Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Symptom-Demand journey map for patients with cardiometabolic multimorbidity undergoing the periprocedural pathway of percutaneous coronary intervention: A qualitative study

Yating Shi
Hubei University of Traditional Chinese Medicine
Tian Li
Wuhan University Renmin Hospital
Yinglin Li
Wuhan University Renmin Hospital
Zhiqiang Wang
Yangtze University
Zhongxiang Cai
841199968@qq.com

Wuhan University Renmin Hospital
Jiali Zhou
Wuhan University Renmin Hospital
Jingjing Tao
Wuhan University Renmin Hospital

Research Article

Keywords: Cardiometabolic multimorbidity, Percutaneous coronary intervention, Periprocedural care, Patient journey map, Qualitative research

Posted Date: November 3rd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10818950/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Patients with cardiometabolic multimorbidity (CMM) undergoing percutaneous coronary intervention (PCI) face complex physical, psychosocial, and self-management demands, yet their stage-specific symptoms and care needs across the PCI pathway remain insufficiently characterized. This study aimed to map these stage-specific experiences and construct a patient journey map to inform tailored nursing care.

Methods

Guided by the Timing It Right (TIR) framework, we conducted a qualitative descriptive study using maximum-variation purposive sampling. Sixteen patients with CMM undergoing PCI were recruited from the Department of Cardiology at a tertiary hospital in Wuhan, China, from June to July 2026 and participated in 20 semi-structured interviews. Qualitative content analysis used four prespecified journey-map domains with inductive development of subthemes, which were synthesized into a patient journey map.

Results

The PCI pathway was represented by three phases: preprocedural preparation, postprocedural recovery, and transition. Forty-eight subthemes were identified across four domains: symptoms, care needs, emotions, and pain points. Preprocedural accounts emphasized symptom recognition, gaps in chronic disease self-management, and needs for procedural information and reassurance; postprocedural accounts centered on symptom burden, prognostic uncertainty, and rehabilitation support; before discharge, patients anticipated difficulties coordinating multimorbidity self-management and expressed needs for structured, multidisciplinary continuity of care.

Conclusions

The journey map identified distinct stage-specific patterns in symptoms, emotions, care needs, and pain points among patients with CMM undergoing PCI. These findings may help align nursing support with preprocedural information and reassurance needs, postprocedural symptom and rehabilitation needs, and pre-discharge preparation for coordinated multimorbidity self-management.

1 Introduction

Cardiometabolic multimorbidity (CMM) refers to the coexistence of two or more cardiometabolic conditions, such as ischemic heart disease, hypertension, type 2 diabetes mellitus, hyperlipidemia, obesity, and stroke [1, 2]. It is one of the major patterns of multimorbidity observed across populations. Its prevalence increases with age, reaching 5.2% among adults aged 40 years or older and 11.6% among those aged 60 years or older [3]. Among hospitalized patients with coronary heart disease (CHD), approximately 58% have at least two chronic cardiovascular or metabolic conditions [4].

In the diagnostic and therapeutic pathway for CHD, coronary angiography is used to define coronary anatomy and assess stenosis, whereas PCI with stent implantation is performed when indicated. Coronary angiography remains a reference standard for assessing coronary stenosis [5], and stent implantation is an established revascularization strategy for restoring coronary blood flow [6]. Compared with patients with a single cardiovascular condition, those with multimorbidity have a higher risk of adverse cardiovascular events [7] and may experience a broader periprocedural symptom burden, including chest pain, dyspnea, weakness, fatigue, anxiety, and depression [8]. The composition and

burden of multimorbidity may also complicate medication regimens and reduce adherence [9]. Together, these factors create complex physical and psychosocial care needs around PCI and make periprocedural nursing care particularly challenging.

Patient journey mapping is a visual method increasingly used in chronic disease management and clinical decision-making to trace changes in health status, care needs, and emotional experiences across a care pathway [10, 11]. In cardiovascular care, however, published journey-mapping studies have focused mainly on postoperative cardiac rehabilitation and care quality in patients with a single cardiovascular condition [12, 13], with limited attention to stage-specific symptoms and care needs in patients with CMM undergoing PCI.

Accordingly, guided by the TIR framework, this qualitative descriptive study aimed to map stage-specific symptoms, care needs, emotions, and pain points across the PCI pathway and synthesize these findings into a patient journey map to inform more tailored nursing care for patients with CMM undergoing PCI.

2 Methods

2.1 Study Participants

Maximum-variation purposive sampling was used to capture heterogeneity in age, gender, multimorbidity profile, duration of CHD, employment status, residence, educational attainment, and marital status. Patients with CMM admitted to the cardiology department of a tertiary hospital in Wuhan, China, from June to July 2026 were eligible. Inclusion criteria were (1) age 45 years or older; (2) confirmed CHD combined at least one additional cardiovascular or metabolic condition, including primary hypertension, type 2 diabetes mellitus, dyslipidemia, or stroke; (3) coronary angiography demonstrating an indication for coronary stent implantation; (4) willingness to participate and sufficient ability to communicate during an interview. Exclusion criteria were (1) critical illness or clinical instability; (2) cognitive impairment or a psychiatric disorder. The sample size was determined according to the principle of information saturation. Data collection was terminated when subsequent interviews yielded no additional perspectives, concepts, or subthemes.

2.2 Ethical Considerations

The study protocol was reviewed and approved by the Medical Ethics Committee of Hubei General Hospital (approval number: WDRY2026-K188). The study procedures adhered to the Standards for Reporting Qualitative Research (SRQR) [14]. All participants provided written informed consent prior to enrollment and were informed of their right to withdraw from the study at any stage.

