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Decision-Making About Health Behaviors Among Patients With Cardiometabolic Multimorbidity Undergoing Percutaneous Coronary Intervention: A Qualitative Study Using Patient Personas, Journey Mapping, and Artificial Intelligence-Assisted Analysis

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Abstract

Background

Patients with cardiometabolic multimorbidity undergoing percutaneous coronary intervention (PCI) require long-term pharmacotherapy, risk factor control, lifestyle modification, and follow-up. Their health behavior decisions are shaped by illness perceptions, multimorbidity burden, social roles, family support, and access to health care. Patient personas and journey mapping can characterize heterogeneity and stage-specific experiences, whereas artificial intelligence (AI)-assisted analysis may support data organization and preliminary theme generation.

Methods

This qualitative descriptive study was conducted from July to August 2026 at a tertiary hospital in central China. Thirty-eight patients with cardiometabolic multimorbidity who underwent PCI participated in timeline-based semistructured interviews. Nonparticipant clinical observations and medical record data were also collected. Analysis was researcher-led and based on qualitative content analysis; ChatGPT 5.5, DeepSeek V3.2, and Doubao Expert Mode were used to generate provisional codes, stage-specific summaries, and analytic memos. Final themes and personas were developed by the research team through manual coding, iterative review of the source data, comparison with AI-generated provisional outputs, meaning-unit-level agreement assessment, journey-stage matrix analysis, and integration of patient personas with journey maps.

Results

Five decision-making personas were identified: active collaboration and risk management; limited treatment understanding and risk underestimation; multimorbidity burden and uncertain safety boundaries; work-family responsibilities and constrained implementation; and support dependence and limited resources. Across five stages—symptom onset and care-seeking decisions, admission assessment and illness understanding, PCI decision-making and preprocedural preparation, post-PCI recovery and risk reappraisal, and discharge preparation and postdischarge self-management planning—participants showed differing emotional and interpretive responses, decision-making patterns, implementation barriers, and support needs. Consensus LLM classifications showed 84.1% agreement with manual primary-category assignments ($\kappa = 0.76$), with higher agreement for explicit themes than for themes requiring interpretation of social context, latent needs, or stage-specific meaning.

Conclusions

Health behavior decision-making among patients with cardiometabolic multimorbidity undergoing PCI was both stage-specific and heterogeneous. Embedding patient personas within journey maps may help identify differentiated nursing needs and inform stratified, stage-based, and context-sensitive transitional care. AI may support qualitative analysis, but interpretation should remain researcher-led, traceable to the source data, and governed by explicit data-protection procedures.

Background

Cardiovascular disease (CVD) remains a leading cause of death and disability worldwide. In 2022, approximately 19.8 million deaths were attributed to CVD, representing about 32% of all deaths globally, many of which were related to myocardial infarction and stroke [1]. The Global Burden of Disease Study likewise identifies ischemic heart disease as a major contributor to global disease burden [2]. In China, coronary artery disease (CAD) prevention and management span acute treatment, secondary prevention, and long-term care [3]. Percutaneous coronary intervention (PCI) is an important revascularization strategy that can relieve symptoms caused by coronary stenosis and improve outcomes in selected high-risk patients, but it is not the endpoint of disease management. Guidelines from the European Society of Cardiology (ESC), the American Heart Association/American College of Cardiology (AHA/ACC), and the American College of Cardiology/American Heart Association/Society for Cardiovascular Angiography and Interventions emphasize integrated pharmacotherapy, risk factor control, lifestyle intervention, cardiac rehabilitation, shared decision-making, and long-term care [4–6]. Post-PCI nursing support should therefore extend beyond periprocedural safety and discharge education to help patients understand residual risk and translate secondary-prevention recommendations into daily self-management.

Patients with CAD commonly have coexisting cardiometabolic conditions, including hypertension, type 2 diabetes mellitus, dyslipidemia, obesity, and chronic kidney disease. The cardiovascular-kidney-metabolic (CKM) health framework highlights shared pathophysiological pathways across cardiovascular, kidney, and metabolic disorders and calls for less fragmented, more interdisciplinary care that also addresses lifestyle and social determinants of health [7]. Patient-centered care similarly extends beyond control of isolated clinical measures to encompass assessment, planning, intervention, and follow-up [8]. For patients with cardiometabolic multimorbidity undergoing PCI, health behavior decisions include adherence to medication regimens, control of blood pressure, glucose, and lipids, dietary modification, safe physical activity or cardiac rehabilitation, smoking cessation, alcohol restriction, symptom monitoring, and follow-up. These decisions are shaped by illness understanding, treatment burden, social pressures, patient engagement, and access to health care resources [9,10]. In this study, health behavior decision-making refers to how patients evaluate and choose actions related to medication use, risk-factor control, lifestyle modification, home monitoring, follow-up, and symptom response. These decisions are considered in relation to patients' risk perceptions, treatment understanding, personal values, family support, and available resources.

Previous studies have examined health behaviors, self-management, and decision-making after PCI. Health behaviors are influenced by illness perceptions and health knowledge, social and cultural contexts, established habits, and available support; patients may also be uncertain about the benefits of behavior

change, concerned about its consequences, or in need of additional information, health care resources, and emotional support [11–15]. Most studies, however, have focused on post-PCI follow-up or a single behavior, with less attention to experiences spanning symptom onset, admission assessment, treatment decision-making, post-PCI recovery, and discharge preparation. Research has also emphasized determinants or behavioral outcomes more often than how patients interpret risks, weigh competing priorities, and make decisions at different stages of care. Persona-based analyses of heterogeneity and stage-specific care needs remain limited among patients with cardiometabolic multimorbidity undergoing PCI.

Patient personas and journey mapping offer complementary approaches to characterizing patient heterogeneity and stage-specific experiences. Journey mapping represents care from the patient perspective by integrating touchpoints, emotional responses, challenges, service barriers, and unmet needs [16–18]. Patient personas are data-derived archetypes that represent subgroups with similar characteristics, behavioral patterns, and needs. Combining these approaches has shown promise in home-based cardiac rehabilitation and cancer care [19,20]. In the PCI context, personas may capture recurring patterns of health behavior decision-making, while journey maps identify when challenges and support needs arise. Their integration may therefore inform stratified, stage-based nursing support. Artificial intelligence (AI)-assisted analysis may facilitate transcript summarization, preliminary coding, and analytic memo generation, but model outputs require researcher review because of risks of contextual misinterpretation, overgeneralization, and poor traceability [21–26]. Using a qualitative descriptive design, we therefore combined retrospective journey mapping, patient personas, and researcher-led AI-assisted analysis to explore health behavior decision-making, stage-specific challenges, and support needs among patients with cardiometabolic multimorbidity undergoing PCI.

Methods

Study Design and Reporting Standards

This qualitative descriptive study used retrospective patient journey mapping as the analytic framework and incorporated patient personas to examine health behavior decision-making, stage-specific challenges, and support needs among patients with cardiometabolic multimorbidity undergoing PCI. Journey mapping structured patients' longitudinal experiences from symptom onset and admission assessment through treatment decision-making, post-PCI recovery, and discharge preparation. Patient personas were used to characterize heterogeneity in risk perception, decision-making patterns, barriers to self-management, and nursing support needs [17,19,20].

Data analysis was grounded in researcher-led qualitative content analysis. AI tools were used only to generate provisional codes, interim summaries, and analytic memos. Final theme interpretation, persona naming, and journey-map construction were undertaken by the research team with reference to the source data, clinical context, and expert consultation. Reporting followed the Consolidated Criteria for Reporting Qualitative Research (COREQ) and the Standards for Reporting Qualitative Research (SRQR) [27,28].

Setting, Participants, and Sampling

Setting

The study was conducted from July to August 2026 at the Coronary Heart Disease Center of Renmin Hospital of Wuhan University, a tertiary hospital in central China. Participants were patients with cardiometabolic multimorbidity who underwent PCI during the index hospitalization. The center provides periprocedural nursing care, chronic disease management, and discharge preparation for patients with CAD and therefore encompasses the principal care touchpoints examined in this study: symptom-related consultation, admission assessment, PCI decision-making, post-PCI recovery, and discharge preparation.

Participants

Cardiometabolic multimorbidity was operationally defined as CAD accompanied by at least two cardiometabolic diseases or metabolic risk states. These included hypertension, type 2 diabetes mellitus, dyslipidemia, overweight/obesity, chronic kidney disease, hyperuricemia, and fatty liver disease. Overweight/obesity was identified from medical record documentation, height and weight data, and body mass index (BMI) and was treated as a metabolic risk state closely associated with cardiometabolic risk. CAD, PCI status, and coexisting conditions were ascertained from electronic medical records, admission diagnoses, examination findings, procedural records, and discharge diagnoses. Because established diagnoses and metabolic risk states are conceptually distinct, they are collectively referred to below as cardiometabolic diseases or metabolic risk states. Eligible participants had CAD and at least two such conditions.

Inclusion criteria were: age ≥ 18 years; a clinical diagnosis of CAD; PCI during the index hospitalization; at least two cardiometabolic diseases or metabolic risk states; clinical stability after PCI sufficient to complete an interview before discharge; ability to communicate verbally and provide a coherent account of the care experience; and written informed consent. Patients who underwent coronary angiography without PCI were excluded. Additional exclusion criteria were critical illness or a need for emergency resuscitation that precluded interview completion; severe cognitive impairment, a mental disorder, hearing impairment, or language difficulties that prevented participation; end-stage malignancy or another serious condition likely to preclude interview completion; or physical discomfort that prevented completion of the interview. Participants who withdrew voluntarily were not included in the final analytic sample.

Sampling and Sample Size

Purposive sampling with maximum variation was used to recruit information-rich participants who could provide detailed accounts of their PCI-related care and health behavior decision-making. Sampling considered age, sex, education, residence, employment, number and type of coexisting conditions, previous hospitalization and PCI history, prior cardiovascular events, baseline health behaviors, and family support to enhance heterogeneity and the explanatory range of the data.

