

The EAPC EXPERT tool

Interactive training and decision support to optimize exercise prescription in cardiovascular disease: the European Association of Preventive Cardiology (EAPC) EXercise Prescription in Everyday practice & Rehabilitative Training (EXPERT) tool

Background

As part of multidisciplinary rehabilitation, exercise training is important as it independently leads to improvements in cardiovascular disease (CVD) risk, endurance exercise capacity, muscle strength, quality of life and prognosis in patients with CVD (risk).^{1–4} As a result, exercise training is considered a Class 1A intervention in the (secondary) prevention of CVD.^{5,6}

According to European recommendations CVD (risk), patients should execute > 150 min of endurance exercise training per week at a moderate intensity, ideally spread over 3–5 days per week, eliciting an energy expenditure of 1000–2000 kcal per week.^{5,6} Moreover, endurance exercise training should be complemented by resistance exercise training two times per week at a moderate exercise intensity.^{5,6}

Problem statement

These European recommendations provide a relevant guideline in how to prescribe exercise to CVD (risk) patients for clinicians, but must not lead to a one-size-fits-all approach in CV rehabilitation. On the contrary, evidence is accumulating that a different exercise prescription is required according to the severity and type of CVD (risk), and ideally, this should persuade clinicians to target different goals during CV rehabilitation (i.e. reducing fat mass, improving blood lipid profile, exercise tolerance, glycaemic control, etc.).⁷ Tailoring the exercise intervention to each single patient according to his/her specificity is a crucial aspect in this endeavour.

However, properly prescribing exercise in different combinations of CVDs and risk factors within the same patient is difficult as this requires integration and prioritization of different exercise recommendations. Indeed, a large heterogeneity in exercise prescription (exercise type, frequency, volume, intensity, session, and programme duration) has been observed between and within different CV rehabilitation units.^{8–15} Clinicians involved in CV rehabilitation are in need of an instrument that assists them in exercise prescription, thereby leading to personalized medicine and better standardisation of exercise intervention.

Interactive training and decision support system for exercise prescription in cardiovascular disease (risk): the EAPC EXPERT tool

With this in mind, the EAPC, together with Hasselt University (Belgium), constructed an interactive training and decision support system for exercise prescription in patients with CVD (risk): the EAPC EXPERT tool.¹⁶

In 2010–2011, the first initiatives to create a CV rehabilitation decision support scheme were launched in Jessa hospital at Hasselt, as clinicians felt that variance in exercise prescription due to personal preferences, should be minimized. However, it was soon realized that such a decisive support scheme should be digitalized and that an enormous amount of data had to be collected, to be able to prescribe exercise in all CVD's and risk factors that clinicians encounter in rehabilitation programmes.

As a result, in 2013, >30 CV rehabilitation experts (EXPERT working group, based on scientific and clinical expertise) from 11 European countries agreed to collaborate and to deliver state-of-the-art exercise recommendations (based on guidelines and evidence) for CVD (risk). These data were then used to construct an algorithm within an interactive training and decision support system by computer scientists (from the Expertise Centre of Digital Media (EDM) of Hasselt University). Several prototypes with different functions were tested and discussed with the EXPERT working group.

Functions of the EAPC EXPERT tool

This EAPC EXPERT tool supports two application modes: a recommendation centre and a training centre.

In the EXPERT recommendation centre (see *Figures 1* and *2*) exercise recommendations are available for ten primary indications for rehabilitation (i.e. coronary artery disease (with or without percutaneous coronary intervention or coronary artery bypass graft surgery), heart failure, cardiomyopathy, intermittent claudication,

