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Hospital discharge planning in cardiac care: study protocol for a mixed-methods study on the implementation, influencing factors and quality of care in Germany

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ABSTRACT

Introduction Discharge planning (DP) is essential to ensure continuity of care during patient transitions between inpatient and outpatient settings. Although DP has been legally required for all hospitals in Germany since 2017, several studies show considerable variation in its implementation, likely due to differences in structural characteristics and organisational processes. Both quality and efficiency-enhancing DP processes are particularly important in the context of cardiovascular disease, which is the leading cause of mortality and a major contributor to healthcare costs in Germany. The 'Ready to Discharge' (R2D) project investigates the implementation status, influencing factors and outcomes of DP in cardiac units of German hospitals. By integrating quantitative and qualitative data, we aim to identify best practices and provide actionable recommendations for improving DP processes.

Methods and analysis A mixed-methods study design will be used. Quantitative analyses will be based on primary data from hospital and patient surveys combined with secondary data from health insurance claims and hospital quality reports. Key outcome measures will include healthcare utilisation outcomes (eg, readmissions, emergency department visits), patient health status outcomes (eg, patient satisfaction, self-rated health) and medication-related outcomes (eg, medication adherence). Qualitative interviews with healthcare professionals will enrich the findings by providing insights into barriers and facilitators to DP.

Ethics and dissemination This study was approved by the Ethics Committee of Bergische University of Wuppertal and the German Federal Office for Social Security. Informed consent will be obtained for all primary data collections. Hospital managing directors will be informed prior to the hospital survey and will be able to withdraw consent. Patients can withdraw their consent at any time. Secondary data will be analysed in pseudonymised form to ensure patient confidentiality. Results will be disseminated through workshops, regional and international conferences and peer-reviewed publications.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The study combines primary and secondary data sources and uses both qualitative and quantitative methods to examine discharge planning (DP) from multiple perspectives, ensuring that our analysis reflects the multi-professional nature and complexity of the DP process.
⇒ We explicitly adopt a patient-centred approach by incorporating patient-reported outcomes, which provide valuable insights into perceived quality and continuity of care.
⇒ Relying on self-reported data from patients and hospitals can introduce biases, including recall bias, subjective interpretation and social desirability.
⇒ Low response rates, potential non-response bias and the focus of the study on cardiology within the German healthcare system may limit generalisability and statistical power.

INTRODUCTION

Background

Patient transitions between inpatient and outpatient settings are critical points where loss of information can occur and poor organisation of follow-up care can lead to adverse outcomes.[1] For example, Forster *et al*[2] found that almost a quarter of patients experienced adverse events after discharge from the hospital. At the same time, rising patient numbers and cost pressures on healthcare systems increase the need for efficient and effective discharge processes. Discharge planning (DP), sometimes also referred to as discharge management, has emerged as a widely studied strategy to address these challenges.

Since 2017, hospitals in Germany are legally obliged to offer DP to hospital patients

after obtaining their written consent. The legal discharge planning directives in Germany outline the basic requirements for DP, including patient consent, education and collaboration between healthcare providers and insurers. However, specific organisational procedures within hospitals and hospital units are not defined, which can lead to considerable variation in the implementation of DP between and within hospitals. For example, previous research suggests that coordination and communication among interest-holders involved in DP remains a challenge in Germany.[3]

Our research project 'Ready to Discharge (R2D)' focuses on DP in cardiac care due to its high relevance in Germany. Cardiovascular disease is the largest contributor to healthcare costs in the country, accounting for approximately 13% of total disease-related expenditures.[4] With overall healthcare costs rising in Germany,[5] addressing this area is a critical priority. In addition, cardiac patients particularly benefit from seamless care after acute hospitalisation, which requires well-coordinated collaboration between healthcare providers (eg, hospitals, general practitioners, outpatient cardiologists, rehabilitation facilities).[6]

Definition of discharge planning

DP aims to ensure continuity of care for patients moving between care settings and can be described as the link between hospital treatment and post-discharge care in the community. There are a number of definitions for DP and related terms, such as discharge management and transitional care, which are sometimes used interchangeably. DP focuses primarily on in-hospital interventions and refers to the development of an individualised plan for patients before they leave the hospital to promote safe and timely transitions between care settings. It includes the identification of personal needs, the definition of a post-discharge destination and the provision of guidance for managing the patient's health condition.[7 8] On the other hand, according to Naylor *et al*,[1] transitional care serves as an umbrella term for continuity of healthcare services and includes a wide range of time-limited interventions that focus on patients during their transition between healthcare settings.

