Advancing continuous education in the radiology department: case example through a novel software that quantifies repeated scans in CT

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INTRODUCTION

- Education and training in a medical imaging department is potentially more efficient as a dynamic rather than a static process.
- Continuous education with relevant information and examples from the daily practice could boost productivity, as well as radiation and safety awareness.
- In this framework, a context-aware module for educational purposes has been developed. It uses specific "context" (based on the available data and found insights) to select and present only relevant (and available) knowledge to the personnel.
- A proof of concept was tested on a novel commercial software that automatically identifies repeated scans in CT.

AIM

To test the **context-aware educational module** through a **first application on a** new commercial **software that** remotely and automatically analyzes CT exams and **calculates unjustified repeated scans**.

Example case:

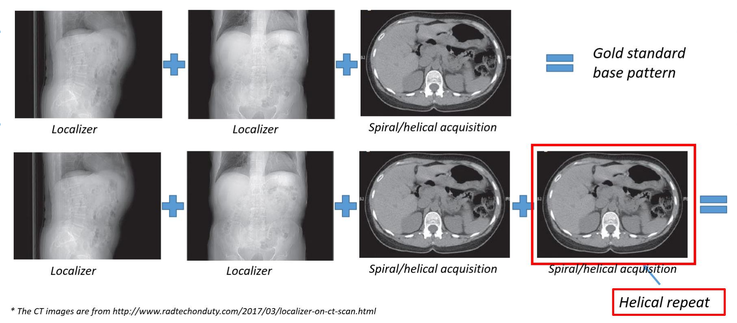

Figure 1. Example of a gold standard - base pattern (upper row) and an exam deviating from the expected due a repeated helical scan (lower row). This is identified as a helical repeat.

BACKGROUND

- Repeated scans in CT have recently been highlighted in the literature(1-3), as they are linked to **excess contrast and radiation dose to patients**, as well as **time loss for the department**.
- Main reasons for repeat CT imaging:
  - Operator errors *(protocol selection error, issue with contrast administration, protocol settings error)*
  - Compromised protocols *(poor protocol instructions, non-optimized settings)*
  - Patient issues *(patient motion or non-cooperation)*
- Cannot eliminate all cases → a low repeat rate is expected
- This indicates the importance of educating the personnel on the spot.

METHOD

The new FOQAL-CT repeat software (Qaelum, Belgium):

➢ Is based on a patented algorithm by the University of Wisconsin-Madison (Figure 1) (1-3)

➢ Data entry is realized via the PACS or dose management systems → in this study data was retrieved from DOSE (Qaelum, Belgium)

➢ Offers advanced analytics and efficiency metrics

The context aware module was developed based on contextual categories; Goal is to present learning blocks at different levels.

<u>For this study:</u>

- 58623 exams / 1 year / 6 scanners (UZ Leuven) were analysed by FOQAL-CT repeat (Qaelum, Belgium)
- Context-aware module was applied on the results to provide relevant educational material based on the findings

RESULTS

Phase I. All exams included, even the ones with clinically relevant repeats

- 211 protocols (gold standard-base patterns) automatically identified
- 2619 exams contained a repeat
- 7% exams were ignored due to low occurrence
- Overall RR of 4.8%

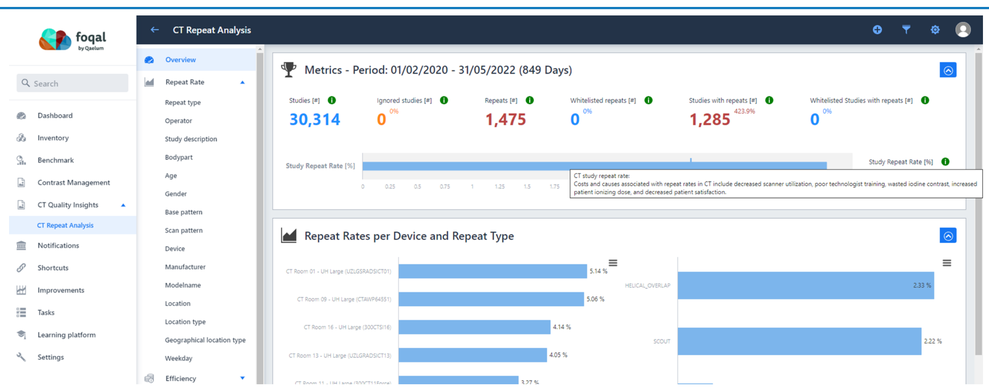

Figure 2. Hovering over the overall repeat rate provides a summary of the impact of repeated scans.

Figure 3. Opening an extended learning block gives information about the reasons for repeated scans, the contextual categories, the user that contributed this information, links to references, as well as search functionality.

The overall repeat rate automatically returned **one learning block**:

- **Small snippets of information** that explain the collected insights: A short summary of the impact of repeated scans is presented (Figure 2).

