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Facilitators and barriers of heart failure care in Kerala, India: A qualitative analysis of health-care providers and administrators

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ABSTRACT

Objective: Heart failure is a leading cause of death worldwide and in India, yet the qualitative data regarding heart failure care are limited. To fill this gap, we studied the facilitators and barriers of heart failure care in Kerala, India.

Methods and results: During January 2018, we conducted a qualitative study using in-depth, semi-structured interviews with 21 health-care providers and quality administrators from 8 hospitals in Kerala to understand the context, facilitators, and barriers of heart failure care. We developed a theoretical framework using iteratively developed codes from these data to identify 6 key themes of heart failure care in Kerala: (1) need for comprehensive patient and family education on heart failure; (2) gaps between guideline-directed clinical care for heart failure and clinical practice; (3) national hospital accreditation contributing to a culture of systematically improving quality and safety of in-hospital care; (4) limited system-level attention toward improving heart failure care compared with other cardiovascular conditions; (5) application of existing personnel and technology to improve heart failure care; and (6) longitudinal and recurrent costs as barriers for optimal heart failure care.

Conclusions: Key themes emerged regarding heart failure care in Kerala in the context of a health system that is increasingly emphasizing health-care quality and safety. Targeted in-hospital quality improvement interventions for heart failure should account for these themes to improve cardiovascular outcomes in the region.

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1. Introduction

Heart failure is a leading cause of mortality and morbidity in India.¹ The incidence of heart failure is increasing, and the prevalence has been estimated to range from 1.3 to 4.6 million people in India.² The Trivandrum Heart Failure Registry ($n = 1205$) in Kerala, a state with an estimated population of 34.8 million and a high sociodemographic index, demonstrated the 3-year mortality rate of patients hospitalized for heart failure was 45%.³ Only one of every four (25%) patients with heart failure with reduced ejection fraction

was discharged from their index hospitalization on guideline-directed medical therapy, including beta-blockers, angiotensin-converting enzyme inhibitors or angiotensin receptor blockers, and mineralocorticoid receptor antagonists. Patients discharged on guideline-directed medical therapy had an 18% lower risk of death at 3 years compared with those who were not discharged on these medications, which highlights the potential gains if discharge medication rates were increased in this population.³

A 2018 systematic review demonstrated poor quality of health care has become a larger driver of mortality than low access to care.⁴ The 2018 National Academy of Medicine report, “Crossing the Global Quality Chasm: Improving Health Care Worldwide”, highlighted the urgency for comprehensive efforts to close such gaps in health-care quality around the world, including in middle-income

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countries like India.⁵ Qualitative research methods are increasingly valued in cardiovascular health outcomes research for their ability to describe complex phenomena in their natural settings.^{6,7} Furthermore, a deeper understanding of the context of care elucidated by qualitative research methods is essential for improving health-care quality. Given the burden of disease and potential gains in improving the quality of heart failure care in India, we use qualitative research methods to describe facilitators and barriers of heart failure care in Kerala.

2. Methods

2.1. Study design

During January 2018, we conducted a qualitative study on acute heart failure care, including the evaluation and management of both heart failure with preserved ejection fraction and heart failure with reduced ejection fraction, based on semi-structured interviews with clinical and administrative staff at 8 hospital sites in Kerala. A qualitative approach was selected to capture key aspects of multifaceted heart failure care at the patient, family, provider, health system, and health policy levels in a setting with limited prior cardiovascular qualitative research using the socioecological model.^{8,9} Furthermore, qualitative research is useful for generating hypotheses and designing interventions that can be tested in future quantitative or interventional research.¹⁰

We used a purposive sampling frame to select an initial sample of participants who had diverse roles and experiences in the care of patients with acute heart failure ranging from cardiologists to cardiac care unit nurses to health-care quality administrators. We then used a snowballing sampling technique based on the in-depth interviews to recruit additional participants with increasing variability until we achieved theoretical saturation at which point no novel concepts seemed to emerge.¹⁰ Participants were selected from the 8 hospitals participating in the Heart Failure Quality Improvement in Kerala study, which evaluated the effect of a quality improvement toolkit on in-hospital care of patients with heart failure using an interrupted time series design. Respondents were invited to participate in person. The study was approved by the Health Ministry Screening Committee of the Indian Council of Medical Research (New Delhi, India), Ethics Committee of the Centre for Chronic Disease Control (New Delhi, India), and Institutional Review Board at Duke University (Durham, USA).

