimation training, overall and stratified by age group. Hodges–Lehmann estimators represent absolute median differences

Age	Pre-training examination	Pre-training median (mGy·cm ²)	Pre-training examination	Post-training median (mGy·cm ²)	Relative change %	Hodges–Lehmann difference, (mGy·cm ²)	P value
All examinations	1,792	143.7	1,791	130.3	−9.3%	−15.6	< 0.001
18–39 years	317	126.7	353	114.5	−9.6%	−10.3	0.009
40–59 years	545	146.4	577	130.6	−10.8%	−17.2	< 0.001
60–79 years	765	149.8	696	138.0	−7.9%	−15.7	< 0.001
≥ 80 years	165	141.4	165	121.6	−14.0%	−20.0	0.002

The stability of exposure parameters throughout the study period makes systematic changes in radiographic technique an unlikely explanation for the observed reduction in DAP. A review of the acquisition data demonstrated that the vast majority of examinations were performed within a narrow tube voltage range of 112–114 kVp. Only five examinations were performed below 112 kVp, and 32 were performed above 114 kVp. Given the minimal variability in tube voltage selection across the cohort, systematic differences in kVp are unlikely to explain the observed reduction in radiation dose. Nevertheless, given the retrospective before-and-after design and the influence of AEC and patient-related factors on DAP, the observed reduction cannot be attributed exclusively to improved collimation.

Previous studies have estimated the potential dose reduction achievable through improved collimation using mathematical or area-based approaches. Esmaeilian et al.¹⁶ estimated that proper collimation could reduce mean DAP by approximately 18%, whereas Guðjónsdóttir.¹⁷ demonstrated substantial unnecessary radiation exposure associated with image cropping in digital radiography. By contrast, our study evaluated the impact of improved collimation when implemented in routine clinical practice through a structured educational intervention. The observed 10.3% reduction in mean DAP, accompanied by a 9.3% reduction in median DAP, provides a real-world estimate of the magnitude of dose reduction that may be achievable following implementation of improved collimation practices.¹⁶

For comparison with contemporary reference data, the facility-specific typical DAP value decreased from 144 mGy·cm² before training to 130 mGy·cm² after training. According to the 2025 United Kingdom National Diagnostic Reference Level (NDRL) guidance, the reference DAP value for adult posteroanterior (PA) chest radiography is 77 mGy·cm². National reference levels, how-

ever, vary across countries; for example, the Irish national DRL for the same PA chest projection is 120 mGy·cm². Thus, although our post-training typical value remained above the UK NDRL, it was closer to the Irish national DRL. Such variation in national reference levels may partly reflect differences in patient populations and clinical practice. Nevertheless, the reduction observed after training indicates a shift toward lower institutional dose levels.^{18,19}

Although most paired patients demonstrated lower DAP values after training, a minority showed an increased radiation dose during the post-training period. Although the reduction in DAP in the paired subgroup did not reach conventional statistical significance, the direction of the observed change was consistent with that of the overall cohort. The relatively small sample size of the paired subgroup (n = 64) may have limited the statistical power to detect a modest within-patient difference. Among the 22 patients with increased DAP values, 16 were hospitalized patients, 3 were emergency department patients, and 3 were outpatients. Most hospitalized patients underwent preoperative chest radiography during the pre-training period and postoperative follow-up examinations during the post-training period. Interval clinical changes, including postoperative status, pleural effusion, pulmonary edema, volume overload, or newly detected pulmonary disease, may have affected inspiratory effort, patient cooperation, and positioning during image acquisition. For example, one patient developed pulmonary edema and another was diagnosed with tuberculosis during the post-training period. Such conditions may limit deep inspiration and make precise positioning more difficult, potentially requiring wider irradiation fields to ensure inclusion of clinically relevant anatomy.

Another consideration is that the present study evaluated the immediate 3-month period following the educational intervention. Therefore, the observed effect may partly re-

flect increased awareness immediately after training, consistent with a Hawthorne-type effect. Future studies incorporating longer follow-up periods, such as 6- or 12-month audits, would help determine whether improvements in collimation practice are sustained over time.

This study has several limitations. First, its retrospective, single-center design and use of a single digital radiography system may limit the generalizability of the findings, although the latter reduced technical variability.

Second, DAP was used as a surrogate marker of collimation performance because digital cropping was performed at the acquisition workstation and only the cropped images were transferred to PACS, precluding retrospective assessment of the original irradiated field size or cropping ratio. Patient height, weight, and body mass index were not available for retrospective analysis; therefore, body habitus could not be directly accounted for as a potential confounder. Moreover, DAP may be influenced by patient positioning, body habitus, and AEC, and residual confounding related to interval clinical changes, particularly in hospitalized or postoperative patients, cannot be excluded.

Third, no formal collimation-specific quality assurance audit was performed during the post-training period, and formal visual grading analysis and repeat/reject rate auditing were not performed. Consequently, preservation of diagnostic image quality cannot be formally confirmed, although routine clinical review by four experienced thoracic radiologists did not identify any apparent deterioration in image quality. Repeat/reject data were unavailable for retrospective review; however, radiographer feedback indicated that occasional repeat examinations occurred during the initial adaptation period but became uncommon as the new collimation practices were incorporated into routine workflows.

Nevertheless, the study has several strengths, including a large real-world cohort, paired patient-level analysis, and age-adjusted regression accounting for intra-patient correlation. Importantly, rather than estimating potential dose savings from field-size measurements, this study evaluated the change in DAP following the implementation of collimation training in routine clinical practice. This real-world approach provides insight into the magnitude of dose reduction that may be achievable when improved collimation practices are incorporated into everyday radiographic workflow.

Our findings suggest that targeted collimation training can help reduce radiation doses in adult chest radiography. This seems especially relevant in daily practice, where digital cropping can easily hide poor collimation on the final image. In that setting, paying closer attention to collimation and supporting radiographers with practical training may be a straightforward way to reduce unnecessary patient exposure. Further prospective studies would still be helpful, particularly if they include direct measurement of the exposed field, assessment of image quality together with dose, and comparisons across different imaging systems.

These findings also support consideration of periodic collimation audits as part of routine radiology quality assurance programs to reinforce optimal collimation practices over time.

Footnotes

Conflict of interest disclosure

The authors declared no conflicts of interest.

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