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Enhancing Qualitative and Quantitative Data Linkages in Complex Mixed Methods Designs: Illustrations from a Multi-Phase Healthcare Delivery Study

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Abstract

While mixed methods research is increasingly used to examine determinants of unwarranted variability in healthcare delivery and outcomes, novel integrative approaches are required to meet the needs of mixed methods healthcare delivery research. This article describes novel refining strategies that enhance the linkage between qualitative and quantitative dimensions of a mixed methods healthcare delivery research study. Leveraging our study experiences, this paper demonstrates several refining strategies: (1) using mediated allocation concealment to facilitate qualitative sampling; (2) informing qualitative inquiry through quantitative analytics; and (3) training and immersing multidisciplinary researchers in qualitative data collection and analysis. Developing and implementing strategies in mixed methods healthcare delivery research could advance methodological rigor and strengthen multidisciplinary collaboration.

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Introduction

Mixed methods research is advocated within health services research to holistically capture the complexity of healthcare, and promote comprehensive approaches for measuring, evaluating, and improving health outcomes in real-world settings (Creswell et al., 2011; Creswell & Plano Clark, 2017; Curry et al., 2013; Fetters et al., 2013). Investigators conducting mixed methods healthcare delivery research often advance healthcare delivery and outcomes in an iterative fashion, including analyzing multi-institutional clinical registries to identify performance outliers for subsequent qualitative inquiry (e.g., interviews) (O'Connor et al., 1996). Alternatively, a multiphase, mixed methods healthcare delivery research design could efficiently integrate quantitative analyses with in-depth qualitative case investigations of care processes across multiple institutions to inform quality improvement interventions (Fetters, 2019). The implementation of such mixed methods healthcare delivery research designs; however, would require an integrative multidisciplinary team composed of methodological and clinical experts. The intersection of diverse methodologies and content expertise in these mixed methods healthcare delivery research studies may generate dynamic tensions rooted in internal differences in paradigms, worldviews, and assumptions (Bryman, 2007; Curry et al., 2012; Fetters & Molina-Azorin, 2017; Lunde et al., 2013). Methodological questions emerging at different dimensions (e.g., research integrity, sampling, data collection, and analysis) of these studies include:

Methodological Question 1: How should mixed methods healthcare delivery research teams advance qualitative sampling decisions to mitigate the undue bias of researchers with knowledge of quantitative findings and maintain trustworthy qualitative data collection? In clinical trial research, concealing randomization of a participant's treatment allocation assignment is advocated to safeguard against potential bias on behalf of the study team (e.g., data collection and analysis) and participant (e.g., responses, outcomes) (Moher et al., 2010). Nonetheless, some mixed methods research methodologists advocate against concealing quantitative information to advance comprehensive understanding during qualitative inquiry (Sharp et al., 2012). To date, robust approaches for balancing the benefits of enhanced qualitative inquiry against the risk of bias in the conduct of mixed methods healthcare delivery research studies are lacking.

Methodological Question 2: How should mixed methods healthcare delivery research teams best utilize quantitative findings from clinical registry datasets to inform qualitative data collection of case institutions? Prior mixed methods research studies have outlined systematic sampling procedures involving the use of quantitative performance indicators to select institutions for qualitative case investigation (Sharp et al., 2012). Other mixed methods healthcare delivery research studies provide integrated case summaries of institutions that reflect quantitative outcomes and qualitative implementation findings (Guetterman & Fetters, 2018; Shaw et al., 2013). However, the literature offers limited

guidance on how to synthesize complex analyses of clinical registry data to contextualize and enhance qualitative inquiry.

Methodological Question 3: How should mixed methods healthcare delivery research teams leverage the content and methodological contributions from a large team of qualitative, quantitative, and clinical researchers in qualitative and mixed methods dimensions of a study? The literature has outlined strategies to promote multidisciplinary collaboration in health sciences, public health, and other qualitative and mixed methods research settings (e.g., supporting methodologically aligned subgroups, maintaining trust and respect, promoting practices that bridge differences in multiple worldviews) (Chandanabhumma et al., 2023; Curry et al., 2012; Lunde et al., 2013; Massey et al., 2006). While fostering communities of research practice (e.g., joint qualitative data collection) has been discussed (e.g., Hemmings et al., 2013), approaches for training and fully immersing multidisciplinary members of mixed methods healthcare delivery research teams in qualitative data collection and analysis are not well described.