2.3 Theoretical Framework

The Timing It Right (TIR) framework, introduced by Cameron et al. in 2008 [15], emphasizes that support needs evolve over the course of illness and that the effectiveness of care depends in part on how well interventions are timed to those changing needs [16]. The framework describes five sequential but potentially overlapping phases: diagnosis, stabilization, preparation, adjustment, and adaptation. The first three generally occur in hospital, whereas the latter two occur after transition to the home and community [17]. Because the periprocedural period surrounding PCI is concentrated within a short hospital stay, we adapted the framework to three phases: preprocedural preparation (including recalled symptom recognition or diagnostic detection leading to admission, hospital evaluation, and preparation for PCI), postprocedural recovery (days 1–3 after PCI), and transition (pre-discharge preparation for return home). This adaptation retained the TIR emphasis on stage-specific support while reflecting the rapid clinical changes associated with PCI. It also provided the conceptual basis for examining changes in symptoms and care needs at clinically relevant time points and for constructing the journey map.

2.4 Semi-Structured Interview Guide

A preliminary semi-structured interview guide was developed from a literature review and research team discussion and refined after pilot interviews with three patients with CMM. The final guide included five sets of questions: (1) Please recall the symptoms and feelings you experienced when you first became unwell and the process that led to hospital admission. How did these symptoms affect your daily life? (2) We understand that you also have one or more of the following conditions: hypertension, diabetes, hyperlipidemia, or stroke. How do you manage these conditions in daily life? What difficulties have you encountered? (3) How did you feel after learning that you would undergo the procedure? After the physician had explained the procedure and the nurse had provided preprocedural education, what concerns remained? What additional help would you like from the health care team before the procedure? (4) Since the procedure, what discomfort have you experienced? What emotional or psychological concerns have you had? What specific needs would you like addressed? (5) Considering your entire hospitalization, what are your expectations for recovery after discharge? What barriers do you anticipate in managing your conditions at home? What would you like the health care team to do before discharge?

2.5 Data Collection and Quality Control

Data were collected in face-to-face, semi-structured interviews. Before each interview, the interviewer established rapport, introduced themselves, explained the study purpose, and assured participants that their privacy would be protected. With participants' informed consent, interviews were audio-recorded. The interviewer followed the guide flexibly and used targeted probes as needed. Participants' emotional expressions, tone of voice, gestures, and other nonverbal behaviors were documented contemporaneously as field notes to provide contextual detail. Interviews continued until data saturation, with no new information emerging. Each interview lasted 25–35 minutes and was conducted in a departmental teaching room. Repeated interviews, when conducted, occurred during preprocedural preparation and before discharge; otherwise, the pre-discharge interview elicited retrospective accounts of earlier phases of the PCI pathway.

2.6 Data Management and Analysis

Qualitative content analysis combined a deductive organizational structure with inductive development of subthemes. Four prespecified journey-map domains (symptoms, care needs, emotions, and pain points) were used to organize the initial coding. Within 24 hours of each interview, the audio recording was transcribed verbatim and supplemented with field notes on emotional expression and tone; two researchers checked the transcripts for accuracy. NVivo 14.0 and Microsoft Excel were used to support data management and coding. The researchers repeatedly read the transcripts and iteratively grouped related codes into categories and subthemes within and across the four domains. Analysis continued until no new subthemes emerged. Credibility and dependability were supported by verbatim transcription, integration of contemporaneous field notes, transcript accuracy checks by two researchers, iterative comparison of codes with the source material, and confirmation of saturation with additional participants. The final subthemes were mapped to the three TIR-informed phases to generate a visual synthesis of periprocedural experiences. The resulting journey map represents a conceptual synthesis across participants and was not intended to depict a quantitatively measured or complete within-person longitudinal trajectory.

3 Results

1 Participant Characteristics

Sixteen participants completed 20 interviews. Data saturation was reached after the 13th participant; three additional participants were interviewed to confirm saturation, and no new information emerged. Participants were assigned identifiers P1-P16. Twelve participants were interviewed once before discharge, whereas P2, P9, P10, and P12 were interviewed twice, once during preprocedural preparation and again before discharge. The phase-specific findings primarily represent a cross-participant synthesis of recalled experiences, supplemented by repeated accounts from four

participants, rather than a complete longitudinal trajectory for every participant. Participant characteristics are presented in Table 1.

3. Preprocedural preparation phase
4. Symptoms

    1. Sudden chest pain with transient visual obscuration and syncope. P1: "I was on the balcony when my chest suddenly started hurting. I felt dizzy, then everything spun and I collapsed to the floor." P10: "I was working at the construction site when my chest suddenly hurt terribly. My vision went black, and I passed out."
    2. Recurrent chest tightness or pain with intermittent relief, accompanied by diaphoresis and limb weakness. P2: "While I was showering, my chest suddenly felt tight. Then my left hand started shaking, I broke out in a cold sweat, and I couldn't use any strength in that hand. It got better after a while, but the same symptoms came back when I lay down to sleep." P4: "The chest tightness kept coming back, especially when I climbed stairs or walked a little faster. Sometimes I also broke out in a cold sweat." P7: "The left side of my chest hurt and felt very uncomfortable. After I took Suxiao Jiuxin Pills, it gradually eased and the pain went away." P11: "Both sides of my chest suddenly felt tight, but it lasted only a moment and then it was gone."
    3. Persistent chest tightness or pain accompanied by limb numbness, nausea, and vomiting. P6: "I was carrying groceries when I suddenly had chest tightness, numbness in my left arm, and dizziness, and it became hard to speak. I rested for a long time, but it still didn't ease." P15: "All of a sudden I felt heavy pressure in my chest and vomited. I thought I had heatstroke because it was so hot, so I drank Huoxiang Zhengqi liquid. About an hour later I still felt unwell. Then I took Suxiao Jiuxin Pills and lay down for another hour, but it still didn't get better."
    4. Referred pain involving the shoulder or back. P8: "Now I get this pulling, tugging pain in my back." P16: "For the past two months, my back has been hurting on and off. At first I thought I had pulled a muscle."
    5. Asymptomatic coronary stenosis detected during routine health examination. P3: "I didn't feel unwell at all. A checkup at our county hospital found a blocked blood vessel, and my husband was worried and wanted me to come to a larger hospital." P5: "I don't have chest tightness or chest pain. It was only found during this checkup, and it has not affected me in daily life."

