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REVIEW

Structural components for the development of a heart failure network

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Abstract

Diagnosis and treatment of heart failure (HF) is challenging, and development of specialized HF networks is mandatory to warrant broad access to guideline directed therapies for patients. Numerous national cardiovascular societies recommend a three-level association of health care providers. This comprises tertiary academic centres, specialized HF clinics and specialized general cardiologists to cover the large spectrum of HF severity and entities. Although this idea of a multi-level care is widely accepted, optimal approach to build and implement a HF network service needs further definition. The core principle is that of network healthcare facilities that also consider regional peculiarities and that implements academic standards, quality indicators (QIs), interdisciplinarity and reimbursement strategies. These determinants of trans-sectoral healthcare need to be embedded in a network that provides sustainability and that incorporates QIs to objectify the efficacy of specific measures. The basis of a HF-network should be a certification system of the respective national HF association to warrant guideline standards and to prevent development of regional hierarchies or dependencies between members. This nationwide framework needs to be complemented by a federal system of regional networks, which also takes local demands into account. These regional units should incorporate digital communication and interaction pathways, structured educational programmes, certified telehealth concepts and follow-up algorithms to meet the requirements of sustainability and efficacy. We here summarize different components of HF networks and introduce the structure and development philosophy of the RUHR-HF-network that constitutes the first certified HF-clinics-network in the Ruhr area—the largest metropolitan area in Germany.

Keywords Heart failure; Networks; Telehealth; Digital

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Introduction

Heart failure (HF) constitutes one of the future's largest challenges for healthcare systems and providers.[1,2] Latest guidelines and earlier statements from cardiovascular societies clearly recommend the establishment of multidisciplinary HF management programmes (HF-MPs) to enable patients to have the correct investigations, an accurate diagnosis, appropriate evidence-based therapy, education, and suitable follow-up (FU).[3–6] All the aforementioned steps, from diagnosis to treatment and FU, need to be clearly defined to minimize interface problems and to standardize procedures across primary and hospital care.

There is broad consent that establishment of HF-MPs is a priority in every healthcare system to improve survival, quality of life (QoL) and reduce hospitalizations. These efforts need to be balanced against the fact that most HF services have unique features, which are specific to their geographical locations and resources.[4] Notwithstanding, there is also consent on the minimum of HF competencies that should be ascertained by tertiary/teaching/university referral centres as well as by HF nurses and primary care physicians.[4,7–9]

Beyond these basic competencies, defined by curricula of national societies and infrastructural demands for institutions, there is an unmet need for the definition of intersectoral and interdisciplinary communication, integration of quality indicators (QIs) and feasible follow-up algorithms.

We here aim to summarize the structural components of an interdisciplinary HF network including latest recommendations from international cardiovascular societies[2–4,7,10] and propose the consideration of additional components that implement standardized, digital and intersectoral communication pathways.

Contemporary challenges in the diagnosis and treatment of HF

HF is the leading cause of hospitalization in the ageing population that is associated with reduced QoL and higher risk of death.[1] Timely and accurate diagnosis require familiarity with signs and symptoms of HF and the respective algorithms among general practitioners, general cardiologists as well as among medical staff in emergency departments (ER) and intensive care units (ICU). Contemporary analyses suggest an average delay of almost 10 months from symptom onset to diagnostic testing and a total delay from symptoms to HF treatment over 2 years.[11] These delays translate into reduced survival rates down to 78% in patients who might achieve a 1 year survival rate of 90% if treated timely (calculated with a 1 year deferral of treatment).[12] Even in the acute setting of acute decompensated HF (ADHF) or after discharge following an episode of ADHF, high rates of rehospitalization and death have been recognized due to insufficient post-discharge disease management with increased 30 day readmission rates from 17.2% to 20.1% in an observational study of 6 955 461 patients.[13,14] Latest guidelines thus recommend an early visit at 1 to 2 weeks after discharge to properly assess signs of congestion, drug tolerance and initiate and/or up-titrate evidence-based therapy.[3] In advanced stages of HF delayed referral or lack of referral of patients who are likely to derive benefit from heart transplant (HTX) or left ventricular assist device (LVAD) evaluation can have important adverse consequences.[15-17] All disease stages throughout the whole HF trajectory are characterized by challenges and shortcomings in contemporary healthcare systems.

