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Developing a Predictive Model of Death Anxiety Based on Self-Efficacy and Health Locus of Control with the Mediating Role of Sense of Coherence in Patients with Gastrointestinal Cancer

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ABSTRACT

Purpose: This study aimed to develop and test a predictive model of death anxiety based on self-efficacy and health locus of control, with the mediating role of sense of coherence, in patients with gastrointestinal cancer.

Methods and Materials: This applied study used a descriptive-correlational design based on structural equation modeling. The statistical population consisted of male and female patients with gastrointestinal cancer referred to teaching and treatment hospitals affiliated with Iran University of Medical Sciences in Tehran. A total of 256 patients were selected through purposive sampling according to the inclusion and exclusion criteria. Data were collected using the Templer Death Anxiety Scale, Multidimensional Health Locus of Control Scale, Sherer General Self-Efficacy Scale, and Sense of Coherence Questionnaire. Data were analyzed using SPSS and AMOS. Pearson correlation analysis and structural equation modeling with maximum likelihood estimation were employed to examine direct and indirect relationships among the study variables.

Findings: The structural model demonstrated acceptable fit ($\chi^2/df = 2.10$, RMSEA = .05, CFI = .94, NFI = .91, GFI = .96, AGFI = .94). Health locus of control significantly and negatively predicted death anxiety ($\beta = -.36$, $t = -6.15$, $p = .001$), and self-efficacy also had a significant negative direct effect on death anxiety ($\beta = -.44$, $t = -7.81$, $p = .001$). Sense of coherence significantly mediated the relationship between health locus of control and death anxiety ($\beta = -.39$, $p = .001$) and the relationship between self-efficacy and death anxiety ($\beta = -.49$, $p = .001$). In addition, meaning in life showed significant indirect effects in the relationships of health locus of control ($\beta = -.39$, $p = .001$) and self-efficacy ($\beta = -.40$, $p = .001$) with death anxiety.

Conclusion: The findings indicate that self-efficacy and health locus of control are significant predictors of death anxiety in patients with gastrointestinal cancer and that sense of coherence plays an important mediating role in these relationships, suggesting the value of strengthening personal competence, perceived control, and psychological coherence in psycho-oncological interventions.

Keywords: Death Anxiety, Self-Efficacy, Health Locus of Control, Sense of Coherence, Gastrointestinal Cancer, Structural Equation Modeling

1. Introduction

Gastrointestinal cancers constitute a major group of malignancies involving organs such as the esophagus, stomach, colorectum, pancreas, liver, and other components of the digestive system, and they remain an important cause of cancer-related morbidity and mortality worldwide. Their clinical course is often complicated by delayed diagnosis, aggressive biological behavior, substantial symptom burden, invasive diagnostic and therapeutic procedures, nutritional disturbances, and uncertainty regarding prognosis. Considerable advances have been made in molecular characterization, biomarker identification, targeted therapy, and immunotherapy, creating new possibilities for individualized treatment and improved disease control (Chen et al., 2025; Zhang et al., 2023). At the same time, early detection remains challenging in several gastrointestinal malignancies because initial symptoms may be nonspecific or absent, which can lead to diagnosis at more advanced stages and increase the psychological burden experienced by patients (Marin et al., 2023). Moreover, gastrointestinal cancers are frequently accompanied by clinically important physical complications, including malnutrition, sarcopenia, impaired functional capacity, and treatment-related complications, all of which may reinforce patients' awareness of physical vulnerability and disease severity (Budai et al., 2026; Zhang et al., 2024). Consequently, the psychosocial dimensions of gastrointestinal cancer have become increasingly important alongside advances in oncological treatment.

