Physiological monitoring in the complex multimorbid heart failure patient - Conclusions

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KEYWORDS
Heart failure; Adherence; Healthcare systems; Physiology

Comorbidities are increasingly recognized as crucial components of the heart failure syndrome. Main specific challenges are polypharmacy, poor adherence to treatments, psychological aspects, and the need of monitoring after discharge. The chronic multimorbid patient therefore represents a specific heart failure phenotype that needs an appropriate and continuous management over time. This supplement issue covers the key points of a series of meetings coordinated by the Heart Failure Association of the European Society of Cardiology (ESC), that have discussed the issues surrounding the effective monitoring of our ever more complex and multimorbid heart failure patients. Here, we present an overview of the complex issues from a healthcare delivery perspective.

Introduction

Chronic heart failure is getting more complex, with patients becoming older and accumulating more comorbidities.1–3 In addition, guideline-directed therapies improve cardiac outcomes4–6 with the effect that the longevity of heart failure patients increases and the burden of age-related non-cardiac diseases rises in parallel to the duration of the syndrome.7,8 Non-cardiac diseases have an adverse effect on outcomes and, in particular, on hospitalization rates, with the number of non-cardiac comorbidities having an additive effect of the complication rates.9,10 Taking into account these issues, a multidisciplinary panel of leading international experts has been organized by the Heart Failure Association of European Society of Cardiology (ESC) to discuss the latest evidence, ongoing research, and controversial issues regarding physiological monitoring in the complex multimorbid heart failure patient. The papers in this supplement reflect the key points raised during these meetings.

General considerations

Drugs used to treat comorbidities can have a negative impact on heart failure outcomes and, in particular, might affect renal outcomes (like non-steroidal antagonists), which in turn affect morbidity and mortality in chronic heart failure.11 Impaired renal function interferes with guideline-directed medical therapies, which are often dependent on renal function (renin-angiotensin-aldosterone inhibitors).4 Cognitive dysfunction and depression affect the adherence to guideline-directed therapies and impair healthcare literacy, with detrimental impact on adherence to heart failure therapies.12–14

Therefore, the monitoring of the complex multimorbid patient is multidisciplinary. As such, it needs to be performed by heart failure specialists and specialists in other fields using a mutual approach. In particular, this approach needs to be organized in specialized programmes, because these patients have a high rate of
hospitalizations. Beyond this, self-care skills need to be fostered, including patient education and incorporating shared decision-making into the concept of the complex patient care.

**Medical adherence**

Medical adherence is one of the major precipitating causes of acute heart failure. Medical adherence is related to a poor degree of health literacy, cognitive dysfunction, and depression and is inversely related to the number of context to health care providers. Monitoring of drug therapies is usually performed by direct contact of the patients with physicians or healthcare nurses. However, tele-monitoring approaches have been tested, although most experiences are present in hypertension. Due to the high prevalence of comorbidities, it became clear that the comprehensive heart failure care must involve a multidisciplinary approach (Figure 1).

**Management of comorbidities**

According to the majority of disease management programmes, a regular patient contact is necessary to obtain signs, symptoms and potentially laboratory tests for the major comorbidities. These include renal dysfunction, hyperkalaemia, anaemia, iron deficiency, thyroid disease, and electrolyte disturbances. Even subtle symptoms should be considered and regular physician-patient contacts or heart failure nurse-patient contacts shall be maintained, as recommended in major disease management programmes and heart failure network programmes. In particular, new introduction of drugs such as mineralocorticoid antagonists, in particular in combination with angiotensin-converting enzyme-inhibitors or angiotensin-receptor blockers, should lead to a regular monitoring of electrolytes, which has been insufficiently performed in real-world studies.

**Education of healthcare providers**

Psychological aspects affect healthcare behaviour and medical adherence. Therefore, monitoring should be made by specialists in depressive symptoms and cognitive dysfunction, as both are frequently found in patients with heart failure and in the elderly population. Furthermore, medical devices like implantable cardioverter-defibrillators (assist devices) and concomitant diseases and complications might induce a loss of trust in medical interventions by heart failure patients. Therefore, regular communication including psychological counselling involving families and other care providers is of particular importance. The threshold to contact a specialist for psychological dysfunction should be low (i.e. also in presence of mild symptoms).

**Monitoring after discharge**

Discharge planning is one of the most important factors to maintain medical care, which has been initiated during an in-hospital stay. Discharge planning should allow patients to see physicians or heart failure nurses within a short period of time to allow them to respond to any changes in signs and symptoms. The change from the in-hospital situation to the out-hospital setting requires close counselling for lifestyle advice in the changing environment. Counselling is not only important shortly after discharge to address the so-called ‘vulnerable phase’. Also long-term follow-up and regular consultation to advise for lifestyle, exercise, medical treatments and to increase patient’s

![Figure 1](https://academic.oup.com/eurheartjsupp/article-abstract/21/Supplement_M/M68/5691330) Multidisciplinary care of heart failure patients involving many disciplines to account for multimorbidity and psychosocial demands.
awareness on signs and symptoms of the disease is of crucial importance. The regular consultation should be accompanied by monitoring of laboratory values for renal function, iron deficiency, anaemia, and potentially natriuretic peptide as well as a rigorous physical examination.