5. Care needs

    1. Need for clear explanations of test results and care processes. Participants wanted clinicians to explain why tests were repeated and what the results meant so they could better understand the diagnostic and treatment pathway. P1: "With so many tests, shouldn't you tell me what the results mean? You can ask Doubao [an AI assistant] these days, but you should still explain them to me." P5: "I had just had an ECG, CT, and other tests in the outpatient clinic, and not long after I was admitted to your department, I was asked to do them again. I'm not refusing; you just need to tell me why."
    2. Need for comprehensive procedural information. Participants wanted a complete explanation of stent options and other procedure-related information so that they could understand the procedure fully. P12: "I really want to know what the difference is between imported and domestically manufactured stents." P15: "You should explain everything related to this procedure to us all at once."
    3. Need for expedited care for older adults with severe symptoms. Participants wanted older patients with more severe illness to receive earlier assessment during emergency admission to reduce discomfort associated with prolonged waiting. P7: "I came in through the emergency department and was already feeling very unwell, but nothing was arranged for me. I waited from morning until afternoon. Could you give priority to patients over 80 like me?"

4. Need for individualized procedural risk information in the context of multimorbidity. Participants wanted a clear explanation of how their coexisting conditions affected procedural risk, which they felt would provide reassurance. P13: "I want you to tell me how risky the procedure is for someone in my condition, with hypertension, diabetes, and a previous stroke. I would feel more reassured if I knew."

6. Emotions

    1. Calmness. Previous experience with coronary procedures appeared to reduce preprocedural anxiety; participants who were familiar with the process generally described themselves as calm. P1: "There isn't much to worry about. This isn't my first time having this procedure." P4: "I had angiography before without a stent. This time I need a stent, but I'm not too worried." P14: "I'm not nervous. I had a stent placed in 2018, so I know the whole procedure very well."
    2. Apprehension. Participants expressed apprehension about disease severity, the necessity of stent implantation, and financial burden. P3: "I thought I might not have long to live. I didn't feel unwell, but the doctor recommended a stent, so I worried that my condition must be very serious." P5: "I was puzzled that someone like me, with no symptoms, still needed a stent. I was afraid it meant the disease was serious." P10: "I had planned to just tough it out and not have the procedure. My family isn't well off, and I'm the only one working, so the burden is heavy. I was also afraid of what would happen if I collapsed. I thought about a lot of things before the procedure."
    3. Anxiety. Participants described preprocedural anxiety related to incomplete recovery from other conditions, lack of previous experience with cardiac procedures, and difficulty accepting the prospect of an implanted stent. P6: "Of course I was anxious. I hadn't recovered from my other illnesses, and now there was a problem with my heart." P11: "I was somewhat nervous. I had never had a heart procedure before." P15: "Of course I was anxious and worried. After all, they're putting something inside my heart." P16: "It was hard to accept. I'm not that old and already need a stent, but I was also lucky that the problem was found early."
    4. Fear. Participants expressed intense fear of procedural risk and possible adverse outcomes. P7: "I'm afraid. I only had angiography last year, and now this year it is angiography again plus a stent. I'm old; I can't keep going through this." P13: "I'm really afraid I might not make it off the operating table."

7. Pain points

    1. Difficulty changing smoking and alcohol use. Participants described persistent smoking or alcohol use that they found difficult to change. P1: "...I just can't quit smoking. I don't know whether that's what has made my condition worse and worse." P16: "I drink almost every day, and I smoke about one pack a day."
    2. Risk of missed doses related to polypharmacy and forgetfulness. Participants described difficulty remembering complex medication regimens, increasing the risk of missed doses. P3: "There are so many medicines I need to take. I usually can't remember them all." P13: "I have about six or seven different medicines to take. At my age, how am I supposed to remember all of them?"
    3. Difficulty adhering to lifestyle recommendations. Participants reported difficulty with dietary and weight management, alongside suboptimal control of blood pressure and lipid levels. P4: "I can't control what I eat. I don't manage my diet well enough, and my blood pressure and lipids are a little high." P5: "I haven't controlled my diet well, and my blood pressure has stayed high." P12: "I usually eat a lot of oily and salty food. I've gained a lot of weight over the past few years, and I hardly exercise."
    4. Activity limitations. Episodes of chest tightness or pain substantially limited physical activity and daily functioning. P6: "When my chest feels tight, I can't do anything. I can only sit leaning against the sofa." P8: "This back pain really affects my physical activity and daily life. It comes in episodes, and whenever it hurts, I can't do anything."

5. Inconsistent follow-up and chronic disease self-monitoring. Competing work demands, limited access, and limited attention to routine monitoring contributed to gaps in follow-up and self-monitoring. P7: "I haven't had my blood pressure or blood lipids checked regularly at the community clinic." P8: "Before I retired, I was busy with work and didn't take my hypertension seriously, so it wasn't well controlled." P10: "I'm usually at the construction site. I don't have the time or opportunity to go for follow-up visits. I never expected my heart problem to become this serious." P12: "It's been more than two years since I last had my blood lipids checked."

8. Postprocedural recovery phase
9. Symptoms

    1. Vascular access-site and compression-related pain. P4: "The puncture site on my right hand still hurts a little." P8: "The puncture site hurt for a few hours right after the procedure." P10: "My right arm, where they went in, hurts so much. It feels like a tendon is twitching constantly." P16: "The puncture site is tender when pressed."
    2. Chest pain and palpitations. P1: "My chest still hurts. If I sleep slightly on my side and put pressure on it, it hurts." P7: "I have a little chest pain and palpitations." P13: "My heart is racing and my hands are shaking. The nurse just checked me and said my blood glucose was low."
    3. Shortness of breath. P7: "Sometimes it's still hard to breathe."
    4. Sleep disturbance. P1: "I haven't slept well at night for the past two days." P2: "I couldn't sleep at all last night after the procedure." P7: "My sleep has been poor these past few days."
    5. Dizziness and generalized weakness. P6: "I feel dizzy and my head feels heavy." P9: "I have no strength at all and my head feels groggy and dizzy. I feel dizzy even when I'm lying down."
    6. Lower-extremity numbness. P9: "I don't know whether it's because I've been lying still for so long, but my leg feels a little numb."