Although survival, symptom control, and treatment response are central clinical outcomes, cancer is also an existentially threatening condition that may substantially disrupt an individual's psychological equilibrium. Patients are required to confront uncertainty about disease progression, repeated medical examinations, surgical interventions, chemotherapy or other systemic treatments, possible recurrence, changes in social and family roles, and concerns about future functioning. Psychological distress is therefore common among individuals with gastrointestinal cancer, and anxiety and depressive symptoms may persist across different phases of diagnosis, active treatment, and survivorship. Evidence indicates that psychological interventions can reduce anxiety and depression among patients with gastrointestinal cancer, underscoring the relevance of psychological processes to comprehensive cancer care (Chen et al., 2024). Likewise, unmet supportive care needs may remain substantial among cancer survivors

and may involve emotional, informational, physical, social, and practical dimensions, suggesting that effective cancer management should extend beyond disease-focused biomedical treatment (R. Song et al., 2024). In gastrointestinal cancer specifically, the burden of illness also extends to family systems, as caregivers may experience high levels of burden that influence their own resilience and quality of life (H. J. Song et al., 2024). These findings collectively demonstrate that cancer-related distress is embedded in a broader psychosocial context and that identifying modifiable psychological determinants is essential for developing more integrated supportive care.

Among the psychological consequences of cancer, death anxiety is particularly important because the diagnosis of a potentially life-threatening illness directly increases awareness of mortality. Death anxiety generally refers to fear, apprehension, distress, or emotional discomfort associated with death, dying, the process of physical deterioration, separation, suffering, and uncertainty concerning what follows death. In patients with advanced or terminal cancer, death anxiety may coexist with generalized anxiety, depression, helplessness, loss of control, and existential distress, potentially compromising quality of life and adjustment to illness (Dunn et al., 2023; Maddox et al., 2023). In gastrointestinal cancer, this phenomenon may be especially salient because patients frequently encounter invasive procedures, surgery, pain, changes in nutrition or gastrointestinal functioning, and uncertainty regarding disease progression. Research focusing on patients with advanced gastrointestinal disease has shown that death anxiety represents a clinically relevant psychological concern rather than a peripheral emotional reaction (Timmermans et al., 2024). Similarly, coping styles have been linked to variation in death anxiety among patients with gastrointestinal cancer, indicating that mortality-related distress is influenced not only by objective disease characteristics but also by the psychological resources through which patients interpret and manage their condition (Fitzgerald et al., 2023).

From this perspective, death anxiety should not be conceptualized solely as an inevitable consequence of disease severity. Individuals facing similar diagnoses may differ considerably in the intensity of mortality-related fear they experience. Such differences may arise from beliefs about personal competence, perceived control over health outcomes, the ability to interpret stressful events coherently, and the extent to which life continues to be experienced as meaningful. Psychological constructs that influence

appraisal, coping, behavioral persistence, and interpretation of illness may therefore provide an important framework for explaining death anxiety in patients with cancer. Understanding these factors is especially important because contemporary cancer care increasingly emphasizes patient-centered decision-making, psychosocial adaptation, and supportive or palliative interventions in parallel with antineoplastic treatment. Evidence from patients with metastatic upper gastrointestinal cancers has highlighted the importance of early palliative care as part of comprehensive management, reflecting the need to address quality of life, symptom burden, and the broader experience of serious illness rather than focusing exclusively on tumor-directed outcomes (Adenis et al., 2024).

One psychological factor that may be particularly relevant to death anxiety is self-efficacy. Self-efficacy refers to an individual's belief in his or her capacity to organize and execute the behaviors required to manage particular situations, challenges, or goals. It affects motivation, persistence, effort, coping behavior, emotional responses, and the interpretation of difficult experiences (Usher & Morris, 2023). In the context of cancer, self-efficacy can be understood as confidence in one's ability to cope with disease-related challenges, tolerate treatment, manage symptoms, communicate with healthcare professionals, regulate emotional responses, and maintain engagement with daily life despite illness. Individuals with higher self-efficacy may perceive themselves as more capable of responding effectively to cancer-related demands and may therefore experience less helplessness when confronting threatening medical information. Recent evidence has shown that coping-related self-efficacy is positively associated with quality of life among patients with cancer, reinforcing its role as an important psychological resource during illness (Li et al., 2025).

