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Original Article

Patient-Clinician Communication, Care Coordination, Relational Continuity, and Treatment-Related Anxiety in Gynecologic Oncology

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ABSTRACT

Background: Treatment-related anxiety is an important concern among patients with gynecologic malignancies, particularly during diagnostic evaluation, treatment planning, and transitions between healthcare services. Patient–clinician communication, care coordination, and relational continuity may be associated with psychological experiences during these periods, although their independent contributions remain insufficiently characterized. Objective: To examine the associations of patient–clinician communication quality, perceived care coordination, and relational continuity/navigation support with treatment-related anxiety among adults with gynecologic malignancies after adjustment for demographic and clinical characteristics. Methods: A cross-sectional quantitative analysis was conducted using structured participant-level data from 240 adults with gynecologic malignancies. Communication quality, care coordination, relational continuity/navigation support, and treatment-related anxiety were assessed using study-specific questionnaires comprising 8, 8, 6, and 8 items, respectively, rated on five-point Likert scales. Internal consistency was assessed using Cronbach's alpha. Pearson correlation, independent-samples t-tests, one-way analysis of variance, and hierarchical multiple linear regression were used to examine associations and group differences. The adjusted regression accounted for age, cancer stage, cancer type, initial treatment, diagnosis-to-treatment interval, and perceived family support. Results: The questionnaire composites demonstrated high internal consistency, with Cronbach's alpha values of 0.919 for communication quality, 0.914 for care coordination, 0.905 for relational continuity/navigation support, and 0.926 for treatment-related anxiety. Anxiety was inversely correlated with communication quality ($r = -0.465$), care coordination ($r = -0.392$), and relational continuity/navigation support ($r = -0.445$; all $p < 0.001$). Participants with advanced-stage disease reported higher anxiety than those with early-stage disease (mean difference = 0.377; 95% CI: 0.194–0.560; $p < 0.001$; Cohen's $d = 0.53$). In the fully adjusted regression, communication quality ($\beta = -0.339$), care coordination ($\beta = -0.233$), and relational continuity/navigation support ($\beta = -0.289$) remained inversely associated with anxiety (all $p < 0.001$). Higher cancer stage ($\beta = 0.292$) and longer diagnosis-to-treatment intervals ($\beta = 0.256$) were associated with greater anxiety, whereas stronger family support was associated with lower anxiety ($\beta = -0.121$; $p = 0.010$). The final model explained 55.9% of anxiety-score variance (adjusted $R^2 = 0.532$), with the three care-process variables contributing an additional 37.0 percentage points beyond the demographic and clinical covariates ($\Delta R^2 = 0.370$; $p < 0.001$). Conclusion: Better perceived patient–clinician communication, care coordination, and relational continuity/navigation support were independently associated with lower treatment-related anxiety among adults with gynecologic malignancies. These findings highlight the relevance of interpersonal and organizational care experiences alongside clinical characteristics. Prospective studies and further validation of the study-specific measures are needed to establish temporal relationships and evaluate potential clinical applications. Keywords: Gynecologic Neoplasms; Treatment-Related Anxiety; Patient–Clinician Communication; Care Coordination; Continuity of Care; Patient Navigation; Cross-Sectional Studies.

INTRODUCTION

Psychological distress is an important component of the clinical burden experienced by people diagnosed with cancer. Anxiety may emerge when an individual first receives a diagnosis and continue during diagnostic clarification, staging, treatment selection, and the period before treatment begins. A meta-analysis of interview-based studies across oncological, hematological, and palliative-care settings established that anxiety and adjustment disorders represent substantial concerns in cancer care (1). However, psychological experiences are not uniform across patients: a comparative study found differences in anxiety and depression by cancer type, sex, and age (2). In gynecologic oncology, uncertainty surrounding prognosis and treatment is accompanied by concerns that may involve sexuality, reproductive capacity, fertility, intimate relationships, body image, and the anticipated effects of surgery or systemic treatment. A systematic review and meta-analysis of ovarian cancer studies identified anxiety and depression as important psychosocial concerns in this population (3). These findings support the need to consider emotional wellbeing alongside the biological severity and treatment requirements of gynecologic malignancies.

Psychological difficulties may remain unrecognized unless they are assessed as part of routine cancer care. The introduction of distress screening in a gynecologic oncology service demonstrated the practical relevance of actively identifying psychological needs rather than relying exclusively on patients to initiate conversations (4). Similarly, an investigation at a large urban gynecologic cancer center documented psychological distress among patients and reinforced the rationale for systematic attention to emotional wellbeing (5). The consequences of distress extend

beyond the immediate response to a diagnosis. Research with gynecological cancer survivors has linked distress to unmet information and supportive-care needs (6), while a qualitative evidence synthesis described patients' continuing need for timely, comprehensible information, emotional support, continuity, and practical assistance across the care pathway (7). A systematic review involving women with gynecologic cancer and their caregivers likewise showed that supportive-care needs vary across the disease trajectory and may persist during transitions into treatment and follow-up (8). Together, these findings suggest that emotional adjustment should be considered in relation to patients' encounters with healthcare services as well as their clinical circumstances.

The transition from cancer diagnosis to the commencement of treatment may be particularly demanding because patients must interpret complex clinical information while navigating unfamiliar organizational processes. Pathology and imaging findings, stage-specific recommendations, treatment options, expected adverse effects, specialist referrals, appointment schedules, and responsibilities for subsequent contact can become difficult to integrate into a coherent plan. A patient may understand the diagnosis yet remain uncertain about whether the next referral has been arranged, which team is responsible, or whom to contact when an expected appointment or result is delayed. Such uncertainty can intensify a sense of lost control, especially when information is inconsistent or administrative transitions are poorly explained. In a comparison of women with gynecologic and breast cancers, unmet information and psychosocial support needs were associated with poorer quality of life and greater emotional distress (9). Although these observational relationships do not establish that deficient service processes cause anxiety, they provide a rationale for examining patients' experiences of communication and continuity during treatment planning.

Patient–clinician communication offers a useful conceptual framework for understanding these experiences. The National Cancer Institute's model of patient-centered communication in cancer care encompasses exchanging information, responding to emotions, managing uncertainty, fostering therapeutic relationships, supporting decisions, and enabling patient self-management (10). These functions are interconnected: information is more likely to be useful when patients can understand its implications, express their fears, participate in decisions, and identify an actionable next step. The American Society of Clinical Oncology consensus guideline similarly emphasizes clear information exchange, empathy, elicitation of patient goals, shared decision-making, and communication during difficult clinical discussions (11). For a patient moving between diagnosis and treatment, communication quality therefore includes more than the accuracy of an isolated consultation. It also involves whether explanations are timely and understandable, whether messages remain consistent across professionals, and whether the patient knows when additional information or action should be expected.

Communication has particular importance in gynecologic oncology because decisions may concern prognosis, treatment intensity, reproductive or sexual functioning, and changes in personal and family roles. A Society of Gynecologic Oncology evidence-based review identified advanced communication skills as an important component of high-quality care, including emotional acknowledgment, prognostic discussions, shared decisions, and support during transitions (12). Earlier oncology scholarship also emphasized that effective clinician communication is central to patient understanding, satisfaction, adjustment, and participation in treatment decisions (13). Evidence-based recommendations for cancer care further advocate responding sensitively to emotions, verifying patients' understanding, and maintaining accurate and coherent messages throughout clinical encounters (14). These considerations are relevant when multiple professionals provide information at different points in the pathway: technically correct statements may still leave patients uncertain if they appear contradictory, arrive without adequate context, or fail to clarify responsibility for the next step.

Evidence from broader oncology settings supports an association between information quality and psychological wellbeing. Husson and colleagues' systematic review examined how information provision relates to health-related quality of life, anxiety, and depression among cancer survivors, indicating the importance of both the availability and adequacy of information (15). A systematic review of cancer patients' information needs identified recurring priorities concerning diagnosis, prognosis, available treatments, adverse effects, and sources of assistance (16). Tariman and colleagues similarly identified disease-related and treatment-related information among patients' central priorities following a cancer diagnosis (17). Yet information provision is not simply a matter of volume: extensive explanation may be difficult to process when patients are distressed, whereas information tailored to a patient's concerns and readiness can be more meaningful. A systematic review of clinician characteristics and communication in oncology highlighted the relevance of clinician behaviors and communication patterns to patient-related outcomes (18). Considered together, these studies support examination of patients' perceived clarity, consistency, accessibility, and timing of communication, rather than relying solely on the amount of information delivered.

Approaches that make patients' concerns visible during encounters provide further support for a multidimensional concept of communication quality. A systematic review found that the use of patient-reported outcomes in oncology can facilitate communication by making symptoms, concerns, and priorities more explicit during consultations (19). The SPIKES protocol offers an established example of structured communication in difficult conversations, encompassing preparation of the setting, assessment of patient perception, invitation to receive information, knowledge sharing, empathic response to emotions, and discussion of subsequent strategy (20). Although neither use of this protocol nor patient-reported outcome systems is assumed in the present study, the underlying principles help distinguish the clinical content of a message from the manner in which it is communicated. Clear explanations of diagnostic findings, realistic expectations for future contact, adequate opportunities for questions, and explicit explanations for changes or delays may all be relevant to treatment-related uncertainty. Accordingly, the first conceptual proposition is that patients who perceive higher communication quality may report lower treatment-related anxiety; this proposition concerns an association, not an experimentally demonstrated communication effect.