In Germany, the legal DP directives reinforce the focus on in-hospital interventions by outlining four key steps (patient assessment, discharge planning, DP implementation and DP evaluation), while assigning hospitals a central role in the process.[3] Given this emphasis on hospital-initiated interventions in the German context, our study adopts the above definition of hospital DP.

Research Gaps

In Germany, the strong separation between inpatient and outpatient care sectors has been extensively discussed as a major barrier to continuity of care.[9 10] A standardised approach to hospital DP could help to enforce and improve cross-sectoral care.[3] To date, however, there is little empirical research on the detailed organisational design and implementation status of the individual aspects of hospital DP in Germany, associated structural factors that may drive variation in DP, and the impact of DP implementation on patient and healthcare resource-related outcomes.

Objective measures of healthcare utilisation, such as readmission rates, hospital length of stay (LOS) or emergency department (ED) visits, are widely used to assess the effectiveness of DP.[7 11] While patient and family involvement has also been recognised as a critical component of an effective transition from inpatient to outpatient care,[12] there remains a paucity of research focusing on patient-perceived quality and continuity of care as quality indicators.[13]

Aim of this study

This study aims to provide previously lacking empirical evidence on the implementation status, influencing factors and the effectiveness of DP in cardiac care in Germany. In addition, the R2D project will provide insights into patients' experiences and perceptions of DP. Four research questions (RQ) will be addressed:

- RQ1: What is the current status of DP implementation in cardiac care in German hospitals and hospital units?
- RQ2: How are structures and resources (eg, staffing levels, capacities of and collaboration with healthcare interest-holders) associated with the implementation and success of DP in cardiac care?
- RQ3: What are the barriers and facilitators from the perspective of those involved in DP?
- RQ4: How does the implementation of DP affect the quality and continuity of cardiac care?

The impact model is depicted in figure 1. Our study is based on the hypothesis that there is significant variation in the design and implementation of DP in cardiac care between German hospitals. This variation may be partly explained by differences in structures and resources between hospitals (eg, different staffing levels). Further explanatory factors for the variation in the implementation of DP may be identified from the expertise of those involved in the daily implementation of DP.

Our study aims to provide practical recommendations tailored to the specific needs of hospitals and cardiac units by identifying best practices for improving DP processes and addressing existing gaps. Thereby, we seek to contribute to more effective and patient-centred (cardiac) care.

METHODS AND ANALYSIS

Study design

A mixed-methods study will be conducted using multiple qualitative and quantitative data sources. As there is little data available on the implementation status and patient perceptions of DP processes in German hospitals, standardised hospital and patient surveys will be conducted. Data from these surveys will be combined with claims

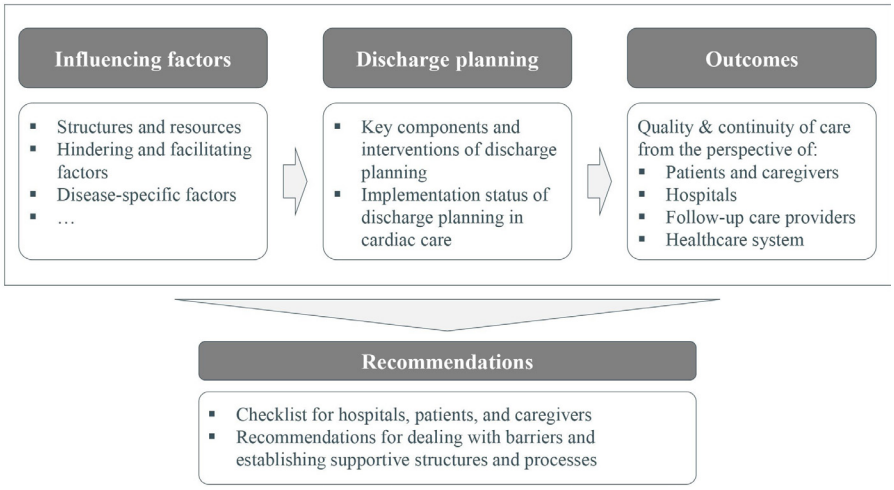

Figure 1 Conceptual impact model of the 'Ready to Discharge (R2D)' project showing how influencing factors affect the implementation of discharge planning and how discharge planning impacts healthcare-relevant outcomes.

data from Germany's largest statutory health insurer (Techniker Krankenkasse (TK), more than 11.8 million insured people), mandatory quality reports from German hospitals and other publicly available secondary data (eg, regional statistical information). To complement our quantitative findings, qualitative expert interviews with individuals involved in DP will be conducted to explore factors that facilitate and hinder effective DP processes. At the time this protocol was submitted, surveys and interviews are ongoing and secondary data preparation has begun, while data merging and analysis have not yet started.

