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## Assessing the Quality and Comparative Effectiveness of Team-Based Care for HF: Who, What, Where, When, and How

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### Abstract

Team-based or multidisciplinary care may be a potential way to positively impact outcomes for heart failure (HF) patients by improving clinical outcomes, managing patient symptoms, and reducing health care costs. A multidisciplinary HF team includes a variety of providers in addition to the HF cardiologist—HF nurses, clinical pharmacists, dietitians, exercise specialists, mental health providers, social workers, primary care providers, and additional subspecialty providers. The timing and setting of multidisciplinary care depends on the needs of the patient and the resources available. Multidisciplinary HF teams should be evaluated based on their ability to achieve goals, as well as their potential for sustainability over time.

### Keywords

HF; multidisciplinary care; team-based care; quality

## INTRODUCTION

Heart failure (HF) is common and costly, affecting more than 5 million Americans with an incidence of 825,000 per year. By 2030, more than 8 million people in the United States are expected to have HF. Annually, HF accounts for more than 1 million hospitalizations in the United States and costs more than \$30 billion, with expenses expected to more than double by 2030. HF-related morbidity and mortality remain high despite available treatments. Five-year mortality is approximately 50%, and HF is listed on one in nine death certificates [1, 2].

Advances in treatment options for HF continue to evolve, with new drugs and devices emerging throughout the past decade. Implantable cardioverter defibrillators (ICDs), cardiac resynchronization therapy (CRT), pulmonary artery pressure sensors, and left ventricular

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assist devices are examples of significant, yet complex therapies which may improve HF outcomes [3–5]. Since there are considerable comorbidities associated with HF, it is important to integrate other strategies into HF care, including behavioral modifications focused on diet, exercise, medication compliance, and self-care as alterable factors driving HF outcomes [6]. Nevertheless, the variety of HF care strategies creates the potential for fragmented care, with multiple disciplines spread across different settings.

Team-based or multidisciplinary care may be a potential way to reduce the burden of care and positively impact outcomes for HF patients. Furthermore, team-based care is a cornerstone of the patient-centered medical home model of care for chronic disease [7]. Team-based care requires resources like personnel, funding, infrastructure, and time; therefore, multidisciplinary teams should be evaluated to ensure organized, effective, and worthwhile interventions.

#### **What are the goals for team based care in HF?**

- **Short- and long-term clinical outcomes**
- **Symptom management**
- **Cost reduction**
- **Patient, caregiver, provider satisfaction**

The goals of HF care are numerous and diverse depending on perspective. Clinical outcome measures for HF often include mortality and hospital readmissions. While attention has focused on short-term outcomes such as 30-day quality measures enforced by the Centers for Medicare & Medicaid, many patients and providers consider long-term outcomes more important [8]. From a patient perspective, managing symptoms and improving functional capacity is also an important goal. From a societal viewpoint, HF carries substantial public health costs, so managing these costs is a top priority for payers and health care systems.

Utilizing a team of providers may improve the quality of care provided to HF patients. In evaluating multidisciplinary care, teams should be evaluated based on their ability to improve morbidity and mortality, decrease rehospitalizations, and cut costs, as well as their ability to provide patient, caregiver, and provider satisfaction.

#### **Who are the key players on the HF care team? (Figure 2a, 2b)**

- **Primary care providers**
- **HF cardiologists**
- **HF nurses**
- **Clinical pharmacists**
- **Specialized cardiac providers**
- **Ancillary service providers**

In both the inpatient and outpatient settings, multidisciplinary teams can be organized to care for HF patients. In addition to cardiologists and other physicians, the HF team may

include specialized nurses, dietitians, pharmacists, social workers, physical therapists, and psychologists. Importantly, the patients themselves, as well as their families and caregivers, are an integral part of the health care team.

