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PreventAble

From hospital to smartphone: the future of cardiac rehabilitation

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Reijo Laaksonen, principal investigator of the European Union (EU)-funded CoroPrevention Project at Tampere University, speaks with calm conviction when discussing the future of secondary prevention in coronary heart disease. Throughout the interview, he emphasizes a single central message: *secondary prevention saves lives, but current systems still fail to identify high-risk patients and provide personalized support at scale*. As he explains, this is not a marginal concern. 'After a myocardial infarction, up to one in five patients will suffer another major event within a year[1],' he notes, pointing out that structured prevention remains underused despite its proven effectiveness.

Two gaps in secondary prevention

As the conversation turns to the roots of this problem, Laaksonen outlines the reality seen across European health systems. Despite remarkable progress in acute cardiovascular care, recurrent coronary events remain common.[2] Structured secondary prevention, including cardiac rehabilitation (CR), has repeatedly been shown to reduce morbidity and mortality, but it simply is not consistently delivered. Laaksonen points to the numbers: across Europe, only 30–50% of eligible patients attend centre-based CR programmes.[3] The reasons, he explains, are well known—lack of systematic referral, programmes that are insufficiently tailored to individual needs, logistical barriers such as travel distance and rigid scheduling, low health literacy, and lack of motivation. Even among those who do enter a programme, long-term follow-up is often undermined by fragmented communication between primary and secondary care, feeding into therapeutic inertia. 'The result is a persistent delivery gap,' he says. 'We know what works, but too few patients receive it'.

But as Laaksonen stresses, there is a second gap that receives far less attention: risk stratification. Current European Society of Cardiology (ESC) guidelines do not provide a validated tool to identify which patients with established coronary heart disease (CHD) are at highest residual risk. Although tools such as U-Prevent exist, they are not embedded in clinical pathways. This leaves clinicians without a practical way to single out those who would benefit most from intensified, personalized care. As the population of CHD survivors grows and healthcare resources become increasingly stretched, this identification gap becomes more problematic. 'We simply cannot intensify preventive care for everyone,' he explains. 'We need to know *who* requires the most support'.

Digital health to the rescue

It is here that the interview shifts towards what he sees as a turning point for cardiovascular prevention: digital health. Nurse-led programmes have demonstrated impressive efficacy in trials, with sustained coaching, medication titration, and motivational support yielding meaningful improvements.[4–6] But scaling such labour-intensive interventions across Europe's millions of CHD patients is unrealistic. Digital health solutions—mobile applications, wearables, and decision-support systems—offer a way forwards. Laaksonen describes their potential to deliver continuous monitoring and feedback, empower patients in self-management, offer scalable personalized interventions at low marginal cost, and enable real-time data sharing between patients and providers.

'Importantly,' he adds, 'digital platforms can overcome several barriers that limit conventional CR, such as rigid scheduling, travel distance, and lack of tailoring'. Technology should not replace nurse-led programmes but extend them, making structured, evidence-based care available without overwhelming the healthcare workforce. These insights strongly shaped the design of CoroPrevention, the European flagship trial Laaksonen leads—a project combining biomarker-based risk assessment with a digitally supported, nurse-led intervention.

The CoroPrevention trial

CoroPrevention is one of the largest prevention initiatives ever undertaken in Europe. Laaksonen outlines the trial design, structured as a prospective risk-screening study (Part A) with a nested randomized clinical trial (Part B) among high-risk patients. The project is active in 11 centres across five countries but will expand to 35–40 centres across up to nine countries, including Finland, Germany, Portugal, Poland, Greece, Italy, Belgium, and potentially Slovakia and Spain.

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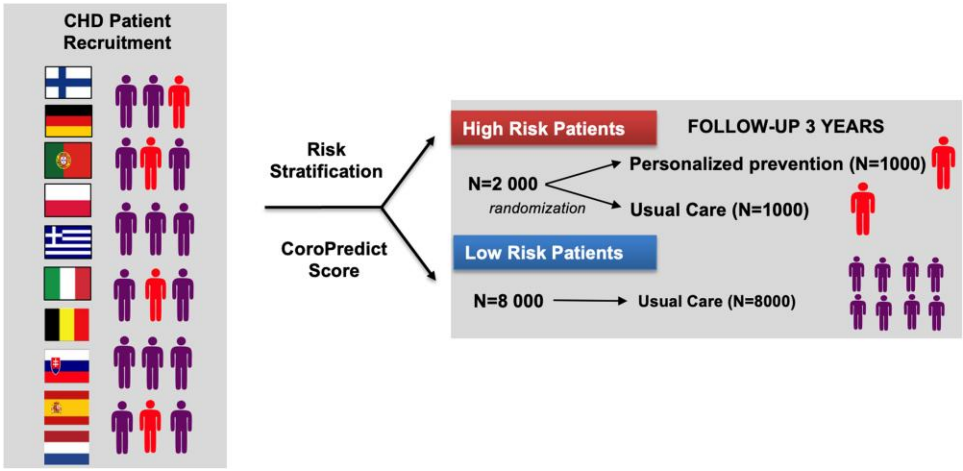

Figure 1 Study flowchart.