Self-efficacy may also be directly relevant to death anxiety because beliefs about personal competence can influence how patients appraise uncontrollable or threatening events. When patients perceive themselves as capable of managing symptoms, treatment demands, emotional reactions, and practical difficulties, the diagnosis of cancer may be experienced as challenging but manageable. In contrast, low self-efficacy may amplify helplessness, avoidance, catastrophic interpretation, and perceived inability to cope with deterioration or uncertainty. Research among patients with cancer has specifically demonstrated a relationship between cancer-related self-efficacy and death anxiety, including evidence that self-

efficacy can function as a mediator between adaptive psychological characteristics such as mindfulness and mortality-related fear (Khanbabai Ghaleie, Farzaneh, et al., 2024; Khanbabai Ghaleie, Naderi, et al., 2024). In addition, findings concerning cancer patients suggest that self-efficacy and sense of coherence may jointly contribute to reductions in death anxiety, indicating that perceived personal competence may operate within a broader network of psychological resilience resources (S. H. Lee et al., 2023). These observations provide a strong rationale for examining self-efficacy as a predictor of death anxiety in gastrointestinal cancer.

A second construct of particular relevance is health locus of control. Health locus of control refers to beliefs about the determinants of health-related outcomes and is commonly conceptualized in terms of internal control, control by powerful others, and control attributed to chance. Individuals with a stronger internal health locus of control generally perceive their own behaviors and decisions as influential in determining health outcomes, whereas those with stronger external orientations may attribute outcomes primarily to healthcare professionals, other powerful individuals, fate, or chance. Health locus of control can shape health behavior, treatment engagement, decision-making, and coping with chronic disease. Evidence from behavioral research indicates that health locus of control is associated with patterns of health-related behavior (Kim & Lee, 2024), while systematic evidence suggests that locus-of-control orientations can influence the effectiveness and design of medical behavioral interventions (Mozafari et al., 2024). More recent research has also shown that health locus of control may contribute to quality of life and life satisfaction among individuals living with chronic diseases (Saiki et al., 2026).

The importance of health locus of control may be even greater in cancer because patients are repeatedly required to negotiate the tension between personal agency and factors outside their control. Treatment choices, disease progression, side effects, medical recommendations, and prognostic uncertainty may all challenge existing beliefs concerning who or what controls health. Qualitative evidence from cancer care indicates that health locus of control influences both patient and oncologist perspectives in medical decision-making, highlighting its relevance to communication and treatment involvement (Dopelt et al., 2022). In patients with gastrointestinal cancer, coping mechanisms and locus-of-control beliefs have also been associated with anxiety and quality of life, suggesting that

perceptions of control may shape psychological adaptation to illness (J. A. Lee et al., 2023). Beyond gastrointestinal cancer, health locus of control has been linked with symptom distress through psychological pathways such as illness acceptance and perceived symptom severity (Qi et al., 2024). These findings indicate that locus-of-control beliefs may affect distress both directly and indirectly through the patient's interpretation of disease and capacity to adapt to symptoms.

The theoretical relevance of health locus of control is also supported by broader evidence linking internal control beliefs to favorable health-related outcomes. For example, internal health locus of control has been identified as a mediating psychological mechanism through which personality characteristics may relate to health outcomes (Shaffer, 2025). Such findings imply that beliefs about personal control are not merely descriptive attitudes but may constitute mechanisms connecting relatively stable psychological characteristics with health behavior and health outcomes. In cancer, a stronger adaptive sense of control may reduce feelings of passivity and unpredictability, whereas excessive reliance on chance or uncontrollable external factors may intensify uncertainty. Nevertheless, locus of control is not inherently beneficial or detrimental in a uniform manner. In serious illness, realistic reliance on clinicians and acceptance of limits to personal control may sometimes be adaptive. Therefore, the effect of health locus of control on death anxiety may depend on intermediate psychological processes that help patients organize and interpret stressful experiences.

Sense of coherence provides one such explanatory mechanism. Originating from the salutogenic perspective, sense of coherence reflects the extent to which individuals perceive life events and stressors as comprehensible, manageable, and meaningful. Comprehensibility concerns the perception that events are structured and understandable rather than chaotic; manageability refers to the belief that sufficient internal or external resources are available to meet demands; and meaningfulness reflects the perception that challenges are worthy of engagement and investment. A strong sense of coherence may therefore help patients integrate the experience of cancer into a psychologically organized framework rather than experiencing the illness only as an unpredictable and overwhelming threat. Among patients with cancer, sense of coherence has been linked to demographic characteristics, psychological variables, lifestyle factors, complementary medicine use, and personal

explanations of disease, demonstrating its relevance to the broader adaptation process (Bargehr et al., 2023).