2.2. Data collection and analysis

We conducted semi-structured interviews in person during January 2018 using an adapted interview guide from prior research in Kerala.⁹ Two members of the study team (A.A. and D.D.) conducted the interviews except one interview, which was conducted by one team member (D.D.) In-depth interviews began with open-ended questions, and probes were used to elucidate emerging themes. An iterative approach was used for data collection and analysis based on the framework method for qualitative research.¹¹ Interviews ranged from less than ten minutes to one hour in length. All interviews were conducted in English, audiotaped, and subsequently transcribed verbatim.

The transcribed interviews were read multiple times for familiarization. Codes were developed iteratively using an inductive process by one author (A.A.) with input from coauthors (D.D., S.G., D.P., M.D.H., P.P.M.) and were applied to specific excerpts in the text. Codes were grouped into categories to develop a theoretical framework to describe the key themes of heart failure care in Kerala in the context of the socioecological model. We used Dedoose v8.0.42 software (Manhattan Beach, USA) for data analysis and

adhered to Consolidated Criteria for Reporting Qualitative Research standards.¹²

3. Results

3.1. Participant characteristics

Our sample included 21 health-care providers and quality administrators from 8 hospitals (Table 1). Most were cardiologists (43%) and male (62%). Four (19%) participants were quality administrators who were responsible for improving in-hospital quality of care and safety by liaising with the National Accreditation Board for Hospitals and Healthcare Providers.¹³ Most participants (86%) were employed by a private hospital. In addition to the major themes described in the following section, we summarized the primary facilitators and barriers of heart failure care in Kerala as characterized by the participants (Table 2, Table 3).

3.2. Study themes

3.2.1. Theme 1. There is need for comprehensive patient and family education on heart failure, especially at the time of hospital discharge

Participants identified discharge counseling as an area of improvement.

“Discharge counselling is the main problem, because we have staff shortage, that’s why main problem is discharge counseling.” (Nurse, private hospital)

“I think the area where we are probably lacking is we are not spending time with the patient at the time of discharge. We are spending [a] lot of time when they are coming back to OPD [outpatient department]. At the time of discharge, they are in a hurry to go, the vehicle is waiting, the discharge summary has to be made ready. There is always a hurry.” (Cardiologist, private hospital)

Participants identified patient and family education as a tool to increase medication adherence, despite limited empirical data supporting education alone for improving medication adherence compared with health system arrangements for longitudinal care.¹⁴ Respondents specifically identified involvement of family members as critical in the counseling process.

“The counseling part should be done along with family members who will be with the patients most of the time at home. Like (the) wife most of the cases, or if wife is not there, then children. They should be with the patient at the time of counseling ... involvement of family is very important.” (Internal medicine physician, private hospital)

Table 1
In-depth interview participant characteristics.

Participant characteristic	N (%)
Total participants	21
Type of heart failure provider	
Cardiologist	9 (42.9)
Internal medicine physician	2 (9.5)
Cardiac care unit nurse	6 (28.6)
Quality administrator	4 (19.0)
Male	13 (61.9)
Employed by private hospital	18 (85.7)

Table 2
Barriers of heart failure care in Kerala, India.

Health system level
<ul style="list-style-type: none"> • Focus on acute coronary syndrome with established systems of care and subsequently limited emphasis on heart failure • Limited availability of specialized cardiac services (e.g. electrophysiologists) • Limited to no availability of support services (e.g. in-hospital dieticians, cardiac rehabilitation)
Provider level
<ul style="list-style-type: none"> • Limited understanding of guideline-directed medical therapy of heart failure among community physicians and nurses • Lack of time for comprehensive discharge education for patients and their families • Discharge medications are prescribed for a limited supply (e.g. 1 month or less)
Patient and family level
<ul style="list-style-type: none"> • Limited understanding of heart failure and frustration with chronic disease process with repeat hospitalizations • Longitudinal and recurrent costs of care (e.g. medications, hospitalizations, device therapy) • Lost to follow-up after index hospitalization due to distance from specialty cardiac clinics

Table 3
Facilitators of heart failure care in Kerala, India.