Primary care providers are often the first line of care for HF patients. Primary care providers are responsible for making a timely and accurate diagnosis of HF, initiating therapy, and managing comorbid illnesses. They must be able to recognize when specialized care is required or would benefit their patients, and make the necessary referrals. Even when a patient is referred to a specialized clinic, the primary care provider may continue to provide follow-up and take on the responsibility of coordinating additional care for the patient [9, 10].

Referring patients to specialized outpatient HF clinics, staffed with trained health care providers who are familiar with current guidelines and available resources, has been shown to reduce hospital admissions. [11, 12]. In addition to HF physicians, HF nurses are often included as part of the HF team, and are responsible for a diverse range of interventions. Nursing interventions have been extensively studied and have been shown to positively impact HF patient care. Close follow-up by a HF nurse in the outpatient setting has been shown to improve patient self-care, reduce readmissions, shorten length of stay, and reduce costs [13–16]. Furthermore, when the nurse-led intervention starts during hospitalization and provides assistance with the transition of care to the outpatient setting, there is an additional benefit of improved quality of life [17, 18].

Medical management is at the core of HF therapy, requiring frequent adjustments and dose titrations. Clinical pharmacists can help with education and medication compliance, monitor for drug interactions and intolerances, and promote proper medication reconciliation through transitions of care between different health care providers and different settings. Pharmacist interventions have been shown to reduce medication errors, advance patient knowledge, improve adherence, increase medication titration and optimization, and decrease health care spending [19–24]. As a result of these benefits, the addition of a clinical pharmacist to a HF team has been shown to reduce mortality and HF events [25, 26].

Outside of the core HF providers, patients also benefit from further subspecialized cardiac care by electrophysiologists, cardiac imaging experts, and cardiac surgeons who have experience caring for HF patients. Involving dedicated electrophysiologists in the care of HF patients can increase appropriate use of ICDs and CRT, allowing for timely troubleshooting and optimization of these devices. Multidisciplinary cardiology care for patients with HF has been shown to improve event-free survival [27–29].

In addition to medications, diet plays an important role in the chronic treatment of HF patients. There are many dietary considerations, including restriction of sodium and fluid, management of obesity, prevention of cachexia, and management of comorbidities such as diabetes and hyperlipidemia [30–36]. Additional considerations are present for patients prescribed drugs with potential food interactions, such as warfarin [37]. A dietitian may have a positive effect on the many aspects of dietary compliance for HF patients [38].

Growing evidence highlights the importance of exercise and lifestyle modification for stable HF patients. Cardiac rehabilitation provides a structured program for these patients, emphasizing the need for physical therapists or exercise physiologists as part of the HF team. Many HF patients have poor exercise capacity, and regular exercise has been shown to be a safe and effective means of improving functional status and quality of life [39–43]. Furthermore, regular exercise results in a reduction in depressive symptoms in HF patients [44].

Mental health disorders such as depression are common in the HF patient population and add additional complexity, since they often require other services or care approaches [45, 46]. Studies have shown that depression is associated with functional decline, rehospitalization, and death. Furthermore, there is a positive correlation between depression severity and outcomes; worse depression is associated with worse outcomes [47–50]. Cardiologists may overlook depressive symptoms and fail to provide treatment recommendations, so including a psychologist as part of a HF multidisciplinary team can help with diagnosis and management of these often untreated psychological conditions [51].

Managing HF requires numerous services and resources, and patients may need assistance from social workers in coordinating care in both the inpatient and outpatient settings. Studies that have included social workers as part of multidisciplinary care teams have shown that they make a significant contribution [52]. By anticipating post-discharge needs, arranging home health services, optimizing insurance benefits, and supporting patient caregivers, involvement of social workers can help HF patients better adhere to their treatment plans [12, 53].

