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Patient Experiences and Trust in Pharmacogenomic Communication for Personalized Medicine

Murni Asridah
UIN Syahada Padangsidimpuan, Indonesia
murniasridah@gmail.com

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ABSTRACT

This study explores how patients understand and interpret physician-delivered pharmacogenomic information during therapeutic decision-making. Using an interpretive phenomenological approach, data were collected through in-depth semi-structured interviews with patients who had undergone pharmacogenomic testing and analyzed using Interpretative Phenomenological Analysis. The findings show that patients experience pharmacogenomic communication as a relational process shaped by trust in physicians, emotional responses, contextual interpretation, and partial comprehension of genomic information. Rather than relying on complete scientific understanding, patients' acceptance of treatment emerges from the personal meaning they assign to pharmacogenomic information within their lived experiences. These findings highlight the importance of patient-centered communication in pharmacogenomic implementation and contribute to a more holistic understanding of personalized medicine by emphasizing the experiential dimensions of genomic care.

INTRODUCTION

The rapid advancement of precision medicine has transformed contemporary healthcare by introducing individualized approaches to diagnosis and treatment, particularly through the integration of pharmacogenomics (Bonini et al., 2024). Pharmacogenomics, as a core component of personalized medicine, examines how genetic variations influence individual responses to medications, thereby enabling clinicians to tailor therapeutic strategies more effectively. This paradigm shift reflects a broader movement in modern medicine from standardized treatment protocols toward patient-specific care, where biological individuality is recognized as a central determinant of therapeutic success. As a result, pharmacogenomic testing has increasingly been incorporated into clinical practice across various fields, including oncology, cardiology, and psychiatry, with the aim of optimizing drug efficacy and minimizing adverse effects.

Despite these scientific and technological advancements, the implementation of pharmacogenomics in clinical settings extends beyond technical accuracy and biomedical outcomes. The process inherently involves communication between healthcare providers and patients, particularly in translating complex genomic data into meaningful and actionable information (Mukhlis, Suradi, et al., 2023; Mukhlis, 2025b). This communicative interaction occurs within a broader social and cultural context, where patients bring their own prior experiences, beliefs, expectations, and levels of health literacy into the clinical encounter. Consequently, the experience of receiving pharmacogenomic information is not merely a cognitive process of understanding scientific data, but also an interpretive and relational experience shaped by trust, emotion, and personal meaning-making.

The relevance of this phenomenon lies in its direct connection to human experience within healthcare. As pharmacogenomic testing becomes more prevalent, patients are increasingly confronted with unfamiliar concepts related to genetic variation and individualized treatment. This encounter can evoke a range of subjective responses, including confusion, reassurance, anxiety, and hope (Bernsen et al., 2025). These responses are further influenced by how information is communicated, the perceived credibility of healthcare providers, and the patient's own social environment. In this sense,

pharmacogenomic communication becomes a critical point where scientific knowledge intersects with lived experience. Understanding this intersection is essential, as it may shape patients' trust in medical decisions, adherence to treatment, and overall perception of personalized medicine as a meaningful and beneficial approach to care.

Given the inherently subjective and context-dependent nature of these experiences, there is a growing need to move beyond purely biomedical or quantitative evaluations of pharmacogenomics. While existing research has provided valuable insights into clinical effectiveness, implementation challenges, and ethical considerations, it has not fully captured how patients themselves experience and interpret pharmacogenomic communication in real-world settings (Anaya et al., 2023). A deeper exploration of these lived experiences is therefore necessary to uncover the meanings that patients assign to genomic information and to understand how these meanings influence their engagement with personalized treatment. Such an exploration aligns with the principles of phenomenology, which seeks to illuminate the essence of human experience as it is perceived and lived. By focusing on patients' subjective perspectives, this approach offers a more holistic understanding of pharmacogenomics, not only as a scientific innovation but also as a human experience embedded in clinical, social, and emotional contexts.

In recent years, the exploration of patient experiences in genomic medicine, particularly within pharmacogenomics, has emerged as an important area of inquiry. As clinical practice increasingly incorporates genetic testing into therapeutic decision-making, attention has shifted toward understanding how patients perceive, interpret, and emotionally respond to genomic information delivered in clinical settings (Aminizadeh et al., 2024). This shift reflects a broader recognition that medical interventions are not only biological processes but also lived experiences shaped by communication, relational dynamics, and individual meaning-making (Mukhlis, Arifin, Ridwan, & Zulbaidah, 2025; Mukhlis, Arifin, Ridwan, Zulbaidah, et al., 2025). Studies have begun to highlight that patients' understanding of genetic test results is often partial and mediated by factors such as trust in healthcare providers, prior illness experiences, and sociocultural context. Consequently, the subjective dimension of pharmacogenomic communication has become increasingly relevant in evaluating the real-world impact of personalized medicine.

However, investigating such subjective experiences presents significant methodological challenges. Much of the existing literature on pharmacogenomics relies on quantitative designs, surveys, or clinical outcome measures that prioritize generalizability and measurable variables over depth of understanding (Alqasrawi et al., 2025). While these approaches provide valuable insights into treatment efficacy, implementation rates, and patient satisfaction, they are inherently limited in capturing the nuanced, context-dependent meanings that patients assign to genomic information. Even studies that incorporate qualitative components often adopt descriptive approaches that focus on surface-level perceptions without engaging deeply with the interpretive processes through which patients make sense of complex medical communication. As a result, the emotional, relational, and existential dimensions of patient experience remain underexplored.