During the study period, 45 eligible patients who underwent PCI were approached. Four declined or were unable to participate because of post-PCI fatigue or unwillingness to be audio-recorded, and three did not complete data collection because they were discharged earlier than expected. Thirty-eight participants were therefore included in the final sample.

Data collection and preliminary analysis proceeded concurrently. After the 35th interview, no new major themes, persona categories, or stage-specific care needs were identified. Three additional interviews were conducted to test thematic stability, persona boundaries, and the adequacy of stage-specific interpretations; no new categories or explanatory insights emerged. The team therefore judged that data saturation had been reached. The final sample was also compatible with the concept of information power, given the focused study aim, sample specificity, and richness of the interviews [29].

Data Collection

Clinical and Demographic Data

Researchers extracted age, sex, reason for admission, CAD diagnosis, coronary angiography findings, PCI details, stent implantation status, previous PCI or coronary artery bypass grafting, cardiovascular-related hospitalization history, coexisting conditions, height, weight, BMI, medications used during hospitalization, and discharge medications from the electronic medical record.

Before the formal interview, brief questions were used to supplement information on education, marital status, residence, employment, living arrangements, primary caregiver, postdischarge cohabitation, long-term medication use before admission, smoking, alcohol use, regular exercise, blood pressure and glucose monitoring, and previous care at other hospitals. These data were used to contextualize participants' clinical backgrounds, verify key care milestones, and inform maximum-variation sampling, persona development, and journey-stage analysis.

Timeline-Based Semistructured Interviews

A single timeline-based semistructured interview was conducted by a researcher trained in qualitative methods after the participant's condition had stabilized following PCI and 1–2 days before discharge. Interviews took place in a quiet, private area of the ward. Before each interview, the researcher explained the study purpose, interview procedures, audio recording, confidentiality measures, and the right to withdraw. Written informed consent was obtained before the interview began.

All interviews were audio-recorded, with concurrent field notes documenting tone of voice, pauses, facial expressions, emotional responses, and other nonverbal cues relevant to interpretation. Thirty-eight interviews yielded 38 verbatim transcripts. Interviews lasted 30–60 min (approximately 1,620 min in total; mean, approximately 43 min), with duration adapted to each participant's physical condition and willingness to continue.

Interviews focused on the participant's current PCI-related care experience. Participants were guided chronologically through five stages: symptom onset and care-seeking decisions; admission assessment and illness understanding; PCI decision-making and preprocedural preparation; post-PCI recovery and risk reappraisal; and discharge preparation and postdischarge self-management planning. At each stage, probes explored illness understanding, emotional experiences, health behavior decisions, major difficulties, information seeking, communication with health care professionals, and support needs.

To reduce temporal confusion in retrospective accounts, interviewers used key milestones documented in the medical record—including admission, diagnostic examinations, PCI, and discharge preparation—as recall anchors. Participants were also prompted to distinguish what they had thought at the time from their current retrospective understanding.

Nonparticipant Clinical Observation and Field Notes

Nonparticipant clinical observation was conducted without disrupting routine care. Researchers did not participate in clinical decision-making or nursing procedures and recorded only contexts relevant to health behavior decision-making. Observations focused on behavioral responses, emotional reactions, spontaneous questions, family involvement, and clinician-patient interactions during preprocedural education, waiting for examinations or procedures, post-PCI recovery, medication counseling, dietary and physical-activity guidance, blood pressure and glucose monitoring instruction, and discharge education.

Fifty-seven observation records were generated across preprocedural education, waiting periods, post-PCI recovery, medication and monitoring guidance, dietary and physical-activity guidance, and discharge education. Field notes documented the time, location, context, key events, participant responses, and researchers' preliminary reflections. Observations were used only to contextualize patient narratives and support journey-map construction, not to evaluate the quality of clinical care.

Development of the Interview Guide and Pilot Interviews

The interview and observation guides were developed from the study aims, the PCI care pathway, journey-mapping requirements, and relevant literature. Previous qualitative research on health behavior decision-making after PCI identified concerns related to perceived benefits, behavioral identity, potential

adverse consequences of behavior change, information needs, health care resources, and emotional support [12]. The research team therefore developed open-ended questions for each of the five journey stages, with probes used to elicit detailed accounts of lived experience.

Five experts—two cardiovascular nursing specialists, one cardiologist, one chronic disease management specialist, and one qualitative research expert—reviewed the draft guide for alignment with the study aims, correspondence with the PCI care pathway, comprehensibility, and suitability for persona and journey-map development.

Three eligible patients participated in pilot interviews before formal data collection; their data were not included in the analysis. The pilot interviews assessed question clarity, the feasibility of timeline-based recall, and interview duration, and the guide was revised accordingly. Core questions are presented in Table 1.

Table 1
Interview Guide

No.	Question module	Corresponding journey stage/analytic dimension	Core interview question
1	Symptom onset and care-seeking decisions	Journey stage 1	What discomfort or other concern first led you to seek medical care?
2	Admission assessment and illness understanding	Journey stage 2	After admission, how did you understand your coronary artery disease and other health conditions?
3	PCI decision-making and preprocedural preparation	Journey stage 3	When you learned that you needed to undergo PCI, what were your main thoughts at that time?
4	Post-PCI recovery and risk reappraisal	Journey stage 4	After PCI, did your views about your condition and future self-management change?
5	Discharge preparation and postdischarge self-management planning	Journey stage 5	After discharge, which lifestyle habits and treatment-related habits do you think you most need to change or maintain?
6	Support needs and service improvement	Cross-cutting support needs and directions for nursing support	To truly make these changes, what kinds of help would you most like to receive?

Note. PCI = percutaneous coronary intervention.

Data Management and De-identification

Interview recordings, observational field notes, medical record extracts, and participant-provided supplementary information were managed by the research team. Each participant received a unique study identifier (eg, P01, P02) that linked interview, observational, and clinical background data. Recordings were transcribed verbatim within 24–48 h. A second researcher checked each transcript against the audio recording, with particular attention to omissions, changes in meaning, and medical terminology.

All materials were de-identified before analysis. Direct and indirect identifiers removed included names, medical record and bed numbers, telephone and national identification numbers, detailed addresses, specific workplaces, names of health care professionals, and other potentially identifying information. Sensitive references to locations, relationships, or distinctive events were generalized without changing their substantive meaning. Only de-identified text was used for manual coding and AI-assisted analysis.

All interviews were conducted and transcribed verbatim in Chinese. Qualitative coding and AI-assisted analysis were performed using the original Chinese transcripts. Representative quotations selected for publication were translated into English and independently checked against the original Chinese transcripts by two bilingual members of the research team to preserve semantic and contextual equivalence.

Data Analysis

Analysis combined researcher-led qualitative content analysis with AI-assisted provisional coding, researcher review of AI-generated outputs, agreement assessment between AI-generated classifications and manual coding, journey-stage matrix analysis, persona development, and journey-map integration. Data collection and analysis proceeded concurrently. After each interview and observation, researchers organized transcripts, field notes, and medical record data, wrote analytic memos, and used preliminary findings to refine subsequent sampling priorities and probes.

Manual Coding and Qualitative Content Analysis

Two researchers repeatedly read the de-identified Chinese-language interview transcripts, observation notes, and medical record summaries to become familiar with participants' narratives and clinical contexts. They independently open-coded the first 12 transcripts and developed an initial coding framework after resolving differences through comparison and discussion. One researcher then conducted preliminary coding of the remaining 26 transcripts, while the second reviewed key meaning units, thematic assignments, and persona assignments across the full dataset. Meaning units relating to illness perceptions, emotional experiences, health behavior decision-making, stage-specific challenges, support needs, and opportunities for nursing support were coded using language as close as possible to participants' accounts. Similar codes were compared, merged, and abstracted into categories and themes, with continual return to the source data to maintain contextual grounding [30,31].

AI-Assisted Provisional Coding and Analytic Memos

After familiarization and development of the initial coding framework, the de-identified Chinese-language transcripts were entered separately into ChatGPT 5.5, DeepSeek V3.2, and Doubao Expert Mode. Each model received the same transcripts, analytic tasks, and prompts and independently generated provisional codes, interim summaries, potential categories, stage-specific challenges, support needs, and analytic memos. Prompts were structured around the five journey stages and asked each model to identify illness perceptions, emotional experiences, health behavior decisions, major challenges, unmet needs, and potential targets for nursing support, with traceable supporting excerpts whenever possible. Large language models (LLMs) may support coding, theme generation, and qualitative synthesis, but their outputs are prompt-sensitive and may be limited by contextual misunderstanding, hallucination, and privacy risks; researcher verification therefore remained essential [21,23,26].

Outputs from the three models were stored separately and were not provided to the other models, reducing the potential for cross-model influence. Model name, version or interface-displayed information, date of use, prompts, and generated outputs were documented to support transparency and traceability. AI outputs were treated only as provisional analytic material and memos, not as final codes, themes, personas, or journey-map findings.

Researcher Review and Refinement of AI-Generated Outputs

The research team compared AI-generated provisional codes, categories, and persona suggestions with manual coding. Review focused on traceability to the transcripts, consistency with narrative context, clinical interpretability, and avoidance of overgeneralization, value judgments, or decontextualized inference. Content identified by all three models, or by at least two models and supported by explicit source evidence, was prioritized for review. Cross-model convergence served only as a screening cue and was not treated as evidence of analytic validity; all retained content required verification against the source data. Suggestions produced by only one model were checked against transcripts, observation notes, and medical records. Only content grounded in participants' accounts and compatible with the clinical context was retained or integrated; untraceable, overgeneralized, decontextualized, or inferential content was excluded. Final themes and classifications were determined by team discussion.

Agreement Assessment Between AI-Generated Provisional Outputs and Manual Coding

To assess agreement between AI-generated provisional classifications and manual coding at the level of theme identification, the research team used meaning units generated during manual coding as the unit of analysis. A meaning unit was defined as a transcript segment conveying a relatively complete idea related to illness perception, health behavior decision-making, stage-specific challenges, or nursing support needs. Two researchers first completed manual coding using the interview transcripts, observational notes, and medical record data and established a reference thematic classification through discussion.