Since HF care teams are made up of a variety of providers, many facets of the team require evaluation. A team should be evaluated based on the services they provide, the providers they include, and the patients they treat. In order to establish which providers are the most essential, teams should be evaluated on the types of providers that make up the team. In addition, team evaluations should include both individual assessments and group assessments to determine the quality of each individual provider and the dynamics of the team as a whole. Understanding that different patients will likely require different degrees of attention and intervention, teams should be evaluated on how well they can assess the needs of each patient and utilize the team-based model most efficiently and effectively.

#### **Where should multidisciplinary care take place?**

- **Inpatient hospitalization**
- **Outpatient clinic**
- **Patient home**
- **Remotely via telephone or telemonitoring**

Multidisciplinary care can occur in numerous settings—in the hospital or outpatient clinic, at home visits, or via telephone or telemonitoring systems. An early meta-analysis of the impact of the location of team-based care interventions concluded that home visits reduced all-cause readmissions, telephone support improved mortality, and both home visits and

telephone interventions reduced HF readmissions. Notably, the interventions that did not include a home component did not affect either readmissions or mortality [54]. A more recent meta-analysis of 47 trials from 2007 to 2013 that assessed transitions of care from the inpatient to the outpatient setting confirmed the benefit of home visits [55]. Home visits were shown to improve 30-day and 3–6 month readmissions; HF clinics and structured telephone support improved 3–6 month all-cause readmissions, but did not impact 30-day outcomes; and home visits, HF clinics, and structured telephone support improved mortality.

Similarly, results of home telemonitoring studies have been mixed. Several small studies have suggested that telemonitoring can improve HF outcomes, whereas larger randomized trials have failed to show a reduction in mortality or hospitalizations compared to standard care [56–58]. One potential reason for these mixed results may be that telemonitoring strategies are often limited by patient compliance. A recent study on automated telemonitoring through implanted devices showed markedly improved outcomes compared to standard care [59]. While self-care is vital for HF patients, these results highlight the benefit of automated follow-up, and the importance of not solely relying on patients to identify early decompensation.

These patient-driven factors may explain why the intervention's location impacts the intervention's effect. Home-based interventions allow providers to perform more in-depth assessments and discover potential barriers to optimal care and disease management. Therefore, providers are able to provide more personalized interventions compared to standardized or uniform interventions that occur over the phone or in the hospital or clinic setting.

Since multidisciplinary care takes place in multiple settings, the setting must be individualized to a patient's needs. Sometimes team members will be the same across different settings, but often teams may be comprised of different individuals and different types of providers. As a result, multidisciplinary care teams should be evaluated based on the care provided and the setting in which this care occurs. Furthermore, because communication within and between teams is critical, teams and team members should be evaluated based on the quality of communication and continuity of care.

#### **When should multidisciplinary care take place?**

- **Diagnosis/new referral**
- **Change in clinical status**
- **Hospitalization**

When to initiate multidisciplinary care varies based on the needs and location of the patient. For patients newly referred to an outpatient HF clinic, implementing a multidisciplinary approach to care has been shown to result in improved functional status and quality of life, as well as decreased hospitalizations [60]. For hospitalized patients, many studies have focused on the transition from the inpatient to the outpatient setting; therefore, the multidisciplinary care initiatives have been structured around discharge planning. Studies in which multidisciplinary care was initiated during the hospitalization showed reduced

mortality, decreased rehospitalizations and health care costs, and improved quality of life [12, 21, 61–63]. Similar outcomes were achieved when multidisciplinary care was initiated within two weeks post-hospitalization [64–66].

In clinical practice, systems must be secured to ensure sustainability of the multidisciplinary model. Ensuring sustainability requires appropriate resource allocation, with the most resources going to patients at highest risk for adverse outcomes and to those for whom interventions will be most successful. Since HF patients often cycle between clinical stability and decompensation, patients may need more intense care at certain time points and less intense care at others. The team-based care model should be able to adapt according to an individual patient's needs at any given time.