Evidence and recommendations for network-based HF care

Current guidelines for the diagnosis and treatment of acute and chronic heart failure emphasize the implementation of existing curricula into national education systems to support training of specialist HF cardiologists and specialist HF nurses.[2,3] Aside from individual training, the guidelines recommend establishment of HF-MPs to enable patient's access to accurate and timely diagnosis, appropriate evidence-based therapy, education and suitable FU.[3] These recommendations cover measures where an evidence level can be given and where concise tasks can be deduced. The largest body of evidence in the field derives from studies investigating the trajectory of patients with established diagnosis of HF and/or patients with ADHF. Since the first diagnosis of HF or an ADHF event are clearly defined landmarks in a patient's history, it is reasonable to implement such landmarks for the establishment of algorithms. A comprehensive meta-analysis of randomized controlled trials (RCTs) between 2000 and 2015 has demonstrated that nurse home visits and disease management clinics have the potential to decrease all-cause mortality after ADHF and can also reduce readmissions along with nurse case management.[6] In contrast to the randomized TIM-HF2 trial (Efficacy of telemedical interventional management in patients with HF) that was conducted in Germany, a significant effect of telephone, telemonitoring, pharmacist and education interventions on outcome was not shown.[18] Although this putative controversy between meta-analysis and RCT is surprising at first sight, it just confirms that it depends not primarily on the kind of applied FU service but on the local setting whether a specific measure is effective in reducing end-points or not.[19] Management of patients with chronic HF (CHF) should include self-management strategies, home-based and/or clinic-based programmes and easy access to healthcare. All these components have the potential to reduce all-cause mortality and/or hospitalization and thus should be mandatorily incorporated in HF-MPs protocols.[3] In addition to patients in CHF stages, networks cover the whole spectrum of the syndrome including also patients in advanced stages who might benefit from HTX, LVAD or temporal mechanical circulatory support (MCS). Identification of patients at risk for deterioration is challenging and timely and appropriate referral of patients with advanced HF should be offered before the development of end-organ failure.[15] To adequately cover and stratify this spectrum, the foundation of the Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) provided a tool for differentiation of the advanced HF continuum (INTERMACS classification, level 1 = critical cardiogenic shock to level 6 = exertion limited), suggesting that patients in INTERMACS level $\leq$3 benefit the most from early evaluation.[20] This classification is widely accepted and supports decision making for HTX/LVAD strategy planning.[3] To guarantee adequate screening and triage, 'Hub and Spoke' networks are considered to be the key to optimal patient management for HF in advanced stages (INTERMACS level 3–6) or cardiogenic shock (CS) (INTERMACS level 1–2).[21,22] Observational studies suggest that a standardized

team-based approach may improve outcome in CS with a survival increase from 30% up to 76.6% in selected settings and cohorts.[23,24] In contrast, a recent retrospective analysis from a setting in the United States found that patients treated with spoke and hub principle experienced similar short-term outcomes within a regionalized CS network.[25] Important findings of this investigation were, that patients with CS more often initially presented to a spoke than a hub centre and that those patients, initially triaged at a spoke centre, more often presented with infarct related CS and were more likely to be treated initially with vasopressors and an intra-aortic balloon pump.[25] Although patients admitted directly to a hub centre had more often acute on chronic HF and were more likely to receive MCS. The implementation of a comprehensive regionalized system of CS care that employs 1-call access, uniform treatment protocols, early multidisciplinary communication, and expedited transfer protocols was associated with similar short-term outcomes for all patients, independent of initial site of presentation.[25] Again, like outlined above when discussing effects of telemedical FU on outcomes, this putative controversy results do not scrutinize the principle of 'Hub and Spoke' networks but rather highlight the importance to increase the granular breakup of network components, like number of HF specialists/site ratio, local treatment protocols or availability/experience and access to MCS. Available literature for network-based patient care is often limited to isolated aspects or components of the HF continuum what makes it difficult to generalize findings and to define benchmarks that really define quality of care (*Figure 1*). In current practice, benchmarking between health care providers relies rather on easy available absolute numbers than on comprehensive performance evaluation.[14,26] High numbers of structural interventions in HF patients, HTX and/or LVAD implantations, MCS utilization or absolute amount of implanted cardiac resynchronization therapies (CRT) neither necessarily reflect quality nor can be adduced to compare institutions without adjustment for differences in patient characteristics and outcome measurement.[27] Moreover, actual benchmark procedures are often limited to HF patients in advanced disease stages or CS whereas the majority of patients is presenting with CHF where quality indicators (QIs) for benchmarking were recently established and need to be implemented (*Figure* 2).