Mixed methods research scholars have advocated for alternative conceptualization of integration (Bazeley, 2009; Bryman, 2007; Castro et al., 2010; Lynam et al., 2020; Mertens, 2007). Nonetheless, the literature lacks important procedural details on how to optimize qualitative and quantitative dimensions (e.g., sampling, data collection, and analysis) to strengthen integration at the methods level (merging, building, connecting, and embedding) for mixed methods healthcare delivery research studies (Fetters et al., 2013; Fetters & Freshwater, 2015). In response, this paper presents “refining” as concrete techniques and procedures that strengthen integration approaches (building, connecting, merging, and embedding) of mixed methods research designs by enhancing the linkage between qualitative and quantitative dimensions of a study.

This paper draws upon a multi-phase mixed methods healthcare delivery research study that aims to develop an expert-guided and customizable infection prevention toolkit within the context of durable left ventricular assist device (dLVAD) implantation (Chandanabhumma et al., 2020, 2023a, 2023b). A dLVAD is a long-term “durable” mechanical device that is surgically implanted in individuals who have reached end-stage heart failure. The device supports the patient’s failing heart by advancing blood flow out of the left ventricle. Patients with LVADs are at risk for several debilitating complications including infections. A recent analysis of Medicare claims found that the risk-adjusted incidence of infections per 100 patient-months was 14.3 (9.3–19.5), while varied from 0.0 to 35.6 across institutions (Likosky et al., 2022). This study was conducted by a large research team representing diverse professional backgrounds (e.g., surgery, infectious disease, and public health) and research contributions (e.g., quantitative, qualitative/mixed methods research, and clinical experts). This paper describes the development of distinctive refining strategies in this multi-phase mixed methods healthcare delivery research study. While they are not exhaustive, the refining strategies that are presented in this multi-phase, mixed methods healthcare delivery research study may be useful for other studies that engage with diverse team members to integrate in-depth quantitative and qualitative data of multiple institutions.

Description of the Study

This national study employed a multi-phase, mixed methods design to obtain a comprehensive understanding of qualitative contexts, promoters, and barriers for addressing inter hospital variability in infections (Chandanabhumma et al., 2020; see Supplement 1 for study-related notes and references). The study was guided by the patient tracer methodology used in health regulatory evaluations and the dLVAD care delivery conceptual framework (The Joint Commission, 2024; see Supplement 2). As shown in Figure 1, the study consisted of three phases, combining an explanatory sequential design with a case series approach. Virtual adaptation to data collection in Phases 2 and 3 was made in response to COVID-19-related constraints (e.g., travel limitations, constrained hospital visitation policies).

During Phase 1, the study team quantitatively assessed institutional performance and identified performance outliers (e.g., creation of risk-adjusted dLVAD infection rates). Determinants of hospital performance were identified through the analyses of a merged clinical registry dataset (see Figure 1). Further, a series of scoping reviews of the literature were conducted to determine patient, clinician, and institutional determinants of variability in dLVAD infections. Through connecting and building, the quantitative findings from Phase 1 informed the selection of case institutions and areas for qualitative inquiry to be explored in Phase 2.

Phase 2 involved 73 virtual, semi-structured, key informant interviews. Clinical experts within the study team informed the criterion sampling approach to select key clinical and non-clinical (e.g., surgeons, heart failure cardiologists, and epidemiologists) informants involved in the care of dLVAD patients across eight institutions. Prior to the start of data collection at each institution, the study team solicited the contact person of the dLVAD program to nominate potential informants who provided care to dLVAD patients. A total of 73 of 135 candidate informants completed the interviews. Relevant LVAD care documents (e.g., protocols, administrative structure) were requested. Thematic analysis of the interview transcripts, field notes, and documents was conducted to synthesize institutional practices, barriers, and facilitators for preventing infections.

The toolkit was developed during Phase 3. The process of merging was used to compare and relate quantitative (e.g., determinants of infections) and qualitative (e.g., infection prevention facilitators and barriers) data across institutions. The synthesis led to a draft set of infection prevention recommendations, along with a compendium of supporting materials. The prototype toolkit and its feasibility were iteratively enhanced through: (1) quantitative and qualitative feedback from an external advisory board of dLVAD clinical experts and (2) institutional pilot testing.

Methodological Refining Strategies

Three refining strategies were developed and implemented across study phases to meet emergent methodological questions (i.e., Methodological Questions 1–3). These strategies included (1) Using a mediated allocation concealment approach to facilitate qualitative sampling decisions; (2) Developing case profiles of quantitative analytics to inform

qualitative inquiry; and (3) Training and immersing quantitative and clinical researchers in qualitative data collection and analysis.