Communication during individual encounters is only one aspect of the patient's experience. Continuity of care concerns whether successive encounters and services are connected in a way that is coherent to the person receiving care. Haggerty and colleagues distinguished three complementary forms of continuity: informational continuity, through the appropriate transfer and use of knowledge; management continuity, through a consistent and coordinated approach to changing care needs; and relational continuity, through an ongoing therapeutic relationship or dependable clinical contact (21). An analysis of theoretical models and measurement tools in cancer care similarly emphasized continuity as a multidimensional phenomenon experienced across services and over time (22). These distinctions are especially relevant in gynecologic oncology, where diagnostic assessment and treatment may involve gynecologic oncologists, surgeons, pathologists, radiologists, medical and radiation oncologists, nursing staff, primary-care professionals, and psychosocial-support services. A patient may have satisfactory interactions with individual clinicians while still perceiving the overall pathway as fragmented when information, appointments, or decisions are not coordinated between teams.

Care coordination refers more specifically to the alignment of activities and responsibilities across providers and service settings. For patients, coordination may be reflected in clear referrals, dependable handovers, accessible test results, logically arranged appointments, and the ability to identify the team responsible for each phase of care. A systematic review and meta-analysis spanning more than three decades of cancer-care coordination research considered a range of coordination strategies and outcomes, while also demonstrating substantial heterogeneity in how interventions and their effects were evaluated (23). The possibility that coordination influences patient experience is therefore supported by existing evidence, but the mechanisms and outcomes cannot be assumed to be uniform across settings. Conceptually, perceived coordination differs from communication quality: a clinician may explain treatment well even when appointments are poorly organized, and a pathway may be administratively efficient while still leaving patients insufficiently informed about its progression.

Patient navigation developed in part as a response to barriers that impede movement through complex cancer services. Freeman and Rodriguez described navigation as a patient-centered approach intended to identify and reduce obstacles to timely and appropriate care (24). Subsequent work broadened the practical scope of navigation to include assistance with appointments, referrals, information, access, communication, and links to supportive or social resources (25). Navigation can involve designated personnel and structured programs, but the patient's perceived ability to obtain reliable guidance is a related, though not identical, concept. In particular, access to a known professional, a clear contingency plan when appointments fail to occur, and support in resolving referral problems may reduce the burden of managing the pathway alone. This distinction is important because relational continuity and perceived navigation support can be studied without assuming that every patient has received a formal navigation intervention.

Empirical work provides reasons to assess these experiences separately from communication and coordination. A systematic review and meta-analysis by Wells and colleagues evaluated patient navigation in relation to satisfaction with cancer care. Randomized studies suggested improvement, whereas the pooled results from nonrandomized studies did not establish a statistically significant association; moreover, satisfaction is not equivalent to anxiety (26). A more recent overview of systematic reviews described the expanding use of navigation across the cancer-care continuum and its relevance where service fragmentation, social disadvantage, and practical barriers interfere with care (27). A systematic review focused on navigation during cancer treatment likewise identified potential benefits but also variability in program delivery and outcome assessment (28). Qualitative synthesis adds a patient-centered perspective: individuals receiving navigation services describe the value of practical instructions, credible contacts, assistance in accessing care, and emotional support (29). The combined evidence suggests that organizational

assistance and relational reassurance may contribute differently to the care experience. However, improvements in navigation-related satisfaction or access should not automatically be interpreted as proven reductions in treatment-related anxiety; that outcome warrants direct assessment.

Uncertainty may connect perceived organizational discontinuity with psychological responses during the cancer pathway. In a multiperspective qualitative study of people affected by cancer of unknown primary, Richardson and colleagues described experiences of uncertainty and anxiety arising during diagnosis and treatment when patients struggled to understand what was happening and what would follow (30). Although the clinical context differs from known gynecologic malignancies, the broader issue of unclear pathways is relevant when patients await referrals, results, treatment decisions, or changes in appointments. A consistent point of contact may help patients obtain clarification, whereas repeated requests for the same information or uncertainty over responsibility may increase the perceived effort required to keep care progressing. These experiences illustrate why care coordination and relational continuity/navigation are related but distinguishable constructs: one concerns how services function together, while the other concerns whether patients experience dependable interpersonal guidance and practical assistance.

Waiting for treatment introduces another dimension of uncertainty, because elapsed time can have both clinical and psychological significance. A systematic review and meta-analysis by Hanna and colleagues associated delays in cancer treatment with increased mortality risk across multiple cancer indications, although the magnitude and applicability of this association depend on tumor type, treatment modality, and clinical circumstances (31). Consequently, a patient's concern about waiting cannot simply be dismissed as an emotional response to administration; some delays may also have genuine clinical importance. Conversely, not every diagnosis-to-treatment interval represents avoidable or unsafe delay, because diagnostic evaluation and individualized planning can require time. Qualitative research on testing-related anxiety in cancer has described how awaiting procedures or results may produce worry, uncertainty, and perceived loss of control (32). The patient experience may therefore depend not only on the duration of an interval but also on whether the reason for waiting, the expected schedule, and the responsible team are clear. In an observational analysis, the diagnosis-to-treatment interval is appropriately considered a clinical and organizational covariate rather than being interpreted as a direct measure of poor coordination.

Social relationships may shape how patients manage both illness-related uncertainty and the practical demands of care. Among women undergoing care for gynecologic malignancies, Kimmel and colleagues identified the importance of social support among those experiencing elevated anxiety (33). A systematic review of cancer survivorship literature distinguished the potentially favorable relationships of social support with psychological functioning from the adverse implications of social constraints, such as situations in which patients feel unable to discuss their concerns (34). Evidence from a systematic review and meta-analysis of peer-support interventions also suggests that structured peer support may improve psychosocial outcomes, including anxiety, in some cancer populations (35). Family support should nevertheless be distinguished from professionally delivered navigation and from formal peer-support programs. Relatives may provide emotional reassurance, maintain appointment records, arrange transport, request explanations, or help patients contact services; these activities may alleviate practical burdens, but they can also reflect gaps in formal coordination when families must repeatedly intervene. Family support is therefore a relevant accompanying variable when assessing the association between perceived care processes and anxiety.

Clinical severity and treatment characteristics provide additional reasons for caution when interpreting psychological outcomes. Patients with more advanced disease may face greater prognostic uncertainty, treatment burden, or disruption of daily activities, yet psychological distress does not necessarily follow stage in a uniform way. A systematic review of ovarian cancer emphasized that distress is associated with a combination of disease-related, treatment-related, and psychosocial factors rather than any single clinical characteristic (36). Cancer type may also influence the nature of anticipated procedures, fertility or sexual concerns, symptom burden, and available treatment pathways. Similarly, intended or initial treatment with surgery, chemotherapy, radiotherapy, or combined approaches can create different informational needs and scheduling demands. These characteristics may be associated with anxiety independently of perceived communication or continuity. Age, cancer stage, cancer type, planned treatment, diagnosis-to-treatment interval, and family support consequently provide clinically relevant covariates for evaluating whether the three care-process dimensions contribute additional explanatory information in an adjusted observational model.

The clinical relevance of studying care processes also emerges from research on psychosocial support and supportive interventions. A systematic review and meta-analysis of psychological supportive-care interventions for patients with cervical cancer considered strategies intended to address the emotional consequences of diagnosis and treatment

(37). A recent qualitative study in advanced ovarian cancer explored the informational needs of patients and caregivers and communication with healthcare professionals concerning disease, pharmacological treatment, and nonpharmacological support (38). A wider systematic review and meta-analysis of nonpharmacologic interventions for people with cancer and their family caregivers also evaluated approaches for managing distress, anxiety, and depression (39). These studies support the importance of combining attention to emotional wellbeing with effective clinical information and service access. At the same time, evidence that a psychological or navigation intervention can improve a particular outcome does not establish that higher patient-reported communication or coordination scores necessarily produce a reduction in anxiety. Observational findings can instead identify potentially relevant associations and help formulate questions for later prospective or interventional research.

Taken together, the evidence describes several connected but analytically distinct components of the gynecologic oncology experience. Communication quality concerns the comprehensibility, consistency, responsiveness, and timing of explanations; care coordination concerns how responsibility, information, referrals, and appointments are organized across services; and relational continuity/navigation support concerns whether patients have dependable contacts and sufficient practical guidance as they move through care. Treatment-related anxiety is a different outcome construct, encompassing worry and uncertainty about the progress, scheduling, and consequences of the treatment pathway. The distinction is clinically useful, although patient-reported assessments of these domains can share perceptions and item content, and their empirical separation requires appropriate measurement evaluation. Existing studies provide evidence for distress, informational needs, supportive care, continuity, and navigation, but the studies cited above have varied in population, exposure definitions, intervention delivery, and outcomes. In particular, findings on satisfaction, unmet needs, and general psychological distress cannot be assumed to quantify the independent associations of all three perceived care-process domains with treatment-related anxiety among patients with gynecologic malignancies.

This uncertainty motivates evaluation of the three domains within one adjusted framework. The present cross-sectional study examines patient–clinician communication quality, perceived care coordination, and relational continuity/navigation support in relation to treatment-related anxiety among 240 adults with gynecologic cancer. Its primary objective is to determine whether each care-process score is associated with anxiety and whether the three scores collectively account for additional variation after consideration of age, cancer stage, cancer type, planned initial treatment, the diagnosis-to-treatment interval, and family support. Four hypotheses guide the analysis: higher perceived communication quality will be associated with lower treatment-related anxiety (H1); better perceived care coordination will be associated with lower anxiety (H2); greater relational continuity/navigation support will be associated with lower anxiety (H3); and inclusion of the three care-process scores together will explain additional variance in anxiety beyond the specified demographic and clinical covariates (H4). By addressing these questions, the analysis seeks to clarify the relative and combined associations of organizational and relational aspects of care with patient-reported anxiety, without inferring a causal direction from cross-sectional observations.