10. Care needs

    1. Need for transparent information about stent manufacturing and quality. Participants wanted information about when stents were manufactured and their quality to strengthen confidence in treatment. P1: "You didn't even show me when the stent was manufactured. What if it was made a long time ago and doesn't last very long?"
    2. Need for timely information about postprocedural status and treatment plans. Participants wanted prompt updates about their condition after PCI and the day's treatment plan to reduce uncertainty. P1: "It's almost noon now, and since the procedure yesterday, no doctor or nurse has come to tell me clearly how things went afterward." P7: "I came here last year and now I've had it done again this year. I want you to tell me exactly what my condition is and why I needed it again." P14: "I think you should tell us what the day's treatment plan is without waiting for us to ask."
    3. Need for scheduled monitoring and medication administration. Participants wanted blood pressure and glucose monitoring and medication administration to occur consistently and on schedule after PCI. P5: "You need to give me my blood pressure and lipid-lowering medicines on time after the procedure. I ask several times a day when the medicines will be given." P13: "You need to come and check my blood pressure and blood glucose on time. And the medicines too-I have to ask every time."
    4. Need for ongoing clinical attention and assistance during recovery. Participants wanted continued contact with staff and help with activities when needed. P6: "It's not easy for me to move around. When my son isn't here, I hope you can help me." P12: "After the procedure, you hooked me up to the ECG monitor and started an intravenous infusion, and then I didn't see you again. You need to pay more attention to me."

11. Emotions

    1. Trust and satisfaction. Participants expressed trust in the clinical team and satisfaction with their early postprocedural status. P4: "I feel very reassured about the result after the procedure." P8: "The doctor explained the procedure and the treatment plan afterward, so I feel very reassured." P11: "I don't have any concerns. The doctor explained everything clearly." P14: "It's been good. I trust you, and I'm very satisfied with how I feel after the procedure."
    2. Concern about prognosis. Participants expressed concerns about returning to normal life, stent durability, the possibility of repeat procedures, and the need for ongoing caution after stent implantation. P2: "I'm very worried about whether I can live normally after having a stent." P3: "I'm afraid the stent won't last many years." P7: "I'm afraid it still hasn't been fixed this time and I'll have to do it again next time." P9: "It feels like after you get a stent, you have to be extra careful with everything."
    3. Confusion. Participants were unsure whether PCI would improve their condition and whether they could tolerate the treatment process in the context of multimorbidity. P6: "I don't know whether this procedure will actually help me." P10: "I don't know whether things will get better after the stent. I really don't know what to expect." P13: "I have so many health problems; I don't know whether my body can handle all this."

12. Pain points

    1. Hydration-related nocturia and sleep disruption after angiography. Participants reported more frequent nighttime urination during post-angiography hydration, which disrupted sleep. P1: "I already have diabetes and normally get up four or five times every night to urinate. Now I've been on IV fluids since the angiography, so I have to get up even more often." P10: "I get up to urinate many times at night, and it really affects my rest."
    2. Fear of movement and falling after PCI. Dizziness and other postprocedural discomfort made participants reluctant to move because they feared falling. P3: "At first after the procedure, I was a little afraid to move." P6: "I don't dare move now. If I make even a slightly bigger movement, I get dizzy. I don't know whether it's from the procedure or something else, and now I'm afraid I'll fall because of it." P9: "I really get dizzy whenever I move my head. I've been lying in bed ever since the procedure."
    3. Financial burden of hospitalization. Participants described substantial concern about ongoing inpatient costs. P10: "Just prescribe my medicines and let me go home. I don't know how much more it will cost if I stay here any longer."
    4. Frequent medication dosing and reduced adherence. Participants described aversion to the frequency of postprocedural medication administration, with one participant reporting a missed dose. P12: "After the procedure, you give me medicines several times a day. I don't even want to take them. I didn't take one of yesterday's pills at all (points to the bedside table)."

13. Transition phase

14. Symptoms

    1. Resolution of ischemia-related symptoms. P4: "I feel that I've recovered pretty well. My chest doesn't feel tight anymore." P8: "My back doesn't hurt at all now. It's much better than when I was first admitted." P15: "The heavy, tight feeling in my chest is gone. Breathing feels much easier now."
    2. Weakness and fatigue. P6: "My chest doesn't hurt and I'm not dizzy now, but I still feel very tired and weak all over." P7: "I just feel weak now. Otherwise I'm okay." P9: "Physically I feel okay, but I have no strength. My daughter has to support me."

15. Care needs

1. Need for multidisciplinary management. Participants wanted integrated guidance for managing CHD alongside hypertension, diabetes, and other coexisting conditions. P1: "For someone like me, with heart disease, hypertension, and diabetes, what I really need to know is how to manage all of them together. Advice from cardiology alone isn't enough."
2. Need for clear, structured guidance on medications and follow-up. Participants wanted written medication lists and follow-up schedules to reduce omissions and support adherence. P3: "I have too many medicines to take and always forget them. I hope you can make me a list." P13: "Please write down the dates when I need to come back for follow-up. It would be even better if you could call and remind me when the time comes."
3. Need for detailed discharge education. Participants wanted more specific discharge instructions and professional guidance on how to respond to recurrent symptoms and manage daily self-care. P4: "I hope the discharge instructions can be more detailed. It would be best if you could give us a health education booklet so we know how to manage the disease and prevent it from coming back." P7: "You need to tell me what to do if the pain comes back." P11: "You need to explain clearly what I should pay attention to after discharge."
4. Need for practical training in home blood pressure and glucose self-monitoring. Participants wanted hands-on instruction before discharge so they could monitor these measures at home. P12: "Before I go home, please teach me how to measure my blood pressure and blood glucose. I plan to monitor them myself at home."

