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Physiological monitoring in the complex multi-morbid heart failure patient - Introduction

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Repeated physiological monitoring of comorbidities in heart failure (HF) is pivotal. This document introduces the main challenges related to physiological monitoring in the complex multimorbid HF patient, arising during an ESC consensus meeting on this topic.

Comorbidities are common in patients with heart failure (HF).[1–3] They are increasingly recognized as central components of the HF syndrome.[4,5] Common comorbidities, such as diabetes,[6–8] hypertension,[9] kidney disease,[10] atrial fibrillation, chronic obstructive pulmonary disease,[11–13] sleep-disordered breathing,[14–16] sarcopaenia,[17] angina,[18,19] cancer,[20] iron deficiency,[21] and neuro-psych ological disorders,[22,23] affect symptoms, quality, and quantity of life of patients with HF as they interfere with the guideline-driven diagnostic and therapeutic pathways of HF.[24,25]

Heart failure patients with comorbidities are usually older and are frequently under-represented into randomized controlled trials.[26–28] Often, several comorbidities are present at the same time in the same patient limiting leading to poly-pharmacy and limiting the adherence and tolerability of guideline-directed life-saving medications, as well as affecting outcomes[29] in ways that are not simply additive or easily predictable.[30]

Furthermore, drugs used to treat comorbidities such as some antidiabetic medications,[31–33] nonsteroidal anti-inflammatory drugs given for chronic arthritic conditions, some anti-cancer drugs[34,35] and many others can often worsen HF. As highlighted by the HFA Guidelines on acute and chronic HF,[36,37] the management of comorbidities is a key component of the holistic care of patients with HF. Although many comorbidities are managed by other specialists who follow their own specialist guidelines the case of the comorbid patient with HF should be sole responsibility of the HF team. This is because HF is in the majority of cases the principal life-limiting disease and priority to HF treatment should be given. It becomes evident that in order to adequately manage HF in the comorbid patient adequate monitoring of the different comorbidities and HF should be implemented. The frail patient, often as consequence of a chronic disease burden,[38] and not just restricted to the elderly,[39] may be the most difficult to treat but also the one least likely to be subject to recruitment into a clinical trial.[40]

However, there is still lack of consensus on how to monitor HF and comorbidities, what to monitor (i.e. which parameter, for which comorbidity), how often and who should do it (i.e. the HF specialist, the general practitioner, the nurse). Even for obesity, we do not know what is the optimal advice for weight loss in HF.[41] An important issue is also how to adapt monitoring to the different organization of care for patients with HF in different Countries. Very simple physiological measurements are routinely checked, but rarely systematically monitored. These include heart rate, blood pressure, electrocardiogram (ECG) pattern, and findings. There is evidence that heart rate should be monitored at all visits and treatments should be implemented in order to reach the target.[42] However, this is true for HF patients in sinus rhythm while no clear evidence on target heart rate exists for patients in atrial fibrillation.[43,44] In HF patients regardless of heart rhythm, the heart rate should be always considered in order not to miss cases of tachycardia-induced cardiomyopathy.

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Despite a wealth of knowledge on the effect of treatments on blood pressure, little is known on the optimal blood pressure to achieve in both HF reduced (HFrEF) or preserved ejection fraction (HFpEF).[9] Also, it is not clear whether nocturnal blood pressure should be measured and monitored routinely, and if there is any role for 24 h ambulatory blood pressure monitoring. The target for the definition of hypotension is different between patients with HF and the general population where lower blood pressure levels are less well tolerated. However, there is no evidence on the relevance of symptomatic hypotension, or whether low blood pressure levels are acceptable if the patient is tolerating it. Patients with different comorbidities should be monitored for hypotension as this can cause potentially fatal events in patients with underlying coronary artery disease or in those with significant carotid atherosclerosis.

While an ECG is routinely performed in patients with HF, there is little evidence on how to monitor ECG patterns, rhythms, and conduction. There is no guidance on whether ECGs should be performed opportunistically or whether they should be routinely performed on regular follow-up. Wearable devices should be recommended for ECG recordings in patients at increased risk of atrial fibrillation (or for detecting it), frequent ectopy, non-sustained ventricular tachycardia, heart block, and pauses. Regular ECGs should be performed in patients with QRS prolongation in order to detect the adequate timing for cardiac resynchronization therapy (CRT).

Left ventricular function defines the types of HF and, in some instances, its prognosis. It is frequently measured but, in assessing it and its trajectory, the importance of intra- and inter-operator variability is not taken into consideration. Apart from echocardiography, there is no evidence or guidance when, how and how frequently other imaging techniques should be used. Important unanswered clinical questions are the recommendations for routine echo follow-up in patients with primary or secondary valve lesions complicating HF, and whether other circumstances justify routine echo during follow-up. No specific guidelines exist on how frequently patients should be rechecked with and echocardiogram after CRT or after drug therapy changes.

Functional capacity should be routinely assessed in transplant patients, transplant candidates as well as patients with ventricular assist devices given the prognostic value of exercise tolerance, and especially of peak oxygen uptake. Other measurements derived from formal cardiopulmonary exercise testing, such as VE/VCO_2 slope, exercise oscillatory ventilation, despite offering immense patho-physiological insight into a patient's condition, have a less well-defined role in routine care. The assessment of functional capacity includes the potential for wearable devices and the possibility of daily activity monitoring although, in this case, adequate and tested monitoring devices should be recommended. In comorbid patients, the remote monitoring and telemedicine—both non-invasive and using implanted technologies (pulmonary artery pressure monitoring and loop recorders) may help patient management and avoid multiple clinic visit and optimize treatment.

Advanced forms of monitoring should include plasma biomarkers, including their diagnostic role, prognostic value, value as inclusion criteria for certain therapies (e.g. sacubitril/valsartan) and the choice of the optimal biomarkers for HFrEF or HFpEF. The routine measurement of natriuretic peptides is not recommended and it can provide misleading information in patients with comorbidities while routine monitoring for renal function and electrolytes should be implemented in all patients with HF.[45]

Specific challenges of monitoring the advanced HF patient include lung congestion or total body water monitoring, along with prevalent comorbidities, renal impairment, electrolyte imbalances,[46–48] haemoglobin, and serum iron (with or without transferrin and transferrin saturation), sleep-disordered breathing, where differentiating central from obstructive sleep apnoea is essential to make the appropriate diagnosis and choose the adequate therapy,[49–51] and monitoring diabetic control. In this latter case, clear targets that should be necessarily different by those suggested by the diabetologists should be identified in patients with HF.

An important question that will need to be addressed in the future is what clinical trials and with what endpoints will be needed to get the proof for the recommendation for routine monitoring of implantable devices. All these pending questions are tackled by the findings of a series of consensus meetings of the Heart Failure Association of the ESC on comorbidities and on frailty, the first of which is the subject of this supplement issue of European Heart Journal. We know that patients who enter trials do better than patients in routine care,[52] and the same is true for registry participants.[53,54] The explanation may simply be the value to improved care of systematically evaluating patients which brings to the clinician's attention the opportunity and the reasons to intervene and improve therapy. It is our aim and our challenge to ourselves to provide this 'best level of care' by systematically monitoring all the comorbidities of our HF patients and using these opportunities to optimize our medical and device care.

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