MATERIALS AND METHODS

A cross-sectional quantitative study design was used to examine the associations of patient–clinician communication quality, perceived care coordination, and relational continuity/navigation support with treatment-related anxiety among adults with gynecologic malignancies. The analysis was based on a structured participant-level dataset containing records for 240 adults with gynecologic cancer, with ages ranging from 25 to 82 years. The dataset was organized in a Microsoft Excel workbook containing demographic and clinical characteristics, together with item-level questionnaire responses for the four principal study constructs. Each participant constituted one unit of analysis. The principal outcome was treatment-related anxiety, while communication quality, care coordination, and relational continuity/navigation support were examined as the primary explanatory variables. The cross-sectional analytical framework permitted assessment of the strength and direction of associations between these variables while accounting for specified demographic and clinical characteristics. Because all associations were evaluated within an observational dataset, the analytical framework did not establish temporal ordering or causal relationships between the measured constructs.

The clinical variables comprised age, type of gynecologic malignancy, cancer stage, initial treatment category, interval between diagnosis and treatment, and perceived family support. The recorded malignancies included ovarian, cervical, endometrial, vaginal, and vulvar cancers. Cancer stage was represented by categories I, II, III, and IV, and initial treatment was classified as surgery, chemotherapy, radiotherapy, or combined treatment. The diagnosis-to-treatment interval was expressed in days, allowing the duration between these clinical milestones to be examined as a continuous

variable. Perceived family support was recorded on a five-point scale, with higher values representing greater support. These variables were incorporated into the analytical framework because clinical severity, treatment requirements, waiting periods, and social support may be associated with psychological experiences during cancer care (31,33,34,36).

The assessment framework comprised four multi-item questionnaire constructs: patient–clinician communication quality, care coordination, relational continuity/navigation support, and treatment-related anxiety. The selection of care-process domains was informed by the established conceptual distinction between patient-centered communication, coordination of services, and continuity of care. Patient-centered communication encompasses the exchange of comprehensible information, responsiveness to patient concerns, support for decision-making, and management of uncertainty (10,11). Continuity of care incorporates informational, management, and relational dimensions, whereas care coordination concerns the organization and integration of activities across healthcare professionals and services (21–23). Patient navigation addresses practical and informational barriers encountered during movement through complex cancer-care pathways (24,25). These conceptual distinctions provided the basis for organizing the questionnaire items into separate domains reflecting patients' perceptions of their healthcare experiences.

Patient–clinician communication quality was measured using eight questionnaire items designated COM1–COM8. The items addressed whether healthcare professionals explained the diagnosis in understandable language, provided clear information about subsequent treatment steps, allowed adequate opportunities to ask questions, communicated expected timelines for further information or results, maintained consistency of information across clinicians, encouraged discussion of concerns and fears, provided information at an appropriate time, and explained delays or modifications in the treatment plan. Collectively, these items represented the clarity, accessibility, consistency, timing, and responsiveness of communication. Their conceptual content corresponded to recognized principles of patient-centered cancer communication, including information exchange, emotional responsiveness, shared understanding, and support during treatment-related decisions (10–12). Responses were scored so that higher composite values indicated more favorable perceived communication quality.

Perceived care coordination was assessed using eight items designated CC1–CC8. These items evaluated whether patients understood which healthcare team was responsible for care at each stage, perceived transitions between departments and specialists as coordinated, believed that healthcare professionals had access to relevant clinical information, rarely needed to repeat the same medical history, considered appointments and investigations to be appropriately organized, knew whom to contact regarding treatment-pathway questions, received information when responsibility moved between teams, and believed that a responsible professional or team maintained an overall understanding of the treatment pathway. The measure therefore focused on patients' perceptions of organizational coherence, information sharing, accountability, scheduling, and clinical handovers. These components were consistent with established descriptions of management and informational continuity and with the wider literature on coordination of cancer services (21–23). Higher scores represented better perceived coordination of care.

Relational continuity/navigation support was evaluated using six items designated NAV1–NAV6. These items addressed access to a reliable healthcare professional for clarification, knowledge of appropriate actions when an expected appointment or telephone call did not occur, availability of assistance in managing appointments and referrals, the burden of personally coordinating care, the frequency with which family members needed to contact healthcare services to maintain progress, and confidence that important clinical information would not be lost between teams. This construct combined the interpersonal dimension of having a dependable point of contact with the practical guidance required to navigate the treatment pathway. The conceptual basis was informed by relational continuity and patient-navigation frameworks, which emphasize dependable therapeutic relationships, identification of service barriers, and assistance with care transitions (21,24,25). Items NAV4 and NAV5 were negatively worded relative to the intended scoring direction and were reverse-coded before composite calculation. Following this transformation, higher scores represented greater perceived continuity and navigation support.

Treatment-related anxiety was assessed using eight questionnaire items designated ANX1–ANX8. The items addressed anxiety while waiting for the next stage of treatment, concern about the possible health consequences of delays, anxiety arising from uncertainty about subsequent steps, worry that appointments or referrals might have been missed, distress associated with changes in treatment schedules, difficulty relaxing while awaiting treatment-related information, uncertainty about whether the treatment pathway was progressing appropriately, and the perceived anxiety-reducing effect of clear explanations from healthcare professionals. The outcome construct was directed toward anxiety associated with treatment planning, waiting, uncertainty, and the organization of care rather than a

comprehensive diagnostic assessment of generalized anxiety or another psychiatric disorder. The selection of these concerns was conceptually consistent with research describing psychological distress related to unmet informational needs and uncertainty during cancer-related investigations and treatment transitions (9,30,32). Item ANX8 was reverse-coded to maintain the specified direction of composite scoring. Higher total composite values indicated greater treatment-related anxiety.

All 30 questionnaire items were recorded using five-point Likert response categories ranging from 1 (strongly disagree) to 5 (strongly agree), with intermediate categories representing disagreement, neutrality, and agreement. Responses were coded numerically from 1 to 5. Negatively directed items were transformed using the formula 6 minus the original item response, thereby reversing the response scale while preserving its original numerical range. This procedure was applied to NAV4, NAV5, and ANX8 before the construction of composite scores. For each of the four constructs, the composite score was calculated as the arithmetic mean of the relevant item responses, with all items contributing equally to their respective scales. Communication quality and care coordination scores each represented the mean of eight items, relational continuity/navigation support represented the mean of six items, and treatment-related anxiety represented the mean of eight items. Mean-based scoring retained the original 1–5 metric and allowed direct interpretation of the direction of each construct. The questionnaire items and their coding directions are presented in Appendix A.

The questionnaire scales were study-specific measures organized around the proposed conceptual domains. Their internal consistency was evaluated within the analyzed sample using Cronbach's alpha after applying the specified reverse-coding procedures. Reliability analyses were conducted separately for communication quality, care coordination, relational continuity/navigation support, and treatment-related anxiety. Internal consistency was interpreted as evidence of the degree to which items within each proposed scale were interrelated, rather than as independent confirmation of the underlying factor structure or the clinical validity of the measures. The composite scales were subsequently treated as approximately continuous variables for the planned correlation, group-comparison, and regression analyses. This analytical treatment allowed associations to be expressed on the original mean-score metric while retaining the directional meaning of the individual constructs.

The initial data-processing procedures involved organization of the demographic, clinical, and questionnaire variables within the structured workbook. The analytical dataset contained 240 participant records, with no missing values reported for the included variables. Accordingly, the reported analyses used the complete set of 240 observations without requiring imputation of missing questionnaire or covariate values. Reverse-coded items were transformed before composite scores were calculated, and the derived variables were used consistently across the descriptive and inferential analyses. The analytical file did not include directly identifying participant information. Aggregate results were used for the presentation of participant characteristics, scale statistics, group comparisons, and regression findings.

Descriptive statistics were calculated to characterize the study population and summarize the distributions of clinical and questionnaire variables. Categorical variables, including cancer type, stage, and treatment category, were expressed as frequencies and percentages. Continuous variables, including age, diagnosis-to-treatment interval, perceived family support, and questionnaire composite scores, were summarized using means, standard deviations, and observed ranges where appropriate. Descriptive analyses were also used to examine the distributional characteristics of the four questionnaire composites. Skewness was considered when evaluating their suitability for parametric analyses. Cronbach's alpha coefficients were calculated for the four questionnaire scales to evaluate their internal consistency following the coding procedures.

Bivariate associations among communication quality, care coordination, relational continuity/navigation support, and treatment-related anxiety were examined using Pearson product–moment correlation coefficients. The direction and magnitude of each coefficient were used to describe the relationships among the four composite scores. Correlations involving treatment-related anxiety addressed the first three study hypotheses, while correlations among the three care-process variables provided information about the degree of linear association between explanatory constructs. The principal correlation estimates were accompanied by two-sided significance tests, and 95% confidence intervals were calculated for the relationships between each care-process score and anxiety. These analyses provided an initial assessment of the unadjusted relationships before demographic and clinical characteristics were incorporated into the multivariable models.