These methodological limitations suggest that many existing approaches are insufficient for uncovering the essence of patients' lived experiences in pharmacogenomic communication. The complexity of interpreting genetic information, combined with the relational nature of physician–patient interactions, requires a research approach that can access deeper layers of meaning beyond observable responses or predefined categories (Agrawal et al., 2021). Without such an approach, the understanding of pharmacogenomics risks remaining incomplete, as it overlooks how patients internalize, negotiate, and integrate genomic knowledge into their personal narratives of illness and treatment. Therefore, there is a clear need for methodologies capable of capturing these experiential dimensions in a holistic and contextually grounded manner, allowing for a more comprehensive understanding of how personalized medicine is lived and experienced in clinical practice.

Current approaches to understanding pharmacogenomic communication in clinical practice have largely relied on established practical frameworks, including quantitative assessments, patient satisfaction surveys, and outcome-based evaluations (Agostinacchio et al., 2024). These approaches have contributed significantly to identifying the clinical utility of pharmacogenomic testing, its

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implementation challenges, and its impact on treatment optimization. In particular, prior studies have emphasized measurable indicators such as patient comprehension scores, adherence rates, and therapeutic outcomes as proxies for evaluating the success of genomic-based interventions. While these strategies provide valuable evidence for clinical effectiveness, they predominantly frame patient engagement as an observable and measurable phenomenon, often overlooking the deeper experiential dimensions of how patients actually live through and interpret these encounters.

However, such practical approaches remain limited in their ability to capture the richness and complexity of subjective experience (Aboelbaha et al., 2023). The communication of pharmacogenomic results involves not only the transfer of information but also the negotiation of meaning within a relational and emotional context. Patients are required to interpret unfamiliar genetic concepts, reconcile them with prior treatment experiences, and integrate them into their personal understanding of illness and care. Quantitative and surface-level qualitative methods are not sufficiently equipped to access these layered processes of meaning-making (Mukhlis et al., 2024; Mukhlis, Maryam, et al., 2023). As a result, the existing body of research provides only a partial understanding of the phenomenon, often reducing patient experience to levels of understanding or satisfaction without addressing how meaning is constructed, how trust is formed, or how emotional responses influence engagement with personalized medicine.

This limitation highlights a critical gap in the literature: the absence of in-depth exploration of the lived experience of patients receiving pharmacogenomic communication. Without examining how individuals interpret, internalize, and emotionally respond to genomic information, the understanding of pharmacogenomics remains incomplete and predominantly biomedical in orientation. An alternative and more suitable approach is therefore required to uncover the essence of this phenomenon. Phenomenology offers a robust framework for addressing this gap by focusing on the subjective, contextual, and interpretive nature of human experience (Almutairi et al., 2025). Through phenomenological inquiry, it becomes possible to move beyond surface-level descriptions and toward a deeper understanding of how pharmacogenomic communication is experienced, negotiated, and given meaning by patients in real clinical contexts. Such an approach is essential for developing more patient-centered communication strategies and for advancing the integration of personalized medicine in a way that aligns with patients' lived realities.

Previous studies have explored patient experiences in healthcare, particularly in relation to treatment adherence, perceived safety, and therapeutic outcomes. In the domain of pharmacogenomics and personalized medicine, research has predominantly emphasized clinical effectiveness, biomarker validity, and optimization of drug response, while comparatively fewer studies have examined how patients experience the communication of genomic information in their everyday lives (Allen et al., 2023). Existing qualitative research suggests that patient perception, trust in healthcare providers, and emotional responses play a critical role in treatment acceptance and engagement. However, these studies often remain limited in capturing the depth of lived experience, particularly in the context of how patients interpret complex pharmacogenomic information delivered during clinical encounters.

In many cases, patients encounter pharmacogenomic communication as part of broader clinical decision-making processes, where information about genetic variability and drug response is presented alongside therapeutic recommendations. Within this context, patients are required to interpret unfamiliar scientific concepts while simultaneously navigating concerns about treatment effectiveness, safety, and personal health outcomes (Mukhlis, Janwari, et al., 2023; Mukhlis & Abdullah, 2025). Similar to findings in other healthcare domains, patients tend to filter such information through their own experiential frameworks, including prior treatment experiences, levels of health literacy, and sociocultural beliefs about medicine. Despite this recognition, current literature has not sufficiently explored how these interpretive processes unfold in real time, nor how they shape patients' understanding, emotional responses, and trust in personalized treatment strategies.

To address this limitation, the present study adopts an interpretive phenomenological approach to explore the lived experiences of patients in understanding and responding to physician communication regarding pharmacogenomic test results. This approach is selected because it enables an in-depth exploration of how individuals construct meaning from complex and context-dependent

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experiences (Alhomsi et al., 2023). Through phenomenology, the study seeks to uncover how elements such as perceived clarity of communication, trust in physicians, emotional responses, and personal context influence how pharmacogenomic information is received and integrated into decision-making. By focusing on subjective experience, the study moves beyond outcome-based evaluation and provides a richer, more nuanced understanding of pharmacogenomic communication as a lived clinical phenomenon.