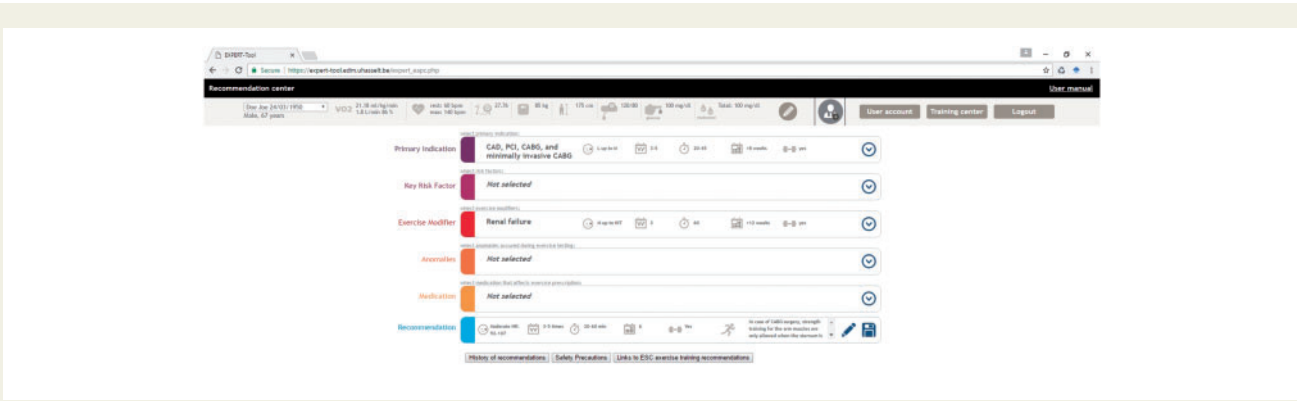


Figure 1 EAPC EXPERT tool recommendation centre.

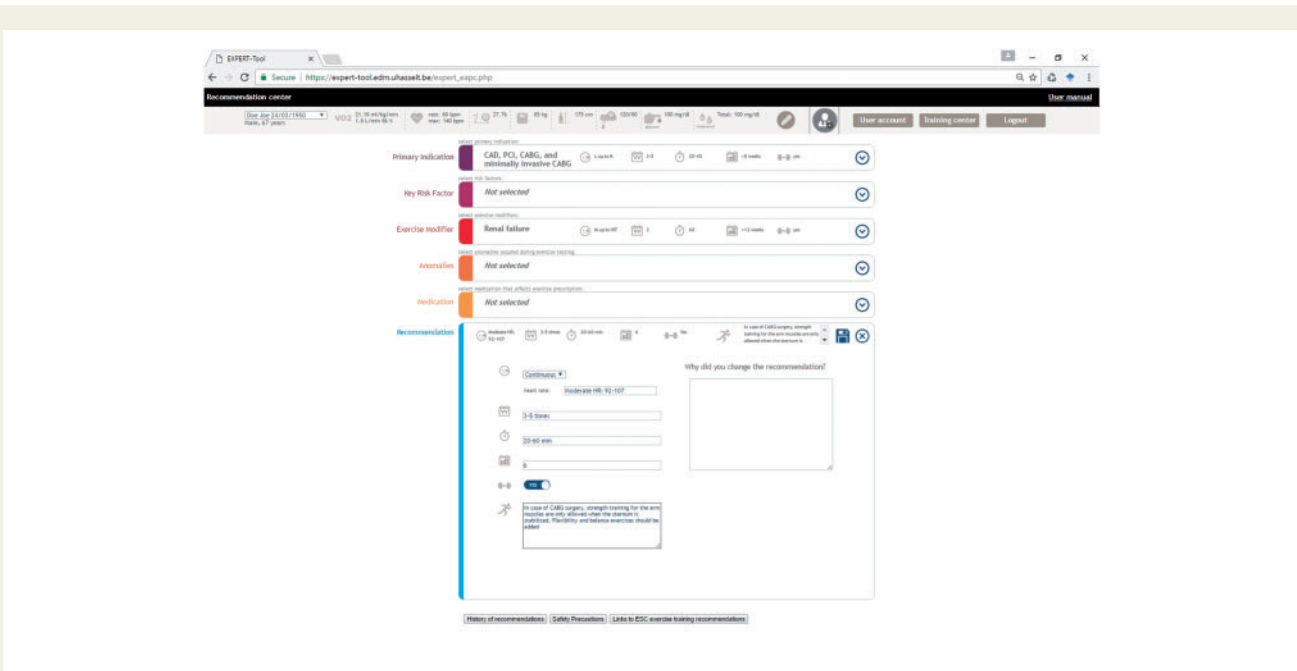


Figure 2 EAPC EXPERT tool exercise recommendation.

