

Title

Use it or Lose it: preventing unnecessary medical scans through leveraging existing scans: a case-study using the coronary calcium CT-scan

Problem statement

The R-ladder of sustainability gives a hierarchy of sustainable practices. The top R is 'Refuse', while for example recycling comes much lower (figure 1). However, the prevention of unnecessary medical activities is rarely being investigated. In the diagnostic process, doctors frequently order medical scans with a specific purpose (clinical question). However, these scans contain much more information which is essentially wasted. One such example is the coronary calcium CT-scan in patients with suspected coronary artery disease. In coronary artery disease, the arteries that supply the heart itself with oxygen are (partially) occluded, which can lead to various heart diseases, such as angina pectoris and myocardial infarction. In order to assess the risk of such an occurrence, clinicians would like to know the presence and amount of disease in the coronary arteries. One accurate way to assess this is by means of coronary calcium CT scans. Yet, an important aspect to keep in mind is that the information on these scans reaches far beyond the coronary arteries alone, and also includes information on other organs and structures. Yet, this information is often left unused.

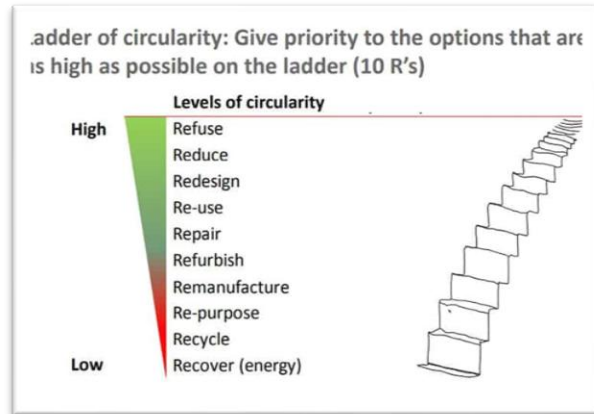


Figure 1: R-ladder of circularity



Figure 2: Coronary calcium CT scan. From Bos et al. Eur. Radiol. 2018

This research will focus on whether leveraging this 'unused' information could be beneficial for the patient (care), and for the hospital, as it may result in earlier detection of disease and in less acquisition of subsequent scans. The current research will use the coronary calcium CT-scan as a case study, but the principle may hold for any kind of medical imaging.

The study will be conducted in the population-based Rotterdam Study, in which we have repeated coronary calcium-scans in over 2000 participants. All participants are being followed for the occurrence of cardiovascular- and non-cardiovascular events which will be used to link the "additional" information of the scans to.

Research question(s)

Can we obtain more information from a single-indication CT-scan, which is beneficial for the patient, care, and the hospital?

- what clinically relevant information can be retrieved from single-indication CT-scans?
- what is the impact of increased information extraction on clinical outcome of patients?
- what are the costs and savings associated with increased clinical information extraction of scans (cost-effectiveness, environmental cost-benefit)?
- what are the social, ethical and legal implications of extracting more clinical information from CT-scans (Health technology assessment)?

Expected type of work

Technical analyses:

- Analyses of coronary CT-scans
- evaluation of image data of CT-scans (training will be provided)
- statistical analysis of clinical parameters using Rotterdam study database

Health technology assessment (HTA):

- Cost-effectiveness assessments (CEA)
- Legal and ethical implications.

Remarks

No medical expertise is required. Different subquestions could be performed independently depending on the student's field of interest and background, e.g. HTA or CEA.

References

- Bos D, Leening M. Leveraging the coronary calcium scan beyond the coronary calcium score. Eur Radiol. 2018; 28(7): 3082–3087.
- Greenland P et al. Coronary Calcium Score and Cardiovascular Risk. J Am Coll Cardiol. 2018 Jul 24; 72(4): 434–447.

Commissioner details

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