#### **How should multidisciplinary care be evaluated?**

- **Ability to achieve goals of care**
- **Sustainability over time**
- **As individuals and as part of a team**

Given the diversity of HF care teams, which encompass different care providers in different settings at different time points with different goals, there is not a universal way by which to assess and compare the effectiveness of team-based care. Teams should be evaluated based on their ability to achieve certain goals and metrics, including reducing morbidity, mortality, readmissions, and health care costs. Equally important is a team's ability to improve patient quality of life, and maintain patient, caregiver, and provider satisfaction.

Both short- and long-term goals should be achievable. Inpatient care teams may focus on helping the patient achieve clinical stability and appropriate discharge, transitional care teams may focus on optimizing care at home following hospitalization, and outpatient care teams may focus on maintaining clinical stability and timely efforts to prevent or halt pending decompensation. Since there may be different team members providing care at different times in different settings, it is essential for team members to have effective communication and handoffs to ensure continuity of care.

The ability to achieve these goals must be maintained over time. Unlike clinical trial settings, team-based care in an actual clinical setting should have no end date. Even though studies have demonstrated that the impact of team-based care may last beyond the team-based intervention, team-based care outside of clinical trials should be continuous and flexible to a patient's needs.

Teams are made up of individuals, so each person and type of provider on a team must be assessed both individually and as part of a team. Frequent evaluations can ensure that a team is structured appropriately. Additionally, it is important to determine how involved each team member needs to be for each patient at any given time; a patient may need to see some providers frequently and others infrequently. As a patient's needs change over time, different components of care will become more or less important, fluctuating based on patient status. Effectively incorporating team members and ensuring that their time is used appropriately and efficiently are keys to effective team-based care.

Yet even the right team components at the right time in the right setting may be ineffective if the team is providing ineffective interventions; therefore, in addition to team evaluations, the interventions these teams provide need to be assessed. Multidisciplinary care teams should use validated assessment tools, education methods, and evidence-based recommendations to provide standardized benefits for their patients.

When designing studies to evaluate the efficacy of multidisciplinary care, many factors must be considered. Decisions must be made regarding which outcomes to evaluate and whether the outcomes will be evaluated for individual patients, single centers, or health systems. Furthermore, outcomes can be compared between groups, or groups can act as their own controls, comparing outcomes before and after the implementation of team-based care. While observational studies may help identify which patients benefit from which interventions, given the complexity and diversity of heart failure patients, unmeasured confounders may bias the results. While prospective randomized trials eliminate selection bias, the results may be less generalizable to a broader heart failure population. Pragmatic trial design is important to allow for the flexibility required in team-based care of heart failure patients.

## SUMMARY

Comparative effectiveness of multidisciplinary care is limited. Few trials have directly compared one multidisciplinary care structure to another. In trials, most multidisciplinary care interventions are compared with standard of care. However, standards of care are not necessarily uniform across trials, thus the ability to compare interventions across trials is limited. Outside of meta-analyses, there are limited direct comparisons of interventions. Overall, it appears that there are notable benefits of multidisciplinary care, but it is still unknown which interventions provide the most benefit. Different team organizations, follow-up intervals, and interventions need to be compared head-to-head in order to find the optimal team structure to provide the most benefit. While it is likely that the optimal team will be different at different time points or for different patients, further studies are needed to determine which patients will benefit the most from which aspects of team-based care.

