Interpretation of CaRi-Heart® Report

CaRi-Heart® is an AI-powered tool that analyses cardiac CT scans to provide detailed information on coronary inflammation, plaque characteristics and cardiovascular risk. It generates a single report to calculate a patient's future cardiac risk by providing three pieces of information:

| Fat Attenuation Index (FAI)	An **unadjusted, visual representation of the extent of coronary inflammation** in the 3 main epicardial coronary arteries
FAI-Score	An **individualised quantification of coronary inflammation** in the 3 main epicardial coronary arteries, adjusted for age and gender **(relative risk)**
CaRi-Heart® Risk	The **absolute risk** of a fatal cardiac event within the next 8 years, based on the personalised FAI-Score values, the coronary atherosclerotic plaque burden and clinical risk factors

Unadjusted FAI

Multiple studies, such as CRISP-CT, have shown that FAI is able to predict adverse cardiovascular events and identify culprit lesions in patients presenting with acute myocardial infarction, by identifying coronary artery segments with high inflammation.[1]

The unit of FAI is a Hounsfield Unit (HU), a metric that is familiar in radiological interpretation. However, the clinical interpretation of a given FAI value for an individual patient is complex, as it is affected by multiple technical and biological factors (e.g. CT tube voltage, background adipocyte size). This limits the clinical value of FAI and calls for the development of standardised metrics to quantify the degree of coronary inflammation based on FAI mapping, to enable meaningful clinical interpretation: The **FAI-Score** fulfils this need.

Interpretation of FAI-Score

FAI-Score represents the **relative risk** of a patient. It is expressed in centile values, to allow comparison with people of the same age and gender. Interpretation of FAI score can be aided by the following risk curves, where centile values are shown on the x-axis and relative risk for a fatal cardiovascular event on the y-axis. For example, an FAI-Score at the **90th centile for the LAD indicates a >3x increased relative risk** for a fatal cardiovascular event.

FAI-Score percentiles around the 3 main epicardial vessels
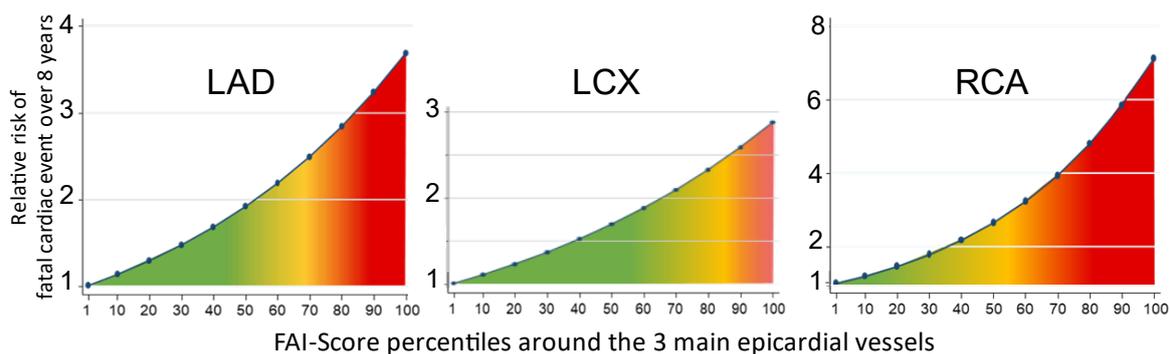
According to the latest European Society of Cardiology (ESC) Guidelines on cardiovascular disease (CVD) prevention in clinical practice, *"The 10-year CVD risk in relatively young, apparently healthy people is on average low, even in the presence of high risk factor levels, but the lifetime CVD risk is in these circumstances very high"*.[2]

In light of this, FAI-Score is particularly useful in estimating cardiovascular risk in younger patients, where traditional cardiovascular risk scores are less helpful, because a low absolute 10-year risk may simply be due to major events only occurring later in life. FAI-Score provides a measure of disease activity, by quantifying coronary artery inflammation.

1. Lancet (2018) 392: 929–39
2. Eur Heart J (2021) doi.org/10.1093/eurheartj/ehab484
3. Cardiovasc Res (2021) doi.org/10.1093/cvr/cvab286

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Interpretation of CaRi-Heart® Risk

International guidelines on the prevention of CVD in clinical practice recommend the assessment of CVD risk using an appropriate risk scoring system.