Quantitative data

Data collection

Hospital survey

The aim of the hospital survey is to investigate the implementation status and the specific DP design within hospital units providing cardiac care. In an iterative process, a standardised questionnaire is developed on the basis of the German legal DP directives, other relevant expert standards/guidelines, previously conducted hospital surveys, literature reviews and expert interviews (see online supplemental appendix). Cognitive and pilot testing will be conducted with 15 experts from academia and practice to ensure that all survey questions are unambiguous and relevant.

The hospital survey will target all cardiac and internal medicine or surgical hospital units with a focus on the care of cardiac patients, operationalised as treating at least 100 inpatient cases per year with a primary cardiac diagnosis (ICD (International Classification of Diseases) chapter IX, excluding I60–I69), accounting for at least 25% of all cases treated within the unit. Applying these criteria, the population comprises about 750 hospital units from about 600 hospitals in Germany. The survey will be conducted as a 'hybrid survey' (allowing online and paper responses) in two waves (initial and follow-up), with an expected response rate of 20%, resulting in approximately 150 responses. To ensure representativeness, characteristics of the participating hospitals (eg, size, ownership) will be compared with the underlying population and, if necessary, corrected by weighting.

Patient survey

A patient survey will be conducted to collect patient experiences of hospital DP. Participants in the survey are adult patients insured with the German health insurer Techniker Krankenkasse (TK) who have spent at least two nights in hospital with a cardiac discharge diagnosis in the last 2 months (index stay). Patients with extensive care needs (care dependency level 4 or 5 according to the Medical Service of the German Social Care Insurance) and palliative care patients will be excluded. Questionnaires will be distributed electronically and via mail to a random subsample of 20 000 eligible individuals. We expect a response rate of approximately 10%, resulting in a sample size of n=2000. This sample size is considered sufficient (power calculation: mean rating 4, effect 0.02; power=80%; α error=5%, required n=1500).

The patient survey is developed based on existing scales to measure patients' perspectives on the quality and continuity of transitional care (see online supplemental appendix). The Case Transition Measure[14] is used as the basis for the development of the questionnaire, as a German version of the scale has already been developed and validated based on internationally accepted recommendations for the translation and adaptation of questionnaires.[15] The questionnaire includes additional relevant dimensions (eg, knowledge and information about follow-up care and arrangements, communication between providers and information across providers), questions related to DP outcomes (eg, DP quality, perceived readiness for hospital discharge) and patient characteristics which are not included in claims data (eg, education, employment situation).

To ensure the representativeness of the sample, patient characteristics are compared with those of the German

population. In case of significant deviations, adjustments can be made either by weighting or by post-selection as part of sensitivity analyses to ensure the generalisability of our results.

Secondary data sources

The first secondary data source is claims data from the largest German statutory health insurer TK. Claims data from 2021 until 2025 will be included to capture the patients' medical history, hospital stay and post-discharge care. Insured individuals with an index inpatient cardiac hospital stay (ICD chapter IX, excluding I60-I69) between July 2021 and December 2024 will be analysed. The time frame was chosen to include both pre-admission healthcare utilisation and post-discharge outcomes, such as readmissions and follow-up care. Pseudonymised data will be available at the patient level and will include information for the calculation of common outcome measures (eg, readmission rates, LOS, ED visits) as well as information on patient-specific control variables (eg, patient master data, patient health status, received outpatient care, prescribed medications). After applying exclusion criteria, the first dataset (inpatient hospital stays between January 2021 and June 2024) contains about 182 000 patients with an index cardiac hospital visit. During the course of the project, we will receive three additional data deliveries which will continuously expand this dataset. The number of patients may therefore change due to further data availability, data validation and data cleaning.

In addition, data from German annual hospital quality reports will be used. The data contain information on all hospitals licensed to provide inpatient care under the German Social Code (SGB V) and their respective units, including general hospital information, information on the number of medical and nursing staff, the number of beds, and the services and treatments offered. This information will primarily be used to stratify our analysis according to hospital characteristics, such as size or geographical location. The reports also include informationon discharge interventions at the hospital level, which will be used to examine the implementation status of DP.