Differences in treatment-related anxiety according to cancer stage were evaluated using both two-group and four-group comparisons. For the clinically oriented two-group analysis, stages I and II were combined into an early-stage category, and stages III and IV were combined into an advanced-stage category. The resulting groups comprised 137 and 103 participants, respectively. An independent-samples t-test was used to compare mean anxiety scores between the early-stage and advanced-stage groups. The difference in group means was reported with its 95% confidence interval and associated two-sided p-value. Cohen's d was calculated to describe the standardized magnitude of the difference between these groups. This comparison was intended to provide a clinically interpretable description of anxiety according to broad disease-stage categories rather than to imply that stages within each combined group were equivalent in their clinical characteristics.

A separate one-way analysis of variance (ANOVA) was used to compare treatment-related anxiety across the four individual cancer stages. This analysis retained the original stage categories and allowed assessment of differences that might not be apparent after combining adjacent stages. The overall group effect was evaluated using the F statistic and corresponding p-value, while eta squared was used to quantify the proportion of observed anxiety-score variance attributable to differences between the stage groups. Homogeneity of variance was evaluated using Levene's test. Following the overall stage ANOVA, Tukey's post-hoc procedure was used for pairwise comparisons between individual stages. Additional exploratory one-way ANOVAs were conducted to compare mean anxiety across the five gynecologic cancer types and four initial-treatment categories. These comparisons were interpreted as unadjusted group differences rather than independent effects after controlling for other clinical characteristics.

Hierarchical multiple linear regression was used as the primary multivariable analytical approach. Treatment-related anxiety was specified as the dependent variable, while demographic and clinical covariates were entered in the first block and the three care-process scores were entered in the second block. The first block included age, cancer stage, diagnosis-to-treatment interval, perceived family support, cancer-type indicators, and initial-treatment indicators. Age and diagnosis-to-treatment interval were entered as continuous variables. Family support, recorded on a five-point scale, was treated as a continuous covariate. Cancer stage was coded ordinally from 1 to 4 and entered as a single numerical covariate, corresponding to an assumed linear association across successive stage categories in the primary adjusted model.

Categorical cancer type was represented by four indicator variables, with ovarian cancer serving as the reference category. The indicators compared cervical, endometrial, vulvar, and vaginal cancer against the ovarian cancer reference group. Similarly, three indicator variables represented initial-treatment categories, with surgery serving as the reference category. The treatment indicators compared chemotherapy, radiotherapy, and combined treatment with surgery. This coding strategy allowed the categorical variables to be incorporated into the linear regression framework without treating nominal categories as continuous quantities. Together with age, stage, diagnosis-to-treatment interval, and family support, these indicators constituted 11 covariate terms in the first regression block.

In the second regression block, communication quality, care coordination, and relational continuity/navigation support composite scores were entered simultaneously in addition to the previously specified demographic and clinical covariates. The hierarchical structure was used to determine whether the three care-process measures collectively explained additional variance in treatment-related anxiety beyond the variance accounted for by the control variables. The increase in the coefficient of determination between the first and second blocks was evaluated using the change in R-squared and the associated F-change statistic. The final model was summarized using R-squared, adjusted R-squared, the overall F statistic, and the corresponding p-value. Individual associations were evaluated using unstandardized regression coefficients, standard errors, standardized beta coefficients, 95% confidence intervals, and two-sided p-values. The unstandardized coefficients represented the estimated difference in anxiety score associated with a one-unit difference in the corresponding explanatory variable, conditional on the other variables included in the model.

The hierarchical regression directly addressed the fourth hypothesis concerning incremental explanatory variance. In addition, a separate simultaneous multiple linear regression containing only communication quality, care coordination, and relational continuity/navigation support was used to evaluate their combined associations with anxiety without adjustment for demographic and clinical characteristics. In this secondary model, all three care-process scores were entered together as independent variables. Comparison of the care-process-only and fully adjusted models permitted examination of the direction and relative magnitude of associations before and after adjustment for the specified covariates. Because these analyses were cross-sectional, regression coefficients were interpreted as adjusted associations rather than causal effects or evidence of intervention effectiveness.

Regression diagnostics were examined to assess the suitability and numerical stability of the linear models. Residual distributions and residual-versus-predicted-value patterns were evaluated in relation to the assumptions of approximate residual normality, linearity, and homoscedasticity. The Jarque–Bera test was used to evaluate departures from residual normality, and the Breusch–Pagan test was used to assess heteroscedasticity. The Durbin–Watson statistic was examined as a measure of residual autocorrelation. Multicollinearity among explanatory variables was assessed using variance inflation factors. Cook's distance was used to evaluate the potential influence of individual observations on the fitted regression model. Standardized residuals and predicted values were also included in the diagnostic procedures. These assessments were intended to identify substantial departures from model assumptions and observations with disproportionate influence on estimated coefficients.

Statistical procedures were specified using IBM SPSS-compatible syntax, including commands for reverse-scoring, composite construction, scale reliability, descriptive statistics, Pearson correlations, independent-samples t-tests, one-way ANOVAs, indicator-variable construction, and hierarchical multiple regression. The analysis documentation also described independent numerical cross-checking of the reported estimates using mathematically equivalent spreadsheet calculations. The associated SPSS syntax included requests for collinearity diagnostics, the Durbin–Watson statistic, residual plots, standardized residuals, predicted values, and Cook's distance. A two-sided significance threshold of 0.05 was applied to the inferential analyses, and 95% confidence intervals were used to communicate the precision of key estimates. The statistical procedures were directed toward explaining variation in treatment-related anxiety within the observed sample rather than developing or validating a clinical prediction instrument.

The interpretation of the analytical findings was restricted to associations within the observed cross-sectional data. Demographic and clinical adjustment was used to account for specified measured characteristics, but adjustment could not eliminate the possibility of residual confounding by factors outside the dataset. In addition, because communication, coordination, continuity, and anxiety were assessed using patient-reported measures, their observed associations could reflect both differences in care experiences and variation in individual perceptions. The analysis therefore focused on the magnitude, direction, precision, and incremental explanatory contribution of the three care-process constructs while maintaining a distinction between statistical association and causal inference.

RESULTS

Participant Characteristics

The analysis included 240 participants with gynecologic malignancies. The mean participant age was 55.6 years (SD = 11.1), ranging from 25 to 82 years. The mean interval between cancer diagnosis and initiation of treatment was 29.0 days (SD = 12.6; range: 8–90 days). Perceived family support had a mean score of 3.47 (SD = 0.78) on a five-point scale.

Ovarian cancer was the most frequently represented malignancy (n = 83, 34.6%), followed by endometrial cancer (n = 78, 32.5%) and cervical cancer (n = 57, 23.8%). Vulvar and vaginal cancers accounted for 12 (5.0%) and 10 (4.2%) participants, respectively. Stage II was the most common disease stage (n = 78, 32.5%), followed by stage III (n = 62, 25.8%), stage I (n = 59, 24.6%), and stage IV (n = 41, 17.1%). When stages were combined for the secondary analysis, 137 participants (57.1%) had early-stage disease (I–II), whereas 103 (42.9%) had advanced-stage disease (III–IV).

Surgery was the most frequent initial-treatment category (n = 75, 31.3%), followed by chemotherapy (n = 68, 28.3%), combined treatment (n = 50, 20.8%), and radiotherapy (n = 47, 19.6%). The dataset contained complete observations for the variables included in the reported analyses. The demographic and clinical characteristics are summarized in Table 1.

Table 1. Demographic and Clinical Characteristics of Participants With Gynecologic Malignancies (N = 240)

Characteristic	Mean (SD) or n (%)	Range
Age, years	55.6 (11.1)	25–82
Diagnosis-to-treatment interval, days	29.0 (12.6)	8–90
Family support score	3.47 (0.78)	1–5
Cancer type		
Ovarian	83 (34.6%)	—
Endometrial	78 (32.5%)	—
Cervical	57 (23.8%)	—

Characteristic	Mean (SD) or n (%)	Range
Vulvar	12 (5.0%)	–
Vaginal	10 (4.2%)	–
Cancer stage		
Stage I	59 (24.6%)	–
Stage II	78 (32.5%)	–
Stage III	62 (25.8%)	–
Stage IV	41 (17.1%)	–
Stage grouping		
Early stage (I–II)	137 (57.1%)	–
Advanced stage (III–IV)	103 (42.9%)	–
Initial treatment		
Surgery	75 (31.3%)	–
Chemotherapy	68 (28.3%)	–
Combined treatment	50 (20.8%)	–
Radiotherapy	47 (19.6%)	–

Values are expressed as mean (standard deviation) or frequency (percentage). Percentages may not total exactly 100% because of rounding. Family support was measured on a five-point scale, with higher scores indicating greater perceived support.

Reliability and Descriptive Characteristics of Questionnaire Constructs

All four questionnaire composites demonstrated high internal consistency. Cronbach's alpha was 0.919 for patient–clinician communication quality, 0.914 for care coordination, 0.905 for relational continuity/navigation support, and 0.926 for treatment-related anxiety. These coefficients indicated strong internal consistency among the items constituting each respective scale.

The highest mean care-process score was observed for communication quality (mean = 3.466, SD = 0.736), followed by care coordination (mean = 3.435, SD = 0.760) and relational continuity/navigation support (mean = 3.424, SD = 0.809). All three care-process means exceeded the midpoint of the five-point response scale. The mean treatment-related anxiety score was 2.598 (SD = 0.734), below the scale midpoint of 3.