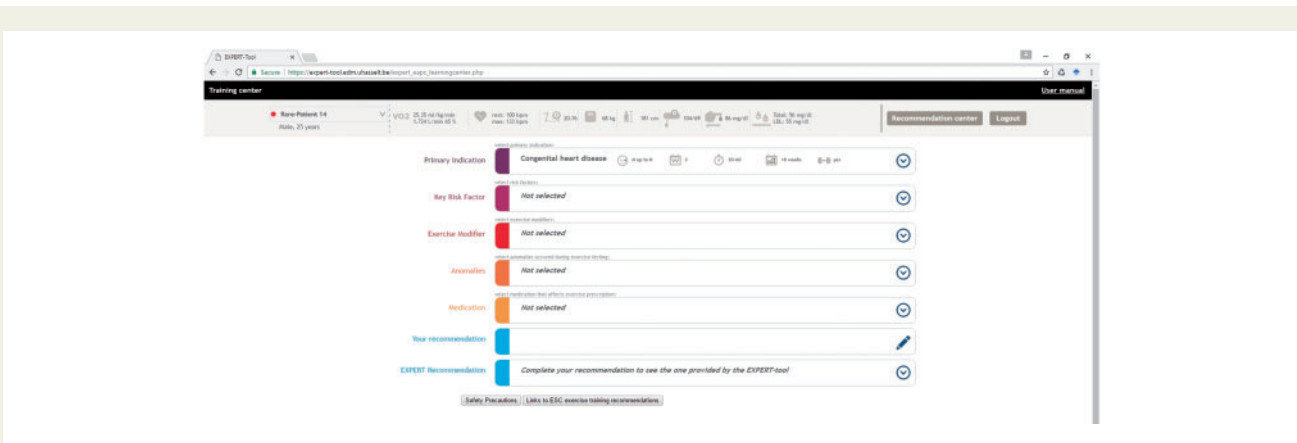


Figure 3 EAPC EXPERT tool training centre.

implantable cardioverter defibrillator or pacemaker, ventricular assist devices, heart transplantation, valve disease or surgery, congenital heart disease, pulmonary arterial hypertension, in-hospital phase rehabilitation), five CVD risk factors (i.e. Type 1 and 2 diabetes, obesity, hypertension, and dyslipidaemia), and three chronic non-CV diseases (i.e. sarcopenia, chronic pulmonary disease, and renal failure).

Based on the patient's medical history, the clinician can activate these CVD's or risk factors, leading to the corresponding exercise prescriptions. In addition, from fill out of the patient's body height and weight, arterial blood pressure, blood lipid profile, fasting glycaemia, resting and peak heart rate during exercise testing, and peak oxygen uptake capacity, these CVD risk factors are automatically activated when certain thresholds are exceeded (leading to the corresponding exercise prescriptions). In final, clinicians can also activate certain medications with significant repercussions for exercise prescription and performance (i.e. beta-blockers, statins, exogenous insulin administration, meglitinide/sulfonylurea) and adverse events during exercise testing (i.e. myocardial ischemia, exercise-induced atrial fibrillation, exercise-induced ventricular tachycardia, implantable cardioverter-defibrillator firing threshold), for further refinement of exercise prescription.

As a result, the EXPERT tool refines exercise prescription for many patient characteristics, medication intake, adverse events during exercise testing, CVDs, and risk factors to maximize tailoring and standardization of exercise intervention. The clinician can adjust this recommended exercise prescription, revise, and recalculate during follow-up. Next to exercise training recommendations, the EXPERT tool also mentions contraindications for certain types of exercise, as well as which safety precautions should be taken into account, based on the patient's profile. These safety advices include which symptoms during exercise training may be anticipated and how to monitor these, and how to adapt training modalities to prevent eliciting/worsening in these symptoms. The EXPERT tool thus not only aims to maximize the clinical benefits of exercise intervention but also the medical safety.

In the EXPERT training centre (see *Figure 3*), numerous patient cases (from easy to difficult, but also rare cases) are available. By using this part of the tool, clinicians can train and optimize their exercise prescription skills. The clinician consults the patient's characteristics. Only after fill out of his/her own exercise prescription, the clinician gets immediate feedback in the tool by showing the recommendations from the EXPERT algorithm.



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Opportunities for the cardiovascular rehabilitation community

By use of the EXPERT tool in clinical practice, certain opportunities for the CV rehabilitation community may emerge, but it will be studied further to verify these hypotheses:

- Greater clinical effectiveness of CV rehabilitation.
- Enhanced medical safety of CV rehabilitation.
- Improved adherence to, or getting to know better, the European exercise prescription recommendations for CVD (risk), leading to lower variance in exercise prescription between different clinicians.

Future of the EAPC EXPERT tool

The EXPERT tool is now available via the EAPC website (<https://www.escardio.org/Education/Practice-Tools/CVD-prevention-tool-box/EXPERT-Tool>) and can be accessed after paying a licence fee. It is hoped that this tool becomes, next to other digital ESC tools, a standard instrument in the cardiology community. The EXPERT tool is updated regularly according to new guidelines or important findings from clinical studies. In addition, new functionalities will be added to the tool and a substantial acceptance rate by healthcare professionals is strived for.

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References

References are available as supplementary material at *European Heart Journal* online.