Clicking on the information icon opens a **new learning block**:

- **Detailed & larger context** – interpretation: Reasons that cause repeat scans are described (Figure 3).

Additionally, there is information about the contextual categories (e.g. modality, age, gender, etc.), the user that contributed this information and when, to avoid using outdated material, links to references, as well as search functionality for more information.

Phase II. The software gives the option to 'whitelist' protocols to avoid false positives (i.e. justified repeats) Discussion with the department about the practice indicated that some protocols with high repeat rates have clinically relevant repeats (radiologists are consulted and often request another scan).
→ These were 'whitelisted' in the FOQAL-CT repeat software, as these are protocols with clinically acceptable deviations from the standard. "Real" spiral RR is found to be 1.9%.

Learning blocks can be also used to clarify or explain calculations and/or terms (Figure 4).

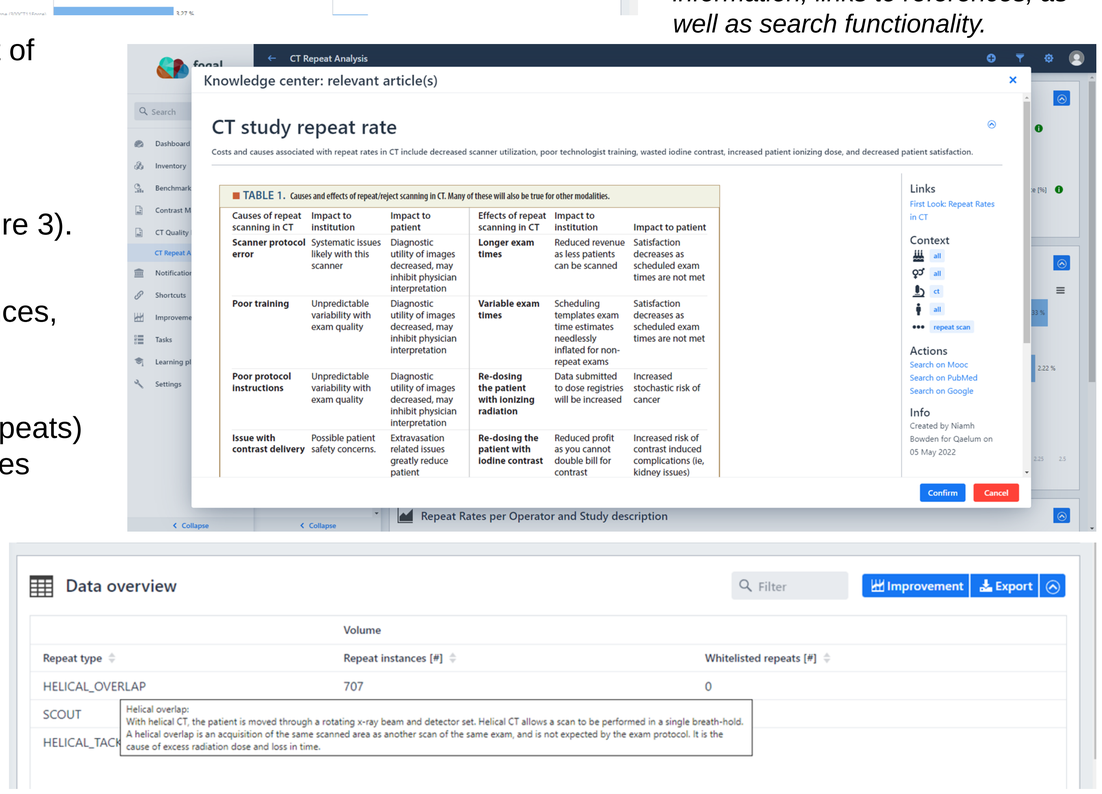

Figure 4. What is a helical overlap? Definition explained in a learning block.

CONCLUSIONS

A software service to integrate relevant learning blocks in the daily practice will save time to the department and potentially reduce errors and optimize clinical practice. In the given example, the training tool educates the team on the reasons that cause repeated scans and forms the basis for improvement actions. Moreover, it creates awareness for the impact of their practice on the environment, the available time slots, the excess contrast and radiation dose burden to patients.

REFERENCES

1. Rose S, Viggiano B, Bour R, Bartels C, Kanne J, Szczykutowicz T. "Applying a New CT Quality Metric in Radiology: How CT Pulmonary Angiography Repeat Rates Compare Across Institutions." Journal of the American College of Radiology, 2021, 18(7).
2. Rose S, Viggiano B, Bour R, Bartels C, Szczykutowicz T. "A Multiinstitutional Study on Wasted CT Scans for Over 60,000 Patients." American Journal of Roentgenology, 2020, 215:5, 1123-1129.
3. Szczykutowicz T, Rose S. "First Look: Repeat Rates in CT." Radiology Management, 2019, 41(5).

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