Refining Strategy 1: Facilitating Qualitative Sampling through a Mediated Allocation Concealment Approach

During the study's connecting phase, the study team struggled with the optimal processes for selecting case institutions and conducting qualitative data collection in Phase 2. Team members differed in their methodological preferences, with some advocating for complete concealment of institutional performance to maintain a non-evaluative, trust-building stance in qualitative data collection. Other team members promoted complete transparency of quantitative findings to optimize explanatory qualitative inquiry. The study team reached a pragmatic compromise by creating a mediated allocation concealment approach to advance the mutual goal of collaboratively selecting candidate institutions for qualitative case inquiry.

The study team designated mediators called "honest brokers" (individuals who serve as intermediaries between two parties, hereafter referred to as "brokers") to select a criterion sample of case institutions for Phase 2. Brokers included the principal investigator (DSL), quantitative analysts (MH, GY), lead clinical experts (FP, KA), and project coordinator (LC). The brokers were informed that some of the quantitative data had limited temporal relevance to current care practices (data reflecting newer dLVAD devices were not reflected in the quantitative datasets), team members, and infection outcomes. The study team's enhanced process for advancing sampling, which is described below, intended to: (i) conceal institutional qualitative researchers to institutional performance, and (ii) leverage the clinical insights of brokers in research decision-making.

Approximately, seven months before starting Phase 2 data collection, the brokers leveraged Phase 1 findings to identify the sampling pool and select candidate institutions. The primary criteria under consideration were the institution's observed to expected infection rate, prioritizing adequate representation from institutions with the highest (low-performing) and lowest tercile (high-performing) of infections. Several secondary criteria were also used (e.g., annualized procedural volume, geographic location, registry data completion, and clinical insights of dLVAD programs). Through this iterative process, a pool of 27 low- and 18 high-performing institutions were selected. After secondary criteria were considered, the candidate pool was reduced to 10 institutions. Following study outreach, eight institutions accepted invitations to participate in Phase 2.

The mediated allocation concealment approach enhanced the connecting process by leveraging Phase 1 findings and brokers' insights regarding sample selection while minimizing the aforementioned risk of bias. The brokers raised important questions regarding assumptions underlying the use of historical data and generated probes for qualitative inquiry. To navigate the differences in methodological preferences described above, the study team: (1) did not create a barrier to information sharing between broker participation and Phase 2; although (2) ensured a considerable elapse of time between broker discussions and the start of Phase 2 data collection (i.e., thereby limiting recall of particular institutional characteristics). Further mitigating approaches were implemented,

including: (1) performance-concealed lead qualitative researchers (PPC and MDF[1]) leading the interviews; (2) framing interview questions from a neutral position; and (3) not revealing performance measures to site participants.

Refining Strategy 2: Developing Case Profiles of Quantitative Analytics to Inform Qualitative Inquiry

During the building phase of the study, the study team grappled with how to synthesize complex quantitative analytical findings from Phase 1 to inform context-specific qualitative case series investigation during Phase 2. An iterative process was conducted, including: (1) inventorying and selecting relevant quantitative measures derived from Phase 1 analyses; and (2) discussing optimal approaches for framing these measures to elicit qualitative inquiry during Phase 2 interviews. As a result, the team generated a prospective case institutional profile (i.e., a report comparing characteristics of one site to other sites over a specified time period), termed a "scouting report." Our past study team member (MDF[1]) coined the term, "scouting report," based on multifaceted scouting reports used to assess prospective athletes. A sample scouting report is illustrated in Figure 2 and shown in full in Supplement 3.

For each institution, the scouting report synthesized quantitative information on care team collaborative network properties, infection-related data, and qualitative web-based dLVAD program description. The final version of the report included a summarized program description, historical 90-day infection rates, annualized procedural volume, and collaborative network measures representing the degree of care team cohesion across phases of dLVAD care. The report included national benchmarks when available. The quantitative analysts and clinical team members collectively interpreted the data to facilitate discussion. To maintain the intent of Refining strategy 1 described above, identifiable information was removed from the report and only historical infection rates were discussed.

The study PI and quantitative analysts convened the study team to facilitate the discussion of each institution's scouting report approximately 1–2 weeks before any interviews. The discussion intended to engage the study team in using scouting report findings to recommend contextually important specific areas for inquiry (e.g., care team members to recruit, probes to ask). The discussion facilitated input from clinical team members (e.g., advising the foci and reasoning therein for suggested areas of inquiry).