QIs for the evaluation of care and outcomes for patients with HF

International guidelines strongly recommend patients with HF with reduced ejection fraction (HFrEF) be treated with angiotensin-converting enzyme inhibitors/angiotensin receptor (RASi) blockers or angiotensin receptor-neprilysin inhibitors (ARNi), beta-blockers (BB), mineralocorticoid receptor antagonists (MRAs) and sodium glucose cotransporter-2 inhibitors (SGLT2i) because these have demonstrated to

Figure 1 Quality of care aspects throughout the spectrum of heart failure. Single interventions like structural interventions in heart failure (HF) patients, ventricular assist device (VAD) implantation, heart transplant (HTX), mechanical circulatory support (MCS)/extracorporeal membrane oxygenation (ECMO) or device implantation and advanced ablation therapies (EP) are often applied to objectify the capacity of institutions and/or networks. These benchmark procedures are often limited to HF patients in advanced disease stages or cardiogenic shock whereas most patients are presenting with chronic HF where quality indicators for benchmarking (like proportion of patients having correct diagnosis, proportion of patients on guideline directed medical therapy (GDMT)) still need to be implemented. Likewise, process and outcome measures need to be considered when assessing the impact of network activities on the burden of HF. QoL, quality of life; FU, follow-up; HF-MPs, HF management programmes. Images are created with Biorender.com.

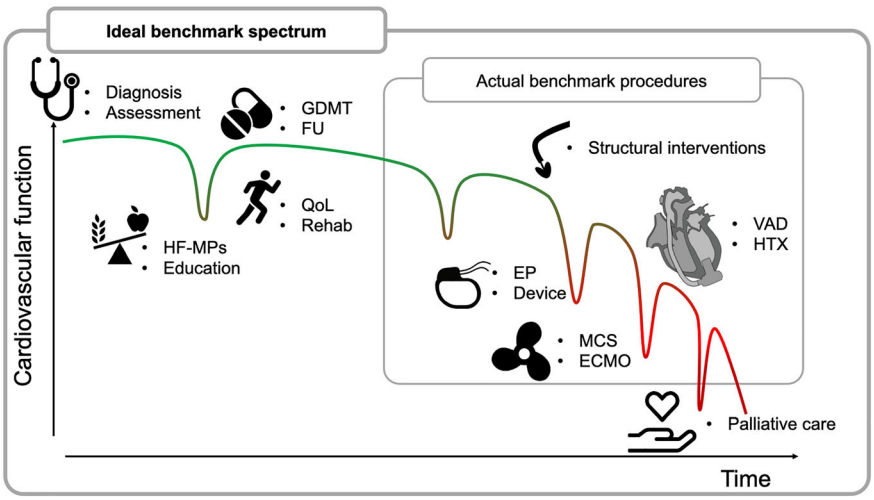
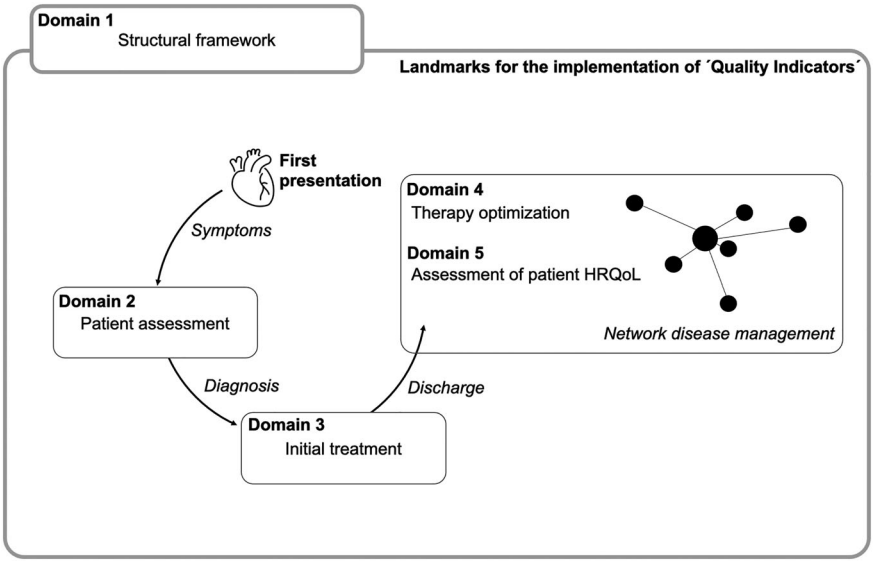