Health system level
<ul style="list-style-type: none"> • Culture of quality improvement (data monitoring, analysis and designing interventions) catalyzed by national accreditation of hospitals • Heart failure clinics with specialized nurses who can contact outpatients frequently to monitor symptoms and medication adherence
Provider level
<ul style="list-style-type: none"> • Experienced nursing staff • Application of existing technology (e.g. “lung ultrasound”) to guide diagnosis
Patient and family level
<ul style="list-style-type: none"> • Educating patients and families regarding home monitoring of weight and adjustment of diuretics to prevent frequent readmissions • Access to mobile phones allowing frequent contact with nurse and other nonphysician health-care providers

3.2.2. Theme 2. There is a gap between guideline-directed clinical care for heart failure and clinical practice

Patients with acute heart failure may be discharged from an index hospitalization with guideline-directed medical therapy prescribed by a cardiologist. However, respondents perceived that community physicians may discontinue guideline-directed medical therapy (i.e. beta-blockers, angiotensin-converting enzyme inhibitors, angiotensin receptor antagonists, and mineralocorticoid receptor antagonists) during follow-up in outpatient departments because of concerns about side effects, including hypotension. Cardiologists lack time for longitudinal follow-up for many patients who may be experiencing progression of their heart failure. Cardiologist respondents described the need for greater education of health-care providers and patients on guideline-directed medical therapy for acute heart failure.

“Many of the patients when [they] go out, they don’t systematically come back. They will naturally go to any other physician who tells the patient that, ‘Look here, you are given these drugs for your blood pressure.’ [The] [m]ost difficult situation is when you give somebody with a blood pressure about [systolic blood pressure] 100 and 110 [mmHg] and ACE-inhibitor and beta blocker, and he go(es) back to the physician, the first thing they do is cut. So that is a major problem, we have to educate the patient. We have to tell them, ‘Look here, these are your heart failure medication and don’t allow anybody to stop it unless you have compelling [contra]indication.” (Cardiologist, private hospital)

Participants describe the limited availability of specialized cardiac services such as electrophysiologists, which may further limit optimal delivery of guideline-directed clinical care such as pacemakers with cardiac resynchronization capability and implantable cardioverter defibrillators.

“We do not have [an] in-house electrophysiologist, but in case of a need we have a visiting electrophysiologist who will go for a difficult ICD [implantable cardioverter defibrillator] or CRT [cardiac resynchronization therapy].” (Cardiologist, private hospital)

Furthermore, ancillary outpatient services, such as cardiac rehabilitation, that improve the quality of life of patients with heart failure are lacking in Kerala, which further limit guideline-directed clinical care of patients with heart failure.

“The truth is that there is no definite cardiac rehabilitation centres, not at all, that is the main problem. Acute [heart] failure management is not a problem.” (Cardiologist, government hospital)

3.2.3. Theme 3. National hospital accreditation has contributed to a culture of systematically improving quality and safety of in-hospital care

The process of obtaining and maintaining national quality accreditation has systematically introduced principles of data monitoring with expectations of activities to achieve high-quality safe-care throughout the hospital and health system.

“We have been collecting data monthly. All the departments are collecting the data ... and they are denoting all the indicators and we are collecting the monthly reports. If there is any drastic change, for example sudden increase in medication errors, we have to inquire why this has happened and [then] we are taking the corrective and preventive actions.” (Quality administrator, private hospital)

The process of obtaining and maintaining national quality accreditation has also systematically introduced principles of

utilizing collected data to design interventions to improve the quality and safety of care throughout the hospital.

“We have passive and active audits. There are direct observations by the ward in charge who have been provided with the WHO [World Health Organization] hand hygiene checklist. Second thing is that we have surveillance group members assigned for each department in that we have infection control, quality improvement team, executives, microbiologist scoring the particular areas. Sometimes we go for direct observations, sometimes we take cultures, sometimes we have swabs directly and everybody is involved in it. These tests are analyzed, sent to the committees and based on the result, we give actions.” (Quality administrator, private hospital)

The process of obtaining and maintaining national quality accreditation has further contributed to the introduction of principles of goal setting to improve quality targets, although some may not be realistic.

“In our hospital policy, we have our ISO [International Organization for Standardization] accreditation so our goal is 0% readmission. Once we receive the patients, we don't want them to come back again to our hospital.” (Nurse, private hospital)

“If the ventilator is not working for an hour, then there is a set time and within that time they have to clear that or else they have to replace that ventilator. If that goal is not met, if that ventilator is not replaced or that is not repaired within the time, then root cause analysis is done and based on that corrective and preventive action is taken.” (Quality administrator, private hospital)

3.2.4. Theme 4. Kerala's health system has focused on improving the quality and safety of acute coronary syndrome, but there has been limited attention toward improving heart failure care despite the increasing burden of disease

Participants described the changing disease patterns of the intensive care unit with increasing heart failure admissions.