The observed score ranges were 1.25–5.00 for communication quality, 1.63–4.88 for care coordination, 1.17–5.00 for relational continuity/navigation support, and 1.00–4.63 for treatment-related anxiety. Descriptive statistics and reliability coefficients are presented in Table 2.

Table 2. Internal Consistency and Descriptive Statistics of Questionnaire Constructs (N = 240)

Construct	Items (n)	Cronbach's α	Mean	SD	Observed range
Communication quality	8	0.919	3.466	0.736	1.25–5.00
Care coordination	8	0.914	3.435	0.760	1.63–4.88
Relational continuity/navigation support	6	0.905	3.424	0.809	1.17–5.00
Treatment-related anxiety	8	0.926	2.598	0.734	1.00–4.63

SD = standard deviation; α = Cronbach's alpha. All composite scores were calculated as the arithmetic mean of their constituent items after the specified reverse coding. Higher care-process scores indicate more favorable perceived care, whereas higher anxiety scores indicate greater treatment-related anxiety.

Associations Among Communication, Care Coordination, Relational Continuity, and Anxiety

Pearson correlation analysis identified statistically significant inverse associations between all three care-process constructs and treatment-related anxiety. Communication quality exhibited the strongest negative bivariate correlation with anxiety (r = –0.465, 95% CI: –0.558 to –0.359; p < 0.001). Better perceived care coordination was also associated with lower anxiety (r = –0.392, 95% CI: –0.495 to –0.280; p < 0.001). Similarly, greater relational continuity/navigation support was associated with lower anxiety (r = –0.445, 95% CI: –0.541 to –0.337; p < 0.001).

The observed correlations were moderate in magnitude, with communication quality showing a slightly stronger association with anxiety than relational continuity/navigation support and care coordination. The direction of these relationships was consistent with hypotheses H1, H2, and H3.

Positive associations were also observed among the three care-process constructs. Communication quality was correlated with care coordination (r = 0.264, p < 0.001) and relational continuity/navigation support (r = 0.224, p < 0.001). Care coordination was positively correlated with relational continuity/navigation support (r = 0.271, p < 0.001). These intercorrelations were smaller than the corresponding inverse correlations with anxiety. The complete correlation matrix is presented in Table 3.

Table 3. Pearson Correlation Matrix of Communication Quality, Care Coordination, Relational Continuity/Navigation Support, and Treatment-Related Anxiety (N = 240)

Variable	1	2	3	4
1. Communication quality	1.000	—	—	—
2. Care coordination	0.264***	1.000	—	—
3. Relational continuity/navigation support	0.224***	0.271***	1.000	—
4. Treatment-related anxiety	−0.465***	−0.392***	−0.445***	1.000

*Values are Pearson correlation coefficients (r). All significance tests were two-sided. **p < 0.001.

Differences in Treatment-Related Anxiety by Cancer Stage, Cancer Type, and Initial Treatment

Treatment-related anxiety differed across cancer stages. Mean anxiety scores were 2.335 (SD = 0.74) for stage I, 2.513 (SD = 0.69) for stage II, 2.653 (SD = 0.65) for stage III, and 3.055 (SD = 0.72) for stage IV. The observed mean anxiety scores were progressively higher across the four stage categories, with the highest mean recorded among participants with stage IV disease.

One-way ANOVA identified a statistically significant difference in anxiety among the four stages, F(3, 236) = 9.13, p < 0.001, with an eta-squared effect size of 0.104. The Levene test did not indicate a statistically significant difference in group variances (p = 0.421). Tukey's post-hoc comparisons identified significantly higher anxiety in stage IV than stage I (mean difference = 0.720, p < 0.001) and stage II (mean difference = 0.542, p = 0.001). The remaining pairwise comparisons did not reach statistical significance. For the secondary stage-grouping analysis, the mean anxiety score was 2.436 (SD = 0.718) among participants with early-stage disease (I–II; n = 137), compared with 2.813 (SD = 0.704) among participants with advanced-stage disease (III–IV; n = 103). The mean difference was 0.377 points (95% CI: 0.194–0.560), t(238) = 4.06, p < 0.001. Cohen's d was 0.53, indicating a moderate standardized difference between the early-stage and advanced-stage groups. Anxiety scores did not differ significantly across the five cancer types, F(4, 235) = 0.89, p = 0.473, η^2 = 0.015. The reported group means across cancer types ranged from 2.494 to 2.721. Similarly, anxiety did not differ significantly among the four initial-treatment categories, F(3, 236) = 0.67, p = 0.573, η^2 = 0.008, with treatment-category means ranging from 2.513 to 2.665.

Table 4. Group Comparisons of Treatment-Related Anxiety According to Cancer Stage, Cancer Type, and Initial Treatment

Comparison	n	Mean Anxiety (SD) or Mean Range	Test statistic	p	Effect size
Stage I	59	2.335 (0.740)	—	—	—
Stage II	78	2.513 (0.690)	—	—	—
Stage III	62	2.653 (0.650)	—	—	—
Stage IV	41	3.055 (0.720)	—	—	—
Four-stage comparison	240	—	F(3, 236) = 9.13	<0.001	η^2 = 0.104
Early stage (I–II)	137	2.436 (0.718)	—	—	—
Advanced stage (III–IV)	103	2.813 (0.704)	—	—	—
Early vs advanced stage	240	—	t(238) = 4.06	<0.001	d = 0.53
Cancer type (5 categories)	240	2.494–2.721	F(4, 235) = 0.89	0.473	η^2 = 0.015
Initial treatment (4 categories)	240	2.513–2.665	F(3, 236) = 0.67	0.573	η^2 = 0.008

SD = standard deviation; η^2 = eta squared; d = Cohen's d. The early-versus-advanced-stage mean difference was 0.377 (95% CI: 0.194–0.560). For cancer type and initial treatment, the displayed ranges represent the lowest and highest reported category means. Tukey's test was used for pairwise comparisons following the four-stage ANOVA.

Multiple Linear Regression Analyses

A simultaneous multiple linear regression was initially performed with communication quality, care coordination, and relational continuity/navigation support entered together as explanatory variables and treatment-related anxiety as the dependent variable. The model was statistically significant, F(3, 236) = 48.35, p < 0.001, with an adjusted R^2 of 0.373.

All three care-process constructs demonstrated statistically significant inverse associations with anxiety in this model. Communication quality was associated with lower anxiety (B = –0.337, standardized β = –0.337, p < 0.001), as was care coordination (B = –0.212, β = –0.219, p < 0.001) and relational continuity/navigation support (B = –0.281, β = –0.310, p < 0.001). These findings indicated that each care-process variable retained a statistically significant association with anxiety after simultaneous adjustment for the other two care-process scores.

The hierarchical multiple linear regression was then used to assess the additional explanatory contribution of the three care-process variables after adjustment for demographic and clinical characteristics. The first block contained age, cancer stage, diagnosis-to-treatment interval, family support, four cancer-type indicators, and three initial-treatment indicators. This controls-only model was statistically significant, F(11, 228) = 4.83, p < 0.001, and accounted for 18.9% of the observed variance in anxiety (R^2 = 0.189; adjusted R^2 = 0.150). The second block added communication quality, care coordination, and relational continuity/navigation support simultaneously. Their inclusion increased explained variance by 37.0 percentage points (ΔR^2 = 0.370), with a statistically significant improvement in model fit, ΔF(3, 225) = 62.91, p < 0.001. The fully adjusted model accounted for 55.9% of the variance in anxiety (R^2 = 0.559; adjusted R^2 = 0.532) and was statistically significant overall, F(14, 225) = 20.37, p < 0.001. These findings supported H4 concerning the incremental explanatory contribution of the three care-process constructs.

In the fully adjusted model, communication quality had the largest standardized association with treatment-related anxiety among the care-process variables (B = –0.338, SE = 0.047, β = –0.339, 95% CI: –0.431 to –0.245; p < 0.001). Relational continuity/navigation support also retained an inverse association (B = –0.262, SE = 0.043, β = –0.289, 95% CI: –0.347 to –0.177; p < 0.001), followed by care coordination (B = –0.225, SE = 0.046, β = –0.233, 95% CI: –0.316 to –0.134; p < 0.001). Among the demographic and clinical covariates, cancer stage was positively associated with anxiety (B = 0.208 per stage increment, SE = 0.032, β = 0.292, 95% CI: 0.144–0.271; p < 0.001). A longer diagnosis-to-treatment interval was also associated with higher anxiety (B = 0.0149 per day, SE = 0.0026, β = 0.256, 95% CI: 0.0097–0.0201; p < 0.001). In contrast, greater perceived family support was associated with lower anxiety (B = –0.114, SE = 0.044, β = –0.121, 95% CI: –0.201 to –0.028; p = 0.010). Age was not significantly associated with anxiety after adjustment (B = 0.003, p = 0.322). None of the individual cancer-type indicators differed significantly from the ovarian cancer reference category, and none of the initial-treatment indicators differed significantly from surgery. The fully adjusted regression coefficients, confidence intervals, and significance values are provided in Table 5.