Variables and data sources

Independent variables

The quality of DP and its implementation are treated as independent variables. A common way of measuring DP quality in the literature is the Discharge Planning Quality Score. However, this score only includes two items ("During this hospital stay, did doctors, nurses or other hospital staff talk with you about whether you would have the help you needed when you left the hospital?" and "During the hospital stay, did you get information in writing about what symptoms or health problems to look out for after you left the hospital?") from the Hospital Consumer Assessment of Healthcare Providers and Systems survey that asks patients about their discharge experience.[16] Due to the complex and interdisciplinary nature of discharge processes, we aim to derive DP quality from different data sources and perspectives:

- German **hospital quality reports** provide information on general DP-related interventions applied at the hospital level.
- The **hospital survey** provides further details on hospital unit discharge practices and interventions from the hospital unit perspective.
- The **patient survey** captures DP practices and DP quality from the patient perspective.

DP implementation and DP quality will be assessed separately for each data source and collectively across all sources. In addition, the relationships between DP metrics derived from different data sources will be investigated.

Outcome measures

To assess the effectiveness of DP processes, commonly used outcome measures will be considered. Outcomes are divided into three categories: healthcare utilisation, patient health status and medication-related outcomes. Table 1 provides an overview of commonly used outcome measures,[7 11] including our respective data source. This overview forms the basis for outcome selection. The final definition of outcome measures will be determined based on the data quality and availability (eg, sample size and number of missing values for the relevant variables).

Control/contextual variables

At the patient level, we will include control variables to account for potential patient-specific confounders that may influence the relationship between DP quality and outcomes, such as comorbidities (eg, Elixhauser Comorbidity Score), age or social environment. These will also be used for potential subgroup analyses.

In addition, we aim to investigate systematic variation in DP practices and DP quality at the hospital level, identifying groups of hospitals that are more advanced in DP implementation and those that may need further improvement. Previous literature has shown that a variety of factors can influence the process and implementation of DP.[16–18] Therefore, we will include hospital-level resources and characteristics (eg, staffing levels, hospital size) from the hospital quality reports in our analysis. Additional information from the hospital survey (eg, organisational structure, subjective relevance of DP processes, distribution of responsibilities) will be integrated. We will also consider publicly available data on outpatient care structures, such as the local availability of general practitioners or nursing care. Expert interviews will be used to enrich the quantitative analysis with qualitative insights into facilitators and barriers, such as organisational culture and process standards.

Statistical analysis of quantitative data

RQ1, RQ2 and RQ4 will be addressed using quantitative data. The data analysis approach will be chosen separately for each RQ.

Table 1 Overview of outcome measures

Outcome category	Measure	Description	Data source
Healthcare utilisation outcomes	Readmissions (30, 90, 180 days)	For example, time to readmission, post-discharge readmission rates	Claims data
	Emergency department visits	For example, emergency department attendance 30 and 90 days post-discharge	Claims data
	Hospital length of stay	Length of patient hospital stay after index cardiac admission	Claims data
	Post-discharge healthcare utilisation	For example, number of General Practitioner (GP) visits, time to first GP visit	Claims data
Patient health status outcomes	Patient satisfaction	Single item	Patient survey
	Patient knowledge	For example, Care Transition Measure[15]	Patient survey
	Patient health status (mental and physical)	For example, patient self-rated health (Short-form health survey (SF-36), single item[22 23]), problems after discharge[24]	Patient survey, claims data
	Mortality	For example, patient death at 30 days post-discharge	Claims data
Medication-related outcomes	Medication adherence	For example, proportion of days covered	Claims data
	Medication error/discrepancy	For example, conflicting information on medication across inpatient and outpatient providers	Patient survey

RQ1: what is the current status of DP implementation in cardiac care in German hospitals and hospital units?

We will perform descriptive analyses (eg, frequencies, distributions, correlations) using hospital survey data to assess the implementation status of DP practices in hospitals and hospital units. We aim to derive a DP score for hospital units that participated in the hospital survey, which reflects how systematically and comprehensively DP processes are implemented. We will relate the score to the organisation of DP, for example, the number and types of professions involved in DP, the qualifications of DP personnel and the organisational embeddedness of the hospital unit responsible for DP (eg, centralised vs decentralised) to derive common DP practices. We will also compare the hospital-reported DP score derived from the hospital survey with information on DP-related activities from the hospital quality reports, which may allow us to approximate a DP score for hospitals that did not participate in the hospital survey. In addition, we will construct a measure of hospital-reported DP quality that measures the hospitals' perception of DP effectiveness (ie, the degree to which hospital staff perceives that current problems such as discharge delays, readmissions or adverse drug events could have been prevented if DP had been improved).