16. Emotions

1. Optimism. Participants expressed confidence in recovery and post-discharge self-management. P4: "I'm very confident about my recovery." P8: "I'm retired now. After discharge, I plan to practice Baduanjin [Eight-Section Brocade] every day and gradually get myself back into shape." P14: "I'm in a good frame of mind. I believe I'll recover."
2. Relief and acceptance. Participants described accepting the need for ongoing medication, diet, and activity management after discharge. P3: "I'll just follow what the doctor said. After discharge, I still need to take my medicines, control my diet, and exercise according to what my body can handle." P7: "I still need to follow the doctor's advice and pay more attention myself. Recovery always takes time." P11: "I'll follow the doctor's advice at home and manage my condition carefully."
3. Uncertainty about future disease control. One participant expressed limited expectations and uncertainty about post-discharge disease control and future health. P13: "Once I'm home, I'll just take it one day at a time. Whether I can keep things under control isn't something I can know right now."

17. Pain points

1. Concerns about managing multiple cardiometabolic targets at home. Participants worried about maintaining control of blood glucose, blood pressure, and other cardiometabolic measures after discharge. P3: "It's mainly the diabetes and hypertension. I'm afraid they won't be controlled well once I go home." P16: "I don't know whether I'll be able to control things well, especially my blood glucose."
2. Family circumstances limiting adequate postprocedural rest. Although participants understood the need for rest, family obligations made it difficult to follow this advice. P10: "The doctor told me to get more rest. I know that, but my family situation doesn't allow it."
3. Difficulty sustaining recommended lifestyle changes. Participants understood recommendations on weight and diet but anticipated difficulty implementing them. P12: "The doctor told me to control my weight and diet, otherwise my blood lipids won't come down. I understand all of that, but I think it's difficult to actually do." P16: "The hardest part is changing my lifestyle habits."

4. Risk of missed follow-up when living alone without reminder support. One participant described forgetting follow-up dates because no one at home was available to provide reminders. P13: "The doctor said I need to come back several times for follow-up, but not long after being told, I forgot the dates. I live alone, and there's no one around to remind me."

18. Construct the patient’s journey map

3. A patient journey map is typically organized along a horizontal time axis and a vertical task axis [18]. Guided by the TIR framework, we divided the time axis into three phases: preprocedural preparation, postprocedural recovery, and transition. In our adaptation, the vertical axis represented four experiential domains: symptoms, care needs, emotions, and pain points. We identified 48 themes: 18 in the preprocedural preparation phase, 17 in the postprocedural recovery phase, and 13 in the transition phase. The map depicts how symptoms, care needs, and emotions change over time and highlights barriers that may represent opportunities for nursing intervention. The resulting periprocedural journey map for patients with CMM undergoing PCI is shown in Figure 1.

4 Discussion

Postprocedural preparation phase: Self-management challenges and needs for information and procedural reassurance in the context of multimorbidity

During preprocedural preparation, participants described gaps in chronic disease self-management together with substantial needs for information and reassurance about procedural safety. At admission, common ischemia-related symptoms included chest tightness, chest pain, and pain radiating to the shoulder or back, although some participants were asymptomatic. Hypertension and cerebrovascular disease may further compound vascular and perfusion abnormalities [19], which could contribute to transient visual disturbance and limb numbness or weakness. Beyond cardiac symptoms, CMM entails the treatment and self-management burden of multiple coexisting conditions and complex medication regimens. Participants described difficulty sustaining recommended lifestyle behaviors, attending regular follow-up, and monitoring cardiometabolic indicators. Polypharmacy and forgetfulness further complicated medication management and increased the risk of missed doses, consistent with Liu et al. [20]. Against this background, uncertainty about the procedure prompted repeated questions about the need for repeat testing, disease severity, and procedural risk in the context of multimorbidity. These questions suggest that incomplete information amplified concerns about procedural safety and may have contributed to anxiety and fear. Similar needs for information and reassurance about procedural safety have been reported among patients undergoing PCI [21,22]. The preprocedural phase may therefore be a key opportunity to address knowledge gaps, strengthen information support, and reduce procedure-related anxiety. Before PCI, clinicians should assess each patient's comorbidity profile, medication history, lifestyle behaviors, and cardiometabolic risk factors and explain, in plain language, the purpose and results of tests, the PCI process, stent options, and procedural risks and benefits. Video-based education may facilitate understanding and timely clarification of concerns. Education should also address modifiable risk factors, including smoking, alcohol use, diets high in fat and sodium, and physical inactivity, while emphasizing regular monitoring of blood pressure, glucose, and lipids. Older adults and patients with a greater burden of coexisting conditions may benefit from timely assessment and proactive communication, particularly during periods of waiting.

Postprocedural recovery phase: Symptom burden and prognostic uncertainty shape needs for comprehensive rehabilitation support

During postprocedural recovery, participants described concurrent physical symptoms and psychological uncertainty, making reliable rehabilitation support and timely clinical updates central care needs. Although PCI can rapidly restore coronary blood flow, chest pain and dyspnea may persist after the procedure; post-PCI chest pain has been reported in 20% to 40% of patients [23]. Vascular access-site and compression-related pain, sleep disturbance, lower-extremity numbness, dizziness, and weakness are also common after PCI [24]. Such symptoms may lead patients to restrict activity

