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The ARTILLERY project: Developing, validating and prospectively evaluating trustworthy AI systems for early detection of cardiovascular disease risk in women with breast cancer using routine CT scans

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Affiliations

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Purpose

To develop, validate, and prospectively evaluate AI systems for automated early detection of CVD risk in women with breast cancer by using routine CT-images.

- In women with breast cancer treated with (at least) radiotherapy ~ 65%.
- Using computed tomography (CT)-images.

CT-images contain information on CVD risk factors like calcifications in the epicardial coronary arteries and aorta.

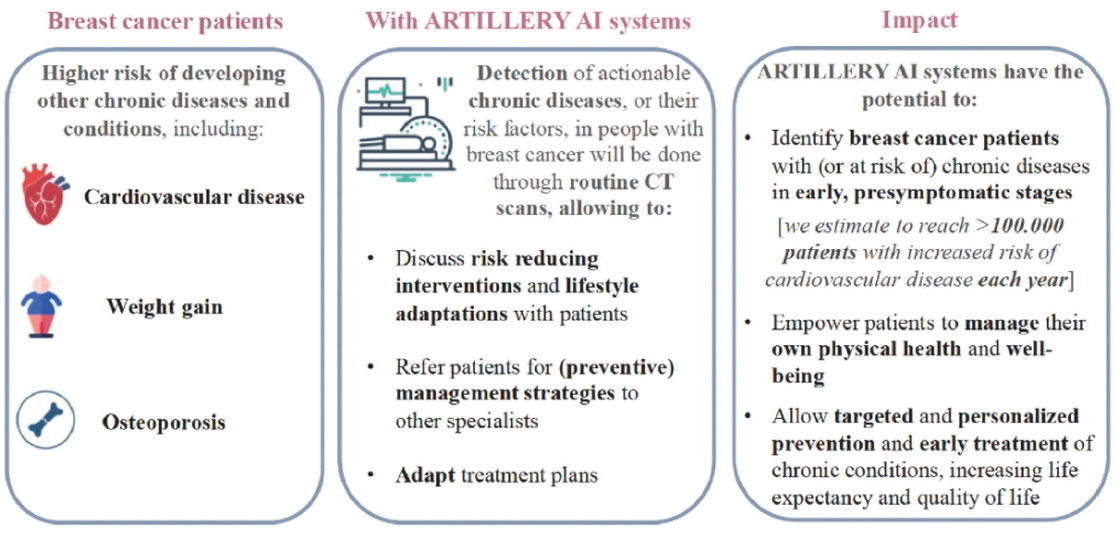

Figure 1. Overview of the ARTILLERY project

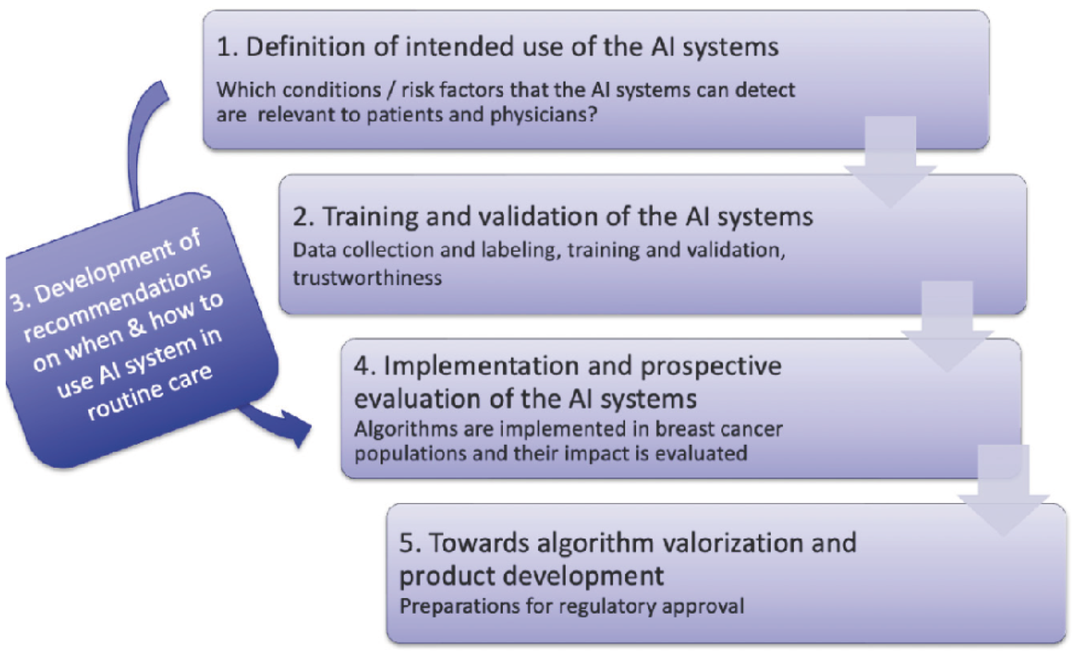

Figure 2. Steps towars implementation of AI systems.

Methods

WP2: Computational scientists will develop and train AI systems for early detection of CVD risk.

WP3: Real World Repository with >26.000 CT scans, risk factors and outcomes of CVD.