“Of the admissions coming to the ICU, ACS [acute coronary syndrome] [is] getting replaced by heart failure. At any point of time, we often have more heart failure patients in ICU than ACS [acute coronary syndrome].” (Cardiologist, private hospital)

Despite this increasing burden of heart failure, many health-care providers continue to focus on delivering optimal acute coronary syndrome care, given the system's current orientation. Most patients with acute coronary syndrome improve significantly after percutaneous coronary intervention and have shorter hospitalizations with a lower risk for recurrent hospitalization than patients with acute heart failure.

“Everybody is concerned about the ACS [acute coronary syndrome]. Once they are sure that it is not an ACS [acute coronary syndrome] they don't take care. That's the problem. Actually, I can understand ... because heart failure is a headache. Because the patient will have recurrent hospitalizations and need a lot of consult visitations to take care of them. With acute ACS [acute coronary syndrome], after 24 hours the patient is stable. The patient is happy, the family is happy, the doctor is happy, the management is happy. But in heart failure the doctor is struggling, the patient is struggling, the family is unhappy, probably the management is [also] not so happy.” (Cardiologist, private hospital)

Multiple health-care providers described the clinical challenges of taking care of patients with heart failure.

“[This is] perhaps [the] only generation of cardiology treating more heart failure patients. The younger generation is only interested in ACS [acute coronary syndrome]. That's why the moment an ACS [acute coronary syndrome] case presents, [they] come to the [cath] lab even before [they] see the patient. Whereas in a heart failure [case], no one comes to attend the call ... people with heart failure do not [have a] future.” (Cardiologist, private hospital)

3.2.5. Theme 5. The application of existing personnel and technology can improve heart failure care

Many participants described nursing staff as key leverage points to improve heart failure care, given their expertise and time available to spend with patients compared with physicians, although many respondents emphasized nurses' roles for acute, rather than chronic management.

“Because in many cardiac centers, the nursing staff is excellent. With many years of experience in cardiology, just by hearing the history itself they will identify whether it is respiratory or cardiac.” (Cardiologist, private hospital)

One facilitator of optimal acute heart failure care was use of existing technology, such as lung ultrasound, to differentiate causes of dyspnea upon patient presentation to the hospital at a lower cost than other tests (e.g. B-type natriuretic peptide testing).

“When the patient reaches here, if we keep the ultrasound probe on the lung, we can differentiate between images of the dry lung and wet lung. Once we are familiar with that, we can identify [if] the patient is having fluid collection in the lung” (Cardiologist, private hospital)

Multiple participants described use of mobile technology, including WhatsApp Messenger (WhatsApp Inc, Mountain View, USA), as a method to facilitate communication for patient care. Nurse-based longitudinal care of patients with heart failure has been demonstrated to be effective at reducing the risk of rehospitalization and mortality, although data ensuring privacy of personal health information and demonstrating effectiveness of this specific messaging platform remain limited.¹⁴

“A dedicated nurse practitioner or one or two persons who is specially trained for heart failure management can contact patients through telephone or through WhatsApp. They can help to assess the status at home and advise early admission or even early OPD [outpatient department] visit. With [a] dedicated heart failure clinic team, follow-ups can be by telephone to improve patient drug compliance.” (Cardiologist, private hospital)

3.2.6. Theme 6. Longitudinal and recurrent costs remain a barrier for optimal heart failure care

Many participants described the costs of medications as reasons for suboptimal medication adherence.

“[In] the Indian context, they do not have enough money to generate their medicine for 1 month, 2 months so sometimes they stop diuretics, ACE-inhibitor. That is the main reason [for] drug defaults.” (Nurse, private hospital)

Higher costs of newer heart failure–specific medications (e.g. sacubitril/valsartan) further limit the prescribing patterns in private and government hospitals, especially if the medication is not offered in government hospital pharmacies.