and fear movement or falling, potentially delaying early mobilization. Periprocedural hydration is used to reduce the risk of kidney injury after contrast exposure [25]; however, greater fluid intake may worsen nocturia and fragment sleep, particularly in patients who already experience frequent nocturia. Post-PCI treatment also adds antiplatelet therapy to already complex regimens for coexisting cardiometabolic conditions, increasing medication burden and potentially reducing adherence. Participants expressed concerns about procedural effectiveness, stent durability, restenosis, and hospitalization costs; these concerns appeared to heighten uncertainty about prognosis and the desire for prompt information about procedural outcomes and subsequent treatment, consistent with Huang et al. [26]. These findings support a comprehensive approach to post-PCI rehabilitation. Nurses should monitor symptoms and changes in blood pressure and glucose, proactively communicate procedural results and the day's treatment plan, explain common postprocedural reactions, and provide person-centered support and practical assistance to patients with mobility limitations. These measures may reduce symptom-related distress and prognostic uncertainty. Education should emphasize the long-term benefits of adherence to prescribed medications. Medication administration should be timely and consistent, while patients should be encouraged to participate actively in medication self-management. Hydration regimens should be individualized according to cardiac and renal function. When clinically appropriate, daytime fluid administration should be prioritized and oral hydration may be combined with intravenous hydration [27,28] to reduce nighttime intravenous fluid exposure while maintaining hemodynamic stability and avoiding volume overload. Rehabilitation clinicians should tailor early mobilization to age, multimorbidity burden, and physical capacity, progressing from ankle-pump exercises in bed to sitting at the bedside and walking indoors [29]. This graded approach may support a shift from passive receipt of care to active engagement in recovery.

Transition phase: Persistent multimorbidity-management challenges highlight the need for individualized, multidisciplinary continuity of care

By the transition phase, ischemia-related symptoms had largely resolved, but residual weakness and fatigue and difficulties transitioning from inpatient care to home-based multimorbidity management persisted. Nursing priorities therefore shifted from acute inpatient treatment to continuity of care after discharge. After PCI, coordinated care for patients with CMM requires management of cardiovascular disease alongside multiple cardiometabolic targets, including blood pressure, glucose, and lipids; cardiology alone may not address all aspects of multimorbidity care. Participants also described uncertainty about how to monitor their conditions at home, difficulty sustaining lifestyle changes, and missed medication doses or follow-up appointments when reminder support was limited. These challenges added to the self-management burden and were accompanied by uncertainty about long-term disease control and a strong need for continued professional guidance, consistent with Lv et al. [30]. A multidisciplinary team including cardiologists, endocrinologists, neurologists, rehabilitation clinicians, and dietitians can develop individualized plans with concrete targets for daily sodium intake, weekly physical activity, and follow-up monitoring. Patients should be involved in developing these plans to strengthen understanding of treatment goals and support implementation. In addition to verbal education, nurses can provide clear illustrated materials on post-PCI precautions and how to respond to recurrent chest pain. Patients receiving multiple medications can be given a schedule listing each medication, dose, and time and encouraged to use a compartmentalized pill organizer for morning, midday, and evening doses. When needed, patients should receive practical instruction in measuring and recording blood pressure and glucose at home. Telephone follow-up and digital platforms can provide reminders at appropriate post-PCI time points and help establish a continuous care pathway linking hospital, community, and home. Such support may improve multimorbidity self-management and recovery self-efficacy [31] and support longer-term secondary prevention.

Limitations and implications for future research

This study has several limitations. First, it was conducted among adults aged 45 years or older at a single tertiary hospital, so the findings are context-dependent and their transferability to other institutions, regions, younger patients, or different multimorbidity profiles should be considered cautiously. Second, 12 of 16 participants were interviewed once

before discharge; consequently, most phase-specific accounts were reconstructed retrospectively, and the journey map represents a cross-participant conceptual synthesis rather than a complete within-person longitudinal trajectory. Third, the transition phase was examined before discharge and therefore captures anticipated home-management challenges rather than directly observed post-discharge experiences. Fourth, only patients were interviewed; caregiver and clinician perspectives were not included.

Future multicenter longitudinal studies using repeated interviews across the PCI pathway and extending into the home period could examine how needs evolve after discharge and incorporate patient, caregiver, and clinician perspectives to strengthen the transferability and depth of the journey map.

5 Conclusion

Guided by the TIR framework, this study constructed a patient journey map summarizing stage-specific patterns in symptoms, care needs, emotions, and challenges across the preprocedural preparation, postprocedural recovery, and pre-discharge transition phases for patients with CMM undergoing PCI. The findings indicate that nursing priorities differ by phase: preprocedural care should address information gaps and procedural reassurance in the context of multimorbidity; early postprocedural care should integrate symptom surveillance, communication, medication support, and individualized rehabilitation; and transition planning should prepare patients for coordinated self-management of multiple cardiometabolic conditions after discharge. These findings suggest that clinical practice should focus on providing targeted nursing interventions tailored to patients' core needs at different stages to improve the overall quality of perioperative management for CMM patients undergoing PCI.

Abbreviations

CMM cardiometabolic multimorbidity

PCI percutaneous coronary intervention

TIR Timing It Right

CHD coronary heart disease

HTN hypertension

T2DM type 2 diabetes mellitus

HLP hyperlipidemia

BMI body mass index

Declarations

Ethics approval and consent to participate

The study was approved by the Ethics Committee of Renmin Hospital of Wuhan University, and informed consent was obtained from all participants.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Funding

Author Contribution

Yating Shi: Data curation, Investigation, Formal analysis, Methodology, Software, Writing – original draft. Tian Li: Data curation, Methodology, Writing – review & editing. Yinglin Li: Data curation, Methodology, Writing – review & editing. Zhiqiang Wang: Data curation, Methodology, Writing – original draft. Zhongxiang Cai: Data curation, Writing – review & editing. Jiali Zhou: Data curation, Writing – review & editing. Jingjing Tao: Data curation, Writing – review & editing. All authors contributed to the article and approved the submitted version.

Acknowledgement

We thank the patients who participated in the study.

Data availability

Data are available upon reasonable request.