This article is structured to guide the reader through a coherent and systematic exploration of the phenomenon. The introduction presents the general and specific background, followed by the identification of the knowledge gap and the rationale for the study. The method section outlines the phenomenological design, participant characteristics, data collection procedures, and analytical approach. The results section presents the main themes derived from participants' lived experiences, supported by direct quotations (Mukhlis, 2025a; Mukhlis & Saidah, 2025). The discussion interprets these findings in relation to existing literature, and the conclusion highlights key implications for clinical communication, patient-centered care, and the future integration of pharmacogenomics in personalized medicine.

RESEARCH METHODS

Study Design

A phenomenological design was employed to explore the lived experiences of patients in understanding and responding to physician communication regarding pharmacogenomic test results in therapeutic decision-making. This design was considered appropriate because the research question focused on subjective meaning, personal interpretation, and experiential depth rather than on measurement, frequency, or causal association. Phenomenology enables the investigation of how a particular phenomenon is perceived, interpreted, and internalized by individuals within the context of their everyday lives (Lutz & Knox, 2014; McNabb, 2015). In the present study, the phenomenon of interest was not pharmacogenomic testing as a technical biomedical procedure, but the patient's lived experience of receiving, interpreting, and emotionally negotiating genomic information during clinical encounters.

An interpretative phenomenological approach was adopted, drawing on the Heideggerian tradition of phenomenology, which emphasizes meaning-making, situated understanding, and the contextual nature of experience. This approach was selected because communication about pharmacogenomic results is inherently complex, relational, and embedded in personal, social, and clinical contexts. Rather than seeking only a descriptive account of what participants experienced, the study aimed to illuminate how those experiences were understood and given meaning by the participants themselves. This approach was therefore aligned with the objective of examining how patients navigated limited comprehension, trust in physicians, emotional responses, and contextual influences while engaging with personalized medicine.

Participants

Participants consisted of adult patients who had undergone pharmacogenomic testing and had received physician explanations regarding the implications of the results for treatment selection or adjustment. A purposive sampling approach was used to identify information-rich cases that were directly relevant to the phenomenon under investigation. Participants were recruited from outpatient clinical services where pharmacogenomic testing had been incorporated into treatment decision-making. Potential participants were first identified through clinical records in collaboration with the treating physician, and eligible patients were then approached by the research team after completion of their clinical consultation. The purpose of the study, interview procedures, voluntary nature of participation, and confidentiality safeguards were explained before written informed consent was obtained. This sampling strategy was appropriate because phenomenological inquiry requires participants who have first-hand experience of the phenomenon and are able to articulate their perceptions, emotions, and interpretations in a reflective manner.

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The inclusion criteria were defined as follows: participants were required to be aged 18 years or older, to have undergone pharmacogenomic testing as part of clinical care, to have received direct communication from a physician regarding the test result and its therapeutic implications, and to be willing to discuss their experiences in an in-depth interview (Hillman & Radel, 2018; Migdal, 2018). Participants were also required to have sufficient cognitive and communicative capacity to provide informed responses. Exclusion criteria included severe clinical instability at the time of data collection, inability to communicate adequately in the interview language, and lack of direct experience with physician-delivered pharmacogenomic communication.

In line with phenomenological principles, the sample size was determined by informational depth and thematic sufficiency rather than by statistical representativeness. A small, focused sample was therefore considered appropriate to allow detailed idiographic analysis. The participant profile was expected to include variation in age, sex, clinical condition, and treatment background in order to capture the range of meanings attached to pharmacogenomic communication while retaining coherence around the shared phenomenon. Demographic information relevant to contextual interpretation, such as age group, sex, diagnosis category, treatment history, and prior exposure to genetic information, was documented to support interpretive depth.

Data Collection

Data were collected through in-depth semi-structured interviews, as this method is particularly suitable for eliciting rich first-person accounts of lived experience. A semi-structured interview guide was used to ensure that all interviews addressed the central dimensions of the phenomenon while still allowing participants to narrate their experiences in their own terms. The guide was developed from the study objective, the research question, and the conceptual focus on communication, understanding, trust, emotional response, and meaning-making in relation to pharmacogenomic testing.

The interviews explored several domains, including participants' recollection of how pharmacogenomic results were explained, the extent to which the information was understood, their emotional reactions during and after the consultation, the role of trust in accepting treatment decisions, and the influence of family, prior treatment experiences, or social context on their interpretation of the information (Carreiras & Castro, 2012; Iosifides, 2016). Open-ended prompts were used to encourage narrative depth, and probing questions were applied when clarification or elaboration was needed.

Data were collected through one-on-one interviews conducted in a private and comfortable setting, such as a consultation room, a quiet hospital space, or a secure online environment when in-person access was not feasible. Interviews were generally conducted face-to-face whenever possible in order to facilitate rapport and allow close attention to verbal nuance and emotional expression. Each interview lasted approximately 45 to 75 minutes, depending on the depth and pace of the participant's narrative. With participant consent, interviews were audio-recorded and subsequently transcribed verbatim (Daly, 2007; Longhofer et al., 2012). Field notes were also prepared during and immediately after the interviews to capture contextual details, emotional tone, pauses, and other non-verbal features that supported interpretation.

A supportive interview environment was maintained by ensuring privacy, minimizing interruption, and allowing participants sufficient time to reflect before responding. Participants were informed that there were no right or wrong answers and that the focus was on their personal experience. This strategy was used to encourage openness and reduce pressure in discussing potentially sensitive experiences related to illness, treatment uncertainty, and genomic information.