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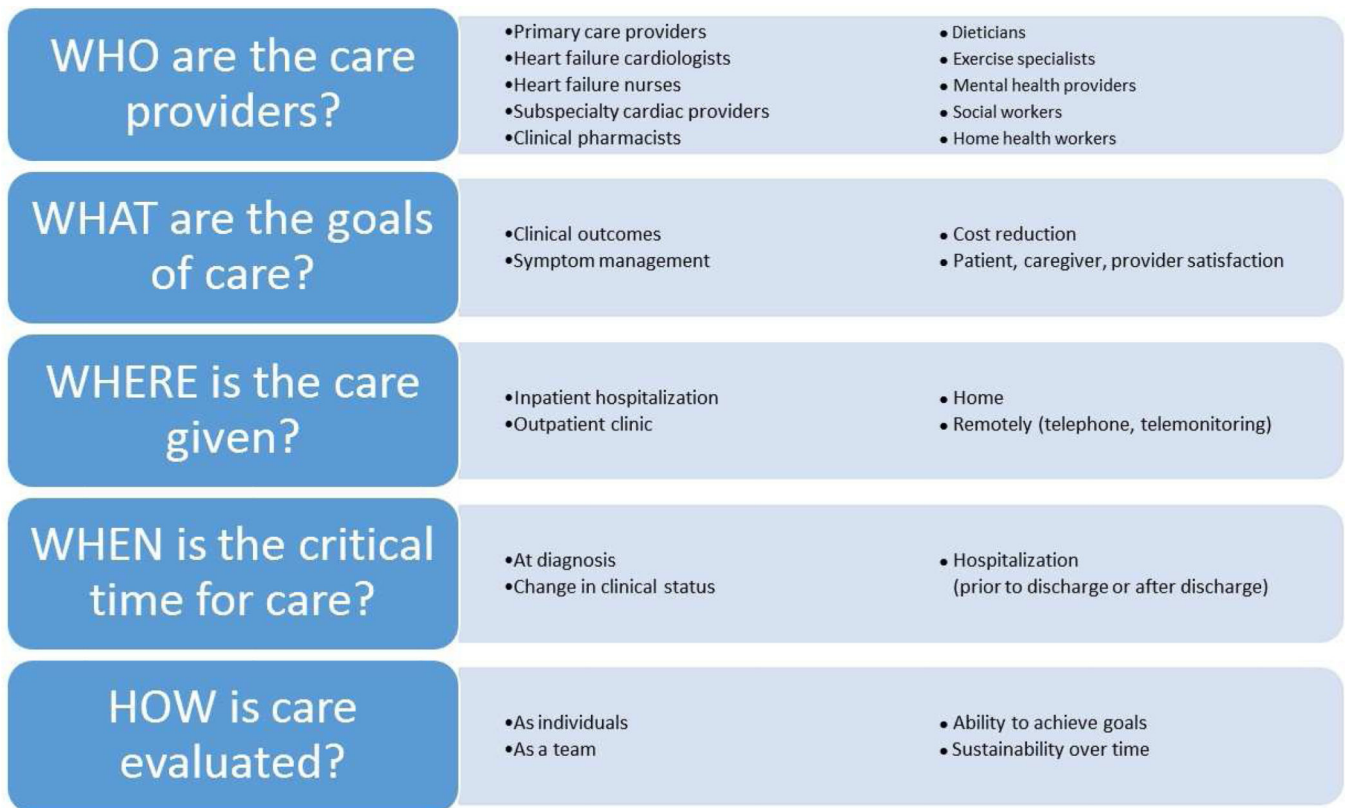