“Most of the medications now for heart failure are very costly, very costly. So we cannot go to the newer drug regime because then compliance is less, so in the routine set up the economic aspects is also [a] very important factor.” (Cardiologist, government hospital)

4. Discussion

We described the key themes regarding facilitators and barriers of heart failure care in Kerala that emerged from in-depth interviews with diverse health-care providers and quality administrators at the patient, family, provider, health system and health policy level. Respondents identified in-hospital patient and family education on heart failure as a key area of improvement, although these are likely necessary but insufficient to improve the quality of heart failure care. Participants described poor penetration of guideline-directed clinical care for heart failure perhaps due to the state health system's historical focus on acute coronary syndrome. Application of existing technology and personnel could improve heart failure care in Kerala; however, longitudinal and recurrent costs remain barriers for optimal care. To our knowledge, this is the first qualitative study of heart failure care in India and provides valuable insights into Kerala's health system and policy response to heart failure.

The World Health Organization (WHO) health system framework characterizes six building blocks of a well-functioning health system necessary to improve health outcomes.¹⁵ The first building block is service delivery, which highlights access to quality health services across the continuum of care. In the heart failure care health system in Kerala, there is limited availability of support services such as in-hospital registered dietitians and physical therapy and no outpatient cardiac rehabilitation services (Theme 2). The lack of standardized cardiac rehabilitation services in Kerala has been noted in prior studies in the region.¹⁶ Locally relevant rehabilitation, such as yoga, might be a sustainable strategy for improving heart failure–related quality of life, based on prior yoga-based cardiac rehabilitation for patients following acute coronary syndrome.¹⁷ A key facilitator of heart failure care is heart failure specialty clinics that include advanced practice heart failure nurses, which currently exist at only a few specialized cardiac centers in Kerala (Theme 5). Innovative models of same-day heart failure access clinics for acute heart failure are being implemented in the United States to mitigate the large and growing in-hospital acute heart failure burden.¹⁸ Furthermore, qualitative research in the United Kingdom illustrates the role specialist heart failure nurses can have in facilitating coordination of care as a bridge between primary and secondary care.¹⁹ Wider adoption and implementation of heart failure telemedicine service arrangements staffed by nurses and other nonphysician health-care providers in Kerala is a promising strategy to improve cardiovascular outcomes in the state.

The second WHO health system building block is health workforce. Participants identified a finite number of cardiovascular specialists (i.e. advanced heart failure physicians, electrophysiologists) as a barrier to optimal heart failure care in Kerala (Theme 2). However, training nurses as specialized advanced practice nurses to be heart failure providers to triage patients with heart failure by telephone and help staff outpatient heart failure clinics could be a viable strategy to increase accessibility of specialized services. A

2015 systematic review illustrated nurse-led titration of angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, and beta-blockers reduced hospitalizations (relative risk [RR] 0.80, 95% confidence interval [CI] 0.72 to 0.88, high-quality evidence) and all-cause mortality (RR 0.66, 95% CI 0.48 to 0.92, moderate-quality evidence) compared to usual care in patients with heart failure with reduced ejection fraction.²⁰

The third WHO health information system building block is health information systems, including the implementation of heart failure clinical guidelines across the continuum of care. Data from India in the Trivandrum Heart Failure Registry illustrates even lower adherence to guideline-directed medical therapy with only 25% of participants receiving optimal treatment at discharge.²¹ Furthermore, participants perceived that community physicians discontinue guideline-directed medical therapy in the outpatient setting, potentially exacerbating the current disparities between guideline-directed clinical care and actual clinical practice (Theme 2), which might be related to fragmentation of care that is common in Kerala. The 2017 American College of Cardiology Expert Consensus Decision Pathway for Optimization of Heart Failure Treatment highlights 7 evidence-based medications, 3 evidence-based device strategies, and several recommended processes of care for optimal care of patients with heart failure with reduced ejection fraction.²² Hospital-level quality improvement interventions have been designed to increase penetration of these guideline recommendations; however, a 2019 systematic review of randomized controlled trials of in-hospital heart failure quality improvement interventions revealed no consistent effect on process of care measures and clinical outcomes.²³ A key facilitator of the health information system in Kerala is a growing culture of data collection, monitoring, and analysis introduced by national accreditation (Theme 3) that may increase the readiness of hospitals to benefit from future in-hospital quality improvement interventions for patients with heart failure.¹³