Figure 2 Landmarks of network development and implementation of quality indicators (QIs). The Working Group for Heart Failure Quality Indicators in collaboration with the Heart Failure Association of the European Society of Cardiology developed quality indicators for the care and outcomes of adults with heart failure (HF) that cover the whole trajectory of a HF patient. QIs were selected across five domains of care for the management of HF: (1) structural framework, (2) patient assessment, (3) initial treatment, (4) therapy optimization, and (5) assessment of patient health-related quality of life.[30] These QIs need to be taken into consideration during HF network development because they represent evidence based tools for the assessment of quality of care. Clinical episodes like first presentation, diagnosis or discharge management are practical landmarks in the disease trajectory of a patient with heart failure to implement QIs objectify process quality. HRQoL, health related quality of life.



improve clinical outcomes.[2,3] Despite unequivocal evidence, contemporary registries of outpatients with CHF uncovered significant gaps in use and dosing of guideline-directed HFrEF medications, which is a common finding in the United States and Europe.[28,29] This frequently documented non-adherence to guideline-directed medical therapies (GDMT) is associated with worsening symptoms, frequent hospitalizations and premature death.[28] The reasons for inadequate GDMT are manifold and vary between regions and health care systems. The disconnection between development and implementation of new therapies and/or healthcare technologies is referred to as 'second translational' or 'evidence-practice' gap.[30] The European Society of Cardiology (ESC) as well as other national and international cardiovascular societies have therefore developed quality indicators (QIs) for the care and outcomes of adults with HF, to enable healthcare providers to provide valid and feasible metrics to quantify and improve quality of cardiovascular care.[27,30–32] These QIs describe aspects of the process of care that should or should not be performed in a specific clinical situation and that were developed in a validated and scientific four-step process. These steps include the identification of key domains of care (1), review of literature to establish candidate QIs (2), final selection of a set of QIs by experts using the modified Delphi method (3) and finally conducting a feasibility assessment by evaluating different ways of defining the QI specifications for the proposed data collection source (4).[27]

Landmarks of QIs for HF network development

Although 'benchmark procedures' like HTX/LVAD, structural interventions in HF patients or MCS numbers can easily be accounted and adduced as performance indicators of a given institution or network, they are frequently limited to the advanced HF spectrum (*Figure 1*). It is reasonable to use such indices because they reflect the feasibility of a system to perform complex procedures and to have the capacities available for realization of the underlying processes and human resources. If these measures are further flanked by comprehensive quality assessment that analyses outcomes and guarantees ongoing process optimization, absolute numbers are helpful indicators for patients and referral practitioners to identify where a dedicated procedure can be done according to highest standards. Albeit these absolute numbers neither imply information about the adherence to GDMT nor can be used to measure the general quality of HF care in the respective surrounding. An applicable QI for the assessment of therapy optimization in HFrEF, for instance, should not be the sole number of CRT-Ds implanted, but the proportion of symptomatic patients with HFrEF in sinus rhythm with a QRS duration $\geq$150 ms and left bundle branch block QRS morphology and with left ventricular ejection fraction $<$35% despite $>$3 month GDMT who are finally offered