Part A: identifying high-risk patients

All enrolled stable CHD patients undergo a biomarker-based risk assessment. The CoroPredict scoring algorithm integrates high-sensitive troponin I, N-terminal pro–B-type natriuretic peptide (NT-proBNP), cystatin C, and CERT2 (a ceramide–phospholipid risk score). Patients are classified as high risk if at least three biomarkers exceed predefined thresholds. This biomarker-driven approach aims to fill the identification gap that current ESC guidelines leave open.

Part B: delivering personalized prevention

Approximately 2000 high-risk patients are randomized 1:1 to either local usual care or the personalized prevention programme (PPP). All continue routine CHD management, but only the PPP group receives the full digital–nurse-led intervention. Follow-up lasts up to 3 years, with optional extension, allowing robust evaluation of long-term outcomes and cost-effectiveness.

In this way, CoroPrevention simultaneously tests both sides of the problem:

(1) Whether biomarker stratification can more accurately identify patients at highest risk
(2) Whether a digital, nurse-led programme can improve delivery of prevention at scale

Figure 1 gives an overview of the study design.

The personalized prevention programme

Discussing the PPP, Laaksonen outlines a structure combining nurse expertise with digital support. Over 3 years, patients attend four nurse visits, two combined nurse–cardiologist visits, and two phone calls, with frequency tapering over time to promote autonomy.[7] Consultations employ shared decision-making and motivational interviewing to prioritize risk factors that are both medically important and personally meaningful—smoking, exercise, diet, stress, and adherence. Goals are specific, measurable, and revisited at each step; barriers are identified early and addressed pragmatically.

Between visits, a smartphone application serves as a behavioural 'co-pilot'. Modules include education, exercise, nutrition—using a CoroPrevention Nutrition-Score aligned with dietary guidance—smoke-free support, stress and mental health tools, medication adherence, and physiological monitoring. Modules are only activated when selected through shared decision-making, avoiding overload. Each module draws on established behavioural techniques such as goal-setting, self-monitoring, and feedback.

On the provider side, a secure dashboard aggregates biomarker profiles, app-derived data, and patient-reported outcomes. Embedded guideline-based tools include the ESC EXPERT system for exercise prescription[8] and a Medication Decision Support System (MDSS) supporting treatment titration. A pre-visit tablet questionnaire streamlines encounters by capturing preferences and outcomes beforehand. Together, the app and dashboard form a continuous loop of patient engagement, nurse-led coaching, and evidence-based decision-making.

Looking ahead

When asked about the future, Laaksonen is pragmatic yet optimistic. CoroPrevention is more than a single trial; it represents a platform for rethinking secondary prevention. Integration with consumer wearables and unobtrusive sensors could extend monitoring into everyday life, while artificial intelligence may one day enable adaptive, personalized interventions. Yet he stresses that scaling digital prevention requires robust frameworks for data privacy, interoperability, and equitable access.

Conclusion

Ultimately, Laaksonen concludes that secondary prevention in CHD faces two stubborn challenges: identifying high-risk patients who need intensified care and delivering that care effectively and sustainably. CoroPrevention directly addresses both through a combination of biomarker-based risk stratification and a digitally supported, nurse-led prevention programme. If successful, it could redefine the standard of care in secondary prevention—shifting from fragmented, centre-based programmes to a personalized, digitally enabled pathway that follows

patients wherever they are. *From hospital to smartphone*, he notes, the project offers a future in which prevention becomes both more precise and more accessible, narrowing the persistent divide between evidence and practice.

Author contributions

Sevda Ece Kizilkilic (Conceptualization [lead], Resources [lead], Visualization [lead], Writing—original draft [lead], Writing—review & editing [lead]), Reijo Laaksonen (Conceptualization [equal], Supervision [equal], Validation [equal], Writing—review & editing [equal]), and Paul Dendale (Conceptualization [lead], Supervision [lead], Validation [lead], Visualization [lead], Writing—review & editing [equal])

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