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Enhancing Patient Safety in CT Examinations

Establishment of a Standardized Manual to Reduce High-Volume Contrast Extravasations and Prevent Air Embolisms

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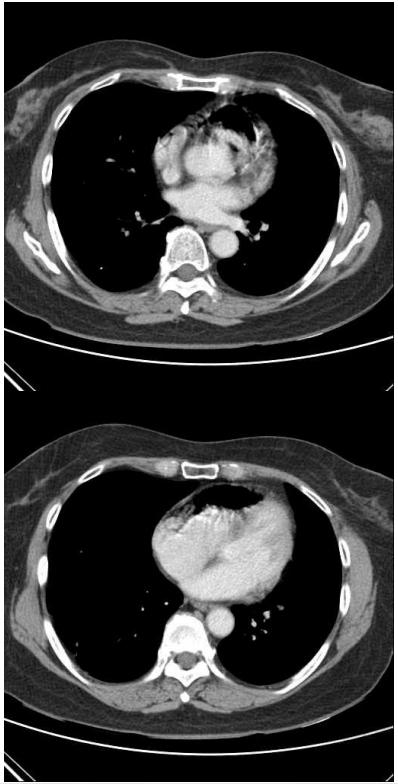
Background

- Contrast-enhanced CT scans are essential diagnostic tools. However, contrast extravasations and air embolisms pose serious patient safety risks.
- In 2021: 66 extravasations (21 cases >30 CC) out of 144,602 exams (31%).
- In 2022: 27 large-volume extravasations (41%) out of 152,136 exams with 2 air embolisms.
- **Current Limitations**: The manual detection methods used in our CT exams are prone to human error and need improvement.
- Limited use of Extravasation Detection Accessories (EDA) during bolus tracking exams only.



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Background

- The increase in large-volume extravasations and air embolism incidents is concerning.
- Current manual monitoring methods (manual palpation and visual inspection) are inadequate for early detection of extravasation or preventing air embolism.
- Develop and implement a standardized CT protocol to reduce large-volume extravasations and prevent air embolism.
- Reduce large-volume extravasation to below 30%
- Achieve zero incidents of air embolism.

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Materials & Methods

- Standard Patient Safety Process was developed to prevent air embolism and evaluate its adherence rate.
- In order to prevent air embolism, we changed the settings of the Auto Injector air check and improved the environment to facilitate the verification of the remaining contrast volume.
- Periodically, we conducted training on the causes and risks of extravasation and air embolism, and shared actual case studies with the staff.

Standard Patient safety process
1. Verifying the volume and type of contrast agent used.
2. Checking for air in the patient's IV line.
3. Checking for air in the injector syringe.
4. Checking for air in the Y-connector and extension line.
5. Positioning the auto injector downward.
6. Performing a saline push before connecting to the patient to remove air from the line.
7. Attaching the extravasation sensor patch.

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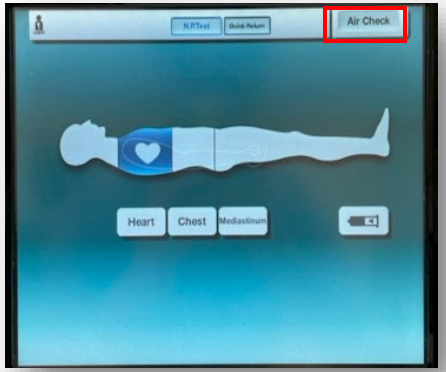
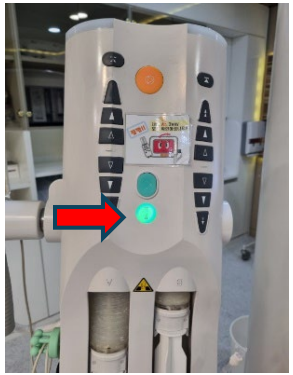
Materials & Methods

- Extravasation Sensor was applied to all eligible patients (Sep 2023 - Feb 2024).
- A Patient Safety Process was implemented to prevent air embolisms with injector setting changes.



(A) Disable the air check button in the console.



(B) Manually check for air in front of the auto injector and press the air check button.

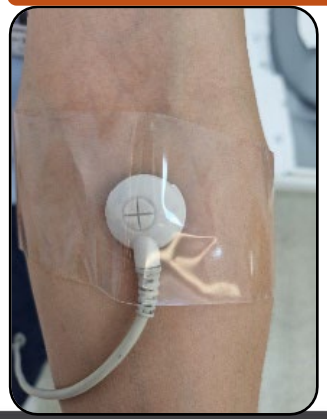
(C) Add setting the saline push process to remove air before connecting an IV line.

Materials & Methods

- Operators were trained on proper sensor usage and adherence to new safety protocols.
- Periodic sessions reviewed risks and best practices, supported by case studies.
- To improve the application rate of the patches, we prepared necessary items for better attachment of the extravasation sensor in the examination room and conducted training on the effectiveness and proper use of the EDA for the operators.

AS-IS

TO-BE

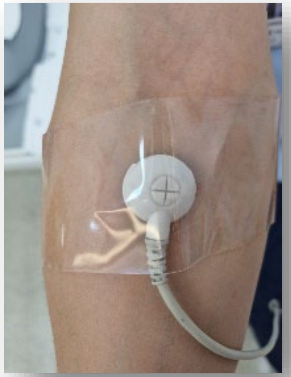


Materials & Methods

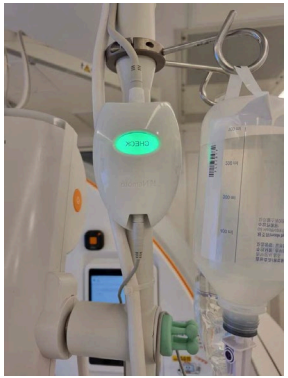
- Enhanced auto-injector settings to check for air more reliably.
- Standardized injection protocols to ensure air check functionality.
- Introduced step-by-step verification of contrast and saline amounts before and during each CT procedure.

(A) Checking for air in the injector syringe.

(B) Performing a saline push before connecting to the patient.



(C) Attaching the extravasation sensor patch.



(D) Ready for scan.

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Results

- The sensor patch application rate increased from 32% to 95%.
- High-volume extravasation rate decreased from 40.9% to 25.7%.
- Detecting and reducing extravasation incidents increased with better patch usage across all exams.
- No air embolism incidents occurred during the study period.
- The new protocol successfully mitigated air embolism risks.

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Discussion

- The standardized protocols significantly reduced large-volume extravasation and air embolism risks.
- Continuous education and system improvements led to a safer environment for both patients and staff.
- Collecting more data on extravasation trends for ongoing improvement.
- Implementing quarterly performance reviews and training sessions to maintain high safety standards.

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Thank You

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