CRT-D.[30] Indicators like these were identified by a working group of the ESC to cover the yet blind 'ideal benchmark spectrum' that should be incorporated in every HF network to reduce the burden of disease. Twelve main and four secondary QIs were identified across five domains of care, which express landmarks not only in the trajectory of a HF patient but also in the development of a HF network (*Table 1*).[3,30] These indicators incorporate structural aspects, process flows and/or outcome measures that reflects the conceptual framework of the dimension of health care based on the Donabedian model.[27] The first domain emphasizes the need of a dedicated multidisciplinary team to manage patients with HF and additional trained healthcare professionals what constitutes the general framework of every HF network (*Figure 2*). The second domain addresses the general patient assessment and implies several main and a single secondary QIs. This domain aims to support the evaluation of patients with the diagnosis of HF, evaluates if the clinical type is named correctly and if basic assessments like ECG documentation and natriuretic peptide/blood tests are measured and documented (*Table 1*). Moreover, the second domain extends the field of patient assessment by the proportion of patients hospitalized with HF who have been referred for a cardiac rehabilitation programme and/or have a FU review by a healthcare professional within a designated time frame (*Figure 2*). The domains 3 and 4 cover the actual adherence to GDMT and the proportion of patients that experience evidence-based therapy optimization and/or primary arrhythmia prevention (*Figure 2*). The fifth domain finally addresses the proportion of patients with HF who have an assessment of their QoL using a validated tool. Although the fifth domain comprises one of the most important outcomes in HF care, this domain has been designed as a 'process QI' given the concerns about the feasibility of capturing health related QoL in clinical practice. Validated QIs throughout the HF trajectory, benchmark procedures and dedicated HF-MPs are the modules that need to be combined for the establishment and development of a HF network.

Structural components of HF networking—Development scheme of the RUHR-HF network

There is no generally applicable model of a universal HF network that addresses all the challenges and that can be adopted by different healthcare systems. Presumably, it is not possible to create one single structure that can be expanded to different regions or systems. It is more likely, that the different components discussed above need to be combined and adopted to the specific demands and capabilities of a given surrounding. The widely accepted model of three different organization levels—HF clinic/GC, HF unit, HF care—constitutes the infrastructural framework for the establishment of a HF network.[4,9,33]

In 2016, the German Cardiac Society (GCS) and the German Society for Thoracic and Cardiovascular Surgery (GSTCS) published an interdisciplinary joint recommendation for the structure and organization of HF-NETs and heart failure units (HFUs) to optimize treatment of acute and chronic HF.[34] It

Table 1 ESC HFA quality indicators for the management of patients with heart failure[30]