The scouting report approach enhanced the building process by enriching the team's understanding of the organizational and care delivery aspects of case institutions and generated context-specific inquiry for Phase 2. For example, clinical experts noted that interviews with surgeons at institutions with a high proportion of early postoperative infections should focus on patient acuity. The study team grappled with intricate analytical decisions during the iterative development of the report (e.g., selection of appropriate institutional measures). However, collective decisions made during the development process enhanced the study team's application of quantitative data toward qualitative case series investigation.

Refining Strategy 3: Training and Immersing Quantitative and Clinical Researchers in Qualitative Data Collection and Analysis

The qualitative procedures for Phase 2 necessitated assembling a multidisciplinary interviewing team composed of members with: (1) qualitative expertise to lead inductive-oriented interviews and (2) clinical and context expertise to probe for candidate modifiable infection risk factors. At that time; however, clinical team members had limited training and exposure to qualitative and mixed methods. Senior methodologists within the study team (MDF, PPC) implemented a series of procedures intended to sensitize multidisciplinary team members to qualitative and mixed methods aspects of the study including: (1) multidisciplinary qualitative and mixed methods training; (2) 3Cs (Content, Context, Concepts) data collection and debriefing processes; and (3) multidisciplinary immersion in qualitative and mixed methods analyses (Bernard, 2006; Fetters & Rubinstein, 2019; Kagawa Singer et al., 2016). First, a three-part training curriculum addressing qualitative semi-structured interviews and 3Cs data collection was conducted by qualitative/MMR experts (see Supplement 4). The presentation included interactive activities to expose team members to the interview process (e.g., assessment of interviewing approaches, mock interview).

Second, the study team established a collaborative process to enhance data collection and analysis of semi-structured interviews. This approach was guided by the 3Cs framework, which provided a systematic process for collecting qualitative data based on context, content, and concepts (Fetters & Rubinstein, 2019). Before each interview, the project coordinator distributed a document (“3Cs Field Notes”) to the interviewing team (see Supplement 5). After each interview, the interviewers debriefed to discuss similarities and differences in emergent content and concepts within their field jottings. The cumulative understanding was compiled into a single version of the 3Cs Field Notes.

Third, the qualitative team employed several interactive approaches to engage quantitative and clinical team members in qualitative analysis and mixed methods integration. After completing each institution’s data collection, information from the scouting report and 3Cs Field Notes were used to generate an internal case profile report (or internal report) that summarized key institutional characteristics, findings organized using the conceptual framework, and infection prevention recommendations. The internal report was shared with the interviewing team to solicit feedback. To advance thematic analysis, the qualitative team consulted with clinical team members to develop clinically relevant domains of the codebook (e.g., antibiotic stewardship, inpatient recovery). Emergent findings were shared regularly with the study team for clinical interpretation and guidance, including supporting the synthesis and prioritization of infection prevention recommendations (see Supplement 4).

The multidisciplinary training and immersion procedures enhanced the qualitative data collection, analysis, and mixed methods integration (merging) in several ways. The integration of clinical team members with qualitative researchers enhanced collective capacity-building in qualitative data collection and analysis. Training activities advanced the clinical team members’ comfort in contributing during interviews (e.g., probes), including with a qualitatively neutral framing. Together, these approaches generated important

insights, including emergent codes and novel toolkit recommendations that were not within the scope of initial inquiry (e.g., pain control, equity considerations in post-LVAD care).

Discussion

This study describes three methodological refining strategies that enhanced the dynamic linkage between qualitative and quantitative dimensions and their integration within a multi-phase mixed methods healthcare delivery research study. These problem-solving approaches helped navigate the challenges of addressing research integrity in qualitative data collection, optimize the use of quantitative analytics in qualitative data collection and strengthen multidisciplinary engagement throughout the study. While starting as ad-hoc methodological debates, the resulting strategies provide alternative pathways that leveraged the strengths and mitigated the weaknesses of each constituent approach (Creswell & Plano Clark, 2017).