References

1. Zheng X, Zhou X, Sun Y, et al. Study on clinical features and medication characteristics of patients with cardiometabolic comorbidities. Chin Gen Med. 2025;28(9):1061–4.
2. Han Y, Hu Y, Yu C, et al. Lifestyle, cardiometabolic disease, and multimorbidity in a prospective chinese study. Eur Heart J. 2021;42(34):3374–84.
3. Chen R, Li HQ, Xia J, et al. Traditional chinese medicine constitution and cardiometabolic multimorbidity: a nationwide cross-sectional study in older adults. Front Public Health. 2026;14:1723708.
4. Lan LH, Wang C, Li YJ, et al. Epidemiological characteristics and prognosis of cardiovascular metabolic comorbidities in elderly patients with hypertension combined with coronary heart disease. J PLA Med Coll. 2025;46(6):539–45.
5. Gurav A, Revaiah PC, Tsai TY, et al. Coronary angiography: a review of the state of the art and the evolution of angiography in cardio therapeutics. Front Cardiovasc Med. 2024;11:1468888.
6. Lawton JS, Tamis-Holland JE, Bangalore S, Bates ER, Beckie TM, Bischoff JM, et al. 2021 ACC/AHA/SCAI guideline for coronary artery revascularization: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. 2022;145(3):e18–114.
7. Dai D, Fernandes J, Sun X, Lupton L, Payne VW, Berk A. Multimorbidity in atherosclerotic cardiovascular disease and its associations with adverse cardiovascular events and healthcare costs: a real-world evidence study. J HEALTH Econ Outcomes Res. 2024;11(1):75–85.
8. Liang QH, Cui FS, Weng JW. Symptom cluster management combined with psychological resilience support for perioperative percutaneous coronary intervention in coronary heart disease patients. Knowl Cardiovasc Dis Prev

Treat. 2025;15(21):87–9.

9. Wang J, Cai L. Research progress on comorbidities and non-ST-segment elevation acute coronary syndrome in the elderly. Adv Cardiovasc Med. 2023;44(9):837–40.
10. Yuan PY, Zhang Y, Zhang XJ, et al. Progress in journey mapping for chronic disease patients. Nurs Res. 2025;39(16):2814–8.
11. Zhou XP, Tian YF, Zhang HY, et al. A review of the scope of patient journey maps used in clinical decision-making. J Nurs. 2026;33(5):27–32.
12. Yuan L, Li Y, Jiang X, Yang Z. A journey map for improving the cardiac rehabilitation experience and care quality of patients with coronary heart disease: a longitudinal qualitative study. Int J Nurs Stud. 2026;178:105390.
13. Xiu M, Wang H, Wang XF, et al. A study mapping the cardiac rehabilitation journey of patients undergoing coronary artery bypass grafting. Mil Care. 2026;43(4):96–100.
14. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. Acad Med. 2014;89(9):1245–51.
15. Cameron JI, Gignac MAM. Timing it right: a conceptual framework for addressing the support needs of family caregivers to stroke survivors from the hospital to the home. Patient Educ Couns. 2008;70(3):305–14.
16. Lu Q, Lu J, Zheng Y, et al. The effectiveness of mindful walking based on the timing it right framework in patients with atrial fibrillation and chronic heart failure. Front Cardiovasc Med. 2025;12:1587547.
17. Tang RX, Liu S, Ren LY, et al. Application of a timing theory-based video education program in young and middle-aged patients with coronary heart disease PCI. Nurs Res. 2026;40(4):633–8.
18. Huang M, Huang S, Ma H. A patient journey map based on the experience of temporomandibular disorders patients: a qualitative systematic review and meta-synthesis. Front Public Health. 2026;14:1769781.
19. Li G, Zhang JJ, Mou X, et al. Mechanisms linking hypertension to cardiovascular and cerebrovascular diseases and their clinical implications: a comprehensive review. Clin Exp Hypertens. 2026;48(1):2631606.
20. Liu CY, Jin R, Chen JH, et al. Experiences of hospitalized elderly patients with cardiometabolic comorbidities participating in medication safety management. Nurs Manag China. 2026;26(5):741–6.
21. Ingle MP, Lammons W, Guigli R, et al. Patient perspectives on the benefits and risks of percutaneous coronary interventions: a qualitative study. Patient Prefer Adherence. 2021;15:721–8.
22. Tsoulou V, Vasilopoulos G, Kapadohos T et al. January. Information needs in percutaneous coronary artery intervention: validation and reliability analysis of NPCI-10 item scale. *Cureus*. 2021.
23. Collison D, Copt S, Mizukami T et al. Angina after percutaneous coronary intervention: patient and procedural predictors. Circ: Cardiovasc Interventions. 2023;16(4).
24. Li Y, Chen WX, Li GY, et al. Multidimensional symptom network analysis of patients after percutaneous coronary intervention. Nurs Res. 2024;38(7):1129–38.
25. Heyman SN, Solomon R, Abassi Z. It is not only fluids: the impact of hydration protocols used for the prevention of contrast nephropathy on renal oxygenation. Ren Fail. 2025;47(1):2528889.
26. Huang W, Su Y, Pan XZ, et al. Analysis of perioperative psychological care needs in patients undergoing percutaneous coronary interventional treatment for acute myocardial infarction based on the KANO model. Shanghai Nurs. 2026;26(6):24–8.
27. Ding L. Clinical application of contrast nephropathy for the prevention of intravenous and oral hydration in patients with heart failure. J Interv Radiol. 2016;25(1):15.
28. Liu J, Zhu H, Liu L. Comparison of intravenous hydration and oral hydration in preventing contrast-induced nephropathy among patients undergoing peripheral vascular interventions. BMC Nephrol. 2026;27(1):119.

29. Wang J, Cui J, Tu S, Li Q, Wang Y, Zhao L et al. Early mobilization after cardiac catheterization via femoral artery: a systematic review and meta-analysis. Rev Cardiovasc Med.
30. Lü X, Fu YP, Wu YY, et al. A qualitative study on the self-management experience and needs of post-PCI patients in young and middle-aged patients with coronary heart disease. Gen Nurs. 2023;21(36):5162–5.
31. Li CX, Song CH, Li XP, et al. The impact of continuous nursing care based on health management models on negative emotions and quality of life in elderly patients with hypertension combined with coronary heart disease after percutaneous coronary intervention. Contemp Chin Med. 2025;32(22):149–54.