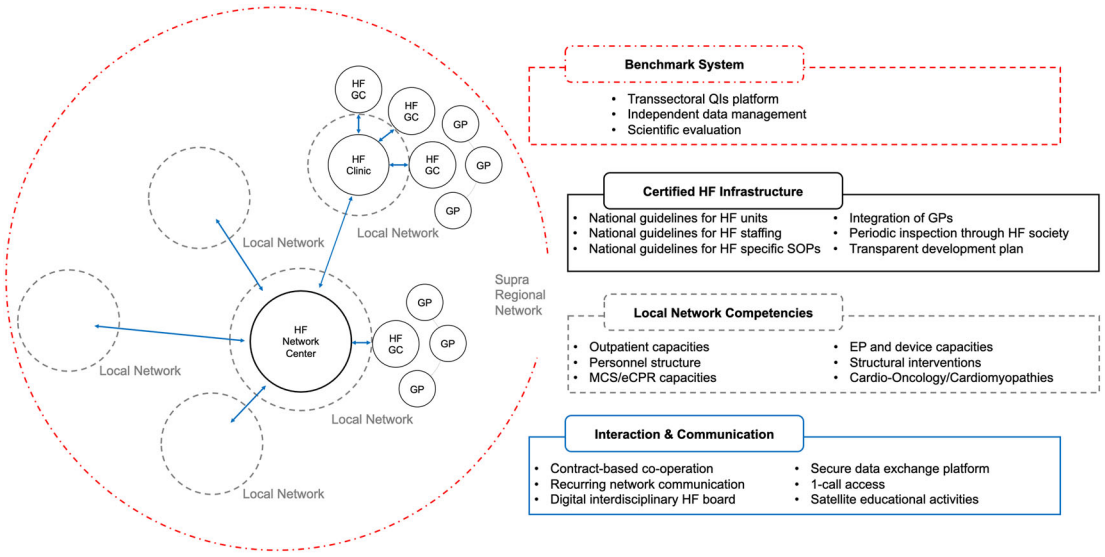
Domain	Quality indicator
Structural framework	• Centres should have a dedicated multidisciplinary team to manage patients with HF • Centres should have dedicated trained healthcare professionals to deliver HF specific education to facilitate patient self-care
Patient assessment	• Proportion of patients with HF who have a documentation of their HF clinical type (HFrEF, HFmrEF, and HFpEF) • Proportion of patients with HF who have a documentation of their ECG findings • Proportion of patients with HF who have their NPs measured • Proportion of patients with HF who have their blood tests documented • Proportion of patients hospitalized with HF who have been referred for a cardiac rehabilitation programme • Proportion of patients hospitalized with HF who have a follow-up review by a healthcare professional within 4 weeks of their hospital discharge
Initial treatment	• Proportion of patients with HFrEF who are prescribed the beta-blocker bisoprolol, carvedilol, sustained-release metoprolol succinate, or nebivolol in the absence of any contraindications • Proportion of patients with HFrEF who are prescribed an ACE inhibitor, ARB or ARNI in the absence of any contraindications • Proportion of patients with HFrEF who are prescribed an MRA in the absence of any contraindications • Proportion of patients with HFrEF who are prescribed a SGLT2 inhibitor in the absence of any contraindications • Proportion of patients with HFrEF who are prescribed loop diuretic therapy if they have evidence of fluid retention
Therapy optimization	• Proportion of symptomatic patients with HFrEF in sinus rhythm with a QRS duration ≥150 ms and LBBB QRS morphology and with LVEF ≤35% despite ≥3 months GDMT who are offered CRT • Proportion of symptomatic patients with HF, LVEF ≤35% despite ≥3 months GDMT, and ischaemic heart disease who are offered primary prevention ICD
Assessment of patient HRQoL	• Proportion of patients with HF who have an assessment of their HRQoL using a validated tool

was the first description of the requirements that should be met by the modules of a HF-NET to be eligible for certification as a HFU and was prepared in collaboration with the German Association of Cardiologists in Private Practice (BNK) and the Working Group of Leading German Hospital Cardiologists (ALKK). The West German Heart and Vascular Center at the University Hospital Essen became the first certified HFU in the Ruhr area in 2018 according to societies recommendations.[35] These considerations then became the basis for the development plan of the RUHR-HF-network that constitutes the first certified HF-network in the Ruhr area (the biggest metropolitan area in Germany with 53 cities, 5 100 000 inhabitants, 4438.69 square kilometres).[36] This development plan summarizes essential components and aims to lay the foundation for a supra-regional, independent benchmark system of QIs that enables healthcare societies to measure quality, improve care and provides a framework for epidemiological science (*Figure 3*).

Benchmark system—Perspectives and challenges

The availability and extend of medical data from patients vary extremely between national healthcare systems and associated data privacy acts. Albeit information on patient level is mandatory for clinical assessment and measurement of outcomes. For this reason, it should be the long-term purpose of every network initiative to establish structures (e.g., registries) that have the potential to generate reliable data. The International Consortium for Health Outcomes Measurement (ICHOM) has developed a standardized patient-centred outcomes measurement set for HF patients that is currently conducted in 13 Brazilian hospitals, coordinated by the Brazilian National Hospital Association, including >1,000 patients.[32] Main metrics for determining pilot success are FU rate >70%, absence of missing data (<10%) and accuracy of obtained information >90%. Because participating hospitals are free to define their data collection instrument, this pilot process is an example for