The same de-identified transcripts were then analyzed independently by ChatGPT 5.5, DeepSeek V3.2, and Doubao Expert Mode using prompts that requested classifications across the five journey stages with supporting source excerpts. For each meaning unit, the research team assessed whether the AI output assigned the corresponding theme or persona category. A consensus LLM classification was defined when at least two of the three models assigned the same or a semantically equivalent theme to a meaning unit. Meaning units for which model outputs were inconsistent or could not be traced to the source text were excluded from the agreement calculation but retained as analytic memos for researcher review.

A binary classification matrix was used for the agreement assessment. Of 568 meaning units directly related to health behavior decision-making, 516 had a clear primary category assignment and could be matched with the consensus LLM classifications; these units were included in the quantitative agreement analysis. The remaining 52 represented background narratives, cross-theme integrative information, or suggestions generated by only one model and were retained only for qualitative interpretation, persona refinement, and journey-map development.

For each persona-related theme, each meaning unit was coded as 1 (assigned to the theme) or 0 (not assigned) for both manual coding and the consensus LLM classification. Theme-level agreement was calculated across the 516 classifiable meaning units, and overall agreement was based on their primary category assignments. The research team constructed the meaning unit-manual coding-consensus LLM classification matrix in Excel, and IBM SPSS Statistics, version 29.0 was used to calculate percentage agreement and Cohen's κ. κ values of 0.61–0.80 were interpreted as substantial agreement and values of 0.81–1.00 as almost perfect agreement.

κ values were used only to describe convergence between AI-generated provisional classifications and manual coding; they did not substitute for researcher interpretation, persona naming, or journey-map construction. Final themes, personas, and journey maps were determined through manual coding, triangulation across data sources, repeated review of the source data, and expert discussion.

Journey-Stage Matrix Analysis

Building on thematic analysis, the research team constructed a journey-stage matrix with the five PCI journey stages as columns and illness perception, emotional experiences, health behavior decision-making, key touchpoints, major challenges, unmet needs, and opportunities for nursing support as rows. A within-case journey summary was first developed for each participant, documenting key events, concerns, risk perceptions, behavioral choices, and support needs at each stage. Cross-case comparison was then used to identify common experiences and differentiated needs. The matrix linked source narratives, themes, personas, and the journey map and helped prevent the map from becoming a purely procedural description.

Development of Patient Personas

Patient personas were developed from thematic analysis, the journey-stage matrix, and cross-case comparison. The research team extracted features related to demographic and social context, clinical and multimorbidity characteristics, previous treatment experiences, baseline health behaviors, illness and risk perceptions, health behavior decision-making, major barriers, family and social support, stage-specific challenges, unmet needs, and opportunities for nursing support. A case-level summary was then prepared for each participant, including background information, the care journey, key stage-specific experiences, decision-making processes, challenges, support needs, and representative quotations.

Persona development was guided primarily by interpretive relevance and usefulness for nursing practice rather than by any single demographic or disease variable. Each persona required a distinguishable health behavior decision-making pattern, reasonably consistent stage-specific challenges and support needs across the PCI journey, and clear implications for nursing support. Persona development integrated multiple dimensions rather than simply relabeling individual themes. For cases with overlapping or uncertain boundaries, the team returned to the source data and journey-stage matrix and refined persona definitions or assignments through discussion.

Final personas were described using a standardized template covering persona name, typical characteristics, disease and multimorbidity context, health behavior decision-making pattern, core challenges, primary support needs, key journey stages, and potential nursing interventions. Persona labels were designed to avoid judgmental or stigmatizing language and to emphasize decision-making patterns and care needs.

Integration and Visualization of the Patient Journey Map

The patient journey map was developed from thematic analysis, journey-stage matrix analysis, and persona development. Using the PCI care pathway as the temporal framework, the research team synthesized key touchpoints, emotional experiences, health behavior decisions, stage-specific challenges, unmet needs, and opportunities for nursing support across five stages: symptom onset and care-seeking decisions; admission assessment and illness understanding; PCI decision-making and preprocedural preparation; post-PCI recovery and risk reappraisal; and discharge preparation and postdischarge self-management planning.

Individual participant journeys were constructed first, followed by cross-case comparison to identify shared experiences and differentiated needs. Personas were then embedded in the journey map to show how decision-making patterns, challenges, and nursing needs varied among persona patterns within the same care stage. This created an analytic link between persona identification, journey-stage mapping, and tailoring nursing support to persona patterns and journey stages. Twelve participants representing different persona characteristics reviewed the initial map for member checking, and five experts—two cardiovascular nursing specialists, one cardiologist, one chronic disease management specialist, and one qualitative research expert—conducted a structured review. The team refined stage definitions, descriptions of challenges, synthesis of needs, and opportunities for nursing support in response to this feedback.

Trustworthiness and Reflexivity

Study trustworthiness was supported through attention to credibility, transferability, dependability, and confirmability [32]. The team comprised two nursing graduate students, one cardiovascular nurse specialist, one cardiovascular nursing researcher, and one qualitative research methodologist. Before data collection, interviewers received training in qualitative methods, journey mapping, persona development, and the PCI nursing pathway, and three pilot interviews were used to standardize interviewing approach and pacing. Open-ended questions, active listening, and follow-up probes encouraged detailed accounts. Transcription and checking were completed within 24–48 h, while field notes and analytic memos were prepared concurrently to preserve contextual and nonverbal information.

The main interviewers were nursing graduate students and a cardiovascular nursing researcher trained in qualitative methods who were not involved in clinical decision-making or routine nursing care for the participants. Before each interview, they explained their roles, the study purpose, data use, confidentiality measures, and the right to withdraw, and clarified that participation would not affect care. During data collection and analysis, the team completed 38 post-interview reflexive journals examining how cardiovascular nursing experience, assumptions about transitional care, and expectations about AI-assisted analysis might shape coding, theme labels, and persona interpretation. Team discussion, review of source data, data-source triangulation, and expert appraisal were used to make assumptions explicit and reduce the influence of any single interpretation.

Two researchers independently coded the first 12 transcripts and resolved discrepancies through discussion. For the remaining transcripts, one researcher conducted preliminary coding and another reviewed key meaning units, thematic assignments, persona assignments, and journey-stage interpretations. Triangulation drew on 38 interview transcripts, 57 nonparticipant observation records, and 38 medical record summaries. Twelve participants took part in member checking of the main experiences, persona characteristics, and journey stages, and five experts appraised the thematic interpretations, personas, and journey maps. Interview recordings, transcripts, coding files, AI prompts and outputs, manual revision records, agreement matrices, field observations, reflexive journals, and analytic memos were retained as an audit trail.

Ethical Considerations and Artificial Intelligence Data Governance

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of Renmin Hospital of Wuhan University (approval No. WDRY2026-K188). Before each interview, researchers explained the study aims and procedures, intended data use, potential risks, privacy protections, AI-assisted analytic procedures, and the right to withdraw. All participants provided written informed consent and were informed that participation was voluntary and that withdrawal would not affect their care. Interview recordings, observation notes, and medical record data were used only for this study, and findings were reported using anonymized participant identifiers.

All text submitted to AI tools was de-identified in advance and contained no names, inpatient identification or bed numbers, contact details, national identification numbers, detailed addresses, specific workplaces, names of health care professionals, or other identifying information. AI outputs were used only to support data organization and preliminary analysis and were not treated as independent findings or substitutes for researcher judgment. De-identified texts, AI outputs, coding files, and analytic memos were stored on password-protected, access-controlled devices. Original data were not accessible outside the research team without ethics approval and participant authorization. Data retention and destruction followed the ethics approval and institutional data-management requirements.

Results

Demographic and Clinical Characteristics of the Participants

Thirty-eight patients with cardiometabolic multimorbidity who underwent PCI participated. Their ages ranged from 39 to 82 years, with variation in sex, education, residence, living arrangements, employment, and caregiving or decision-making support. Junior high school education or below was most common. Sixteen participants were undergoing their first PCI, 15 their second, and seven their third or subsequent procedure. Disease duration ranged from 1 month to 16 years, and self-rated health was predominantly fair or poor. Participant characteristics are shown in Table 2.

Table 2. Characteristics of Patients With Cardiometabolic Multimorbidity Undergoing PCI

Participant ID	Age, years	Sex	Educational level	Place of residence	Living arrangement	Employment status	Main caregiving or decision-making support	Disease duration	PCI history	Self-rated health
P01	58	Male	Senior high school	Urban area	Living with spouse	Sick leave	Spouse	6 months	First PCI	Fair
P02	72	Male	Junior high school	County/town	Living with children	Retired	Children	8 years	Second PCI	Poor
P03	61	Male	College or above	Urban area	Living with spouse	Retired	Spouse	1 year	First PCI	Good
P04	47	Female	Secondary vocational school	Urban area	Living with spouse and children	Employed	Spouse and children	1 year	First PCI	Good
P05	70	Female	Primary school or below	Rural area	Living with children	Unemployed/farming	Children	2 years	First PCI	Fair
P06	52	Male	Junior high school	Urban area	Living with spouse	Employed	Spouse	8 months	First PCI	Fair
P07	66	Male	Junior high school	County/town	Living with spouse	Retired	Spouse	3 years	First PCI	Fair
P08	74	Female	Primary school or below	Rural area	Living alone	Unemployed/farming	Occasional assistance from children	5 years	First PCI	Poor
P09	73	Male	Junior high school	Urban area	Living with spouse	Retired	Spouse	12 years	Third or subsequent PCI	Poor
P10	45	Male	Senior high school	Urban area	Living with spouse and children	Employed	Spouse	1 year	First PCI	Good
P11	53	Female	Secondary vocational school	Urban area	Living with spouse and children	Employed	Spouse	2 years	First PCI	Fair
P12	55	Male	College or above	Urban area	Living with spouse	Employed	Spouse	4 years	First PCI	Fair
P13	68	Male	Senior high school	Urban area	Living with spouse	Retired	Spouse	6 years	Second PCI	Fair
P14	50	Female	Secondary vocational school	Urban area	Living with spouse and children	Employed	Spouse and children	1 year	First PCI	Good
P15	69	Male	Junior high school	County/town	Living with spouse	Retired	Spouse and children	7 years	Second PCI	Fair
P16	63	Male	Junior high school	County/town	Living with spouse	Sick leave	Spouse	3 years	First PCI	Fair
P17	42	Female	Senior high school	Urban area	Living with spouse and children	Employed	Spouse	1 month	First PCI	Good