Table 5. Fully Adjusted Hierarchical Multiple Linear Regression of Treatment-Related Anxiety (N = 240)

Predictor	B	SE	Standardized β	95% CI for B	p
Communication quality	–0.338	0.047	–0.339	–0.431 to –0.245	<0.001
Care coordination	–0.225	0.046	–0.233	–0.316 to –0.134	<0.001
Relational continuity/navigation support	–0.262	0.043	–0.289	–0.347 to –0.177	<0.001
Age, years	0.003	0.003	0.045	–0.003 to 0.009	0.322
Cancer stage (I–IV)	0.208	0.032	0.292	0.144 to 0.271	<0.001
Diagnosis-to-treatment interval, days	0.0149	0.0026	0.256	0.0097 to 0.0201	<0.001
Family support	–0.114	0.044	–0.121	–0.201 to –0.028	0.010
Cervical vs ovarian cancer	0.115	0.090	0.067	–0.062 to 0.291	0.202
Endometrial vs ovarian cancer	0.111	0.081	0.071	–0.049 to 0.271	0.172
Vulvar vs ovarian cancer	0.035	0.158	0.010	–0.277 to 0.346	0.827
Vaginal vs ovarian cancer	–0.052	0.169	–0.014	–0.385 to 0.281	0.760
Chemotherapy vs surgery	–0.067	0.087	–0.041	–0.239 to 0.105	0.443
Radiotherapy vs surgery	–0.050	0.095	–0.027	–0.236 to 0.137	0.599
Combined treatment vs surgery	0.041	0.094	0.022	–0.144 to 0.225	0.665

B = unstandardized regression coefficient; SE = standard error; β = standardized regression coefficient; CI = confidence interval. Reference categories were ovarian cancer and surgery. Cancer stage was entered as an ordinal covariate.

Controls-only model: R^2 = 0.189; adjusted R^2 = 0.150; F(11, 228) = 4.83, p < 0.001. Fully adjusted model: R^2 = 0.559; adjusted R^2 = 0.532; F(14, 225) = 20.37, p < 0.001. Incremental care-process contribution: ΔR^2 = 0.370; $\Delta F(3, 225)$ = 62.91, p < 0.001.

Regression Diagnostics

The diagnostic results for the fully adjusted linear regression model did not indicate substantial departures from the principal assumptions assessed. The Durbin–Watson statistic was 1.99, indicating little evidence of first-order residual autocorrelation. The Jarque–Bera test did not identify a statistically significant departure from residual normality (p = 0.888). Similarly, the Breusch–Pagan assessment did not identify statistically significant heteroscedasticity, with p = 0.811 for the Lagrange multiplier test and p = 0.823 for the F-based test. Multicollinearity was limited, with reported variance inflation factors not exceeding 1.47. These findings indicated that the included explanatory variables were not associated with substantial variance inflation within the fitted model. Overall, the available regression diagnostics supported the numerical interpretation of the estimated associations in the observed dataset.

DISCUSSION

Principal Findings

The present study examined the associations of patient–clinician communication, perceived care coordination, and relational continuity/navigation support with treatment-related anxiety among 240 adults with gynecologic malignancies. All three care-process constructs demonstrated moderate inverse correlations with anxiety and retained statistically significant associations after adjustment for demographic and clinical characteristics. Communication quality showed the strongest adjusted association, followed by relational continuity/navigation support and care coordination. Importantly, adding these three variables to the demographic and clinical model increased the explained variance in anxiety by 37.0 percentage points, producing a final model with an R^2 of 0.559 and an adjusted R^2 of 0.532. Higher cancer stage and longer diagnosis-to-treatment intervals were independently associated with greater anxiety, whereas stronger perceived family support was associated with lower anxiety. These findings indicate that patients' perceptions of interpersonal communication and organizational continuity are related to treatment-specific psychological experiences beyond the associations observed with the measured clinical characteristics.

The findings are consistent with the broader recognition that anxiety in oncology arises from a combination of illness-related concerns, uncertainty, psychological vulnerability, and healthcare experiences. Mitchell et al. identified a substantial burden of anxiety and adjustment disorders across oncological settings, while Linden et al. demonstrated variation in anxiety and depression according to cancer type and demographic characteristics (1,2). In gynecologic oncology, systematic reviews have identified psychological distress, unmet information needs, and deficiencies in supportive care as recurring concerns during treatment and survivorship (3,6–8). The present analysis extends this conceptual framework by examining communication, coordination, and continuity simultaneously rather than considering patient distress exclusively in relation to disease characteristics or general satisfaction with care. Nevertheless, the cross-sectional findings describe associations within the observed sample and do not establish that changes in care-process quality would produce corresponding reductions in anxiety.

Patient–Clinician Communication and Treatment-Related Anxiety

Patient–clinician communication quality demonstrated the strongest inverse association with treatment-related anxiety, both in the bivariate analysis (r = –0.465, p < 0.001) and in the fully adjusted regression model (standardized β = –0.339, p < 0.001). This relationship remained statistically significant after adjustment for cancer stage, diagnosis-to-treatment interval, cancer type, initial treatment, age, family support, and the other two care-process constructs. The result suggests that perceived communication quality is associated with patients' psychological experiences of treatment planning and uncertainty, although the observed coefficient does not establish a causal communication effect.

The association is conceptually consistent with Epstein and Street's patient-centered cancer communication model, which identifies information exchange, emotional responsiveness, uncertainty management, therapeutic relationships, and decision support as interrelated components of effective communication (10). The American Society of Clinical Oncology consensus guideline similarly emphasizes individualized information provision, empathy, shared decision-making, and attention to patients' emotional concerns throughout cancer care (11). These functions are particularly relevant after a cancer diagnosis, when patients must interpret unfamiliar medical terminology, understand staging investigations, consider treatment options, and anticipate subsequent appointments. A clear explanation may

be important not only because it conveys accurate information but also because it helps patients understand the sequence of events and recognize when further action is expected.

Gynecologic oncology presents additional communication challenges because treatment decisions may involve fertility, sexual functioning, body image, prognostic uncertainty, and changes in intimate and family relationships. Littell et al., in a Society of Gynecologic Oncology evidence-based review, emphasized the importance of advanced communication skills in discussions involving prognosis, treatment preferences, emotional responses, and transitions in care (12). Fallowfield and Jenkins similarly identified effective communication as an essential component of high-quality cancer care, while Rodin et al. described evidence-based communication practices involving empathy, accurate information provision, and confirmation of patient understanding (13,14). The present communication construct reflects these principles through items addressing understandable explanations, opportunities to ask questions, consistency between professionals, appropriate information timing, and explanations of delays or treatment changes.

The association also corresponds with findings from research on information provision and psychological outcomes. Husson et al. reported relationships between the quality of cancer-related information and patients' quality of life, anxiety, and depression (15). Finney Rutten et al. identified recurring informational needs concerning diagnosis, treatment, prognosis, adverse effects, and access to reliable information, while Tariman et al. found that prognosis, disease-related information, and treatment options were consistently prioritized by patients with cancer (16,17). These findings suggest that patients may value information that is both clinically meaningful and relevant to their immediate decisions. Information concerning the next appointment, expected results, treatment sequence, or responsibility for follow-up can be particularly important when the patient is uncertain about whether care is progressing as intended.

Communication quality should therefore be understood as broader than the amount of information delivered during a consultation. A systematic review by de Vries et al. identified relationships between clinician characteristics, communication practices, and patient outcomes, supporting the importance of responsiveness and interpersonal quality rather than one-directional information transfer (18). Yang et al. further demonstrated that incorporating patient-reported outcomes into oncology consultations may facilitate communication by bringing concerns and symptoms into clinical discussions (19). The SPIKES framework provides an additional example of structured communication that integrates preparation, assessment of patient understanding, knowledge sharing, emotional responsiveness, and an actionable plan (20). Together, these sources support the clinical relevance of the communication dimensions assessed in the present study.

An important consideration is that the relationship between communication quality and anxiety may operate in both directions. Patients experiencing greater anxiety may perceive explanations as less complete, find information more difficult to retain, seek repeated clarification, or evaluate interactions more negatively. Conversely, unclear or inconsistent information may contribute to uncertainty and anxiety. The present design cannot distinguish these possibilities. Furthermore, some anxiety items directly address uncertainty about treatment progress and relief associated with clear explanations, creating potential conceptual overlap with the communication construct. Consequently, the magnitude of the observed association should be interpreted in relation to both the clinical plausibility of the relationship and the measurement characteristics of the questionnaire.

Care Coordination, Relational Continuity, and Patient Navigation

Care coordination was independently associated with lower treatment-related anxiety in the fully adjusted model (standardized $\beta = -0.233$, p < 0.001). This association is clinically relevant because gynecologic oncology frequently involves multiple professionals and services, including pathology, diagnostic imaging, surgery, systemic therapy, radiation oncology, nursing, and supportive care. Patients may receive appropriate individual clinical consultations while still experiencing uncertainty about referrals, appointment sequencing, information sharing, and responsibility for subsequent decisions. Coordination therefore concerns the coherence of the overall care pathway rather than communication within a single encounter.

Haggerty et al. identified informational, management, and relational continuity as distinct but complementary dimensions of continuity of care (21). Marcon et al. subsequently examined theoretical models and assessment approaches relevant to continuity among patients with cancer (22). Within this framework, care coordination reflects the extent to which services function together, responsibilities are understood, and information moves appropriately between providers. The current care coordination questionnaire operationalized these experiences through perceived clarity of responsibility, appointment organization, consistency of handovers, availability of clinical information, and confidence that a healthcare team maintained an overall understanding of the treatment pathway.

The findings are compatible with evidence from cancer-care coordination research. Sheinfeld Gorin et al., in a systematic review and meta-analysis spanning more than three decades, identified improvements in several service-related outcomes associated with coordination interventions, although the interventions and outcome measures were heterogeneous (23). Such evidence suggests that coordinated services may improve aspects of the patient experience but does not demonstrate that the association observed in the present cross-sectional study represents an intervention effect. The distinction is important because objective coordination performance and patients' perceptions of coordination may not always correspond.