Sense of coherence may be particularly important in explaining how self-efficacy and health locus of control are translated into lower death anxiety. Self-efficacy provides confidence in one's ability to act, whereas health locus of control influences beliefs regarding the sources of control over health. Yet these resources may reduce mortality-related fear more effectively when patients are also able to perceive the cancer experience as understandable, manageable, and meaningful. A patient may, for example, believe that personal actions contribute to treatment management but still experience intense death anxiety if the illness feels chaotic and incomprehensible. Conversely, a strong sense of coherence may organize control beliefs into a more stable coping framework, allowing patients to interpret uncertainty without becoming psychologically overwhelmed. Empirical findings have suggested that self-efficacy and sense of coherence are both associated with lower death anxiety in cancer populations (S. H. Lee et al., 2023). Research in other contexts has likewise shown that sense of coherence can function as a mediating psychological resource linking adverse experiences to subsequent subjective well-being, supporting the broader proposition that coherence can transmit the effects of prior or concurrent psychological conditions onto emotional outcomes (Erus et al., 2024).

The importance of coherence becomes clearer when considering the existential dimension of serious illness. Cancer may disrupt assumptions about predictability, continuity, identity, future plans, and the meaning of everyday activities. In such circumstances, individuals are not only attempting to control symptoms; they are also attempting to construct a psychologically coherent interpretation of what is happening to them. This process is closely related to, but conceptually distinguishable from, meaning in life. Research using meaning-centered and logotherapy-based interventions has shown that attention to meaning may facilitate psychological adaptation among patients with cancer (Medeiros et al., 2025). Although the principal focus of the present study is sense of coherence, the broader evidence on meaning is relevant because meaningfulness constitutes one of the fundamental components of coherence and may protect patients from existential despair. The ability to preserve meaning, identify valued relationships or goals, and interpret illness within a broader life narrative may reduce the perception of death as exclusively threatening.

These psychological processes should also be considered within the biological and clinical complexity of gastrointestinal cancer. The development and progression of these malignancies involve interactions among genetic and environmental determinants (Liu et al., 2024), while contemporary treatment pathways increasingly integrate surgery, chemotherapy, targeted agents, immunotherapy, nutritional support, and supportive care (Budai et al., 2026; Chen et al., 2025). Such complexity can itself affect patients' sense of predictability and control. For some individuals, greater understanding of treatment options and medical information may enhance coherence and perceived agency; for others, complicated treatment decisions may intensify uncertainty. The psychological burden of cancer therefore cannot be reduced to a single emotional symptom. It reflects the interaction of disease characteristics, treatment demands, personal coping resources, health beliefs, existential interpretation, and interpersonal support.

Despite growing evidence concerning death anxiety, self-efficacy, health locus of control, and sense of coherence, several limitations remain in the existing literature. First, many studies examine these variables separately rather than integrating them into a coherent predictive framework. Second, research frequently focuses on broad cancer populations, despite important differences in symptom burden, treatment pathways, functional complications, and mortality concerns across cancer types. Third, evidence suggests that psychological adaptation is shaped by both direct effects and mediating mechanisms, yet comparatively few studies have tested whether sense of coherence explains how self-efficacy and health locus of control become associated with death anxiety. The importance of such modeling is underscored by research showing that psychological variables may operate through indirect pathways rather than exerting isolated effects (Khanbabai Ghaleie, Naderi, et al., 2024; Qi et al., 2024). Moreover, as supportive oncology increasingly recognizes emotional and psychosocial needs alongside physical outcomes, identifying modifiable pathways that may reduce death anxiety has practical implications for screening, counseling, psycho-oncology interventions, and patient-centered care (R. Song et al., 2024).

Accordingly, developing an explanatory model that integrates self-efficacy, health locus of control, sense of coherence, and death anxiety may contribute both theoretically and clinically to understanding psychological adaptation among patients with gastrointestinal cancer. Such a model can clarify whether patients' perceived capacity for

coping and beliefs about control are associated with death anxiety directly and whether these associations are partly explained by the extent to which patients experience their lives and illness as coherent, manageable, and meaningful. This perspective is consistent with emerging evidence that psychological resources can influence adjustment, coping, quality of life, and mortality-related distress in cancer populations (Bargehr et al., 2023; Fitzgerald et al., 2023; Li et al., 2025). It also provides a basis for moving from simple correlation toward a more process-oriented understanding of death anxiety, which may ultimately support more targeted psychosocial interventions for patients confronting serious gastrointestinal malignancies.