P18	71	Male	Junior high school	Urban area	Living with spouse	Retired	Spouse	10 years	Third or subsequent PCI	Poor
P19	57	Male	Senior high school	Urban area	Living with spouse and children	Employed	Spouse	2 years	First PCI	Fair
P20	65	Male	Junior high school	County/town	Living with spouse	Retired	Spouse	5 years	Second PCI	Fair
P21	67	Male	College or above	Urban area	Living with spouse	Retired	Spouse	6 years	Second PCI	Fair
P22	76	Male	Primary school or below	Rural area	Living with children	Retired	Children	10 years	Second PCI	Poor
P23	62	Male	Junior high school	County/town	Living with spouse	Retired	Spouse	3 years	First PCI	Fair
P24	60	Female	Junior high school	Urban area	Living with children	Retired	Children	4 years	Second PCI	Fair
P25	78	Male	Primary school or below	Rural area	Living with children	Retired	Children	15 years	Third or subsequent PCI	Poor
P26	70	Male	Junior high school	Urban area	Living with spouse	Retired	Spouse	11 years	Third or subsequent PCI	Poor
P27	54	Female	Secondary vocational school	Urban area	Living with spouse and children	Employed	Spouse and children	5 years	Second PCI	Fair
P28	64	Male	Secondary vocational school	Urban area	Living with spouse	Retired	Spouse	4 years	Second PCI	Fair
P29	82	Male	Primary school or below	County/town	Living alone	Retired	Remote reminders from children	12 years	Second PCI	Poor
P30	59	Female	Junior high school	County/town	Living with spouse	Retired	Spouse	6 years	Second PCI	Fair
P31	39	Male	College or above	Urban area	Living with spouse and children	Employed	Spouse	6 months	First PCI	Good
P32	75	Male	Junior high school	Urban area	Living with spouse	Retired	Spouse	14 years	Third or subsequent PCI	Poor
P33	69	Male	Junior high school	County/town	Living with spouse	Retired	Spouse	8 years	Second PCI	Fair
P34	71	Female	Primary school or below	Rural area	Living alone	Unemployed/farming	Occasional assistance from children	7 years	Second PCI	Poor

P35	77	Male	Primary school or below	County/town	Living with other relatives	Retired	Other relatives	13 years	Third or subsequent PCI	Poor
P36	56	Female	Senior high school	Urban area	Living with spouse	Sick leave	Spouse	5 years	Second PCI	Fair
P37	60	Male	Junior high school	Urban area	Living with spouse	Retired	Spouse	5 years	Second PCI	Fair
P38	80	Female	Primary school or below	Rural area	Living alone	Unemployed	Self-care/no fixed support	16 years	Third or subsequent PCI	Poor

Note. P indicates participant ID. CAD = coronary artery disease; PCI = percutaneous coronary intervention; T2DM = type 2 diabetes mellitus; CKD = chronic kidney disease.

Manual Coding, AI-Assisted Analysis, and Agreement Assessment

ChatGPT 5.5, DeepSeek V3.2, and Doubao Expert Mode were used to generate provisional analyses of the de-identified interview transcripts alongside manual coding. Across models, provisional outputs addressed risk perception, treatment understanding, multimorbidity burden, work and family responsibilities, family support, and access to resources. The research team repeatedly returned to the interview transcripts, observation records, and medical records to compare and refine AI-generated provisional outputs against manual coding. This process contributed to five provisional persona categories (Table 3).

Agreement was higher for explicit themes, including active collaboration and risk management, limited treatment understanding and risk underestimation, and multimorbidity burden and uncertain safety boundaries. Agreement was lower for themes requiring greater contextual interpretation, particularly work-family constraints and support dependence and limited resources. These patterns suggest that LLMs may assist with identifying explicit themes, whereas interpretation of social context, latent needs, persona boundaries, and stage-specific meaning remains researcher-dependent. Agreement between AI-generated classifications and manual coding is summarized in Table 4.

Table 3. Health Behavior Decision-Making Themes and Provisional Patient Personas Across Large Language Models and Manual Coding

Analytic dimension	Health behavior decision-making theme	ChatGPT 5.5 output	DeepSeek V3.2 output	Doubao Expert Mode output	Manual coding	Integrated provisional persona
Risk Perception and Active Engagement	Risk reappraisal after percutaneous coronary intervention (PCI) and engagement in long-term secondary prevention	Active questioning; risk management; monitoring of clinical measures	Heightened risk perception; inclination toward shared decision-making; awareness of long-term management	Higher health literacy; proactive development of a management plan	Patients recognized that PCI was not a cure and actively asked about stents, medication, physical activity, follow-up, and monitoring of blood pressure, glucose, and lipids. They sought to translate health-professional recommendations into concrete action plans.	Active Collaboration and Risk Management
Treatment Understanding and Illness Perception	Insufficient understanding of the limitations of PCI and perceived cure after the procedure	Insufficient disease-related knowledge; weak awareness of post-PCI management	Underestimation of post-PCI risk; relaxation of self-management after symptom relief	Perception of stent treatment as curative; risk of reduced adherence	Patients understood that coronary stenosis required treatment but had limited awareness of the need for long-term medication, risk factor control, and follow-up after PCI. Symptom relief could reduce vigilance about ongoing self-management.	Limited Treatment Understanding and Risk Underestimation
Multimorbidity and Risk Vigilance	Recurrence concerns and safety-related apprehension under the burden of cardiometabolic multimorbidity	Multimorbidity; medication-related concerns; fear of recurrence	Burden of multimorbidity management; uncertainty about exercise safety; sensitivity to fluctuations in clinical measures	Concerns about restenosis; pressure from polypharmacy; vigilance toward abnormal symptoms	Patients were motivated to self-manage but faced overlapping demands from multimorbidity and polypharmacy. Concerns about recurrence, bleeding, hypoglycemia, and safe levels of physical activity made stable management plans difficult.	Multimorbidity Burden and Uncertain Safety Boundaries
Social Roles and Implementation Constraints	Work and family responsibilities constraining the implementation of health behaviors	Work-related stress; insufficient time; implementation difficulties	Conflict between family responsibilities and rehabilitation plans; restricted follow-up arrangements	Work, family, and dietary contexts limiting the implementation of health behaviors	Patients understood the need for medication, diet, physical activity, and follow-up, but sustained implementation was constrained by work, family caregiving, income demands, daily routines, and eating contexts.	Work-Family Responsibilities and Constrained Implementation
Resource Accessibility and Support Systems	Reliance on external support in the context of limited health care access, family support, and digital capability	Financial and transportation constraints; dependence on family members; difficulty with follow-up	Limited support systems; insufficient linkage with primary care; low confidence in implementation	Difficulty using digital tools; need for family involvement; need for telephone follow-up	Patients relied heavily on health care professionals or family members to understand advice, manage medication, arrange follow-up, and conduct home monitoring. Self-management was constrained by health literacy, transport and financial barriers, caregiver stability, primary-care access, and digital skills.	Support Dependence and Limited Resources

Note. PCI = percutaneous coronary intervention.

Table 4. Agreement Between AI-Generated Provisional Classifications and Manual Coding for Health Behavior Decision-Making Themes

Theme/patient persona	Consensus LLM classifications	Manual coding	Percentage agreement and Cohen's κ	Interpretation of agreement	Main researcher refinement
Active collaboration and risk management	At least two models consistently identified proactive questioning, risk awareness, secondary prevention, monitoring of clinical measures, and collaboration with health care professionals.	Manual analysis further confirmed that patients understood percutaneous coronary intervention (PCI) as the starting point for long-term risk management and attempted to translate medical and nursing advice into medication use, monitoring, exercise, follow-up visits, and cardiac rehabilitation plans.	89.7%; κ = 0.83	Almost perfect agreement	The interpretation that "PCI is not a cure but the starting point for long-term secondary prevention" was strengthened, and the process by which patients translated information into action plans was further elaborated.
Limited treatment understanding and risk underestimation	At least two models consistently identified insufficient disease knowledge, weak awareness of post-PCI management, and risk underestimation.	Manual analysis showed that patients understood the need to treat vascular stenosis; however, after symptom relief, they tended to form the judgment that "the disease had been resolved after stent placement," which weakened their awareness of long-term medication use, follow-up visits, and risk factor control.	86.5%; κ = 0.79	Substantial agreement	The broad category of "insufficient knowledge" was refined to distinguish limited understanding of the therapeutic limits of PCI from the misconception of cure after PCI, highlighting how symptom relief shaped health behavior decision-making.
Multimorbidity burden and uncertain safety boundaries	At least two models consistently identified multimorbidity, concerns about recurrence, pressure related to polypharmacy, uncertainty about exercise, and sensitivity to fluctuations in clinical measures.	Manual analysis further revealed that patients remained vigilant about restenosis, bleeding, hypoglycemia, changes in renal function, exercise intensity, and thresholds for abnormal symptoms. Although they were willing to engage in self-management, they found it difficult to develop stable management plans.	84.9%; κ = 0.76	Substantial agreement	The analysis distinguished two dimensions—overlapping multimorbidity management tasks and unclear safety thresholds—to avoid reducing these experiences to anxiety alone.
Work-family responsibilities and constrained implementation	At least two models consistently identified work-related stress, insufficient time, family responsibilities, and difficulties implementing rehabilitation.	Manual analysis showed that patients did not necessarily fail to understand medical advice; rather, they repeatedly weighed work income, family caregiving, dietary contexts, the cost of taking leave, and follow-up arrangements. Self-management was often constrained by real-life responsibilities.	81.7%; κ = 0.72	Substantial agreement	The model-derived category of "insufficient time" was expanded to capture social-role conflict and the combined effects of work, family, economic conditions, and everyday contexts on health behavior implementation.
Support dependence and limited resources	At least two models consistently identified economic and transportation constraints, dependence on family members, difficulties with follow-up, barriers to using digital tools, and insufficient support.	Manual analysis further showed that, after discharge, patients depended on external support for medication use, follow-up visits, home monitoring, and management of abnormal symptoms. These difficulties arose from limited health literacy, instability of caregiver support, inadequate primary care linkage, and insufficient digital competence.	79.4%; κ = 0.69	Substantial agreement	The broad category of "resource constraints" was refined to distinguish limited access to health care, insufficient family support, limited digital health competence, and weak linkage with primary care, thereby avoiding an interpretation centered solely on poor adherence.
Overall agreement	Large language models were able to identify the main themes related to health behavior decision-making experiences, particularly explicit risk perceptions, disease knowledge, and multimorbidity burden.	Manual analysis provided further interpretation of theme boundaries, implicit emotions, social contexts, and stage-specific changes across the patient journey.	84.1%; κ = 0.76	Substantial agreement	The research team finalized the personas by integrating manual coding with the original interview transcripts, observation records, and medical record data.