These refinement strategies strengthened integration at different points throughout the study. The qualitative sampling process (connecting) was enhanced by proposing a modified allocation concealment approach to address potential biases during qualitative inquiry. Further, the qualitative data collection process (building) was strengthened by developing a case profile of advanced quantitative analytics to contextualize institution-specific qualitative case investigation. Last, the implementation of multidisciplinary training and immersion maximized the contributions of our diverse team in qualitative data collection and analysis, and mixed methods integration (merging). These procedures also helped the study team advance the study goals by critically evaluating paradigms and assumptions underlying the quantitative and qualitative data. For example, through iterative discussions, the brokers discovered institution-level under-reporting of health-related quality of life, a potentially important and modifiable quality measure. The immersion of multidisciplinary team members in qualitative data collection motivated a quantitative investigation (and publication) of the association between the completeness of this variable and infection rates (see Supplement 1).

A few methodological points are worthy of further discussion. First, the study team had to navigate long-standing differences in methodological paradigms, worldviews, and beliefs between and sometimes within methodological subgroups. Fostering trust and primary ownership of research leads in each major study phase helped to navigate these tensions (Curry et al., 2012).

Second, major healthcare disruptions due to the COVID-19 pandemic necessitated adapting data collection procedures to optimize engagement across institutions (Meixner & Spitzner, 2023). In this study, virtual adjustment to Phase 2 and Phase 3 data collection approaches limited the team’s ability to conduct clinical observations and administer planned institutional practice surveys.

Contribution to the Field of Mixed Methods

This study contributes to the mixed methods research literature by presenting systematic techniques and procedures that could strengthen the linkage of qualitative and quantitative dimensions in a multi-phase mixed methods healthcare delivery research study. Illustrative

refining strategies presented in this article include (1) facilitating qualitative sampling through a mediated allocation concealment approach, (2) developing case profiles of quantitative analytics to inform qualitative inquiry, and (3) training and immersing quantitative and clinical researchers in qualitative data collection and analysis. Developing, implementing, and finessing these strategies enhanced the sophistication of our mixed methods, healthcare delivery research study by promoting the rigor of data collection and analysis, optimizing the use of quantitative analytics in planning qualitative inquiry, and strengthening multidisciplinary collaboration. However, these strategies could also be contextualized to meet the needs of other mixed methods research studies that engage with multidisciplinary teams to systematically integrate multi-institutional quantitative and qualitative data. Table 1 summarizes the refining strategies and lessons learned from this study that may benefit multidisciplinary mixed methods research researchers and practitioners conducting mixed methods, healthcare delivery research, and similar research efforts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

Bazeley P (2009). Editorial: Integrating data analyses in mixed methods research. Journal of Mixed Methods Research, 3(3), 203–207. 10.1177/1558689809334443

Bernard HR (2006). Research methods in anthropology: Qualitative and quantitative approaches (4th ed.). AltaMira Press.

Bryman A (2007). Barriers to integrating quantitative and qualitative research. Journal of Mixed Methods Research, 1(1), 8–22. 10.1177/2345678906290531

Castro FG, Kellison JG, Boyd SJ, & Kopak A (2010). A methodology for conducting integrative mixed methods research and data analyses. Journal of Mixed Methods Research, 4(4), 342–360. 10.1177/1558689810382916 [PubMed: 22167325]

Chandanabhumma PP, Fàbregues S, Oetzel J, Duran B, & Ford C (2023a). Examining the influence of group diversity on the functioning of community-based participatory research partnerships: A mixed methods study. American Journal of Community Psychology, 71(1–2), 242–254. 10.1002/ajcp.12626 [PubMed: 36342500]

Chandanabhumma PP, Fetters MD, Pagani FD, Malani PN, Hollingsworth JM, Funk RJ, Aaronson KD, Zhang M, Kormos RL, Chenoweth CE, Shore S,Watt TMF, Cabrera L, & Likosky DS (2020). Understanding and addressing variation in health care-associated infections after durable ventricular assist device therapy: Protocol for a mixed methods study. JMIR Research Protocols, 9(1), Article e14701. 10.2196/14701 [PubMed: 31909721]

Chandanabhumma PP, Zhou S, Fetters MD, & Likosky DS (2023b). Expanding our methodological toolbox to improve quality: The role of mixed-methods evaluations. Circulation. Cardiovascular Quality and Outcomes, 16(5), Article e009629. 10.1161/CIRCOUTCOMES.122.009629 [PubMed: 37144915]

Creswell JW, Klassen AC, & Plano Clark V (2011). Best practices for mixed methods in the health sciences. Bethesda, MD: Office of behavioral and social sciences research. National Institutes of Health.