The fourth WHO health system building block is access to essential medicines. Many participants described the costs of medications as reasons for reduced medication adherence among patients (Theme 6). The Prospective Urban Rural Epidemiology study ($n = 16,874$ households) identified 59% of households in India would find the combination of aspirin, beta-blockers, angiotensin-converting enzyme inhibitors, and statins unaffordable based on a 20% capacity to pay threshold.²⁴ Although essential medicines are free of direct costs in the public sector in Kerala, participants noted that some heart failure–specific medications were not always available in public sector pharmacies, leading to higher out-of-pocket expenditures at private pharmacies. Monthly medication prescriptions, rather than 3-month prescriptions, also increase indirect costs (including related to travel and time off of work) and the risk for nonadherence. The WHO Model List of Essential Medicines is a tool used by the Government of India to guide the National List of Essential Medicines, which is used for drug procurement for the public health-care system.²⁵ Ensuring state and national essential medicine lists are updated in concordance with national clinical practice guidelines may help increase equitable and affordable access to essential heart failure medications in Kerala.²⁶

The fifth WHO health system building block is health financing to protect patients from financial catastrophe. Participants noted longitudinal and recurrent costs remain a barrier for optimal heart failure care in Kerala (Theme 6). These costs are related to direct medication expenses and recurrent hospitalizations, indirect costs associated with medicine-related travel and family care, and loss of economic productivity due to poor health. Economic analysis using data from the United States demonstrated 77% of lifetime costs of heart failure are accrued during hospitalizations, and the overall

30-day readmission rate among patients hospitalized for heart failure was almost 20%.^{27,28} A 2011 cross-sectional study of the microeconomic impact of cardiovascular disease hospitalization revealed a lack of health insurance was associated with nearly fourfold higher odds of catastrophic health spending in Trivandrum, India (odds ratio 3.93, 95% CI 2.23, 6.90).²⁹ Potential solutions to reduce the financial risk associated with heart failure in Kerala include increased uptake of social health insurance programs and improved accessibility and affordability of heart failure medications as part of a universal health coverage package. Cost-effectiveness data demonstrate angiotensin receptor inhibitors and beta-blockers for heart failure to be cost-saving (cost-effectiveness ratio 219) in South Asia.^{14,30}

The sixth WHO health system building block highlights the importance of leadership and governance. The expanding role of the National Accreditation Board for Hospitals and Healthcare Providers (NABH) in hospitals in Kerala was identified by several participants as a key facilitator of improving quality of heart failure care (Theme 3).¹³ The introduction of data collection, monitoring, and design of interventions in NABH-accredited hospitals has demonstrated an increased readiness to change to improve quality of care and safety. The need for the environment within which health professionals function to be prepared to change was identified by the 2001 Institute of Medicine report as a critical step to improve quality of care.³¹ The accreditation of NABH in Kerala hospitals has increased the readiness of these hospitals for heart failure quality improvement interventions by strengthening a culture of quality and safety. Although in-hospital quality improvement interventions for acute heart failure in high-income countries do not show a consistent effect on process of care and clinical outcomes, further research is needed in low- and middle-income countries where the baseline quality of heart failure care may be lower.²³ Whether the process of accreditation itself improves the quality and safety of care remains an important research topic, particularly in rapidly changing health systems, including in Kerala and India more broadly, where policies to promote improved access can be complemented by policies to promote quality and safety.

This qualitative study on heart failure care in Kerala has several strengths. First, the qualitative methodology using semi-structured interviews illustrated a variety of perspectives on heart failure care at patient, family, provider, health system, and policy levels, which have not been described before and may have been missed in a quantitative study. Second, interviews were conducted using an interview guide developed based on prior research in the region.^{9,16} Third, recorded interviews were transcribed by an independent researcher, standardized coding was performed using qualitative software for quality assurance, and the report adhered to standard qualitative research reporting guidelines.

However, this qualitative study also has several limitations. First, participants were selected from 8 hospital sites participating in a heart failure quality improvement study, which introduces the risk of selection and social desirability biases. However, we utilized a purposive sampling frame and snowballing technique to recruit additional informants to be inclusive in diverse perspectives on heart failure care. Most participants were affiliated with private hospitals, which represent a specific perspective, and we may have missed some concepts as a result of the size of the sampling frame. Second, semi-structured interviews were conducted in English. Although English is spoken fluently by many providers in Kerala, we may have missed nuances that would have emerged if Malayalam were used. Third, patients with heart failure and their families were not included in the selected sample, which is a key area of future research to understand their perspectives on heart failure care in Kerala and strategies for improvement.