Figure 3 Structural components of a supra regional heart failure network—development scheme of the RUHR-HF network. The conceptual framework of a heart failure (HF) network needs to cover all dimensions of health care. According to the Donabedian model, these are structure (Certified HF infrastructure—solid black lines, Local Network Competencies—dotted grey lines), process (Interaction & Communication—solid blue lines), and outcomes (Benchmark System—dotted red lines). The overall aim of network building should be a sustainable and measurable reduction of the burden of HF—to objectify theses aims, an independent benchmark system using validated quality indicators (QIs) should be installed. The well-established model of a three-staged association of health care providers comprising tertiary academic centres, specialized HF clinics and specialized general cardiologists (HF GC) constitutes the basis of the structure. According to the fact that general practitioners (GP) are often involved in both first diagnosis as well as follow-up of HF and HF patients this cohort needs to be considered in the establishment of a comprehensive HF management programme. Infrastructural demands need to be specified, controlled, and certified by national cardiac societies to prevent hierarchies between network members. This nationwide certificate structure needs to be further adopted by incorporating regional and local competency maps to adopt algorithms and to individualize protocols between the institutions. The development plan of the RUHR-HF network incorporates a more granular breakup of the dimensions and highlights the need for contract-based interaction, recurring network communication and digital communication pathways. MCS, mechanical circulatory support, ECMO, extracorporeal membrane oxygenation, EP, electrophysiology.



the modular concept of HF network building. Another pilot study in a European setting identified some important data errors that were caused by fundamentally different data collection practices in routine clinical care versus research, for which the ICHOM standard set was originally developed.[37] To truly examine to what extent healthcare providers today are able to routinely collect the evidence of their success in achieving good health outcomes, a comprehensive data acquisition concept is needed that might imply telehealth approaches for balancing local differences. Whether these approaches will be reimbursed by research funding and imbedded in scientific registries or part of statutory regulations to reduce the socioeconomic burden of HF will depend on the national political context.

Certified HF infrastructure—Transparent supervision

The detailed requirements for medical units, education of staff and equipment are discussed and outlined extensively elsewhere.[2,3,9,33] Apart from these pre-defined indicators it is important to build a HF network on the basis of recommendations from national societies to prevent regional hierarchies or dependencies between network members. Certification procedures should be supported and supervised regularly by officials from societies and according to published and transparent protocols. These certification procedures are often limited to HF hospitals and GCs that are specialized in HF. A less clearly defined challenge is the incorporation of non-cardiovascular professionals because most HF patients will be followed up by GPs.[38,39] Within the RUHR-HF network, FU of LVAD patients appeared to be an exemplary challenge during the COVID-19 pandemic. The individual needs of this patient cohort can often not be adequately addressed by non-specialized healthcare providers, albeit these patients undergo intensified education and training. If an additional telemedical monitoring in patients with LVAD has an impact on LVAD-associated complications, hospitalization rates and QoL is therefore currently investigated in a prospective pilot study of the RUHR-HF network (NCT04613401). Irrespective of latest guidelines that recommend a FU within 2 weeks after an ADHF event, it is a question of capacities and regional availabilities if close monitoring can be warranted through an HF outpatient clinic, a FU service (telehealth and HF nurse) or an incorporated GC. If capacities of the latter components cannot guarantee close FU or regional peculiarities make it impossible for the patients, the GPs need to address this gap in care. The same is true for interdisciplinary patient transfer to nephrologists, palliative care or other non-cardiovascular disciplines that are commonly needed. This implies that the steering committee of a HF network defines HF competencies and algorithms for non-cardiovascular healthcare providers that should be adopted to local demands, algorithms and incorporated in discharge and FU management.