Note. AI = artificial intelligence; LLM = large language model; PCI = percutaneous coronary intervention. A consensus LLM classification was defined as a theme assignment that was identical or semantically equivalent across at least two of the three LLMs for the same meaning unit. Of 568 meaning units directly related to health behavior decision-making, 516 had clear primary category assignments and were included in the agreement assessment; the remaining 52 represented contextual narratives, cross-theme information, or content without a stable classification and were retained only for qualitative interpretation. Percentage agreement and Cohen's κ were calculated from meaning unit-level binary classification matrices indicating whether a unit was assigned to each theme. Overall agreement was based on the primary category assignments of the 516 classifiable units. The matrix was constructed in Excel and analyzed in IBM SPSS Statistics, version 29.0. κ values describe only correspondence between AI-generated provisional classifications and manual coding and were not used as evidence of persona validity or as a substitute for researcher interpretation.

Health Behavior Decision-Making Personas and Journey Maps Among Patients With Cardiometabolic Multimorbidity Undergoing PCI

Overall Characteristics of the Five Patient Personas

As shown in Tables 5 and 6, five health behavior decision-making personas were developed from manual coding, AI-generated provisional outputs, observational data, and medical record information: active collaboration and risk management (n = 9), limited treatment understanding and risk underestimation (n = 5), multimorbidity burden and uncertain safety boundaries (n = 7), work-family responsibilities and constrained implementation (n = 9), and support dependence and limited resources (n = 8). The personas differed in illness and risk perceptions, decision-making participation, barriers to self-management, and nursing support needs. They were not defined mechanically by age, education, or PCI history; demographic and clinical characteristics were used only to contextualize decision-making patterns. Tables 5 and 6 summarize persona characteristics and stage-specific needs.

Table 5. Patient Personas Reflecting Health Behavior Decision-Making Among Patients With Cardiometabolic Multimorbidity Undergoing PCI

Indicator/category	Active collaboration and risk management	Limited treatment understanding and risk underestimation	Multimorbidity burden and uncertain safety boundaries	Work-family responsibilities and constrained implementation	Support dependence and limited resources
Patient personas					
Participant IDs	P01, P03, P12, P13, P20, P21, P28, P33, P37	P06, P07, P16, P23, P24	P02, P09, P15, P18, P26, P30, P32	P04, P10, P11, P14, P17, P19, P27, P31, P36	P05, P08, P22, P25, P29, P34, P35, P38
Age	55–69 years	52–66 years	59–75 years	39–57 years	70–82 years
Illness duration	6 months to 8 years	8 months to 4 years	6–14 years	1 month to 5 years	2–16 years
Self-rated health	Fair or good	Fair	Fair or poor	Fair or good	Fair or poor
Education	Junior high school to college or above	Mainly junior high school	Mainly junior high school	Senior high school, secondary vocational school, or college or above	Mainly primary school or below
Description	Strong risk awareness; active participation in treatment decisions; proactive planning for long-term cardiometabolic risk management.	Limited understanding of CAD progression, the therapeutic limits of PCI, and long-term secondary prevention; symptom relief could be interpreted as disease resolution.	Multiple cardiometabolic conditions with persistent vigilance about recurrence, polypharmacy, clinical fluctuations, and physical-activity safety.	Recognition of long-term management needs, but implementation constrained by work, caregiving, income pressure, and everyday circumstances.	Greater reliance on health care professionals, family members, and external resources; resource constraints reduced capacity for independent long-term self-management.
Characteristics	• Higher health literacy • Actively asked questions and recorded clinical measures • Valued secondary prevention and feedback from health care professionals • Relatively stable family support	• Limited disease-related knowledge • Underestimation of post-PCI risk • Reduced management awareness after symptom relief • Less active questioning	• Coexisting multiple conditions and polypharmacy • Sensitivity to recurrence and adverse drug reactions • Strong willingness to engage in management but uncertainty about safe self-management • Repeated requests for clarification about medication- and exercise-related risks	• Assumed major work or family responsibilities • Understood self-management requirements • Time and energy were constrained by real-life responsibilities • Difficulty sustaining diet, exercise, and follow-up plans	• Limited health literacy and digital skills • Restricted access to follow-up care because of transportation and cost barriers • Unstable caregiving support • Difficulty remembering medication and follow-up information
Needs	• Individualized secondary prevention action plan • Clear standards for exercise, monitoring, and follow-up visits • Cardiac rehabilitation and feedback through digital follow-up	• Plain-language and repeated health education • Visual or checklist-based discharge instructions • Family participation and teach-back confirmation	• Integrated explanation of multimorbidity management • Guidance on polypharmacy management and adverse reactions • Graded exercise plan and continuous follow-up feedback	• Low-burden, time-efficient management plan • Guidance on return to work and safe activity limits • Recommendations for brief bouts of physical activity, workplace meal choices, and flexible follow-up	• Concise, low-cost, and actionable management plan • Paper-based checklists and telephone follow-up • Family involvement, linkage with primary care, and guidance on digital tools
Disease and risk perception	Recognized PCI as the beginning of long-term secondary prevention and cardiometabolic risk management rather than a cure.	Understood the need to treat coronary stenosis but had limited awareness of long-term medication, risk factor control, and follow-up after PCI.	Recognized persistent recurrence risk after PCI and closely monitored blood pressure, glucose, lipids, renal function, weight, and medication safety.	Recognized the need for long-term medication, diet, physical activity, and follow-up but weighed these demands against work and family responsibilities.	Accepted PCI and professional recommendations but had limited understanding of the relationships among CAD, long-term medication, and multimorbidity management.
Decision-making approach	Participated in shared decision-making based on explanations from health care professionals, actively asked questions, and attempted to translate recommendations into action plans.	Relied mainly on physicians and family members for arrangements and focused primarily on whether the procedure was successful and whether symptoms were relieved.	Participated cautiously and repeatedly sought confirmation, making decisions based on perceived risks, perceived safety limits, and feedback from health care professionals.	Repeatedly weighed disease-related risks against work income, family caregiving, leave-related costs, and daily life arrangements.	Relied more heavily on physicians, nurses, and family members for arrangements and had limited capacity to independently interpret recommendations and sustain self-management.

Barriers to self-management	Routine education was relatively general and lacked individualized exercise guidance, home-monitoring thresholds, and clear criteria for responding to abnormal findings.	Barriers included limited disease-related knowledge, low risk perception, the misconception of cure after PCI, and unclear goals for medication use, follow-up, exercise, and monitoring.	Management tasks for multiple conditions were cumulative; concerns about recurrence were prominent, and there was uncertainty regarding medication safety and safe levels of physical activity.	Barriers included conflicts between work and family responsibilities, insufficient time and resources, financial concerns, constraints in daily living contexts, and inconvenient follow-up arrangements.	Barriers included limited health literacy, financial and transportation burdens, unstable family support, insufficient linkage with primary care, and limited ability to use digital tools.
Targeted nursing support	Provide shared decision-making support, develop individualized discharge plans, refer patients to cardiac rehabilitation, guide home-monitoring records, and conduct digital follow-up.	Use visual health education and the teach-back method, correct the misconception that symptom relief indicates cure, and provide checklists for medication use, follow-up visits, monitoring, and symptom recognition.	Establish an integrated multimorbidity management plan, clarify key points for medication observation, and provide graded exercise guidance, red-flag criteria, and psychological support.	Develop context-specific discharge plans and provide return-to-work advice, brief bouts of physical activity, workplace meal guidance, medication reminders, flexible follow-up, and family-collaborative support.	Conduct family-participatory discharge education, provide paper-based visual checklists and low-cost monitoring plans, link patients with primary care services, and establish telephone follow-up.

Note. P denotes participant ID; CAD = coronary artery disease; PCI = percutaneous coronary intervention. Personas were developed by integrating manual coding, interview transcripts, observational records, and medical record data. Age, education, and residence describe contextual characteristics and were not classification criteria. Persona labels emphasize health behavior decision-making patterns and nursing support needs and are not intended to judge individual attributes or predict outcomes. Any persona images are illustrative depictions of non-real patients and contain no personally identifiable information.

