

Toward Smarter Imaging



Eliminating Waste Through
Repeat Scan Insights



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Introduction

In computed tomography (CT), diagnostic image quality is critical, but it comes at a cost. Scans are often repeated due to factors such as protocol selection errors, patient positioning or motion, contrast timing, or the need to adjust technical parameters like tube current and voltage. While repeats can occasionally reflect careful clinical practice, consistently high repeat rates signal inefficiencies that increase radiation exposure, contrast use, resource consumption, and financial burden.

Turning Repeats Into Measurable Quality Metrics

Qaelum's CT Repeat module (FOQAL-CT Repeat, Qaelum, Belgium), embedded within its FOQAL quality platform, addresses this challenge by automatically identifying both intra- and inter-study repeats. Its core algorithm, developed and patented by the University of Wisconsin-Madison [1], classifies repeats by type: localizer, bolus tracking, helical or axial overlap, and extension scans, and flags potential inefficiencies.

The software also measures inter-study repeat rates, or recalls, by tracking exams for the same patient across a user-defined timeframe. Importantly, this analysis spans all scanners within the institution, offering a system-wide perspective on recall patterns.

For complex protocols with inherent variability, such as contrast studies with delayed phases, the software incorporates a "whitelisting" function. This allows radiology teams to exclude clinically expected variations, reducing false positives and ensuring repeat analysis remains focused on true optimization opportunities.

From Validation to Real-World Impact

Validation of the algorithm on 61,000 retrospective studies demonstrated sensitivity and specificity of 92% and >99%,

respectively, excluding rare protocols [1]. The study also highlighted variability across institution types: while repeat rates at one academic institution ranged between 1.1–4.3%, rural sites recorded significantly higher rates for extension (3.3%) and bolus tracking (11.6%) scans.

Deployment at UZ Leuven confirmed the impact in a European setting: one year of data from six scanners revealed an initial repeat rate of 4.8%, reduced to 1.9% after clinically justified repeats were excluded [2,3]. Notably, the analysis revealed that certain protocols were far more prone to overlap repeats, with acute stroke scans (29.7%), high-resolution chest studies with inspiration/expiratory phases (12.3%), and kidney scans with late excretion phases (6.5%) showing the highest rates. These findings underscore how specific clinical pathways can disproportionately drive inefficiencies, highlighting where targeted protocol refinement could have the greatest impact. The financial implications were striking — lost scanner time was estimated at 85.5 hours, representing nearly \$18,000 in costs for a single scanner.

Collaborative Insights Across Sites

Collaborations with Maastricht University Medical Center (MUMC) further validated the software against manual review of 4,500 pulmonary embolism (PE) studies, with both approaches yielding a repeat rate of 3% [4]. Automatic analysis went further by quantifying repeat rates for localizers (2%) and bolus tracking (5%).

Additional evaluations quantified the impact of repeats on resources: in PE studies, repeats increased average scan counts per exam from 4 to 6, boosted dose length product (DLP) by 79%, and prolonged study duration from 4 to 9 minutes. Contrast use rose from 51 ml to 82 ml per exam [5]. In another university hospital, wasted slot time from repeats across 35,300 patient exams amounted to 87 hours — or nearly three

weeks of scanning capacity [6].

At Fürth Clinic, Germany, analysis of 11,500 studies found an overall repeat rate of 2.2%, reduced to 0.8% when localizers were excluded [7]. Motion artifacts emerged as the most common cause, with a recall rate of 4.4% (primarily justified follow-ups, but with a measurable fraction due to avoidable errors like incorrect patient identification). Of the recalls, 4.8% were deemed avoidable, with 3.4% lacking clinical justification.

Why Repeat Analysis Matters

Across diverse institutions, repeated scans consistently translate into higher radiation dose, increased contrast usage, longer exam times, and unnecessary strain on departmental resources. Integrating repeat analysis into quality assurance programs ensures that protocols with elevated repeat and recall rates can be identified, monitored, and improved.

Looking Ahead: From Measurement to Improvement

Repet analysis is more than a compliance tool, identifying opportunities to transform inefficiencies into actionable quality insights. Qaelum's FOQAL-CT Repeat provides transparency at the level of protocols, operators, exam types, and sites, enabling radiology teams to design and track targeted improvement trajectories.

In an era where efficiency, safety, and patient experience are paramount, minimizing unnecessary repetitions is not just about optimization — it is about delivering better care with fewer risks, less waste, and greater value.

References

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