The 2021 ESC guidelines embrace the concept of lifetime CVD risk and personalized treatment decisions using CVD risk estimations. They state that *"the estimation of CVD risk remains the cornerstone of these guidelines and thus appears at the forefront of the proposed management schemes,"* and try to refine risk with the recommended use of multiple tables, including country-specific risk estimates combined with clinical and demographic risk factors. [2]

This aligns well with the personalized information provided by a CaRi-Heart® analysis: CaRi-Heart® Risk is individualised and overcomes the complexity of using many different clinical, socioeconomic and geographical risk factors, all of which are surrogate indicators of risk rather than direct indicators of disease activity.

The CaRi-Heart® analysis significantly improves risk discrimination over clinical risk factor-based models (such as SCORE2, QRisk, Framingham or Pooled Cohort Equations risk scores). CaRi-Heart® Risk has a consistent net clinical benefit on decision curve analysis above a baseline traditional risk factor-based model, across the full spectrum of cardiac risk.[3]

According to the 2021 ESC guidelines "***While no risk threshold is universally applicable, the intensity of treatment should increase with increasing CVD risk***. *[…] Across the entire range of CVD risk, the decision to initiate interventions remains a matter of individual consideration and shared decision-making."*[2]

Patient management recommendations and risk factors interventions are decided by the physician, who can use the CaRi-Heart® report to inform and guide individual treatment decisions. Possible patient management pathways are outlined below:
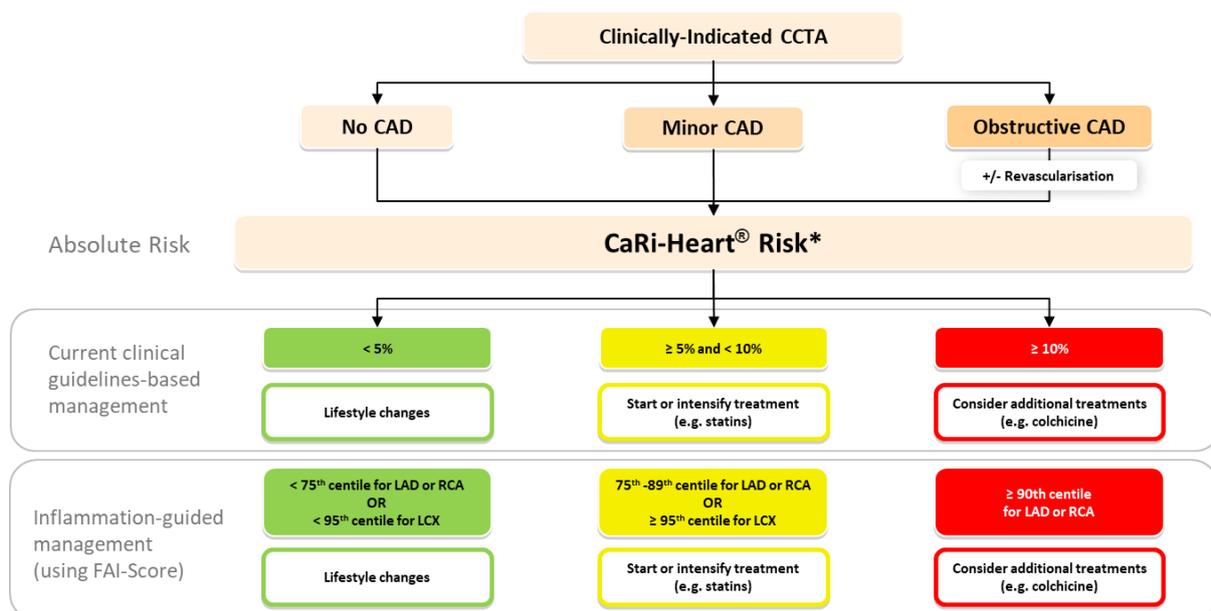
* 8-year risk of cardiac death : incorporates personalised FAI-Score with clinical risk factors, demographics, and plaque burden

1. Lancet (2018) 392: 929–39
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