5. Conclusions

Key themes emerged regarding heart failure care in Kerala, including limited focus on heart failure in the region, poor penetration of guideline-directed clinical care, recurrent costs of care, and an increasing emphasis on health-care quality and safety. These data can be useful to guide strategies for heart failure quality improvement in Kerala and beyond.

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Conflict of Interest

M.D.H. has received funding from the World Heart Federation to serve as its senior program advisor for the Emerging Leaders program, which is supported by Boehringer Ingelheim and Novartis with previous support from Bupa and AstraZeneca. M.D.H. also receives support from the American Heart Association, Verily, and AstraZeneca for work unrelated to this research. The authors have no relevant conflicts of interest related to this research.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ihj.2019.04.009>.

References

- Prabhakaran D, Jeemon P, Roy A. Cardiovascular diseases in India. *Circulation*. 2016;133(16):1605–1620. <https://doi.org/10.1161/circulationaha.114.008729>.
- Huffman MD, Prabhakaran D. Heart failure: Epidemiology and prevention in India. *NMJI (Natl Med J India)*. 2010;23(5):283–288.
- Sanjay G, Jeemon P, Agarwal A, et al. In-hospital and three-year outcomes of heart failure patients in South India: the Trivandrum heart failure Registry. *J Card Fail*. 2018. <https://doi.org/10.1016/j.cardfail.2018.05.007>.
- Kruk ME, Gage AD, Joseph NT, Danaei G, García-Saisó S, Salomon JA. Mortality due to low-quality health systems in the universal health coverage era: A systematic analysis of amenable deaths in 137 countries. *Lancet*. 2018;392. [https://doi.org/10.1016/s0140-6736\(18\)31668-4](https://doi.org/10.1016/s0140-6736(18)31668-4).
- National Academies of Sciences, Engineering and Medicine. *Crossing the Global Quality Chasm: Improving Health Care Worldwide*. Washington, DC: The National Academies Press; 2018. <https://doi.org/10.17226/25152>.
- Curry LA, Nembhard IM, Bradley EH. Qualitative and mixed methods provide unique contributions to outcomes research. *Circulation*. 2009;119(10):1442–1452. <https://doi.org/10.1161/circulationaha.107.742775>.
- Krumholz HM, Bradley EH, Curry LA. Promoting publication of rigorous qualitative research. *Circulation Cardiovascular Quality and Outcomes*. 2013;6(2):133–134. <https://doi.org/10.1161/circoutcomes.113.000186>.
- Sarma S, Harikrishnan S, Baldrige AS, et al. Availability, sales, and affordability of tobacco cessation medicines in Kerala, India. *Circulation Cardiovascular Quality and Outcomes*. 2018;10(11):e004108. <https://doi.org/10.1161/circoutcomes.117.004108>.
- Patel A, Mohanan PP, Prabhakaran D, Huffman MD. Pre-hospital acute coronary syndrome care in Kerala, India: a qualitative analysis. *Indian Heart J*. 2017;69(1):93–100. <https://doi.org/10.1016/j.ihj.2016.07.011>.
- Crabtree BF, Miller WL. *Doing Qualitative Research*. Thousand Oaks, California: Sage Publications; 1999.
- Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol*. 2013;13(1):117. <https://doi.org/10.1186/1471-2288-13-117>.
- Tong A, Sainsbury P, Craig J. Consolidated Criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J*