Therefore, the aim of the present study was to develop and test a predictive model of death anxiety based on self-efficacy and health locus of control, with the mediating role of sense of coherence, in patients with gastrointestinal cancer.

2. Methods and Materials

2.1. Study Design and Participants

The present study employed a descriptive-correlational research design based on structural equation modeling (SEM) and was applied in terms of its objective. The statistical population consisted of male and female patients diagnosed with gastrointestinal cancer who were referred to teaching and treatment hospitals affiliated with Iran University of Medical Sciences in Tehran, Iran. From this population, 256 patients were recruited through purposive sampling according to the predetermined inclusion and exclusion criteria. Participants were selected from eligible patients receiving diagnostic, therapeutic, or follow-up services at the participating medical centers. Eligibility for participation was determined on the basis of a confirmed diagnosis of gastrointestinal cancer, the ability to understand and respond to the questionnaire items, willingness to participate in the study, and provision of sufficiently complete questionnaire responses for statistical analysis. Patients who were unable to complete the questionnaires because of their clinical condition or who submitted substantially incomplete questionnaires were excluded from the final analysis. Following recruitment, participants were informed about the general purpose of the study and the procedure for completing the research instruments. Data were then collected using standardized self-report measures assessing death anxiety, health locus of control, general self-efficacy, and sense of coherence. The proposed conceptual

model examined self-efficacy and dimensions of health locus of control as predictor variables, death anxiety as the principal outcome variable, and sense of coherence as the mediating variable. Accordingly, both the direct relationships between the predictor variables and death anxiety and the indirect relationships operating through sense of coherence were evaluated within a structural equation modeling framework.

2.2. Data Collection Tools

Templer Death Anxiety Scale. Death anxiety was assessed using the Death Anxiety Scale developed by Templer in 1970. The scale consists of 15 items designed to assess individuals' attitudes and concerns regarding death and encompasses aspects related to general anxiety, death-related anxiety, and fear associated with pain and surgical procedures. Each item is answered dichotomously using "yes" or "no" response options. After scoring the items according to the scale instructions, total scores range from 0 to 15, with higher scores indicating greater levels of death anxiety. The original psychometric evaluation of the instrument demonstrated satisfactory reliability and validity. A test-retest reliability coefficient of 0.83 was reported for the original version. Evidence of concurrent validity was also obtained through correlations of 0.27 with a manifest anxiety measure and 0.40 with a measure of depression. In Iran, Rajabi and Bahrani evaluated the psychometric properties of the scale and reported an internal consistency coefficient of 0.73. They also examined its validity in relation to a manifest anxiety scale and reported a correlation coefficient of 0.34 between the two instruments, supporting the applicability of the scale for assessing death anxiety in Iranian samples.

Multidimensional Health Locus of Control Scale. Health locus of control was assessed using the Multidimensional Health Locus of Control Scale developed by Wallston and colleagues in 1976. The instrument consists of 18 items and is available in Forms A, B, and C. It evaluates three major dimensions of health locus of control: powerful others, internal health locus of control, and chance health locus of control. The Powerful Others dimension is assessed by Items 3, 5, 7, 10, 14, and 18; the Internal Health Locus of Control dimension by Items 1, 6, 8, 12, 13, and 17; and the Chance dimension by Items 2, 4, 9, 11, 15, and 16. Responses are rated on a six-point Likert scale ranging from 1, representing "strongly disagree," to 6, representing "strongly agree." Scores for each subscale are calculated separately, with

higher scores reflecting a stronger tendency to attribute health outcomes to the corresponding source of control. Cassianos and colleagues reported correlations ranging from 0.36 to 0.40 between the instrument and the General Self-Efficacy Scale as evidence supporting its convergent validity. In an Iranian psychometric investigation, Mani and colleagues reported a Cronbach's alpha coefficient of 0.85 and provided evidence of validity through the relationship of the instrument with Levenson's internal-external locus of control measure. These findings indicate satisfactory reliability and validity for assessing individual differences in beliefs about control over health outcomes.