Data Analysis

Data were analyzed using Interpretative Phenomenological Analysis (IPA), which was selected because of its capacity to examine how individuals make sense of significant and complex experiences. This analytic approach was well suited to the study because communication about pharmacogenomic results involves both cognitive interpretation and emotional negotiation within a clinical relationship. IPA also supports an idiographic mode of inquiry, allowing each participant's account to be examined in detail before patterns are developed across cases.

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The analytic process began with repeated reading of each verbatim transcript in order to achieve immersion in the data and develop familiarity with each participant's narrative structure, language, and experiential emphasis. Initial noting was then carried out to identify significant statements, emotional expressions, interpretive tensions, and meaning-bearing segments of text. These notes were used to generate emergent codes that captured both descriptive content and experiential significance. The coded material was subsequently examined for conceptual convergence, and related codes were clustered into developing themes within each case.

After individual case analysis had been completed, patterns across participants were identified through comparison of thematic clusters. Through this process, broader experiential themes were constructed while preserving the nuance of individual accounts (Fife, 2020; Kawamura, 2020). The final thematic structure reflected recurrent dimensions of the phenomenon, including difficulty with genomic terminology, reliance on physician trust, emotional ambivalence in personalized treatment, and contextual meaning-making through prior experience and social relationships. These themes were not treated as abstract categories detached from participants' narratives, but as interpretive syntheses grounded in lived accounts.

To support data management and organization, qualitative analysis software such as NVivo may be used to store transcripts, facilitate coding, and document thematic development. However, interpretive engagement with the data remained central, and software functioned only as an organizational aid. Credibility in the analytic process was strengthened through iterative review of transcripts, comparison between themes and original quotations, and maintenance of an audit trail documenting coding decisions, theme refinement, and analytic memos. Member checking was also incorporated by inviting participants to confirm the resonance and accuracy of the interpreted meanings where appropriate. The analytic process ultimately aimed to move from individual expressions toward the essential structure of the phenomenon as experienced across participants.

RESULTS

Confronting the unfamiliar language of genomic medicine

A dominant feature of the participants' experiences was the sense of entering an unfamiliar linguistic and conceptual territory when physicians explained pharmacogenomic test results. Although participants generally understood that the test was intended to improve treatment suitability, many reported difficulty grasping the exact meaning of genetic variation, drug response, and individualized therapeutic implications. Their accounts showed that the clinical value of pharmacogenomics was acknowledged, but the language used to communicate it often remained distant from their everyday health literacy.

Several participants described the consultation as a moment in which they recognized the importance of what was being explained, yet could not fully process its content. They often distinguished between understanding the "goal" of the explanation and understanding the "details" of the explanation. In this sense, comprehension was partial rather than complete. One participant stated, "The doctor explained that my genes could affect how the medicine works, and I understood that it was supposed to help choose the right treatment, but the scientific terms were difficult for me to follow." This statement reflects the gap between perceived relevance and actual comprehension. Another participant similarly expressed, "I knew it was something important about my body and how I respond to drugs, but I could not really explain it back in my own words."

The challenge was not simply intellectual difficulty, but also the experience of feeling temporarily displaced in the clinical conversation. Participants often described themselves as listeners attempting to catch meaning from highly specialized language. In some cases, this produced hesitation to ask follow-up questions because they did not want to appear uninformed or disrupt the consultation flow. One participant noted, "I wanted to ask more, but I felt the explanation was already very advanced. I was afraid I would ask the wrong question." This reveals that genomic communication could unintentionally create a subtle asymmetry between physician expertise and patient participation.

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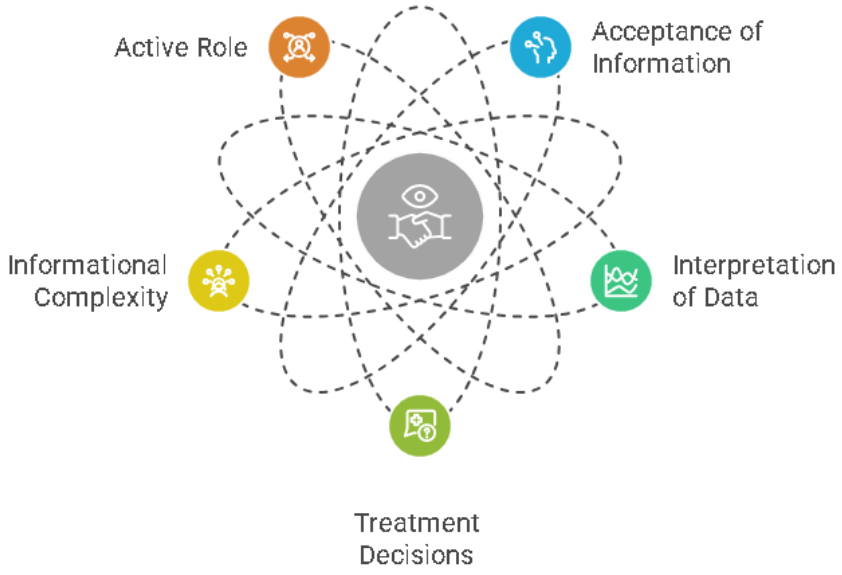
At the same time, the confusion experienced by participants did not necessarily result in rejection of pharmacogenomic testing. Rather, it positioned understanding as incomplete and ongoing. Patients frequently retained fragments of meaning, especially the idea that the treatment was being tailored to them. What remained less clear was how the genomic result translated into the physician's actual prescribing decision. Thus, the first theme shows that participants encountered pharmacogenomic communication as clinically meaningful but cognitively difficult, with unfamiliar language shaping the first layer of their lived experience.