Table 6. Integrated Matrix of Five Patient Personas Across the PCI Health Behavior Decision-Making Journey

Patient persona	Symptom onset and care-seeking decisions	Admission assessment and illness understanding	PCI decision-making and preprocedural preparation	Post-PCI recovery and risk reappraisal	Discharge preparation and postdischarge self-management planning
Active collaboration and risk management	Response: vigilant and proactive.	Response: attentive to disease etiology.	Response: rational appraisal.	Response: increased confidence.	Response: strong planning orientation.
	Decision-making behavior: promptly sought care or accepted diagnostic evaluation.	Decision-making behavior: actively sought to understand the relationship between CAD and coexisting cardiometabolic conditions.	Decision-making behavior: asked about the necessity, risks, and costs of stent implantation.	Decision-making behavior: focused on recurrence prevention and safe levels of physical activity.	Decision-making behavior: developed plans for medication use, monitoring, and follow-up visits.
	Support need: early confirmation of risk.	Support need: individualized explanations.	Support need: support for shared decision-making.	Support need: guidance on secondary prevention.	Support need: an actionable management checklist and referral to cardiac rehabilitation.
Limited treatment understanding and risk underestimation	Response: symptom minimization and hesitation.	Response: limited active participation.	Response: reliance on clinicians and family.	Response: reassurance and reduced perceived residual risk.	Response: willing to act but uncertain about how to proceed.
	Decision-making behavior: attributed symptoms to fatigue or gastrointestinal discomfort.	Decision-making behavior: accepted examinations but had limited understanding.	Decision-making behavior: relied on physicians and family members.	Decision-making behavior: showed reduced engagement in self-management after symptom relief.	Decision-making behavior: had difficulty developing a long-term plan.
	Support need: recognition of high-risk symptoms.	Support need: plain-language explanations of the disease.	Support need: explanation of the role and limitations of PCI.	Support need: clarification that PCI does not eliminate residual risk.	Support need: teach-back, a medication list, and follow-up instructions.
Multimorbidity burden and uncertain safety boundaries	Response: highly vigilant.	Response: increased uncertainty.	Response: cautious and worried.	Response: concerned about recurrence.	Response: motivated but uncertain about safety.
	Decision-making behavior: sensitive to chest pain, palpitations, and fatigue.	Decision-making behavior: concerned about multiple abnormal clinical measures.	Decision-making behavior: repeatedly confirmed risks related to stents, contrast agents, and polypharmacy.	Decision-making behavior: associated minor abnormalities with potential risks.	Decision-making behavior: sought integrated guidance for multimorbidity management.
	Support need: differentiation of warning signs.	Support need: clarification of management priorities.	Support need: comprehensive risk communication.	Support need: symptom grading and clear safety thresholds.	Support need: home monitoring and continuous follow-up.
Work-family responsibilities and constrained implementation	Response: work/family priorities and delay.	Response: responsibility-related anxiety.	Response: concern about practical arrangements.	Response: eager to resume social roles.	Response: motivated to change but worried about inability to sustain changes.
	Decision-making behavior: delayed care-seeking because of work or family responsibilities.	Decision-making behavior: worried that hospitalization would affect income and caregiving responsibilities.	Decision-making behavior: focused on costs, length of hospitalization, and time to return to work.	Decision-making behavior: prioritized resuming social roles over rehabilitation.	Decision-making behavior: had difficulty embedding health behaviors into daily life.
	Support need: reinforced recognition of high-risk symptoms.	Support need: incorporation of social role assessment.	Support need: clarification of activity restrictions.	Support need: clear guidance on recovery pacing.	Support need: low-burden, context-specific planning and flexible follow-up.
Support dependence and limited resources	Response: hesitation and dependence.	Response: difficulty understanding.	Response: concerns about costs and caregiver accompaniment.	Response: temporary reassurance.	Response: uncertainty and low confidence in self-management.
	Decision-making behavior: relied on family members to judge symptoms and arrange care-seeking.	Decision-making behavior: had difficulty retaining complex health information.	Decision-making behavior: decisions were largely guided by physicians and family members.	Decision-making behavior: had low confidence in long-term management.	Decision-making behavior: had difficulty independently managing medication use, monitoring, and follow-up visits.
	Support need: clear indications for seeking care.	Support need: visual materials and repeated explanations.	Support need: explanations of costs, reimbursement, and	Support need: reinforcement of the importance of	Support need: family involvement, printed checklists, telephone

	caregiver arrangements.	secondary prevention.	follow-up, and linkage with primary care.

Note. CAD = coronary artery disease; PCI = percutaneous coronary intervention.

Active Collaboration and Risk Management Persona and Journey Map

The Active Collaboration and Risk Management persona was characterized by strong risk awareness, active information seeking, and willingness to engage in self-management (Table 5). Participants represented by this persona generally had higher health literacy and viewed PCI as the beginning of long-term secondary prevention rather than a cure. They asked about coronary lesion severity, stent implantation, medication effects, diet, resumption of physical activity, monitoring of blood pressure, glucose, and lipids, and follow-up, and sought to translate recommendations from health care professionals into concrete action plans.

At symptom onset, these patients generally recognized chest pain, chest tightness, or shortness of breath promptly and sought care or accepted evaluation after family prompting (Table 6). During admission, they tried to understand the relationships between CAD and coexisting conditions, although complex information and limited individualization remained challenging. When considering PCI, they asked about procedural necessity and risks, post-PCI medication, and costs and participated in decision-making after discussion with health care professionals. After PCI, symptom relief increased confidence but also shifted attention toward recurrence prevention, medication safety, and safe levels of physical activity. By discharge, they wanted specific, actionable plans with clear opportunities for feedback.

Participants represented by this persona were well positioned to translate intentions into action, but generic education did not fully meet their need for individualized guidance. Potential nursing support included shared decision-making, integrated explanation of coexisting conditions, individualized discharge planning, cardiac rehabilitation referral, home-monitoring records, and digitally supported follow-up.

“I know a stent does not mean the disease is cured. Opening the blood vessel is only the first step. I still need to manage my blood pressure, blood lipids, and weight so it does not become blocked again. What I really want to know is how much I can safely do each day after I go home, how to take my medicines, and what numbers I need to keep an eye on.” (P03)

“I write down what the doctors and nurses tell me and ask again if I do not understand. Before, I only knew I had high blood pressure and high blood sugar. During this admission, I realized these problems are connected with my heart. After I go home, I cannot just watch for chest pain; I need to manage all of them together.” (P12)

“My chest feels much better after PCI, but I do not think that means I am cured. I would like a clear chart before I go home—when to come back, what blood pressure or blood sugar levels mean I should call someone, and how much exercise is safe to start with. I would feel more confident with that.” (P21)

Limited Treatment Understanding and Risk Underestimation Persona and Journey Map

The Limited Treatment Understanding and Risk Underestimation persona was characterized by an incomplete understanding of CAD progression, the therapeutic limits of PCI, and the relationship between cardiometabolic conditions and recurrent cardiovascular risk (Table 5).

Participants represented by this persona generally understood that coronary stenosis required treatment but had limited awareness of long-term secondary prevention, continued medication after stent implantation, and the importance of managing hypertension, diabetes, and dyslipidemia. Decision-making involved limited active participation and little questioning about treatment rationale or postdischarge management. Symptom relief after PCI could reinforce the belief that the disease had been resolved and reduce attention to medication adherence, diet, exercise-based rehabilitation, home monitoring, and follow-up.

At symptom onset, patients in this persona often attributed chest tightness, chest pain, or fatigue to overwork, gastric discomfort, or aging, delaying care until symptoms worsened or family members encouraged help-seeking. During admission, they accepted examinations and treatment but had limited understanding of the longer-term relationships between CAD and cardiometabolic multimorbidity. During PCI decision-making, they largely relied on physicians and family members and focused on procedural success and symptom relief rather than long-term management. After PCI, symptom improvement could be interpreted as disease resolution. At discharge, patients wanted simple, explicit guidance but struggled to develop their own medication, follow-up, exercise, and monitoring plans.

Key barriers were limited disease knowledge, low perceived residual risk, a misconception of cure after PCI, and unclear implementation plans. Patients represented by this persona may therefore benefit from plain-language communication, visual materials, repetition, teach-back, family involvement, and concise checklists covering medication, follow-up, physical activity, home monitoring, and warning signs.

“I thought the blood vessel was blocked and that once the stent was in, it was open again. My chest was not tight anymore, so I thought I was almost cured. Later, the nurse told me I still had to manage my blood pressure, blood sugar, and blood lipids over the long term. That was when I realized they were also related to future heart problems.” (P07)

“Before the procedure, the doctor said I needed PCI. I did not really understand it, so I followed what the doctor and my family arranged. I just wanted the problem dealt with. I did not expect that I would still need medicines for a long time, follow-up visits, and changes to my diet and exercise.” (P16)

“There was a lot in the discharge instructions, and I could not remember it all at once. I mainly want to know which medicines I must not stop, when I need to come back, and how bad chest discomfort has to be before I should go to the hospital. If it is too technical, I am afraid I still will not understand it at home.” (P24)

Multimorbidity Burden and Uncertain Safety Boundaries Persona and Journey Map

The Multimorbidity Burden and Uncertain Safety Boundaries persona was characterized by a high perceived burden of illness, concern about recurrence, and cautious engagement in self-management during PCI-related care (Table 5).

Participants represented by this persona had multiple chronic cardiometabolic conditions, commonly used several long-term medications, and closely monitored blood pressure, glucose, lipids, renal function, uric acid, weight, and adverse drug effects. They did not view PCI as a definitive resolution of illness; instead, they regarded it as an important treatment milestone within ongoing risk management. Their decision-making involved caution, repeated reassurance seeking, and risk avoidance. Although motivated to self-manage, concerns about recurrence, restenosis, bleeding, hypoglycemia, renal impairment, and exercise-related cardiac symptoms made stable action plans difficult to establish.

At symptom onset, participants represented by this persona were highly attentive to chest pain, chest tightness, palpitations, and fatigue. During admission, multiple test results and multimorbidity-related clinical indicators heightened uncertainty. During PCI decision-making, they repeatedly asked about stent necessity, procedural risks, contrast exposure, and the safety of multiple medications. After PCI, mild chest discomfort, blood pressure fluctuations, or bruising could trigger concern about recurrence or adverse drug effects. At discharge, the central difficulty was not lack of motivation but the absence of an integrated long-term plan with clear safety parameters. Potential support needs included integrated explanations of coexisting conditions, polypharmacy guidance, graded exercise advice, criteria for warning symptoms, home-monitoring plans, and ongoing feedback.