Sherer General Self-Efficacy Scale. General self-efficacy was measured using the Self-Efficacy Scale developed by Sherer and colleagues in 1982. The instrument contains 17 items designed to assess individuals' generalized beliefs regarding their ability to successfully perform behaviors and cope effectively with difficult or challenging situations. Items are scored on a five-point Likert scale ranging from 1, "strongly disagree," to 5, "strongly agree," with higher scores representing greater perceived self-efficacy. Sherer and colleagues reported a Cronbach's alpha coefficient of 0.86 for the General Self-Efficacy Scale, indicating satisfactory internal consistency. The psychometric properties of the Persian version were examined by Asgharnejad and colleagues using exploratory and confirmatory factor analyses. Their exploratory factor analysis indicated a three-factor structure, whereas confirmatory factor analysis supported a hierarchical model comprising three first-order factors and a higher-order general self-efficacy factor. In addition, a Cronbach's alpha coefficient of 0.83 was obtained for the scale, demonstrating acceptable internal consistency in the Iranian population. In the present study, the total self-efficacy score was considered an indicator of participants' general perceived capability to manage demands, overcome obstacles, and effectively deal with challenging life circumstances.

Sense of Coherence Questionnaire. Sense of coherence was assessed using the questionnaire developed by Flensburg-Madsen and colleagues in 2006. The instrument consists of 35 items and assesses the major components of sense of coherence, including comprehensibility, which reflects the extent to which internal and external experiences are perceived as understandable and structured; manageability, which reflects the perceived availability of adequate resources for dealing with demands; and meaningfulness, which represents the extent to which life demands are considered worthy of engagement and effort.

The first 24 items are scored on a three-point response format consisting of “no” = 1, “do not know” = 2, and “yes” = 3. Items 25 through 35 use a five-point Likert-type response format ranging from 1, “very dissatisfied,” to 5, “very satisfied.” The questionnaire yields an overall score representing the individual's sense of coherence, with higher scores indicating a stronger sense of comprehensibility, manageability, and meaningfulness. Flensburg-Madsen and colleagues reported Cronbach's alpha coefficients of 0.87 and 0.86 in psychometric evaluations of the instrument, indicating satisfactory internal consistency. In Iran, Alipour and Sharif examined its construct validity using exploratory factor analysis and found evidence supporting a single-factor structure, with the extracted factor accounting for 76.5% of the total variance. These findings supported the use of the instrument as an overall measure of psychological sense of coherence in the present study.

2.3. Data Analysis

The collected data were analyzed using SPSS and AMOS software. Initially, data were screened for completeness, coding accuracy, and suitability for statistical analysis. Descriptive statistics, including frequency, percentage, mean, standard deviation, minimum, and maximum values, were used to summarize the participants' characteristics and the distributions of the principal study variables. The distributions of the observed variables were examined before conducting the inferential analyses to determine their suitability for parametric statistical procedures and structural equation modeling. Pearson correlation coefficients were calculated to examine the bivariate relationships among death anxiety, self-efficacy, the dimensions of health locus of control, and sense of coherence. Subsequently, structural equation modeling was performed in AMOS to test the hypothesized predictive model. In the structural model, self-efficacy and health locus of control were specified as exogenous predictor variables, sense of coherence was specified as the mediator, and death anxiety was specified as the endogenous outcome variable. Both direct effects of self-efficacy and health locus of control on death anxiety and their indirect effects through sense of coherence were

estimated. The adequacy of the proposed model was evaluated using commonly recommended goodness-of-fit indices, including the chi-square to degrees-of-freedom ratio (χ^2/df), Comparative Fit Index (CFI), Incremental Fit Index (IFI), Goodness-of-Fit Index (GFI), and Root Mean Square Error of Approximation (RMSEA). Standardized path coefficients were used to determine the magnitude and direction of the relationships among the study variables. The mediating role of sense of coherence was evaluated by estimating the indirect effects of the predictor variables on death anxiety, with the statistical significance of indirect pathways assessed using resampling-based estimation where applicable. A significance level of $p < .05$ was used for inferential statistical analyses.