Relying on physician trust amid limited comprehension

When direct understanding was constrained, trust in the physician emerged as the central mechanism through which participants accepted and interpreted pharmacogenomic information. Participants repeatedly conveyed that even when they could not fully understand the technical explanation, they were willing to proceed with treatment decisions because they believed the physician was acting in their best interest. Trust therefore functioned not as a passive attitude, but as an active interpretive anchor in a situation marked by informational complexity.

The Role of Trust in Pharmacogenomic Decisions



For many participants, the physician's clarity, tone, patience, and willingness to explain became more important than mastering every scientific detail. The relational dimension of communication shaped how secure they felt in responding to the proposed treatment plan. One participant explained, "I did not fully understand the genetic result itself, but I trusted my doctor because she explained calmly and made me feel that this decision was made carefully for me." Another said, "What convinced me was not that I understood the science completely, but that the doctor seemed confident and transparent." These narratives suggest that patients often evaluated the communication not only by informational content, but by interpersonal credibility.

Trust also reduced the emotional burden associated with uncertainty. Participants described how confidence in their physician enabled them to tolerate ambiguity about pharmacogenomic details. In this context, trust acted as a bridge between limited health literacy and therapeutic acceptance. A participant remarked, "I cannot say I understood everything, but I felt safe enough to continue because I believed the doctor knew what was best." This statement shows that treatment acceptance was grounded in relational assurance rather than purely technical understanding.

However, trust was not unconditional. Some participants indicated that trust was strengthened when physicians translated genomic information into simple language, linked the result to treatment consequences, and invited questions. When these elements were absent, participants reported feeling less secure, even if they still complied with treatment. One participant shared, "If the doctor only gives

scientific explanations without checking whether I understand, I feel like I am just following instructions, not really participating." This reveals that trust was closely tied to communicative inclusion. Patients did not merely need expert authority; they needed to feel recognized as participants within the therapeutic decision-making process.

Overall, this theme demonstrates that physician trust was not a secondary aspect of pharmacogenomic communication, but a primary experiential structure through which complex genomic information became acceptable, meaningful, and actionable for patients.

Negotiating hope and anxiety in personalized treatment decisions

Another major theme concerned the emotional ambivalence that accompanied personalized treatment decisions based on pharmacogenomic information. Participants frequently described a tension between hope and anxiety. On one hand, the idea that treatment could be tailored to their genetic profile generated optimism, reassurance, and a sense of individualized care. On the other hand, the same information also raised concern, uncertainty, and emotional vulnerability, particularly when participants realized that their body might respond differently from others or that previous treatments may have been less suitable.

Hope was often expressed as a response to the promise of better therapeutic accuracy. Participants felt encouraged by the possibility that treatment was no longer based solely on general protocols, but on their own biological characteristics. One participant stated, "It gave me hope because it felt like the treatment was finally being adjusted to me, not just given to everyone in the same way." Another explained, "When the doctor said the test could help choose a medicine that fits my body better, I felt more optimistic about the next stage of treatment." These accounts show that pharmacogenomics was experienced not only as a diagnostic tool, but as a symbol of personalized attention and improved care.

At the same time, hope was closely accompanied by anxiety. Several participants reported feeling unsettled by the idea that their genes could reveal vulnerabilities or complicate treatment decisions. For some, the genomic explanation introduced a new layer of uncertainty rather than resolving an existing one. One participant said, "I was hopeful, but also nervous. When they started talking about genetics, I began to wonder whether something was wrong in my body in a deeper way." Another participant reflected, "It sounded advanced and promising, but it also made me feel that my treatment was more complicated than I thought before."

This emotional duality was especially visible in moments when participants tried to connect pharmacogenomic findings with their treatment future. They were hopeful that personalized medicine could improve outcomes, but anxious about what would happen if the test showed limited drug compatibility or a higher risk of side effects. One participant explained, "I thought, what if the result means there are fewer options for me? So even though it sounds personalized, I was also afraid of what it might limit." Such statements indicate that personalized medicine was not experienced in purely positive terms; it also required patients to confront uncertainty regarding their own biological individuality.

Thus, the third theme shows that pharmacogenomic communication carried strong emotional consequences. Personalized treatment was lived as a space of possibility and vulnerability at once, where hope for precision coexisted with anxiety about what genomic individuality might reveal.

Making sense of personalized medicine through personal and social context

Participants did not interpret pharmacogenomic information in isolation. Their understanding was shaped by prior treatment experiences, family conversations, cultural assumptions about medicine, and personal beliefs about the body and illness. In this way, the meaning of personalized medicine was socially and biographically constructed. Genomic information became understandable to patients only when it could be connected to experiences already familiar to them.