“It is not just a heart problem for me now. I have to manage my blood pressure, blood sugar, and blood lipids too. Even with the stent, I still do not feel completely reassured. If one of my numbers is a little high, or I feel even mild chest discomfort, I start wondering whether the vessel is becoming blocked again.” (P09)

“The doctor told me to exercise after I go home, but I am still afraid. If I walk too little, I worry I will not recover well; if I walk too much, I worry my heart will not cope. I just want to know how much walking is safe and when I should stop.” (P18)

“There are so many medicines that I worry about taking them the wrong way. I have antiplatelet, blood-pressure, blood-sugar, and cholesterol medicines. If I see bruising, I worry about bleeding; if my blood sugar is a little low, I worry about hypoglycemia. I never really feel settled.” (P26)

Work-Family Responsibilities and Constrained Implementation Persona and Journey Map

The Work-Family Responsibilities and Constrained Implementation persona was characterized by recognition of the need for post-PCI self-management alongside practical constraints arising from work schedules, family responsibilities, financial pressure, and limited time (Table 5).

Many participants represented by this persona were working-age adults who remained employed, carried substantial household financial responsibilities, or cared for relatives. Their barriers reflected conflicts between self-management tasks and everyday responsibilities rather than knowledge deficits alone. Although they understood the need for regular medication, dietary control, physical activity, blood pressure and glucose monitoring, and follow-up, work schedules, family meals, social obligations, financial pressure, transportation costs, and caregiving duties made sustained implementation difficult. Their decisions therefore involved repeated trade-offs among health risks, income security, family roles, and available time.

At symptom onset, work or family obligations could contribute to delayed help-seeking when chest symptoms or fatigue were attributed to overwork or stress (Table 6). During admission, patients worried about income, employment, and caregiving responsibilities. During PCI decision-making, concerns centered on treatment costs, length of stay, activity restrictions, and return to work. After PCI, many wanted to resume social roles quickly, sometimes at the expense of rest or rehabilitation. At discharge, they were motivated to change but needed feasible, flexible plans that could be incorporated into daily routines, including return-to-work guidance, clear activity limits, short bouts of physical activity, workplace meal strategies, medication reminders, flexible follow-up, and family support.

“The nurse told me to take my medicines on time, exercise, and come back for follow-up after discharge. I know those things are important. But I work during the day, and when I get home I still have to cook and take care of family matters. It is not that I do not want to do them; sometimes I just cannot fit everything in.” (P11)

“What worries me most is going back to work. My family mainly depends on my income, so I cannot keep resting for too long. The doctor said not to overdo it, but I do not know what kind of work is safe or how much is too much.” (P19)

“I understand the advice about diet and exercise, but I do not eat by myself at home—I eat what my family eats. At work, I can only have the meals they provide. What I really want to know is what I can realistically do in that situation.” (P27)

Support Dependence and Limited Resources Persona and Journey Map

The Support Dependence and Limited Resources persona was characterized by substantial reliance on external support and limited access to resources needed for PCI-related care and postdischarge self-management (Table 5).

Participants represented by this persona often had lower educational attainment, lived farther from tertiary care, experienced substantial financial pressure, or lacked a stable caregiver. Their difficulties reflected limited health literacy together with barriers to health care access, family support, finances, and digital health use. Although generally willing to follow PCI-related recommendations, they had difficulty understanding the relationships among CAD, stent implantation, long-term medication, and cardiometabolic risk management and therefore struggled to independently sustain medication regimens, home monitoring, follow-up, and rehabilitation.

At symptom onset, participants represented by this persona often relied on family members to judge symptom severity and arrange care, and transportation, costs, or limited risk recognition could delay help-seeking. During admission, they had difficulty understanding and retaining information about CAD and coexisting conditions. During PCI decision-making, physicians and family members largely guided decisions, while patients focused on expenses, reimbursement, length of stay, and caregiver availability. After PCI, symptom relief increased reassurance, but long-term medication, antiplatelet therapy, risk-factor control, and rehabilitation required repeated explanation. At discharge, common barriers included remembering medicines and schedules, transportation and financial costs of follow-up, limited home-monitoring equipment, difficulty using digital tools, and inconsistent caregiver reminders. Potential support needs included plain-language explanations, family-involved discharge education, concise printed checklists, low-cost monitoring plans, telephone follow-up, primary-care linkage, and basic digital guidance when appropriate.

“I understand some of what the doctors and nurses explain, but I worry that once I am home I will forget how to take the medicines or when to come back. I usually rely on my children to remind me. When they are not around, I do not know whom to ask.” (P08)

“It is not easy for me to come back for follow-up. I have to change buses, and it costs quite a bit. If I do not feel very unwell, I may just put up with it for a while. Before I leave, I would like someone to tell me what signs mean I need to come to the hospital right away and what I can ask about by phone first.” (P22)

“The nurse said I could use my phone to see test results and make appointments, but I do not really know how. When my blood pressure or blood sugar is high, I do not know how serious it is. No one at home knows either, so I just want a simple chart I can follow.” (P34)

Discussion

Stage-Specific Heterogeneity in Decision-Making About Health Behaviors

We identified five recurring persona patterns of health behavior decision-making across the PCI journey. These findings show that decision-making changes as patients move from symptom recognition and illness understanding to treatment choice, post-PCI risk reappraisal, and discharge planning. Within the same clinical pathway, some patients treated PCI as the beginning of long-term risk management, whereas others underestimated residual risk after symptom relief. Some were motivated to self-manage but constrained by multimorbidity, polypharmacy, or uncertainty about safe activity; others faced competing work and family demands or relied on external support because of limited health literacy, transport, digital skills, primary-care linkage, or family support.

This heterogeneity is consistent with contemporary chronic coronary disease and cardiometabolic care frameworks. The 2023 AHA/ACC multisociety guideline emphasizes patient-centered, team-based care, shared decision-making, social determinants of health, medication access, and long-term lifestyle management [5]. The 2024 ESC guideline similarly frames chronic coronary syndrome management as extending beyond treatment of stenotic lesions to ongoing assessment of ischemic risk, symptoms, risk factor control, and patient preferences [4], while revascularization guidance supports incorporating patient goals when treatment involves trade-offs [6]. Our findings extend these principles to nursing care by showing how residual-risk understanding, social context, and capacity for implementation shape patients’ needs as care shifts from PCI to long-term cardiometabolic risk management.

Previous studies have described post-PCI decisional conflicts involving perceived behavioral benefits, identity, concerns about adverse consequences, information, health care resources, and emotional support [12], as well as changes in health behaviors over time [11] and the influence of cognition, social support, and everyday context on lifestyle modification [13]. Our journey-based analysis shows when these issues become salient: symptom recognition and help-seeking dominate early; illness and multimorbidity understanding become central during admission; treatment necessity, risks, costs, and family views become prominent around PCI; symptom relief prompts risk reappraisal during recovery; and medication, monitoring, diet, activity, follow-up, and symptom response dominate discharge preparation. Embedding personas within these stages helps explain why standardized education can lead to different levels of behavioral uptake without reducing patients to simple labels of good or poor adherence.

Perceived Cure and Risk Reappraisal After PCI: From Information Provision to Risk Understanding

Symptom relief after PCI altered risk perception in different directions. Patients in the Active Collaboration and Risk Management persona understood PCI as one component of ongoing secondary prevention, whereas those with limited treatment understanding could interpret symptom relief as evidence that the disease had been resolved. The latter group understood the immediate rationale for treating coronary stenosis but had a weaker grasp of the limits of stent therapy and the continuing need for antiplatelet and lipid-lowering therapy, follow-up, and risk-factor control. These findings suggest that peri-PCI education may need to address not only what patients should do after discharge but also why residual risk persists despite successful revascularization.

Guidelines for chronic coronary disease and chronic coronary syndromes position revascularization within a broader strategy of medical therapy, lifestyle intervention, cardiac rehabilitation, risk factor control, and long-term follow-up [4–6]. Equating symptom relief with disease resolution may therefore weaken sustained engagement in secondary prevention. Zhang et al. [12] similarly reported uncertainty about the benefits and consequences of health behaviors after PCI. The Ottawa Decision Support Framework further emphasizes knowledge, expectations, values, support, and individual characteristics as determinants of decision quality [33,34]. These findings support a shift from one-way instruction toward decision support that helps patients understand residual risk, clarify priorities, and adapt management to their own circumstances.

Patients with limited treatment understanding and risk underestimation may benefit from plain-language communication and teach-back to clarify what PCI can and cannot achieve, why atherosclerotic risk persists, and how coexisting hypertension, diabetes, dyslipidemia, obesity, or chronic kidney disease contributes to future risk. Visual aids and concise checklists can translate long-term management into medication, monitoring, follow-up, physical activity, diet, and warning-sign tasks. Before discharge, teach-back can confirm that patients understand medication purposes, missed-dose instructions, follow-up timing, warning symptoms, and when to seek care. Patients in the Active Collaboration and Risk Management persona may instead benefit from more individualized targets, home-monitoring thresholds, cardiac rehabilitation referral, progressive activity plans, and feedback mechanisms.

Multimorbidity, Treatment Burden, and Uncertainty About Safety Boundaries

The Multimorbidity Burden and Uncertain Safety Boundaries persona illustrates a different challenge: high motivation can coexist with difficulty translating intentions into action. Patients often remained highly alert to recurrence but also had to manage multiple conditions, medications, fluctuating clinical indicators, potential bleeding or hypoglycemia, renal-function concerns, and uncertainty about safe physical activity. Their vigilance reflected clinically meaningful concerns rather than simple nonadherence or psychological maladjustment. Without clear priorities and safety parameters, motivated patients may still struggle to build sustainable self-management routines.

The American Heart Association CKM health framework emphasizes the interconnectedness of metabolic risk factors, chronic kidney disease, and cardiovascular disease and calls for patient-centered, interdisciplinary care that reduces fragmentation across specialties [7]. Our findings align with this framework: patients' concerns extended beyond coronary lesions to blood pressure, glucose, lipids, renal function, weight, drug interactions, and exercise safety. Disease-specific education delivered in isolation may therefore leave patients with fragmented advice and uncertainty about which recommendations take priority or how to reconcile competing demands.