Creswell JW, & Plano Clark VL (2017). Designing and conducting mixed methods research. Sage Publications. https://play.google.com/store/books/details?id=BXEzDwAAQBAJ

Curry LA, Krumholz HM, O'Cathain A, Plano Clark VL, Cherlin E,&Bradley EH (2013). Mixed methods in biomedical and health services research. Circulation. Cardiovascular Quality and Outcomes, 6(1), 119–123. 10.1161/CIRCOUTCOMES.112.967885 [PubMed: 23322807]

Curry LA, O'Cathain A, Clark VLP, Aroni R, Fetters M, & Berg D (2012). The role of group dynamics in mixed methods health sciences research teams. Journal of Mixed Methods Research, 6(1), 5–20. 10.1177/1558689811416941

Fetters MD (2019). The mixed methods research workbook: Activities for designing, implementing, and publishing projects. Sage Publications. https://play.google.com/store/books/details?id=mGlDwAAQBAJ

Fetters MD, Curry LA, & Creswell JW (2013). Achieving integration in mixed methods design principles and practices. Health Services Research, 48(6 Pt 2), 2134–2156. 10.1111/1475-6773.12117 [PubMed: 24279835]

Fetters MD, & Freshwater D (2015). The 1 + 1 = 3 integration challenge. Journal of Mixed Methods Research, 9(2), 115–117. 10.1177/1558689815581222

Fetters MD, & Molina-Azorin JF (2017). The journal of mixed methods research starts a new decade: The mixed methods research integration trilogy and its dimensions. Journal of Mixed Methods Research, 11(3), 291–307. 10.1177/1558689817714066

Fetters MD, & Rubinstein EB (2019). The 3 Cs of content, context, and concepts: A practical approach to recording unstructured field observations. The Annals of Family Medicine, 17(6), 554–560. 10.1370/afm.2453 [PubMed: 31712294]

Guetterman TC, & Fetters MD (2018). Two methodological approaches to the integration of mixed methods and case study designs: A systematic review. American Behavioral Scientist, 62(7), 900–918. 10.1177/0002764218772641

Hemmings A, Beckett G, Kennerly S, & Yap T (2013). Building a community of research practice: Intragroup team social dynamics in interdisciplinary mixed methods. Journal of Mixed Methods Research, 7(3), 261–273. 10.1177/1558689813478468

Kagawa Singer M, Dressler W, George S, Bell RA, Burhansstipanov L, Burke NJ, Dibble S, Elwood W, Garro L, Gravlee CC, Guarnaccia P, Hecht ML, Henderson J, Hruschka D, Lewis-Fernández R, Like R, Mouton C, Myers HF, & Williams D, The NIH Expert Panel. (2016). Culture: The missing link in health research. Social Science & Medicine, 170, 237–246. 10.1016/j.socscimed.2016.07.015 [PubMed: 27542574]

Likosky DS, Yang G, Zhang M, Malani PN, Fetters MD, Strobel RJ, Chenoweth CE, Hou H, Pagani FD, Michigan Congestive Heart Failure Investigators, Abou El Ela, A. S. AA, Tang PC, Thompson MP, Aaronson K, Shore S, Cascino T, Salciccioli KB, & Nassar K (2022). Interhospital variability in health care-associated infections and payments after durable ventricular assist device implant among Medicare beneficiaries. The Journal of Thoracic and Cardiovascular Surgery, 164(5), 1561–1568. 10.1016/j.jtcvs.2021.04.074 [PubMed: 34099272]

Lunde A, Heggen K, & Strand R (2013). Knowledge and power: Exploring unproductive interplay between quantitative and qualitative researchers. Journal of Mixed Methods Research, 7(2), 197–210. 10.1177/1558689812471087

Lynam T, Damayanti R, Rialine Titaley C, Suharno N, Bradley M, & Krentel A (2020). Reframing integration for mixed methods research. Journal of Mixed Methods Research, 14(3), 336–357. 10.1177/1558689819879352

Massey C, Alpass F, Flett R, Lewis K, Morriss S, & Sligo F (2006). Crossing fields: The case of a multi-disciplinary research team. Qualitative Research: Quaternary Research, 6(2), 131–147. 10.1177/1468794106062706

Meixner C, & Spitzner DJ (2023). Leveraging the power of online qualitative inquiry in mixed methods research: Novel prospects and challenges amidst COVID-19. Journal of Mixed Methods Research, 17(2), 171–186. 10.1177/15586898221084504 [PubMed: 38603220]

Mertens DM (2007). Transformative paradigm: Mixed methods and social justice. Journal of Mixed Methods Research, 1(3), 212–225. 10.1177/1558689807302811