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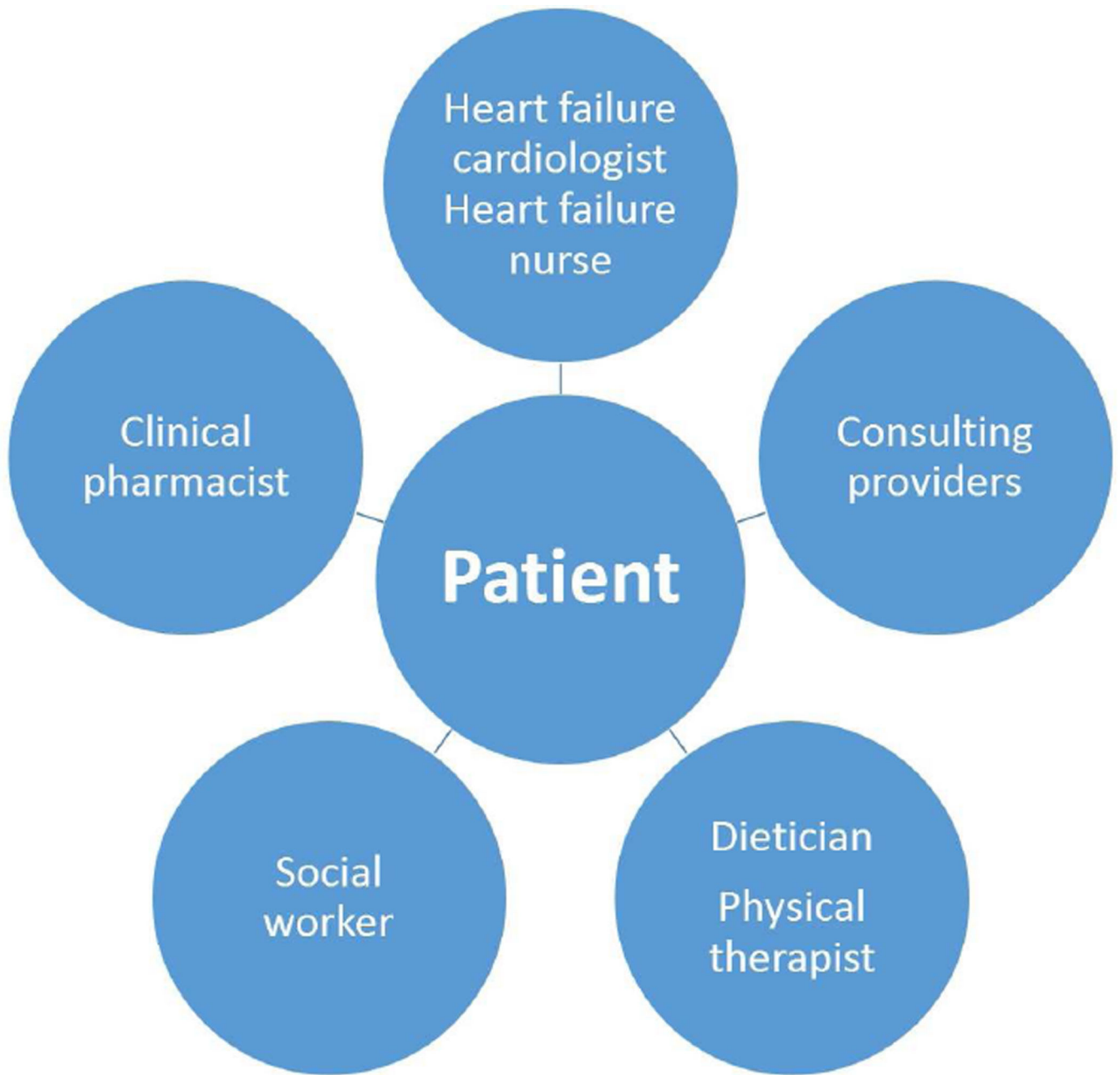
**KEY POINTS**