- University Medical Center (UMC) Utrecht, Amsterdam UMC, Region Hovedstaden, Champalimaud Foundation.

WP4: A decision impact study will evaluate the uptake and acceptability of the AI systems in routine care and measure to what extent the use of AI systems affects clinical decision making. Decisions will be recorded before and after the AI systems results have been made available to multidisciplinary tumour boards at the clinical sites. Patient adherence to the recommendations will be recorded after 3 and 6 months.

Decisional impact will be evaluated in terms of clinical benefits, health economical and patient-related aspects, including potential harms like false alarms or induced stress.

WP5: Requirements for trustworthy AI will be evaluated:

- Human agency and oversight.
- Technical robustness and safety.
- Privacy and data governance.
- Transparency.
- Fairness.
- Societal and environmental wellbeing, and accountability.

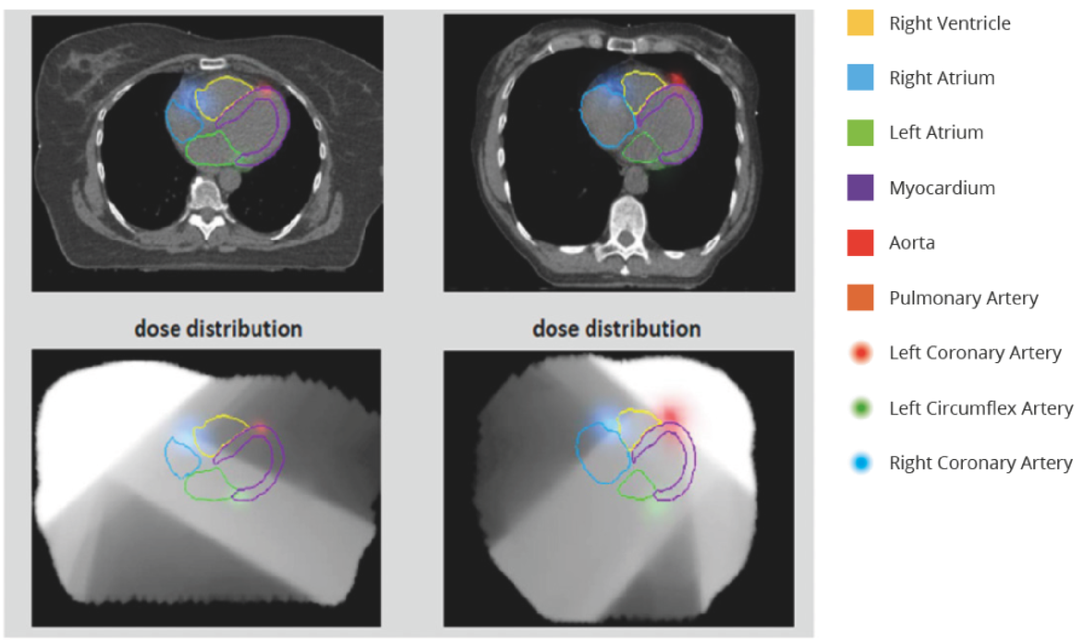

Figure 4. AI-obtained segmentations of cardiac chambers and localization of coronary arteries in