Moher D, Hopewell S, Schulz KF, Montori V, Gøtzsche PC, Devereaux PJ, Elbourne D, Egger M, & Altman DG (2010). CONSORT 2010 explanation and elaboration: Updated guidelines for reporting parallel group randomised trials. BMJ, 340(mar23 1), c869. 10.1136/bmj.c869 [PubMed: 20332511]

O'Connor GT, Plume SK, Olmstead EM, Morton JR, Maloney CT, Nugent WC, Hernandez F, Clough R, Leavitt BJ, Coffin LH, Marrin CAS,Wennberg D, Birkmeyer JD, Charlesworth DC, Malenka DJ, Quinton HB, Kasper JF, Quinton H, Carey-Johnson D, & Zografos C (1996). A regional intervention to improve the hospital mortality associated with coronary artery bypass graft surgery. The Journal of the American Medical Association, 275(11), 841–846. 10.1001/jama.1996.03530350023029 [PubMed: 8596221]

Sharp JL, Mobley C, Hammond C,Withington C, Drew S, Stringfield S, & Stipanovic N (2012). A mixed methods sampling methodology for a multisite case study. Journal of Mixed Methods Research, 6(1), 34–54. 10.1177/1558689811417133

Shaw EK, Ohman-Strickland PA, Piasecki A, Hudson SV, Ferrante JM, McDaniel RR Jr., Nutting PA, & Crabtree BF (2013). Effects of facilitated team meetings and learning collaboratives on colorectal cancer screening rates in primary care practices: A cluster randomized trial. Annals of Family Medicine, 11(3), 220–228. 10.1370/afm.1505 [PubMed: 23690321]

The Joint Commission (2024). Tracer methodology fact sheet. https://www.jointcommission.org/resources/news-and-multimedia/fact-sheets/facts-about-tracer-methodology/ (last accessed on May 28, 2024).

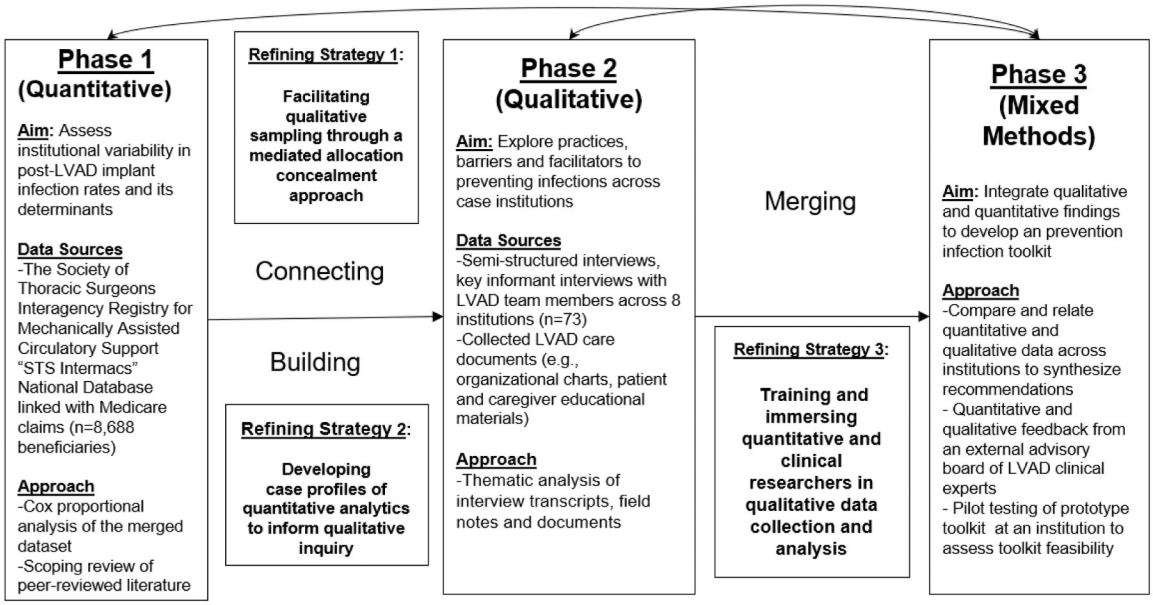

Figure 1:
Procedural Diagram of the Study.