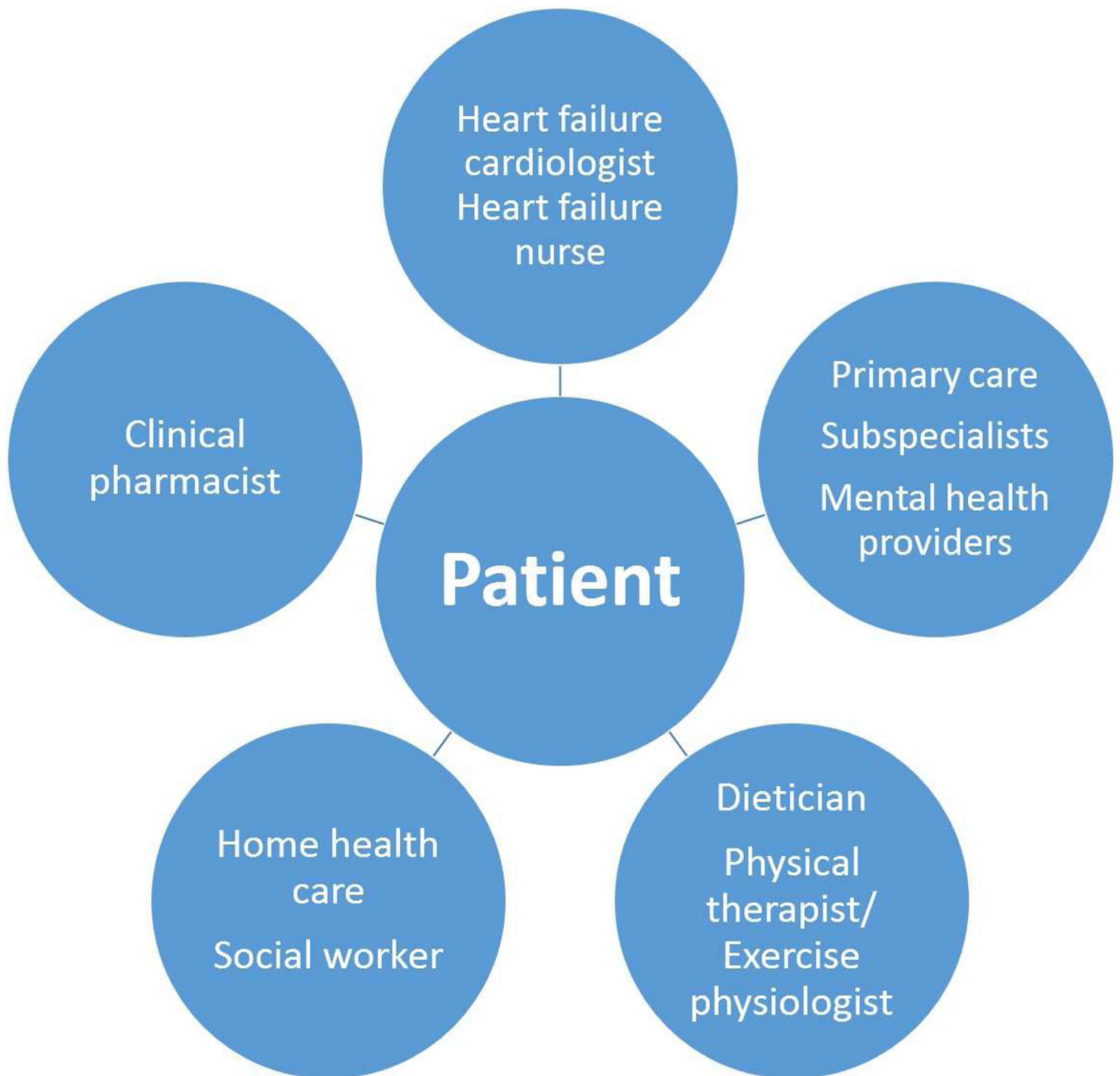
- Goals of multidisciplinary care in heart failure (HF) include improving clinical outcomes, managing patient symptoms, and reducing health care costs.
- Providers in a multidisciplinary HF team include HF cardiologists and nurses, other health care providers, pharmacists, and ancillary support including exercise specialists, dieticians, and social workers.
- Multidisciplinary care can take place in an inpatient or outpatient setting, at home, or remotely.
- Multidisciplinary HF teams should be evaluated based on their ability to achieve goals, as well as their potential for sustainability over time.



**Figure 1. Team-Based Care in HF**

This figure displays who, what, where, when, and how of team-based care in HF.





**Figure 2. HF Multidisciplinary Care Team**

This figure provides examples of: (a) inpatient; and (b) outpatient providers of team-based case in HF.