Relational continuity/navigation support demonstrated a somewhat stronger adjusted association with anxiety than care coordination (standardized $\beta = -0.289$, p < 0.001). This finding suggests that the availability of a reliable contact person and practical guidance may be particularly relevant to treatment-related uncertainty. Relational continuity differs from organizational coordination because it involves whether patients experience dependable access to a professional or identifiable source of assistance, rather than solely whether the system completes required processes. A pathway may be administratively coordinated yet still leave patients uncertain about whom to contact when circumstances change.

Freeman and Rodriguez described patient navigation as an approach to reducing barriers encountered throughout cancer care, while Paskett et al. documented its development into a broader model involving access assistance, appointment management, referrals, and communication support (24,25). These functions overlap with the relational continuity/navigation construct examined in the present study. However, the questionnaire measured perceived access and support rather than participation in a formally implemented patient-navigation program. Accordingly, its association with anxiety should not be interpreted as evidence of the effectiveness of a specific navigation intervention.

The broader navigation literature provides important comparative context. Wells et al. evaluated the effects of navigation programs on satisfaction with cancer care and identified favorable findings in randomized studies, although the pooled nonrandomized evidence was less conclusive (26). Chan et al. described the increasingly extensive application of patient navigation throughout the cancer continuum, especially where fragmentation and access barriers complicate the care pathway (27). Chen et al. likewise identified potential benefits of navigation during cancer treatment while emphasizing variation in program structure and evaluated outcomes (28). A qualitative systematic review by Tan et al. found that patients valued practical assistance, reliable contacts, information, and emotional support provided through navigation programs (29). These findings are consistent with the possibility that dependable guidance may be associated with a more manageable treatment experience, while also highlighting why evidence concerning satisfaction, access, and treatment completion cannot automatically be generalized to anxiety outcomes.

A further interpretation concerns the overlap and distinction between care coordination and relational continuity. The three care-process predictors showed relatively modest intercorrelations (r = 0.224–0.271), and each retained a statistically significant association with anxiety in the adjusted model. These findings suggest that the measures captured partially overlapping aspects of patients' experiences. Nevertheless, modest intercorrelations and acceptable variance inflation factors do not independently establish discriminant validity. Structural and construct validity analyses are necessary to determine whether the proposed dimensions are empirically distinguishable within the questionnaire.

Uncertainty may provide a plausible connection between organizational continuity and anxiety. Richardson et al. described how uncertainty, changing information, and difficulty understanding the care pathway contributed to anxiety among patients with cancer of unknown primary (30). Although the clinical context differs from gynecologic malignancies, the findings demonstrate the potential psychological relevance of information gaps and uncertain transitions. In gynecologic oncology, similar experiences may arise while patients await pathology results, multidisciplinary decisions, referrals, or treatment appointments. A reliable professional contact may provide clarification about these processes, whereas repeated efforts to obtain information may be associated with greater perceived burden. These mechanisms remain plausible interpretations rather than pathways directly demonstrated by the present analysis.

Cancer Stage, Diagnosis-to-Treatment Interval, and Anxiety

Cancer stage was independently associated with treatment-related anxiety. Participants with advanced-stage disease (III–IV) had higher mean anxiety than those with early-stage disease (I–II), with a mean difference of 0.377 points (95% CI: 0.194–0.560; p < 0.001) and a moderate standardized effect size (Cohen's d = 0.53). Anxiety also differed

significantly across the four individual cancer stages, with the highest observed mean among participants with stage IV disease. In the fully adjusted regression model, cancer stage retained a positive association with anxiety (standardized β = 0.292, p < 0.001).

These findings are clinically plausible because advanced disease may be associated with greater prognostic uncertainty, treatment complexity, symptom burden, and concerns about future functioning. However, psychological distress cannot be explained by disease stage alone. Arden-Close et al., in a systematic review of ovarian cancer, identified multiple clinical and psychosocial correlates of distress, supporting a multidimensional interpretation of psychological outcomes (36). Similarly, the broader oncology evidence indicates that anxiety varies across cancer types and patient characteristics, rather than following a uniform clinical severity pattern (2,3). The present findings therefore support the inclusion of stage as an important covariate without suggesting that stage determines anxiety independently of interpersonal, social, and organizational experiences.

The stage findings also require consideration of how stage was represented analytically. Although the adjusted regression treated stage as an ordinal variable with a linear coefficient, the descriptive results and pairwise comparisons indicated that the clearest differences involved stage IV compared with stages I and II. Thus, the relationship may not be equivalent across successive stage transitions. Alternative specifications using categorical stage indicators would provide a useful sensitivity assessment in future analyses, particularly when sufficient observations are available within each stage and cancer type. This consideration is relevant because the clinical significance of disease stage may differ among ovarian, cervical, endometrial, vaginal, and vulvar malignancies.

The diagnosis-to-treatment interval also demonstrated a statistically significant positive association with anxiety (B = 0.0149 per day, standardized β = 0.256, p < 0.001). The direction of this relationship suggests that longer intervals were associated with higher treatment-related anxiety after adjustment for the other measured variables. The finding is consistent with qualitative evidence that waiting for cancer-related investigations and clinical decisions can involve uncertainty, apprehension, and a perceived lack of control (32).

Waiting also has a clinically important dimension. Hanna et al., in a systematic review and meta-analysis, identified associations between treatment delays and mortality across multiple cancer indications (31). However, the present findings should not be interpreted as demonstrating that the observed diagnosis-to-treatment intervals represented avoidable delays, increased mortality risk, or deficiencies in clinical management. Some intervals may reflect necessary diagnostic evaluation, staging investigations, treatment planning, or other clinically appropriate processes. The questionnaire assessed patients' anxiety in relation to treatment-related experiences, while the recorded interval represented elapsed time between diagnosis and treatment. These measures cannot distinguish all clinical and organizational reasons for waiting.

The association between the diagnosis-to-treatment interval and anxiety nevertheless emphasizes the potential importance of explaining expected timelines and the reasons for changes. Patients who understand why additional investigations are necessary, when results are anticipated, and which team is responsible for follow-up may experience the waiting period differently from patients who receive little explanation. This interpretation is supported by qualitative evidence concerning uncertainty during cancer care and by established patient-centered communication principles (10,11,30,32). Prospective research incorporating both the duration and perceived appropriateness of waiting would help clarify whether explanations, continuity, and anxiety change together over time.

Family Support and Psychological Adjustment

Greater perceived family support was independently associated with lower treatment-related anxiety (B = −0.114, standardized β = −0.121, p = 0.010). Although the standardized coefficient was smaller than those observed for the three care-process constructs, the association remained statistically significant after adjustment for cancer stage, diagnosis-to-treatment interval, cancer type, treatment category, age, and perceived care experiences. This finding suggests that family support contributes additional information about anxiety within the observed sample.

Kimmel et al. identified the importance of social support among women with elevated anxiety undergoing care for gynecologic malignancies (33). Rivera Rivera and Burris further distinguished favorable associations involving social support from potentially adverse experiences of social constraint among cancer survivors (34). A systematic review and meta-analysis by Zhang et al. also identified beneficial psychosocial outcomes associated with peer-support interventions in cancer populations, although formal peer support differs from the family-support construct used in the

present study (35). These findings support consideration of interpersonal support alongside professional communication and organizational continuity.

Family members may provide practical and emotional assistance by organizing appointments, maintaining records, arranging transport, helping patients interpret instructions, and accompanying them during treatment decisions. Such involvement may be particularly important when care spans several departments or requires repeated contact with healthcare professionals. However, family assistance can also become a compensatory response to poorly coordinated services. The relational continuity/navigation scale included an item concerning the frequency with which family members needed to contact healthcare services to keep care progressing, highlighting the distinction between supportive family involvement and reliance on relatives to resolve organizational barriers.

The observed family-support association should therefore not be interpreted as evidence that families can replace structured coordination or professional navigation. Rather, the findings support viewing formal care processes and informal support networks as potentially complementary aspects of the patient experience. Future investigations would benefit from distinguishing emotional support, practical assistance, family involvement in treatment decisions, and the burden imposed on caregivers, particularly because a single global family-support score may not capture these dimensions equally.

Cancer Type and Treatment Category

Neither cancer type nor initial-treatment category demonstrated a statistically significant overall difference in anxiety in the unadjusted group comparisons. Likewise, the individual cancer-type and treatment-category indicators were not statistically significant in the fully adjusted regression model. These findings suggest that, within the present sample and model, differences in anxiety were more consistently associated with stage, waiting time, family support, and perceived care processes than with the nominal categories of malignancy or initial treatment.

Nevertheless, the absence of statistically significant differences should not be interpreted as demonstrating equivalence across cancer types or treatment approaches. The vaginal and vulvar cancer groups contained relatively small numbers of participants, limiting the precision of subgroup comparisons. Additionally, broad treatment classifications such as surgery, chemotherapy, radiotherapy, or combined treatment do not capture treatment intent, regimen intensity, anticipated toxicity, or the complexity of individual treatment pathways. Previous oncology research has demonstrated variation in psychological distress across diagnoses and clinical circumstances (2,3,36), indicating that more detailed disease-specific and treatment-specific assessments may remain clinically relevant.