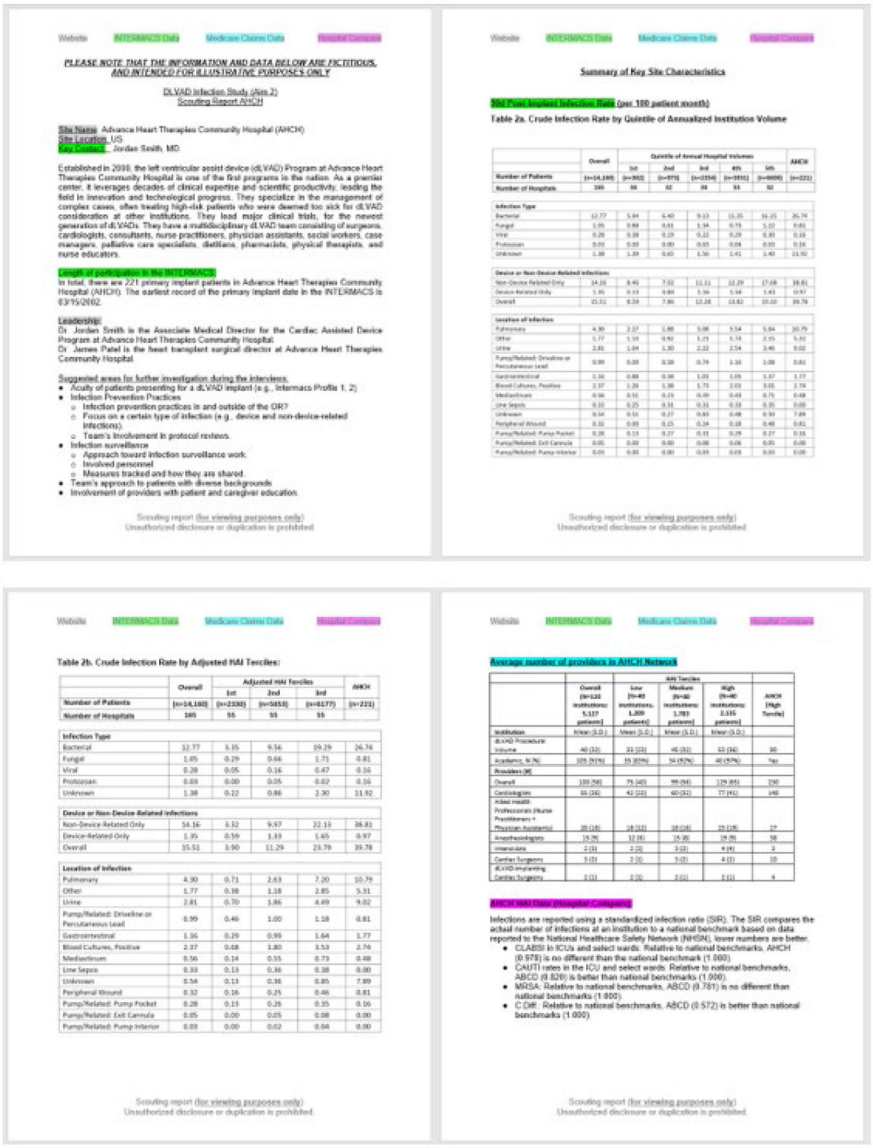

Figure 2.

Illustrative scouting report. *Note*. Illustrative information contained in this report is fictitious.

Table 1.

Summary of Refining Strategies and Lessons Learned.

Refining Strategy	Summary of Study Approach	Lesson Learned from this Mixed Methods Healthcare Delivery Research Study
1) Facilitating qualitative sampling through a mediated allocation concealment approach	• Designation of mediators (i.e., brokers) • Convene brokers to review information and select case institutions	• Prioritize mutual research goals when methodological dilemmas emerge among multidisciplinary team members • Use a collaborative, practical process to navigate emergent tensions within the study
2) Developing case profiles of quantitative analytics to inform qualitative inquiry	• Iterative development of case profile (i.e., scouting report) • Team interpretation and discussion of scouting report	• Conduct an inventory of quantitative data to incorporate measures that could refine qualitative and mixed methods procedures • Develop effective presentation of quantitative analytics to generate insights for qualitative data collection and analysis
3) Training and immersing quantitative and clinical researchers in qualitative data collection and analysis	• Multidisciplinary qualitative and mixed methods training • Collaborative 3Cs data collection approach • Multidisciplinary engagement in qualitative and mixed methods analysis	• Sensitize and promote the engagement of multidisciplinary team members in quantitative, qualitative, and mixed methods aspects of the study

Note

[1] Please see Acknowledgements for more information about Dr. Fetter's study contributions.