Local competencies—Considering individual strengths and weaknesses

A centralized certification process can warrant infrastructural and personal minimum requirements, like board certifications do for the estimation of individual competencies of practitioners. Despite these standardizations it must be taken into consideration during development of a HF network that even large tertiary university hospitals have strengths and weaknesses, and that this given fact can be generalized to all members of a network. For this reason, we implemented an individualized competencies map during the planning stage of the RUHR-HF network where all members were able to range in their HF capacities. Although some spoke centres can provide 24/7 MCS and advanced therapies like extracorporeal life support (ECLS), others report ECLS on-call duty only on weekdays or do not have any options for MCS/ECLS at all. This information is essential for the HF network centre ('hub') to adopt algorithms and to individualize protocols between the institutions. When incorporating measures like treatment protocols and expedited transfer protocols it is possible to reach similar short-term outcomes for patients with CS, independently of initial site of presentation as outlined above.[25] This concept of individualized interaction between network partners should not be limited to extreme conditions like CS and procedures like MCS/ECLS but should be expanded to all areas of intersectoral patient care. Network partners should therefore assess their local competencies regarding procedures as advanced ablation therapies for ventricular tachycardias, endomyocardial biopsy, transcatheter valve implantation/repair or fields of expertise like cardio-oncology and cardiomyopathies. Analysing and mapping these competencies within a network enables quick orientation for practitioners to navigate patients if they need specific procedures or competencies. This analysis needs to be repeatedly conducted to cope with local changes in infrastructure or staff and to warrant those developments of network members are timely respected. Mapping not only procedural capacities but also competencies enable the further establishment of an individualized educational programme. Local grand rounds that are adopted to local demands of the network partners constitute an additional tool to harmonize standards of care on top of board certifications.

Standardized network communication pathways —Easy access as highest priority

Whenever a patient is treated by different institutions or practitioners, communication pathways and interfaces become essential tools to reach optimal care. Regarding HF, a network structure should warrant easy access for GPs and GCs to refer new or refractory cases for spoke centres to refer advanced or crushing cases and for patients and relatives to get questions answered. The most straight-forward algorithm that is well established in most HF networks is for the transfer of patients with CS. Institution of a shock team with corresponding pre-defined communication pathways for referral hospitals has the potential to decrease 30 day all-cause mortality (hazard ratio: 0.61 [95% CI, 0.41–0.93] in a contemporary setting.[23] Key element of these kind of approaches are 1-access communication and 24/7 available treatment protocols. What is less defined is the communication process for patients with new onset of HF, complications, or questions during ambulant treatment of HF or deterioration of CHF. During the COVID-19 pandemic, synchronous audio/video interactions, also known as virtual visits (VVs), have emerged as an innovative and necessary alternative to clinic visits-pillars of care for patients with HF.[40] Incorporating digital access not only for patients during VVs but also for healthcare professionals might simplify patient and information transfer. The development plan of the RUHR-HF network implies a digital, interdisciplinary HF board with dedicated members (HF cardiologist, HF cardiac surgeon, HF nurse, LVAD nurse, and palliative care team member). Scheduled time slots for affiliated HF hub centres, HF GCs as well as GPs having questions about patients with HF or suggested HF enable a trans-sectoral access to the HF-MP. Pre-defined eligibility requirements are required for participating partners to warrant fast and positive discussion of cases. Partners need to prepare a minimal information set about the cases of interest and decisions of the HF board need to be documented. On top of these weekly HF boards, it is advisable to perform network communication conferences on a regular basis. We propose to have a quarterly network communication with dedicated representatives of each HF network partner to inform and discuss problems and update about changes at the different sites. These regular communications should be paralleled by a mutual education programme to cover the individual needs of network partners and to warrant further development. The interaction of partners within a network and the participation in regular communication should be contract based to guarantee pre-defined transparent responsibilities for all members and to prevent the development of hierarchies.

Future of interdisciplinary HF networks

Increasing awareness for HF among healthcare providers, easy access pathways to HF-MPs, independent supervision of quality of care, scientific development and reimbursement strategies are future challenges to HF networks. We here summarized recent developments regarding evidence and recommendations for HF-MPs as well as the need for the implementation of QIs to cover a broader spectrum of the disease. The development plan of the RUHR-HF network constitutes a regional approach that should warrant implementation of all the discussed aspects of networking and quality assessment. This structural development plan of a network can be transferred to most regions as it does not rate the different modules but summarizes most aspects that need to be considered for a comprehensive approach.

If establishment of HF networks has finally the potential to reduce the burden of disease can only be answered if network initiatives incorporate an independent and safe data management. This illustrates the political dimension of this important topic and underlines the relevance for cardiovascular societies.

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Conflicts of interest

Peter Luedike received research funding and honoraria for consulting and lectures from Edwards Lifesciences, Pfizer, Bayer, and Medtronic outside of the submitted work. Bastian Schmack received research funding and honoraria for consulting and lectures from Abiomed, Abbott and Berlin Heart outside of the submitted work. The rest of the authors declare no conflicts of interest.

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