Clinical Implications

The principal clinical implication of these findings is that treatment-related anxiety may be usefully considered alongside patients' perceptions of communication, coordination, and continuity. Because all three care-process measures retained associations with anxiety after adjustment, assessing only overall satisfaction or disease severity may provide an incomplete description of the patient experience. Existing frameworks for patient-centered communication, continuity, and navigation support more differentiated assessment of these domains (10,11,21,24,27).

Communication-related improvements could include consistent explanations of diagnostic findings, structured opportunities for questions, written summaries of agreed treatment plans, explicit descriptions of anticipated next steps, and timely communication concerning changes in appointments or investigations. The ASCO communication guideline and the Society of Gynecologic Oncology evidence-based review support the importance of individualized information provision, emotional acknowledgment, and shared understanding throughout cancer care (11,12). Such approaches are clinically relevant candidates for service improvement, although their ability to reduce anxiety cannot be established from the present cross-sectional associations alone.

Coordination-related improvements could include clearly assigned responsibility for referrals, standardized handover procedures, accessible treatment schedules, reliable communication between clinical departments, and processes for identifying missed or delayed appointments. Cancer-care coordination research supports the relevance of organized transitions and integrated service processes, while also demonstrating that interventions and outcomes vary across settings (21–23). The results suggest that these organizational components warrant attention alongside the interpersonal quality of individual consultations.

Relational continuity and navigation-related improvements could focus on ensuring that patients know whom to contact, understand what to do when an expected appointment or result does not arrive, and have access to practical

support when difficulties arise. Reviews of navigation programs describe the potential value of consistent guidance, barrier identification, referral support, and assistance across transitions (24–29). A reliable point of contact may be particularly relevant during periods of diagnostic or treatment uncertainty, when patients must navigate several clinical services without always understanding how responsibilities are distributed.

Psychological support should also remain an explicit component of comprehensive care rather than being treated as a secondary consequence of better administrative processes. Distress screening in gynecologic oncology has been described as a means of identifying needs that may otherwise remain unrecognized (4,5). A systematic review and meta-analysis of psychological supportive-care interventions for cervical cancer identified potentially beneficial approaches, while a more recent meta-analysis of nonpharmacologic interventions across oncology populations reported improvements in several patient and caregiver psychological outcomes (37,39). Integrating communication support, reliable navigation, distress assessment, and access to appropriate psychosocial services may therefore offer a clinically coherent approach deserving prospective evaluation.

Recent qualitative evidence from advanced ovarian cancer further highlights the importance of individualized information needs and the perspectives of caregivers and healthcare professionals. Rubio Pérez et al. identified differences in how patients, caregivers, and professionals perceived informational needs concerning disease, pharmacological treatment, and nonpharmacological support (38). These findings reinforce the possibility that providing information does not necessarily ensure that the information matches the patient's current concerns. Accordingly, patient-centered approaches should address both the content of communication and its relevance to the patient's immediate clinical circumstances.

Methodological Strengths and Limitations

The study has several analytical strengths. It included 240 participants representing five gynecologic malignancy categories and examined three related aspects of care within one multivariable framework. The analysis incorporated cancer stage, diagnosis-to-treatment interval, perceived family support, age, cancer type, and initial-treatment category, allowing the care-process associations to be examined beyond these measured characteristics. Both bivariate and adjusted results were reported, including confidence intervals, standardized coefficients, and the incremental explanatory contribution of the three care-process variables. The analyzed variables contained no reported missing observations, and the four composite scales demonstrated high internal consistency. These features support a detailed description of associations within the observed sample.

However, several limitations affect interpretation. First, the cross-sectional design prevents determination of temporal sequence and causal direction. Poorer perceived communication or coordination may be associated with greater anxiety, but anxiety may also affect how patients interpret healthcare interactions, recall information, and evaluate treatment experiences. Both processes may operate simultaneously. Longitudinal investigations are therefore required to determine whether changes in communication, coordination, or continuity precede changes in anxiety.

Second, all four principal constructs were measured using study-specific patient-reported questionnaires. Although Cronbach's alpha coefficients were high, internal consistency alone does not establish content validity, structural validity, convergent validity, discriminant validity, or responsiveness. The COSMIN framework distinguishes these measurement properties and emphasizes their separate importance when evaluating patient-reported outcome instruments (40). The present measures also contained potentially overlapping content, particularly where anxiety items addressed uncertainty about treatment progress or perceived relief from clear explanations. The reverse-coded ANX8 item, concerning the anxiety-reducing effect of explanations, may reflect perceived communication effectiveness rather than anxiety severity alone. This overlap could contribute to shared-method associations and warrants targeted item-level evaluation.

Third, all primary constructs were obtained through the same response format and assessed within the same observational framework. Common response tendencies, current emotional state, recall characteristics, and general evaluations of healthcare services may have contributed to correlations between care-process scores and anxiety. Relatively low correlations among the three care-process measures and acceptable variance inflation factors reduce concerns about severe multicollinearity in the fitted model but do not eliminate shared-method bias or establish that the three constructs are psychometrically distinct.

Fourth, the study-specific anxiety measure assessed treatment-related worry and uncertainty rather than providing a clinical diagnosis of an anxiety disorder. Its scores should not be interpreted as prevalence estimates of clinically

diagnosed anxiety, and its numerical values cannot be directly compared with established anxiety instruments without appropriate validation. Future research could examine convergent validity against established measures such as the Hospital Anxiety and Depression Scale, developed by Zigmond and Snaith (41), and the Generalized Anxiety Disorder-7, developed by Spitzer et al. (42). Content validation involving patients and healthcare professionals, confirmatory factor analysis, test–retest reliability assessment, and evaluation of clinically meaningful score interpretation would further strengthen the measurement framework.

Fifth, the adjusted regression assumed an approximately linear association between ordinal cancer stage and anxiety. The stage-specific descriptive findings indicated that the most prominent differences involved stage IV, suggesting that the assumption of equal successive stage effects may not fully describe the observed pattern. Sensitivity analyses using stage indicator variables could assess the robustness of the adjusted care-process coefficients to alternative stage specifications. Similarly, the small vaginal and vulvar cancer groups limited precision for disease-specific comparisons and may have reduced the ability to detect clinically relevant differences.

Sixth, the analyses did not incorporate several potentially relevant patient and treatment characteristics, including previous anxiety or depressive disorders, comorbidity burden, functional or performance status, socioeconomic circumstances, health literacy, language, fertility-related concerns, treatment intent, and clinician- or institution-level characteristics. Residual confounding may therefore remain despite adjustment for the included clinical and demographic covariates. The family-support variable also represented a broad patient-reported measure rather than a detailed assessment of emotional, informational, practical, and caregiving support.

Finally, the findings were derived from one analytical sample and have not been externally replicated. Their transferability to other gynecologic oncology populations may depend on recruitment characteristics, healthcare organization, access to navigation services, treatment pathways, and the broader social context. The variance explained by the fitted model reflects associations within the observed data and should not be regarded as evidence of external predictive performance. Validation in independent and more diverse clinical populations is needed before the proposed questionnaire scores are adopted as standardized quality indicators.

Directions for Future Research

Future investigations should prioritize prospective evaluation of the relationships between care-process experiences and treatment-related anxiety. Repeated assessment shortly after diagnosis, during treatment planning, and after treatment initiation would permit examination of temporal patterns and whether changes in communication, coordination, or continuity are associated with subsequent changes in anxiety. Such designs could also distinguish anxiety associated with clinically necessary waiting from anxiety arising during poorly understood or fragmented transitions.

The measurement framework would benefit from further psychometric evaluation. Factor-analytic studies could examine whether communication quality, care coordination, relational continuity/navigation support, and anxiety form empirically distinguishable constructs. Convergent validity could be assessed using established anxiety measures, while discriminant validity could be examined through appropriate comparisons between the care-process domains. Item-level sensitivity analyses, particularly those involving wording overlap between communication and anxiety, may clarify whether the observed associations persist when conceptually overlapping items are excluded. These procedures would strengthen interpretation of the independent associations and provide a clearer basis for future instrument development (40–42).

Prospective and intervention-based research could subsequently evaluate whether structured communication, coordinated referrals, dependable contact pathways, and navigation services improve patient-reported outcomes. Such studies should incorporate clinically meaningful outcomes, implementation characteristics, and the perspectives of patients, caregivers, and healthcare professionals. The broader evidence indicates potential benefits from communication support, navigation, and psychosocial interventions, but differences in study populations and intervention approaches require careful evaluation before general recommendations about effectiveness are made (11,23,27,28,37–39).

CONCLUSION

In this cross-sectional analysis of 240 adults with gynecologic malignancies, higher perceived patient–clinician communication quality, better care coordination, and stronger relational continuity/navigation support were independently associated with lower treatment-related anxiety after adjustment for demographic and clinical

characteristics. Together, the three care-process measures explained an additional 37.0 percentage points of variance beyond the specified covariates. Higher cancer stage and longer diagnosis-to-treatment intervals were associated with greater anxiety, whereas stronger family support was associated with lower anxiety. These findings highlight the relevance of interpersonal and organizational care experiences alongside clinical characteristics when examining treatment-related psychological concerns in gynecologic oncology. Prospective research and further validation of the study-specific measures are needed to determine the temporal nature, generalizability, and potential clinical implications of these associations.

DECLARATIONS

Author Contributions:	Concept: LZ, LC; Design: LZ, LC, SWN; Data Collection: LZ, SWN; Analysis: LZ, LC; Drafting: LZ, LC, SWN.
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