Table 1

Table 1. Participant Characteristics (n = 16)

Number	Gender	Age	Marital status	Type of CMM	Duration of CHD, years	Residence	Employment status	Educational level
P1	Male	62	Married	CHD + HTN+T2DM	17	Urban	Retired	Higher education
P2	Female	49	Married	CHD + HTN	1	Rural	Employed	Secondary education
P3	Female	53	Married	CHD + HTN+HLP +T2DM	2	Rural	Employed	Primary education
P4	Male	68	Married	CHD + HTN+HLP	8	Rural	Retired	Higher education
P5	Male	70	Married	CHD + HTN	3	Urban	Retired	Secondary education
P6	Female	68	Married	CHD + HTN+Stroke	5	Urban	Retired	Primary education
P7	Female	84	Married	CHD + HTN+HLP +Stroke	5	Urban	Retired	Secondary education
P8	Male	60	Married	CHD + HTN	2	Urban	Retired	Higher education
P9	Female	58	Married	CHD + HLP	1	Rural	Retired	Primary education
P10	Male	53	Married	CHD + HTN+T2DM	6	Rural	Employed	Primary education
P11	Male	66	Married	CHD + HTN	1	Rural	Retired	Higher education
P12	Male	61	Married	CHD + HTN+HLP +Obesity(BMI>28 kg/m²)	3	Urban	Employed	Secondary education
P13	Female	66	Widowed	CHD + HTN+T2DM +Stroke	4	Urban	Retired	Secondary education
P14	Female	71	Married	CHD + HLP	10	Urban	Retired	Higher education
P15	Male	63	Married	CHD + HTN	3	Urban	Retired	Secondary education
P16	Male	49	Unmarried	CHD + HTN+HLP +T2DM	1	Urban	Employed	Higher education

Abbreviations: CHD, coronary heart disease; HTN, hypertension; T2DM, type 2 diabetes mellitus; HLP, hyperlipidemia; BMI, body mass index.

Figures

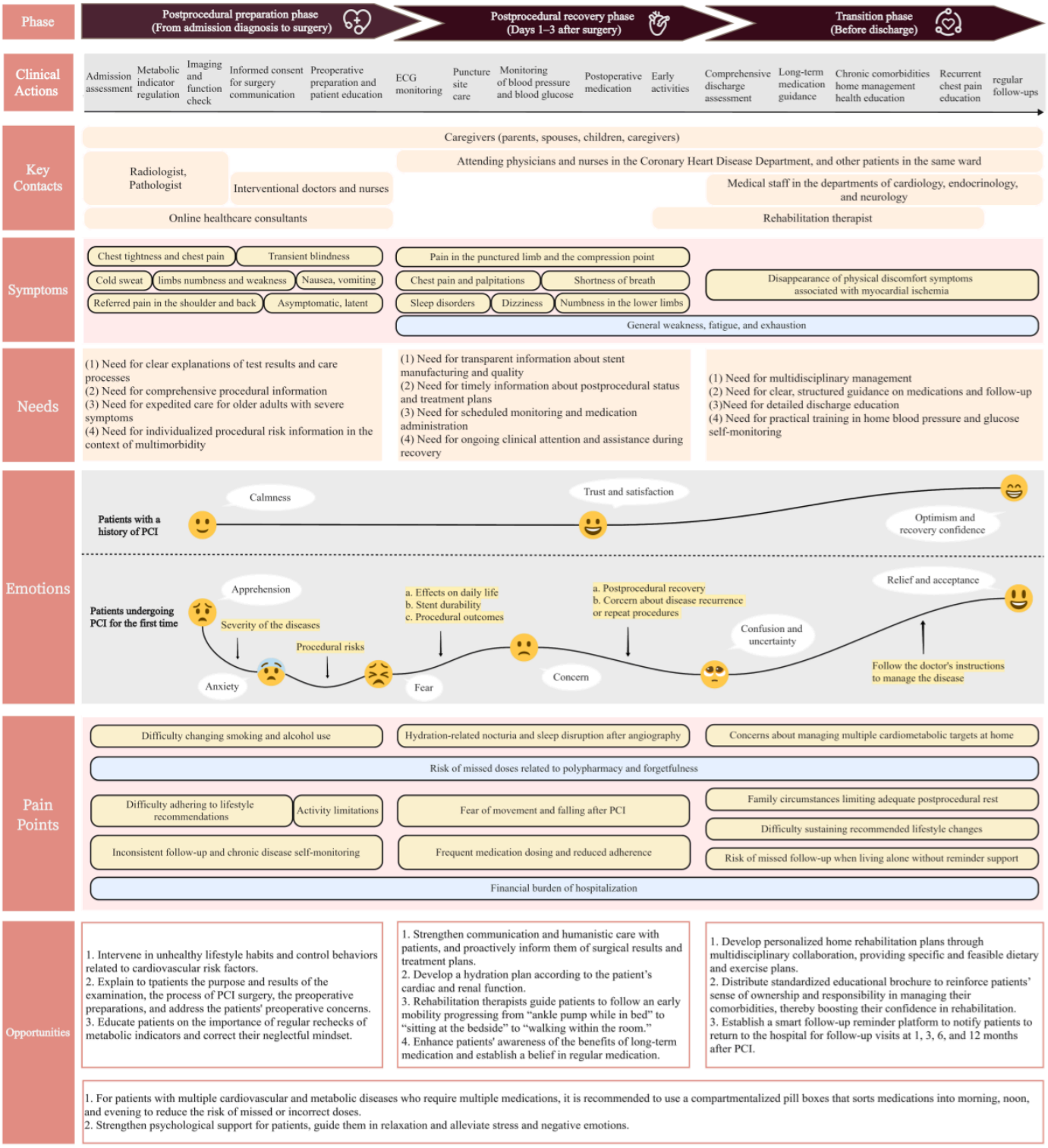


Figure 1

Journey map for patients with CMM undergoing the periprocedural pathway of PCI