RQ2: how are structures and resources associated with the implementation and success of DP in cardiac care?

To answer RQ2, we will analyse the association between resource and structural variables on the implementation and quality of DP. Hospital characteristics obtained from the hospital survey and hospital quality reports will serve as independent variables, while the implementation status and quality of DP as reported in the hospital survey will be treated as the dependent variables. We will apply ordinary least squares (OLS) regression analysis for continuous measures of DP implementation and quality and logistic regression for binary indicators.

RQ4: how does the implementation of DP affect the quality and continuity of cardiac care?

We will analyse the relationship between the DP implementation and the quality and continuity of care from three perspectives. First, we will quantitatively assess the association between DP implementation, DP quality and perceived quality and continuity of care from the hospital perspective. We will use regression analysis, specifically OLS for continuous outcomes and logistic regression for binary outcomes.

Second, we will quantitatively assess the association between DP implementation/DP quality and perceived quality and continuity of care from the patient perspective. We will use multilevel regression models to account for the hierarchical data structure, as patients are nested within hospital units, which are further nested within hospitals. Depending on the nature of the outcome, we will select appropriate multilevel modelling approaches, such as linear mixed effects models or generalised linear mixed models.

Finally, we will assess the impact of DP implementation and DP quality on objective outcome indicators derived from claims data. We will again apply multilevel modelling techniques to control for clustering effects of patients within hospitals and hospital units. These will include hierarchical logistic regression for binary outcomes (eg, 30-day readmission) and survival analysis (eg, Cox proportional hazards models) for time-to-event outcomes (eg, time to outpatient healthcare provider

visit). Missing values will be examined and reported descriptively. Appropriate methods such as multiple imputation will be applied depending on the extent and pattern of missingness.

Sensitivity analyses will be performed to validate and extend our results, for example, by comparing different risk adjustments (Elixhauser Comorbidity Index, Patient Clinical Complexity Level), using different statistical models (random vs fixed effects models) and performing subgroup analyses (eg, according to hospital size, ownership type). We expect that the lack of unit-level cost data will not allow us to make reliable statements about the cost-effectiveness of DP measures. Quantitative data analysis will be conducted primarily using Stata (V.18), supplemented by other suitable software if these provide analysis options that Stata does not cover.

Qualitative data

Data collection

Participants and setting

The study will employ semistructured individual interviews and focus groups to capture expert perspectives. Focus groups allow for interactive discussions and provide comprehensive and in-depth insights into DP processes in practice. An exemplary interview guide for individual interviews is provided in the online supplemental appendix. The interview guide will be slightly adapted for other interest-holders to reflect their perspectives. The qualitative research team consists of academics with expertise in nursing, health services research and acute hospital care. Four different qualitative interview approaches will be used, targeting different interest-holders:

1. Semistructured individual interviews with individuals involved in DP from different professional backgrounds in the hospitals.
2. Mono-professional focus group interviews with 6–12 participants, each with individuals from a single profession (eg, physicians, nurses, social workers).
3. Multi-professional focus group interviews with four to six participants, each with professionals from the same hospital.
4. Focus group interviews with post-discharge service/care providers (eg, general practitioners, cardiologists, representatives of rehabilitation centres/nursing homes) with four to six participants each. Individual interviews are possible, if providers do not participate in a focus group format.

Different sampling strategies will be used to recruit interview participants. Sampling for approaches (1)–(3) will be carried out through the hospital survey, in which staff from participating hospital units can express their interest in participating in qualitative interviews. From this pool, participants will be selected based on structural variables covering hospital and unit size, specialty, geographic region and hospital ownership (purposive sampling). Participants for the post-discharge care interviews (4) will be recruited based on recommendations from participants in approaches (1)–(3) during the initial interviews, focusing on post-discharge care providers located near participating hospitals. Participant recruitment may be extended to other regions of Germany, if necessary. The main selection criterion for post-discharge care/service providers is experience in treating cardiac patients.

The chief physicians of interested hospital units (gatekeepers for interested parties), professionals involved in the DP, and post-discharge care professionals will be invited to participate in the interview study by mail, email and a subsequent telephone call. Individuals will be invited to participate in interviews either online or face-to-face at their workplace.