Patients eligible for telemonitoring or implantable monitoring devices should be carefully evaluated by an expert physician to improve hemodynamic monitoring. Selected patients should be carefully evaluated for these innovative possibilities.

Conclusions

Chronic heart failure patients are commonly burdened by multiple comorbidities, which require a systematic monitoring over time. Key factors to be monitored are lung congestion or total body water monitoring, renal impairment, haemoglobin and serum iron, transferrin and transferrin saturation, sodium, potassium, sleep-disordered breathing, and of course monitoring diabetic control.

Also, there is a growing incidence of non-cardiac comorbidities. Often heart failure patients are burdened by co-existing cancer, with the need to develop evidence-based strategies for monitoring and protecting cardiac function during anti-cancer regimes.

Finally, psychological and cognitive aspects must be carefully monitored over time due to their link with poor adherence and prognosis.

For all these reasons, physiological monitoring in the multimorbid heart failure patient is particularly challenging and upcoming research with clinical trials specifically including old and multimorbid patients are strongly needed.

Conflict of interest: none declared.

References

1. Wong CY, Chaudhry SJ, Desai MM, Krumholz HM. Trends in comorbidity, disability, and polypharmacy in heart failure. Am J Med 2011; 124:136-143.

2. von Haehling S. Co-morbidities in heart failure beginning to sprout and no end in sight? Eur J Heart Fail 2017; 19:1566-1568.

3. Pan A. The real-world evidence of heart failure co-morbidities. Eur J Heart Fail 2017;19:434.

4. Ponikowski P, Voors AA, Anker SD, Bueno H, Cleland JG, Coats AJ, Linde C, Nihoyannopoulos P, Parissis JT, Pieske B, Riley JP, Rosano GM, Ruilope LM, Ruschitzka F, Rutten FH, van der Meer P; Authors/ Task Force Members; Document Reviewers. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC). Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. Eur J Heart Fail 2016;18:981-975.

5. Pareek A, Chandurkar N, Dharmadhikari S, Agewall S. Congestive heart failure: more common as well as an important cardiovascular outcome. Eur Heart J Cardiovasc Pharmacother 2017;3:98.

6. Hartman O, Sinisalo J, Kovanen PT, Lehtonen J, Eklund KK. Congestive heart failure: more common as well as an important cardiovascular outcome: reply. Eur Heart J Cardiovasc Pharmacother 2017;3:99.

7. Böhm M, Komajda M, Borer JS, Ford I, Maack C, Tavazzi L, Moayn A, Swedberg K; SHIFT Investigators. Duration of chronic heart failure affects outcomes with preserved effects of heart rate reduction with ivabradine: findings from SHIFT. Eur J Heart Fail 2018;20:373-381.

8. Wolsk E, Claggett B, Kaber L, Pocock S, Yusuf S, Swedberg K, McMurray JJV, Granger CB, Pfeffer MA, Solomon SD. Contribution of cardiac and extra-cardiac disease burden to risk of cardiovascular outcomes varies by ejection fraction in heart failure. Eur J Heart Fail 2018;20:504-510.

9. Böhm M, Robertson M, Ford I, Borer JS, Komajda M, Kindermann I, Maack C, Lainscak M, Swedberg K, Tavazzi L. Influence of cardiovascular and noncardiovascular co-morbidities on outcomes and treatment effect of heart rate reduction with ivabradine in stable heart failure (from the SHIFT Trial). Am J Cardiol 2015;116:1890-1897.

10. Böhm M, Pogue J, Kindermann I, Piss J, Koon T, Yusuf S. Effect of comorbidities on outcomes and angiotensin converting enzyme inhibitor effects in patients with predominantly left ventricular dysfunction and heart failure. Eur J Heart Fail 2014;16:325-333.

11. Metra M. October 2017 at a glance: phenotyping heart failure, co-morbidities, use of evidence-based therapy and new treatments. Eur J Heart Fail 2017;19:1216-1217.

12. DiMatteo MR, Lepper HS, Crogan TW. Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. Arch Intern Med 2000;160:2101-2107.

13. Komajda M, Cowie MR, Tavazzi L, Ponikowski P, Anker SD, Filippatos GS; QUALIFY Investigators. Physicians’ guideline adherence is associated with better prognosis in outpatients with heart failure with reduced ejection fraction: the QUALIFY international registry. Eur J Heart Fail 2017;19:1414-1423.