Many participants interpreted the physician's explanation by comparing it to previous medication experiences, especially experiences of side effects, treatment failure, or prolonged therapeutic uncertainty. One participant shared, "When the doctor explained that my body may react

differently to medicine, I immediately thought about the time I had severe side effects before. That made the explanation feel real to me." Another participant stated, "I understood it better when I linked it to my past treatment, because before that it just sounded like abstract science." These narratives suggest that prior embodied experiences served as interpretive frameworks through which genomic explanations gained meaning.

Family and social relationships also played an important role. Some participants discussed pharmacogenomic results with spouses, children, or other relatives in order to validate their own understanding and emotional response. In several cases, these discussions helped normalize the experience; in others, they added concern. One participant remarked, "After I went home, I explained it to my family in a simpler way, that the doctors were trying to find the medicine that suits me best. That helped me accept it." Another noted, "My family became worried when they heard the word genetic. They thought it meant something hereditary or dangerous." These accounts indicate that the meaning of pharmacogenomic communication extended beyond the clinic and entered the patient's social world.

Participants also drew on broader cultural beliefs about medicine, authority, and scientific progress. Some viewed genomic-based treatment as evidence of advanced modern care and therefore interpreted it positively. Others felt cautious because highly technological medicine seemed distant from ordinary patient experience. One participant said, "It sounded sophisticated, which made me feel lucky to receive that kind of treatment, but also a bit intimidated because it seemed beyond what ordinary patients usually understand." This statement captures the simultaneous prestige and distance associated with genomic medicine.

This final theme shows that personalized medicine was not understood solely through biomedical explanation. Patients made sense of pharmacogenomic communication through lived history, family interaction, and social meaning. The experience was therefore relational and contextual, rather than purely individual or technical.

DISCUSSION

The findings indicate that patients experienced pharmacogenomic communication not simply as the delivery of biomedical information, but as a complex relational event shaped by partial understanding, trust in physicians, emotional ambivalence, and contextual meaning-making. In response to the broader question raised in the Introduction, the study shows that the acceptance and interpretation of personalized medicine are deeply grounded in lived experience rather than in technical comprehension alone.

These findings contribute to the research question by clarifying how patients subjectively understand and respond to physician communication about pharmacogenomic test results during therapeutic decision-making (Aladin et al., 2023). The study demonstrates that patient engagement with pharmacogenomics is not determined solely by the clarity of scientific explanation, but by the extent to which genomic information becomes meaningful within the patient's personal world. In this sense, the findings extend the understanding of pharmacogenomic communication beyond knowledge transfer and reveal it as an interpretive process in which patients actively connect unfamiliar genetic information with prior treatment experiences, interpersonal trust, and emotionally significant expectations about care. This contribution is important because it reframes personalized medicine as a lived clinical experience, not merely a technically improved model of drug selection.

A central contribution of this study lies in showing that limited comprehension does not necessarily prevent treatment acceptance. Instead, when scientific understanding is incomplete, trust in the physician becomes the main pathway through which pharmacogenomic information is rendered acceptable and actionable (Al-Meshkhas et al., 2025). This suggests that the success of pharmacogenomic communication depends not only on informational precision but also on the relational conditions in which the information is delivered. Patients were not passive recipients of genomic explanations; rather, they negotiated meaning through a combination of uncertainty, confidence, and situational judgment. The findings therefore answer the research question by revealing

that patients respond to pharmacogenomic communication through a layered process involving cognitive interpretation, emotional regulation, and relational reliance.

The results also make a distinctive contribution by highlighting the emotional structure of personalized medicine. Pharmacogenomic communication was experienced as both promising and unsettling. Patients associated genomic-based treatment with a more precise and individualized form of care, which generated hope and reassurance. At the same time, the same communication introduced concern, especially when genetic explanations exposed bodily difference, treatment uncertainty, or the possibility of limited therapeutic options (Ahlstrand et al., 2024). This duality suggests that personalized medicine is not lived only as progress or innovation; it is also lived as a moment of vulnerability in which patients confront the meaning of biological individuality. Such an interpretation deepens the current understanding of treatment acceptance by showing that acceptance is emotional as well as cognitive.

Another important contribution concerns the role of context in shaping meaning. The findings show that patients did not interpret pharmacogenomic results as isolated clinical facts. Instead, they understood these results through personal illness histories, prior adverse experiences, family conversations, and broader assumptions about medicine and modern care. This indicates that the meaning of pharmacogenomic communication is socially mediated and biographically grounded. As a result, effective communication in personalized medicine cannot be reduced to simplifying terminology alone; it also requires sensitivity to the patient's lived context. This insight provides a more nuanced answer to the research problem by showing that the meaning of genomic information emerges through interaction between clinical explanation and everyday life experience.

These interpretations are consistent with previous studies showing that patient understanding of pharmacogenomic testing is often incomplete, even when the perceived purpose of testing is generally appreciated. Haga et al. (2018) found that patients frequently recognized the potential value of pharmacogenomic testing while still demonstrating uncertainty about the scientific content of the results. The present findings build on that observation by showing how this partial understanding is experienced in real clinical communication. Rather than treating limited comprehension as a deficit alone, this study shows that patients often maintain engagement by relying on relational trust and practical meaning, thereby expanding the discussion from informational accuracy to lived interpretive process.