Interview facilitation

The four interview approaches (1)–(4) will be carried out sequentially. Two semistructured interview guides will be developed and used in the interviews: one for hospital professionals and one for post-discharge care/service providers. The guides will be based on a comprehensive qualitative literature review on facilitators and barriers to DP, German legal DP directives and other relevant qualitative DP standards and guidelines. The interview guide for the focus groups will be adapted based on the findings from the initial individual interviews.

The interview guides for hospital professionals and post-discharge care/service providers will cover the following key topics:

- Implementation status of DP in cardiac hospital care (discussed with hospital professionals only)
- Experiences, expectations and perceptions of interprofessional collaboration.
- Perception of problem areas in DP and need for change.
- Conditions for successful transitional and post-discharge care, including operational, structural and individual barriers.
- Measures to improve interprofessional and multiprofessional collaboration during transitional care.

The interview guides will be pre-tested with professionals involved in DP (not limited to cardiac care) in both hospital and post-discharge care settings (eg, physicians, nurses, case management, general practitioners). The guides will be adapted as necessary based on feedback.

Digital audio and/or video recordings will be made for all individual interviews and focus groups. Immediately after each interview, the interviewer will take field notes to document special aspects (eg, recruitment of further interviewees, interruptions, deviations from the interview guide, discussions before and after the recording). The qualitative data will be transcribed according to the transcription rules of Dresing and Pehl.[19] After transcription, all recordings will be deleted.

Participants will complete a short questionnaire to collect demographic data and data on their profession, qualification, role in DP or post-discharge care, and years of professional experience to contextualise participants'

Table 2 Overview of variables and data sources

Variable type	Description	Quantitative data					Qualitative data
		Claims data	Patient survey	Hospital survey	Hospital quality reports	Further secondary data	Expert interviews
Independent variable	Implementation status and quality of discharge planning (DP) (eg, adherence to four phases of DP, implementation of different DP interventions)		x	x	x		
	Further qualitative information on relevant DP practices and quality of DP						x
Outcomes	Objective outcome measures (eg, hospital readmissions, length of stay, emergency department visits)	x					
	Perceived quality and continuity of care (*hospital perspective*)			x			
	Perceived quality and continuity of care (*patient perspective*)		x				
Control / contextual variables (*patient-level*)	Comorbidities (eg, Elixhauser Comorbidity Score), age, need for (home) care, etc.	x	x				
	Subjective health status, social environment		x				
Control / contextual variables (*hospital-level*)	Hospital resources and characteristics (eg, staffing levels, hospital size)				x		
	Organisation and structures of hospital DP (responsibilities, process standardisation, etc.)			x			
	Indicators for availability of post-discharge care capacities (eg, number of general general practitioners (GPs) per inhabitant and region)					x	
	Qualitative hindering and facilitating factors for DP (eg, organisational culture, responsibilities)						x

perspectives and identify patterns across respondent groups.

Qualitative data analysis

RQ3 will be addressed using qualitative data. Qualitative analysis will begin before data collection is complete and will be refined as the interviews progress. The qualitative data will be analysed using the Framework Analysis method.[20] The analysis will be carried out in five stages as outlined by Ritchie and Spencer:[21]

1. *Familiarisation* and getting to know the data (eg, listening to audio recordings, reading transcripts and interview protocols), making notes to document preconceptions, key ideas and recurring topics.
2. *Identifying a thematic framework* to organise the research material in a meaningful and manageable way, creating index categories based on a priori defined key themes (through research questions and interview guide) and newly emerging themes (based on important or recurring topics).
3. *Indexing* and systematically applying the thematic framework to each interview transcript by categorising content and indexing (coding) references (either numerical or descriptive).
4. *Charting* (structured representation), summarising indexed data into thematic charts and aggregating thematic charts into a central chart that highlights core themes. This reduces and structures the data into a manageable format (final framework) for further analysis.
5. *Mapping and interpretation* data, identifying relationships, patterns and key insights, drawing conclusions based on the thematic framework, supported by illustrative anchor examples and discussed in peer briefings.

MAXQDA software will be used for data structuring, coding and note taking. Each of the four interview approaches will be analysed separately, before being integrated in a convergent analysis. Two validation procedures will be applied. Internal validation (peer debriefing) will include structured workshops within the research team and feedback from interviewees during the analysis. For external validation, external thematic experts will review the overall results.