Cardiac rehabilitation guidance identifies assessment, nutrition, weight management, blood pressure, lipid and glucose control, exercise training, psychosocial management, smoking cessation, and long-term follow-up as core components [35]. Home-based or hybrid rehabilitation may also improve accessibility for appropriately selected, clinically stable patients when risk assessment, exercise guidance, and follow-up are available [36]. Patients with multimorbidity and uncertain safety boundaries may benefit from early clarification of management priorities and safety limits across coexisting conditions. Before discharge, individualized guidance on medication-related risks, home-monitoring thresholds, and graded physical activity can be paired with explicit criteria for pausing exercise or seeking medical attention. Follow-up through outpatient, telephone, or digital channels can then reinforce these plans and address emerging uncertainty.

Work-Family Responsibilities, Resource Constraints, and Continuity of Postdischarge Care

Findings from the Work-Family Responsibilities and Constrained Implementation persona suggest that post-PCI self-management is shaped not only by knowledge but also by the practical demands of everyday life. Medication, diet, physical activity, and follow-up must compete with work schedules, income needs, caregiving, workplace meals, transport, and the costs of taking leave. These constraints are consistent with guideline emphasis on social determinants of health [5,7] and with evidence that travel distance, financial cost, education, multimorbidity, employment, caregiving responsibilities, and limited resources can affect participation in cardiac rehabilitation [37–39]. Interruptions in postdischarge self-management may therefore reflect, in part, a mismatch between care plans and patients' social and material circumstances rather than lack of motivation alone.

The Support Dependence and Limited Resources persona also highlighted gaps in continuity of postdischarge care. Older age, lower educational attainment, rural or county residence, living alone, and unstable caregiving support were common contextual features, but the practical problems were more specific: understanding instructions, remembering medications, arranging follow-up, completing home monitoring, and using digital tools. Informational, emotional, and practical support influence recovery after PCI [40]. Discharge systems that depend heavily on verbal instruction or mobile applications may therefore increase cognitive burden or digital exclusion for some patients. Accessible support can include illustrated paper checklists, family participation, telephone follow-up, primary-care linkage, medication cards or pillboxes, monitoring logs, and clear escalation pathways for abnormal symptoms. For patients constrained by work and family responsibilities, useful adaptations include return-to-work guidance, workplace meal strategies, short bouts of physical activity, flexible follow-up, remote consultation, family role-sharing, and low-burden monitoring plans.

Embedding Patient Personas in Journey Maps to Inform Stratified, Stage-Specific Nursing Care

Embedding personas within the PCI journey created a practical link between persona-specific decision-making patterns and the timing of care needs. Personas characterized recurring patterns of risk appraisal and implementation barriers, while journey mapping located challenges and unmet needs at specific stages. Together, the two approaches translated qualitative findings into practical cues for stratified nursing support. This use is consistent with literature showing that journey mapping can identify service touchpoints, experiential barriers, and opportunities for care improvement [16,17,41].

Mapping the five personas across the five journey stages also showed that patients at the same clinical stage may require different forms of support. At discharge, for example, the Active Collaboration and Risk Management persona showed a need for refined action planning; the Limited Treatment Understanding and Risk Underestimation persona, for correction of residual-risk misconceptions; the Multimorbidity Burden and Uncertain Safety Boundaries persona, for explicit safety parameters; the Work-Family Responsibilities and Constrained Implementation persona, for context-adapted strategies; and the Support Dependence and Limited Resources persona, for stronger external support.

Persona approaches in eHealth, health care co-design, and home-based cardiac rehabilitation can help identify population characteristics, capabilities, needs, and barriers, but they should remain grounded in real-world data and be used without stereotyping [19,42,43]. In practice, the personas in this study could guide different emphases in care: shared decision-making and feedback for active collaborators; plain-language, visual, teach-back-based education for patients with limited treatment understanding; integrated multimorbidity and medication-safety support for patients with uncertain safety boundaries; flexible, low-burden plans for those balancing work and family; and family, telephone, primary-care, and low-cost monitoring support for patients with support dependence and limited resources.

These personas should be treated as adaptable analytic patterns rather than fixed patient categories; their value lies in prompting individualized assessment, education, discharge preparation, and transitional care.

Role, Limits, and Governance of AI-Assisted Qualitative Analysis

The AI-assisted component was deliberately researcher-led. LLMs generated explicit provisional themes such as proactive risk management, gaps in treatment understanding, and multimorbidity burden and were useful for provisional coding, stage summaries, and analytic memos. By contrast, social-role conflict, reliance on external resources, implicit emotions, and stage-to-stage changes required interpretation against transcripts, observations, and clinical context. This pattern is consistent with studies showing that LLMs can support coding and thematic synthesis but remain dependent on prompt design, researcher review, and contextual interpretation [21,23,44–48]. AI was therefore used as analytic support rather than as an autonomous analyst, and final themes, persona labels, journey-map integration, and nursing interpretation remained the responsibility of the research team.

Data governance is central to trustworthy AI-assisted qualitative research. World Health Organization guidance on generative AI in health care highlights risks related to privacy, erroneous outputs, bias, overreliance, and accountability and emphasizes human autonomy, safety, transparency, responsibility, inclusiveness, and sustainability [49,50]. Accordingly, our workflow used de-identified inputs, separately retained provisional outputs, source-data checking, researcher revision, team consensus, and an audit trail. Persona development also avoided treating age, sex, education, or urban-rural residence as deterministic labels; labels instead focused on decision-making patterns and care needs.

Percentage agreement and Cohen's κ quantified correspondence between AI-generated classifications and manual coding at the meaning-unit level. Agreement was strongest for explicit themes, a pattern consistent with a limited supporting role for LLMs in preliminary theme identification and data organization. These statistics should not, however, be interpreted as evidence that AI possesses clinical or qualitative interpretive capacity equivalent to that of researchers. Context-dependent themes—including work-family conflict, resource limitations, and implicit emotional meaning—still required researcher interpretation grounded in participants' narratives and clinical context.

Strengths, Limitations, and Future Research Directions

This study captured heterogeneity across age, education, residence, employment, previous PCI experience, multimorbidity patterns, and caregiving support. Interviews were triangulated with nonparticipant observations and medical record data, allowing participant narratives to be interpreted within their clinical context. The analytic pathway linked manual coding, AI-generated provisional outputs, journey-stage matrices, personas, and journey maps, enabling both theme development and identification of stage-specific opportunities for nursing support. By spanning symptom onset through discharge preparation, the study also captured decision-making across a broader portion of the PCI journey than studies focused only on postdischarge behavior.

Several limitations warrant consideration. First, this was a single-center study, and institution-specific PCI workflows, nursing practices, discharge systems, and regional resources may limit transferability. Second, interviews were conducted primarily 1–2 days before discharge in clinically stable patients; postdischarge implementation, follow-up attendance, behavior maintenance, and readmission experiences were therefore not observed directly. Third, the personas are qualitative analytic constructs, not clinical prediction models, and should not be used to infer individual prognosis. Fourth, AI-assisted results depend on model version, prompting, source-text quality, and review procedures. The κ analysis also depends on meaning-unit segmentation, theme-assignment rules, and criteria for matching AI and manual classifications and cannot capture interpretive depth or contextual sensitivity. Future multicenter longitudinal studies could examine how decision-making and self-management change at 1, 3, and 6 months after discharge and evaluate persona-informed discharge tools, assessment checklists, or follow-up interventions.

Taken together, the findings support stage-specific decisional support across the PCI journey rather than reliance on discharge education alone. Combining personas with journey mapping may help nurses tailor support to differences in residual-risk understanding, safety concerns, social constraints, and access to resources. AI may assist with data organization and provisional theme generation, but its use should remain researcher-led, traceable to source data, and supported by explicit ethical and data-governance procedures.

Conclusions

Health behavior decision-making across the PCI journey was both stage-specific and heterogeneous among patients with cardiometabolic multimorbidity. Decisions extended beyond treatment adherence to encompass residual-risk understanding, multimorbidity-related safety concerns, competing social roles,

family support, and access to health care resources.

Five personas captured recurring patterns in these decisions: active collaboration and risk management; limited treatment understanding and risk underestimation; multimorbidity burden and uncertain safety boundaries; work-family responsibilities and constrained implementation; and support dependence and limited resources. Their differing risk perceptions, participation in decision-making, implementation barriers, and support needs suggest that standardized discharge education alone is unlikely to meet all patients' needs.

Embedding these personas within journey maps identified distinct nursing priorities from symptom recognition through discharge preparation and may inform stratified, stage-specific, and context-sensitive transitional care. AI-assisted analysis supported data organization and provisional theme generation, but final interpretation required researcher review grounded in the source data and clinical context. Future multicenter longitudinal studies should develop and evaluate persona-informed assessment tools and tailored transitional-care pathways for patients with cardiometabolic multimorbidity.

Abbreviations

ACC, American College of Cardiology; AHA, American Heart Association; AI, artificial intelligence; BMI, body mass index; CAD, coronary artery disease; CKD, chronic kidney disease; CKM, cardiovascular-kidney-metabolic; COREQ, Consolidated Criteria for Reporting Qualitative Research; CVD, cardiovascular disease; ESC, European Society of Cardiology; LLM, large language model; PCI, percutaneous coronary intervention; SRQR, Standards for Reporting Qualitative Research; T2DM, type 2 diabetes mellitus.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of Renmin Hospital of Wuhan University (approval No. WDRY2026-K188). All participants provided written informed consent before data collection.

Consent for publication

Written informed consent for publication of anonymized quotations and study findings was obtained from all participants.

Availability of data and materials

The de-identified qualitative data are not publicly available because they contain potentially sensitive participant information and are subject to ethics and consent restrictions. Requests for access may be directed to the corresponding author and would require appropriate ethics approval and participant authorization.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

ZW, TL, and YL contributed equally to this work and jointly contributed to study conceptualization and design, methodology development, study implementation, data acquisition and curation, qualitative analysis, interpretation of the findings, development of the patient personas and journey maps, and drafting and critical revision of the manuscript. ZW coordinated the overall preparation of the manuscript. YW, YS, BX, ZD, and ZL contributed to study implementation, data curation, validation of the qualitative findings, interpretation of the results, and revision of the manuscript. ZC contributed to supervision, methodological guidance, interpretation of the findings, and critical revision of the manuscript. All authors read and approved the final manuscript and agreed to be accountable for all aspects of the work.

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