The findings also align with McCullough et al. (2020), who emphasized the importance of communication in genomic medicine and the need to translate complex scientific material into forms that patients can engage with meaningfully (Aboye et al., 2024). The present study complements that perspective by demonstrating that communication quality is not only a matter of explanation, but also of how patients feel positioned within the consultation. When participants felt invited into the conversation, they experienced greater confidence and therapeutic reassurance. When communication remained overly technical or one-directional, they described a sense of distance, even if they still complied with treatment. This extends previous literature by showing that the subjective experience of inclusion is central to how pharmacogenomic information is received.

The current findings also resonate with Van der Wouden et al. (2022), whose work suggests that patient interpretation of genetic results is shaped by more than cognitive literacy alone. The present study strengthens that conclusion by identifying emotional and social interpretation as equally important dimensions. Patients did not respond to genomic information as neutral data. They filtered it through fear, hope, prior illness narratives, and family meanings. This broader interpretive frame helps explain why understanding in personalized medicine cannot be fully captured through assessments of recall or satisfaction. The phenomenon is richer than whether patients can repeat what they were told; it includes how they internalize what the information means for their body, treatment future, and relationship with care.

In relation to Lemke et al. (2021), who highlighted practical challenges in integrating pharmacogenomics into clinical care, the present study adds a phenomenological layer to implementation concerns. Existing implementation discussions often focus on institutional readiness, provider knowledge, and infrastructure. While these issues remain crucial, the findings here indicate

that implementation is also shaped by the patient's experience of meaning. Even technically well-executed pharmacogenomic practice may remain incomplete if patients experience communication as confusing, emotionally burdensome, or disconnected from their lived realities. In this way, the study complements implementation literature by showing that patient-centered integration of pharmacogenomics requires attention to experiential quality as well as clinical workflow.

The study may also be understood through the interpretive phenomenological position that meaning is always situated and mediated by context. From this perspective, patient responses to pharmacogenomic communication are not fixed reactions to objective information, but situated interpretations emerging from embodied experience, relational trust, and social understanding. This helps explain why the same type of clinical explanation may be experienced differently across participants. What mattered was not only what was said, but how the explanation entered each participant's existing horizon of illness, treatment, and responsibility. This interpretive lens reinforces the value of phenomenology for examining pharmacogenomics, because it captures the human significance of personalized medicine in ways that standardized evaluation cannot fully access.

Overall, the present findings support, deepen, and extend prior literature by demonstrating that the experience of pharmacogenomic communication is fundamentally relational, emotional, and contextual. The study does not challenge the importance of pharmacogenomics as a scientific advancement; rather, it shows that its clinical meaning is completed through the patient's lived experience. This interpretive contribution is significant because it clarifies that the effectiveness of personalized medicine, from the patient's perspective, depends not only on biological precision but also on the quality of communication and the meanings patients are able to construct from it.

The findings carry important implications for both clinical communication and the broader implementation of personalized medicine. At a scientific level, the study suggests that pharmacogenomic communication should not be understood as a neutral transfer of technical information, but as a human encounter in which meaning is co-shaped by knowledge, trust, emotion, and context. This has direct relevance for the way personalized medicine is conceptualized in practice. If patients experience genomic information primarily through partial comprehension and relational interpretation, then the quality of pharmacogenomic care depends not only on the accuracy of the test result, but also on the communicative process through which that result becomes meaningful in the patient's life. This interpretation supports previous literature emphasizing the importance of patient-centered communication in genomic medicine and extends it by showing that meaning-making is central to treatment acceptance rather than secondary to it.

From a practical perspective, the findings indicate that healthcare professionals should communicate pharmacogenomic results in ways that are not only scientifically correct but also emotionally responsive and contextually sensitive. Patients in this study did not reject personalized medicine because of scientific complexity; instead, they attempted to work through that complexity by relying on physician trust and by linking new information to prior experiences. This suggests that effective communication should include more than simplified terminology. It should also involve checking the patient's understanding, acknowledging emotional responses, allowing space for questions, and connecting treatment explanations to the patient's own experience of illness and care. Such an approach may strengthen trust, reduce uncertainty, and improve engagement with treatment decisions. In this sense, the findings are relevant not only to pharmacogenomics but also to other areas of precision medicine where highly specialized biomedical information must be translated into lived clinical meaning.

The findings also have social and cultural significance. Patients did not interpret genomic information in isolation from their personal worlds; they understood it through family discussion, previous treatment experiences, and broader beliefs about medicine, safety, and modern healthcare. This indicates that pharmacogenomic communication is socially embedded. Its meaning is shaped not only by what occurs inside the consultation room but also by how patients carry that information into their everyday relationships and value systems. For that reason, the implications of this study extend beyond the immediate clinical population. In wider healthcare settings, especially in culturally diverse contexts, patients may engage with personalized medicine through different assumptions about trust,

authority, heredity, and risk. The study therefore underscores the importance of communication models that are flexible enough to accommodate different social meanings while still preserving clinical clarity. This broader relevance strengthens the argument that successful integration of pharmacogenomics requires attention to the lived realities through which medical innovation is actually experienced.

Another important implication concerns professional practice. The study suggests that physician competence in pharmacogenomics should be accompanied by communicative competence. Biomedical expertise alone may be insufficient if patients leave the consultation with unresolved confusion, emotional unease, or a sense of exclusion from decision-making. The findings therefore support the view that effective personalized medicine requires an integration of scientific knowledge and relational care. This implication is particularly important in settings where pharmacogenomics is still emerging, because early patient experiences may shape future acceptance of genomic-based care more broadly. When communication is experienced as trustworthy, understandable, and personally meaningful, pharmacogenomics is more likely to be accepted as a beneficial component of treatment. When communication remains overly technical or detached, its promise may be weakened at the level of patient experience.