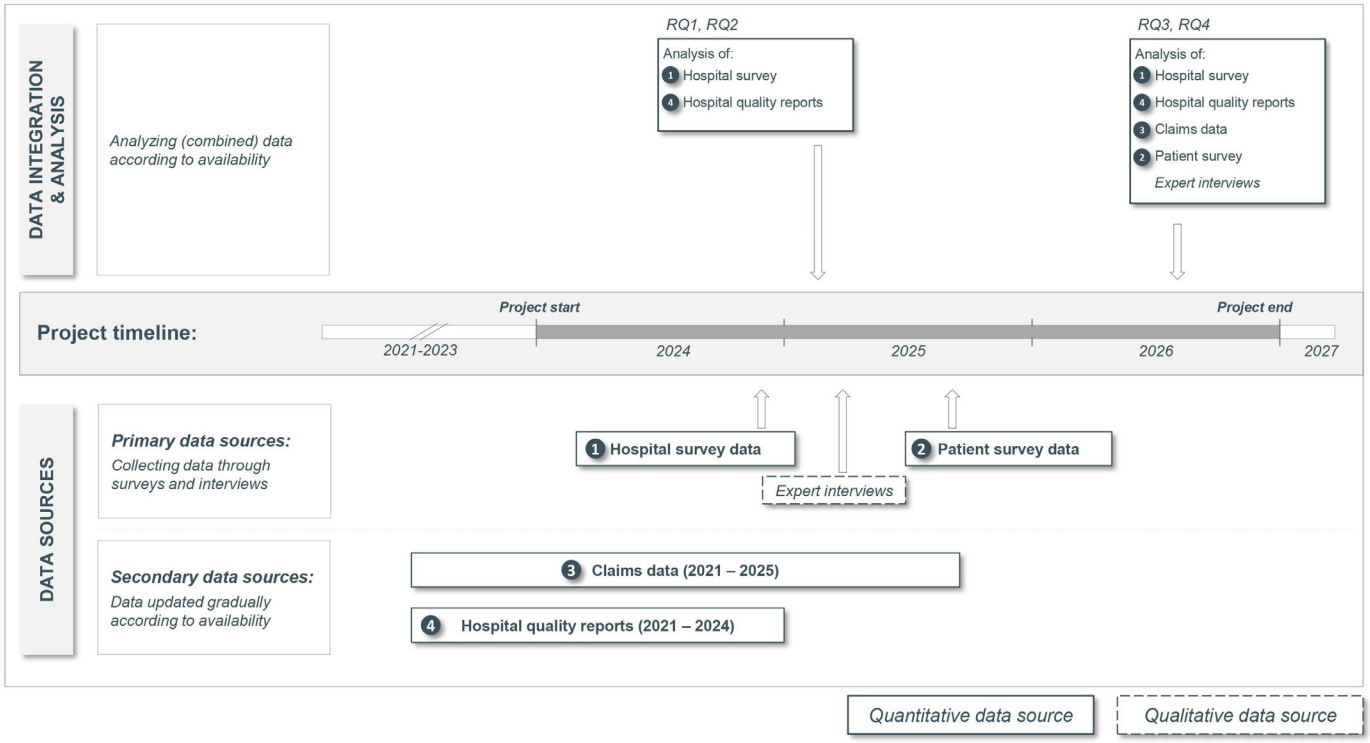

Figure 2 Timeline illustrating key phases of data collection, integration and analysis based on primary and secondary data sources in the 'Ready to Discharge' study. (RQ: research question)

Integration of quantitative and qualitative data sources

Table 2 provides an overview of the variables and respective data sources that will be included in our analyses, from both qualitative and quantitative research approaches.

Quantitative data sources will be linked progressively according to data availability. First, information on the implementation and quality of DP from the hospital survey will be matched with information from hospital quality reports at the hospital and hospital unit level to answer RQ1 and RQ2.

Next, claims data will be merged to the existing data set to obtain information on objective outcome measures. Finally, the results of the patient survey will be matched with the existing dataset (hospital survey, hospital quality reports, claims data) at the patient level based on pseudonymised patient IDs. Individual patient data will be encrypted in such a way that identification or tracing of an individual is de facto impossible, thus ensuring a high level of individual data protection.

The qualitative data from the expert interviews will first be analysed separately. The results will then be compared and linked to findings from the quantitative data analysis. The findings from the qualitative interviews will provide a context for understanding the hospital and patient level data, particularly in relation to facilitators and barriers to effective DP. Figure 2 depicts the timeline of data availability for primary and secondary data sources as well as planned data analyses.