- Qual Health Care. 2007;19(6):349–357. <https://doi.org/10.1093/intqhc/mzm042>.
13. National Accreditation Board for Hospitals and Healthcare Providers; 2016. Available at: <http://www.nabh.co/>. Accessed January 12, 2019.
 14. Huffman MD, Roth GA, Sliwa K, Yancy CW, Prabhakaran D. *Heart Failure. Cardiovascular, Respiratory, and Related Disorders*. 3rd ed. Washington DC: The International Bank for Reconstruction and Development/The World Bank; 2017 [Chapter 10].
 15. World Health Organization. *Everybody's Business: Strengthening health systems to improve health outcomes*; 2007. Available at: http://www.who.int/healthsystems/strategy/everybodys_business.pdf. Accessed January 12, 2019.
 16. Huffman MD, Mohanan PP, Devarajan R, et al. Effect of a quality improvement intervention on clinical outcomes in patients in India with acute myocardial infarction: the ACS QUIK randomized clinical trial. *J Am Med Assoc*. 2018;319(6):567–578. <https://doi.org/10.1001/jama.2017.21906>.
 17. Chandrasekaran AM, Kinra S, Ajay VS, et al. Effectiveness and cost-effectiveness of a yoga-based cardiac rehabilitation (Yoga-CaRe) program following acute myocardial infarction: study rationale and design of a multi-center randomized controlled trial. *Int J Cardiol*. 2019. <https://doi.org/10.1016/j.ijcard.2019.01.012>.
 18. DeVore AD, Allen LA, Eapen ZJ. Thinking outside the box: treating acute heart failure outside the hospital to improve care and reduce admissions. *J Card Fail*. 2015;21(8):667–673. <https://doi.org/10.1016/j.cardfail.2015.05.009>.
 19. Glogowska M, Simmonds R, McLachlan S, et al. Managing patients with heart failure: a qualitative study of multidisciplinary teams with specialist heart failure nurses. *Ann Fam Med*. 2015;13(5):466–471. <https://doi.org/10.1370/afm.1845>.
 20. Driscoll A, Currey J, Tonkin A, Krum H. Nurse-led titration of angiotensin converting enzyme inhibitors, beta-adrenergic blocking agents, and angiotensin receptor blockers for people with heart failure with reduced ejection fraction. *Cochrane Database Syst Rev*. 2015;12. <https://doi.org/10.1002/14651858.cd009889.pub2>.
 21. Harikrishnan S, Sanjay G, Anees T, et al. Clinical presentation, management, in-hospital and 90-day outcomes of heart failure patients in Trivandrum, Kerala, India: the Trivandrum heart failure Registry. *Eur J Heart Fail*. 2015;17(8):794–800. <https://doi.org/10.1002/ejhf.283>.
 22. Yancy CW, Januzzi JL, Allen LA, et al. 2017 ACC Expert Consensus decision Pathway for optimization of heart failure treatment: answers to 10 pivotal issues about heart failure with reduced ejection fraction a report of the American College of cardiology task force on Expert Consensus decision pathways. *J Am Coll Cardiol*. 2018;71. <https://doi.org/10.1016/j.jacc.2017.11.025>.
 23. Agarwal A, Bahiru E, Yoo S, et al. Hospital-based quality improvement interventions for patients WithHeart failure: ASystematic review. *Heart*. 2019;0:1–8. <https://doi.org/10.1136/heartjnl-2018-314129>.
 24. Khatib R, McKee M, Shannon H, et al. Availability and affordability of cardiovascular disease medicines and their effect on use in high-income, middle-income, and low-income countries: an analysis of the PURE study data. *Lancet*. 2016;387(10013):61–69. [https://doi.org/10.1016/s0140-6736\(15\)00469-9](https://doi.org/10.1016/s0140-6736(15)00469-9).
 25. Kishore SP, Blank E, Heller DJ, et al. Modernizing the world health organization list of essential medicines for preventing and controlling cardiovascular diseases. *J Am Coll Cardiol*. 2018;71(5):564–574. <https://doi.org/10.1016/j.jacc.2017.11.056>.
 26. Ewen M, Zweekhorst M, Regeer B, Laing R. Baseline assessment of WHO's target for both availability and affordability of essential medicines to treat non-communicable diseases. *PLoS One*. 2017;12(2):e0171284. <https://doi.org/10.1371/journal.pone.0171284>.
 27. Dunlay SM, Shah ND, Shi Q, et al. Lifetime costs of medical care after heart failure diagnosis. *Circulation Cardiovascular Quality and Outcomes*. 2011;4(1):68–75. <https://doi.org/10.1161/circoutcomes.110.957225>.
 28. Jalnapurkar S, Zhao X, Heidenreich P, et al. A hospital level analysis of 30-day readmission performance for heart failure patients and long-term survival: findings from get with the guidelines-heart failure. *Am Heart J*. 2018. <https://doi.org/10.1016/j.ahj.2017.11.018>.
 29. Huffman MD, Rao KD, Pichon-Riviere A, et al. A cross-sectional study of the microeconomic impact of cardiovascular disease hospitalization in four low- and middle-income countries. *PLoS One*. 2011;6(6):e20821. <https://doi.org/10.1371/journal.pone.0020821>.
 30. Gaziano TA. Cardiovascular disease in the developing world and its cost-effective management. *Circulation*. 2005;112(23):3547–3553. <https://doi.org/10.1161/circulationaha.105.591792>.
 31. Committee on Quality of Health Care in America, Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. National Academies Press; 2001.