14. Agewall S. Adherence to guidelines and registry data. Eur Heart J Cardiovasc Pharmacother 2017;3:183-184.

15. Angermann CE, Stöck S, Gelbrich G, Faller H, Jahn R, Frantz S, Loeffler M, Ertl G; Competence Network Heart Failure. Mode of action and effects of standardized collaborative disease management on mortality and morbidity in patients with systolic heart failure: the Interdisciplinary Network for Heart Failure (INH) study. Circ Heart Fail 2012;5:25-35.

16. Fitzgerald AA, Powers JD, Ho PM, Maddox TM, Peterson PN, Allen LA, Masoudi FA, Magid DJ, Havernak EP. Impact of medication nonadherence on hospitalizations and mortality in heart failure. J Card Fail 2011;17:664-669.

17. Doxanescu C, Mellicori P, Mabote T, Torabi A, Clark AL, Cleland J. The effects of short-term omission of daily medication on the physiological/pathophysiology of heart failure. Eur J Heart Fail 2017;19:643-649.

18. Wu JR, Lennie TA, Dekker RL, Biddle MJ, Moser DK. Medication adherence, depressive symptoms, and cardiac event-free survival in patients with heart failure. J Card Fail 2013;19:317-324.

19. Ambarek AV, Fonarow GC, Hernandez AF, Pan W, Yancy CW, Krantz MJ; Get With The Guidelines Steering Committee and Hospitals. Characteristics and in-hospital outcomes for nonadherent patients with heart failure: findings from Get With The Guidelines-Heart Failure (GWTG-HF). Am Heart J 2009;158:644-652.

20. Ambrosy AP, Gheorghiade M. Real-world dosing of evidence-based medications for heart failure: embracing guideline recommendations and clinical judgement. Eur J Heart Fail 2017;19:1424-1426.

21. Agewall S. Cardiovascular pharmacotherapy. Eur Heart J Cardiovasc Pharmacother 2018;4:1-11.

22. Lip GYH, Coca A, Kahan T, Boriani G, Manolis AS, Olsen MH, Oto A, Potpara TS, Steffel J, Marin F, de Oliveira Figueiredo MJ, de Simone G, Tzou WS, En Chiang C, Williams B. Hypertension and cardiac arrhythmias: executive summary of a consensus document from the European Heart Rhythm Association (EHRA) and ESC Council on Hypertension, endorsed by the Heart Rhythm Society (HRS), Asia-Pacific Heart Rhythm Society (APHRS), and Sociedad Latinoamericana de Estimulación Cardíaca y Electrofisiología (SOLEACE). Eur Heart J Cardiovasc Pharmacother 2018;3:235-250.

23. Rosano GMC, Tamargo J, Kjeldsen KP, Lainscak M, Agewall S, Anker SD, Cecconi C, Coats A, Drexel H, Filippatos G, Kaski JC, Lund L, Niessen A, Ponikowski P, Savarese G, Schmidt TA, Seferovic P, Wassmann S, Walther T, Lewis BS. Expert consensus document on the management of hyperkalaemia in patients with cardiovascular disease treated with renin angiotensin aldosterone system inhibitors: coordinated by the Working Group on Cardiovascular Pharmacotherapy of the European Society of Cardiology. Eur Heart J Cardiovasc Pharmacother 2018;4:180-188.
24. Agewall S. Anticoagulation, atherosclerosis, and heart failure. *Eur Heart J Cardiovasc Pharmacother* 2017;3:1–2.

25. Tamargo M, Tamargo J. New potassium binders reduce the risk of hyperkalaemia in patients treated with renin-angiotensin-aldosterone system inhibitors. *Eur Heart J Cardiovasc Pharmacother* 2018;4:193–194.

26. Kapelios CJ, Malilias K, Kaldara E, Vakrou S, Nanas JN. Loop diuretics for chronic heart failure: a foe in disguise of a friend? *Eur Heart J Cardiovasc Pharmacother* 2018;4:54–63.

27. Ertl G, Angermann CE, Bekeredjian R, Beyersdorf F, Güder G, Gummert J, Katus HA, Kindermann I, Pauschinger M, Perings S, Raake PWJ, Störk S, von Scheidt W, Böhm M. Aufbau und Organisation von Herzinsuffizienz-Netzwerken (“Heart Failure Units”, HFUs) zur Optimierung der Behandlung der akuten und chronischen Herzinsuffizienz: gemeinsame Empfehlungen der DGK und der DGTG zur Behandlung der Herzinsuffizienz. *Kardiologe* 2016;10:222–235.

28. Pitt B, Ferreira JP, Zannad F. Mineralocorticoid receptor antagonists in patients with heart failure: current experience and future perspectives. *Eur Heart J Cardiovasc Pharmacother* 2017;3:48–57.

29. Coats A. HFA Committee on Comorbidities—report of a meeting on physiological monitoring in the complex multimorbid heart failure patient. *Eur J Heart Fail* 2019;21:543–544.