Data management

Collected quantitative, qualitative and pseudonymised claims data will be managed via a centralised, secure electronic database hosted in Germany. All patient identifiers will be removed before data merging and analysis. Access to the dataset is restricted to approved study personnel via role-based authentication. Data will be stored securely for a period of 10 years post-publication.

Patient and public involvement

A comprehensive approach to patient involvement actively engages patients throughout the entire research process. A core group of about four patients, with the possibility of ad hoc expansion, contributes to field access, recruitment, study progress (eg, reviewing patient-focused instruments) and data interpretation. Patients are also encouraged to participate in conferences and scientific presentations. We aim to actively involve patients in all stages of the project, including design, conduct, evaluation and dissemination of results at conferences and through publications. As the study aims to develop actionable results and recommendations to improve the quality and continuity of cardiac care, the perspectives and individual experiences of patients are not only valuable but also essential.

For this reason, objective outcome measures will be combined with self-reported patient perspectives on DP in Germany. In addition, the research team working on this study includes a variety of experts covering multiple perspectives, such as the medical, nursing, statistical and regulatory fields.

ETHICS AND DISSEMINATION

This project was approved by the Ethics Committee of the Bergische University of Wuppertal, Germany, on 24 July 2024 (reference number: SK/AE 240712) prior to the start of patient recruitment. In addition, data provision by the participating statutory health insurer (TK) was approved by the Federal Office for Social Security (BAS) on 17 July 2024 (reference number 117-1010904#00008#0007).

Written informed consent will be obtained for each primary data collection. For the hospital survey, the managing directors of all hospitals invited to participate will be informed before the start of the survey and will be given the opportunity to refuse to participate. For the patient survey, patients will be asked for their consent before starting the survey. Information from patients who do not consent to the processing of their data after completing the survey will not be included in any analyses. Participants in qualitative interviews will also be asked for their consent and may withdraw their consent at any time. For the analysis of claims data, insured TK members may object to the processing of their claims data at any time. Patient-related data will only be transmitted and analysed in pseudonymised form to minimise the risk of identifying individuals.

Dissemination efforts will include presentations at academic conferences and collaboration with (non-) cardiac societies to maximise the impact of the study results.

DISCUSSION

Effective hospital DP is an important tool for ensuring continuity of care and reducing adverse outcomes associated with transitions between care settings. However, the implementation status and effectiveness of these concepts in the German healthcare context remains largely underexplored. Moreover, the lack of standardisation in DP practice allows for considerable variation as hospital staff adapt existing guidelines based on individual experience and preferences.[3]

Challenges to DP are multifaceted and can generally be attributed to patient-level factors (eg, age, comorbidities) and system-level factors (eg, availability of outpatient care, administrative delays).[13] Addressing these issues requires a comprehensive approach. Therefore, our study combines quantitative analysis and qualitative insights to provide a holistic understanding of DP implementation and its effectiveness.

Our study aims to identify key mechanisms and critical factors for high-quality and continuous cardiac care. We aim to develop actionable best practice recommendations to improve quality and continuity of care through an efficient and effective discharge process, taking into account existing structures and processes within hospitals and hospital units. Patient clusters (eg, based on diagnoses, severity of illness) will be created to tailor recommendations to specific patient groups.

In a mixed-method design, we will integrate key findings from both quantitative and qualitative analyses, along with best practices from hospitals with well-functioning DP processes, to develop preliminary recommendations. These recommendations will be further refined through expert workshops with healthcare professionals to ensure practicality and relevance. Our findings will be summarised into practical guidelines for optimising patient discharge processes in cardiology units. Although our study focuses on cardiology, our findings are designed to be transferable to other specialties, such as neurology and orthopaedics. Wherever possible, recommendations will be formulated in general terms to allow for adaptation to different medical specialties.

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Contributors VW is the study director, led the study design and is the guarantor of the study. LI drafted the first version of the manuscript with input from VW, KSB and RH. RH and KB are responsible for the hospital survey. VW, KSB and RB are responsible for the patient survey. JS and LI oversee the collation and analysis of the quantitative data. US and DH-S facilitate the provision of claims data and sample selection for the patient survey. SG, SF and GM are responsible for the conduct of the qualitative research. BAR provides clinical expertise and contributes to the interpretation of the findings. All authors reviewed and approved the final manuscript.

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