Results

- AI systems will have been implemented at radiotherapy working stations of 5 hospitals to automatically calculate patient's imaging-based risk of CVD.
- Results of AI systems will be discussed in multidisciplinary breast cancer teams and incorporated in medical decision making.
- Ethical and legal aspects of trustworthy AI systems for breast cancer patients will have been addressed, and reports on responsible development and implementation of AI systems will benefit future developers.

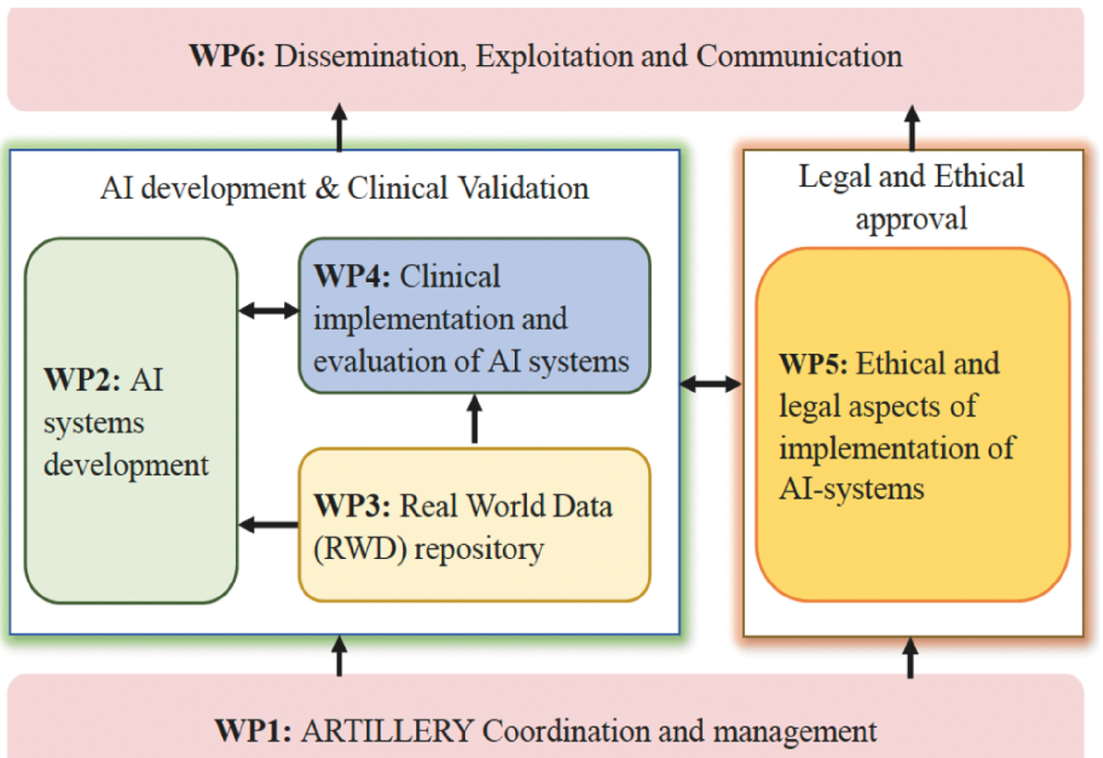

Figure 3. Overall structure of the ARTILLERY work packages

IMPACT

- The burden of CVD will be reduced in women with breast cancer due to earlier detection and management, and quality of life will be improved. Breast cancer professionals will be confident to use AI systems.
- Healthcare costs will be reduced due to early management by lifestyle advice and (risk) reducing pharmaceutical and non-pharmaceutical interventions.
- Real-World Data repository will be available for analysis scientists, healthcare professionals, epidemiologists and statisticians, SMEs, and larger companies.
- Application of AI systems and technological approaches in other areas and diseases.