Limitations of the Study

Several limitations should be considered when interpreting the findings. First, as with phenomenological inquiry more broadly, the purpose of the study was to generate depth of understanding rather than broad representativeness. The findings therefore illuminate the meanings attached to pharmacogenomic communication within a specific experiential context and should not be interpreted as universally applicable to all patient populations. The study offers insight into how the phenomenon was lived and understood by a focused group of participants, but the meanings identified may differ across other clinical, cultural, or institutional settings.

Second, the study was based on retrospective narrative accounts. Participants described experiences that had already occurred, and those accounts may have been shaped by memory, later reflection, or the outcome of subsequent treatment experiences. Although such reflection is valuable in phenomenological research because it reveals how experience is interpreted over time, it may also influence the immediacy of recall. In addition, the depth and richness of the data depended on participants' willingness and ability to articulate complex emotions and meanings related to genomic information. Some dimensions of experience may therefore have remained unspoken or only partially expressed.

Third, the study focused specifically on patients who had already undergone pharmacogenomic testing and had received physician explanations regarding the results. This focus was necessary to maintain coherence around the phenomenon, but it also means that the findings do not capture the perspectives of patients who declined testing, lacked access to personalized medicine, or received genomic information through different communicative pathways. Similarly, the study did not aim to compare different clinical specialties or institutional models of pharmacogenomic care, and therefore cannot determine how strongly the themes may vary across specific healthcare systems.

A further limitation concerns interpretive scope. Because the study adopted an interpretive phenomenological approach, the findings reflect a contextual reading of lived experience rather than a claim to objective completeness. This is consistent with the philosophical basis of the study, yet it also means that the themes should be understood as interpretive constructions grounded in participant narratives rather than exhaustive descriptions of all possible experiences. Rather than weakening the study, this limitation clarifies the nature of its contribution: the findings provide depth, nuance, and experiential insight, but not universal generalization. These limitations also point to important directions for further inquiry.

Prospective Directions for Future Research

Future research may build on these findings by examining how patient experiences of pharmacogenomic communication vary across different clinical populations, treatment settings, and cultural contexts. Because the present study shows that meaning is shaped by trust, prior illness experience, and social interpretation, further phenomenological research could explore whether these

elements take different forms in oncology, psychiatry, cardiovascular care, or other areas where pharmacogenomics is increasingly applied. Comparative studies across healthcare environments may help clarify how institutional culture and communication practices influence the lived experience of personalized medicine.

Further inquiry may also extend beyond the patient perspective to examine how physicians, genetic counselors, or other healthcare professionals experience the challenges of communicating pharmacogenomic results. Such work would be valuable because communication is relational, and a fuller understanding of the phenomenon may emerge by considering how both sides of the clinical encounter negotiate complexity, uncertainty, and responsibility. In addition, longitudinal qualitative studies could explore how patients' interpretations of pharmacogenomic information evolve over time, particularly as treatment outcomes, side effects, or family discussions reshape the meaning of the original consultation.

The present findings also open possibilities for applied research aimed at improving clinical communication in personalized medicine. Future studies could investigate how communication strategies might be developed or refined to better support patient understanding, emotional comfort, and trust while preserving scientific accuracy. Such research would be especially valuable if grounded in the experiential themes identified here, since interventions informed by lived experience are more likely to address the realities patients actually face. In this way, the current study contributes not only to phenomenological understanding but also to the future development of more humane and context-sensitive approaches to pharmacogenomic care.

Finally, the study suggests a broader question for future scholarship: how can personalized medicine remain truly patient-centered when its scientific foundations become increasingly complex? This question extends beyond pharmacogenomics alone and touches on the future of precision medicine as a whole. By demonstrating that patients interpret genomic information through lived, relational, and emotional frameworks, the present study provides a foundation for future research that seeks to align biomedical innovation with the meanings through which patients experience care. Its prospective contribution, therefore, lies in helping the field move toward a model of personalized medicine that is not only biologically precise, but also experientially meaningful.

CONCLUSION

This study examined how patients experience and interpret physician communication of pharmacogenomic test results within the context of personalized medicine. The findings reveal that patients engage with pharmacogenomic information through a complex process shaped by limited comprehension, reliance on physician trust, emotional ambivalence, and contextual meaning-making. These results demonstrate that treatment acceptance does not depend solely on scientific understanding, but emerges from how genomic information becomes meaningful within patients' lived experiences. By addressing the limitations of previous outcome-focused research, this study provides a deeper understanding of pharmacogenomic communication as a relational and experiential phenomenon rather than a purely technical interaction. The study contributes to the field by highlighting the importance of integrating communication quality and patient context into the implementation of personalized medicine. Practically, these findings suggest that personalized medicine should be supported by patient-centered communication strategies that help physicians explain pharmacogenomic results in ways that are understandable, emotionally sensitive, and relevant to individual treatment decisions. However, this study is limited by its focus on patients' reported experiences within a specific clinical context, which may affect the transferability of the findings to other healthcare settings, patient populations, or models of pharmacogenomic implementation. Future research may extend these insights by exploring diverse clinical settings and developing communication strategies that align more closely with patients' lived realities.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this article.

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