3. Findings and Results

A total of 256 patients with gastrointestinal cancer participated in the study. Of these, 155 participants (60.5%) were men and 101 (39.5%) were women. Regarding educational attainment, the largest group consisted of participants with an associate degree, comprising 72 individuals (28.1%), followed by participants with less than a high-school diploma, comprising 69 individuals (27.0%). With respect to marital status, 126 participants were married, 89 were single, and 41 were classified under other marital-status categories. Based on the reported frequencies and the total sample of 256 participants, these groups represented approximately 49.2%, 34.8%, and 16.0% of the sample, respectively.

Descriptive statistics for the study variables and their subscales are presented in Table 1. The mean total self-efficacy score was 43.30 (SD = 5.57), while the mean total health locus of control score was 53.60 (SD = 5.76). The mean total sense of coherence score was 63.50 (SD = 8.35), and the mean total meaning in life score was 26.00 (SD = 4.38). The mean total death anxiety score was 13.20 (SD = 1.83). Examination of skewness and kurtosis showed that all values were within the range of -3 to $+3$, providing preliminary evidence that the observed variables approximated a normal distribution.

Table 1

Descriptive Statistics for the Study Variables and Their Components

Variable	Mean	SD	Skewness	Kurtosis
Initiative in behavior	9.30	1.86	0.151	-0.311
Effort persistence	10.20	2.96	0.046	0.226
Persistence in the face of failure	11.50	3.01	0.050	-0.060
Self-efficacy, total	43.30	5.57	-0.125	-0.470
Internal health control	18.10	2.72	-0.090	-0.470
Powerful others control	18.30	2.55	-0.660	0.630
Chance health control	17.20	2.01	0.220	0.680
Health locus of control, total	53.60	5.76	-0.690	0.120
Comprehensibility	29.30	2.79	-0.100	-0.210
Manageability	34.80	3.70	0.400	0.020
Meaningfulness	29.30	2.86	-0.390	-0.230
Sense of coherence, total	63.50	8.35	-0.060	-0.160
Search for meaning	12.40	2.58	-0.240	-0.020
Presence of meaning in life	13.60	2.43	-0.100	0.210
Meaning in life, total	26.00	4.38	-0.030	-0.110
General anxiety	4.76	0.846	0.126	-0.020
Death-related anxiety	4.94	0.749	0.103	0.202
Fear of surgery	3.88	0.469	0.040	-0.111
Death anxiety, total	13.20	1.83	-0.080	-0.660

Prior to testing the structural model, the dataset was subjected to preprocessing procedures involving the identification and treatment of missing observations and outliers. Missing responses were identified across a number of subscales. Nine missing responses were detected for initiative in behavior, six for effort persistence, eight for persistence in the face of failure, five for internal health control, four for powerful others control, five for chance health control, four for comprehensibility, eight for manageability, three for meaningfulness, four for search for meaning, three for presence of meaning in life, four for general anxiety, four for death-related anxiety, and three for fear of surgery. Missing observations were replaced using the median of the corresponding variable, after which no missing values remained in the dataset.

Potential univariate outliers were subsequently examined by converting raw scores to standardized z scores. A criterion of ± 2.58 was used for identifying observations located within approximately the extreme 1% of a normal distribution. Two outliers were identified for initiative in behavior, with a maximum absolute z value of 4.16; two for effort persistence, with a maximum z of 4.21; two for persistence in the face of failure, with a maximum z of 3.98; three for internal health control, with a maximum z of 3.87; four for powerful others control, with a maximum z of 3.71; six for chance health control, with a maximum z of 3.79; four for comprehensibility, with a maximum z of 4.02; two for

manageability, with a maximum z of 3.73; two for meaningfulness, with a maximum z of 3.96; five for search for meaning, with a maximum z of 3.78; three for presence of meaning in life, with a maximum z of 3.66; two for general anxiety, with a maximum z of 4.01; four for death-related anxiety, with a maximum z of 4.19; and five for fear of surgery, with a maximum z of 4.13. Following their identification, outlying values were replaced with the mean of the corresponding variable.

Univariate normality was examined through skewness and kurtosis indices. As shown in Table 1, none of the indicators had skewness or kurtosis coefficients outside the interval of -3 to $+3$; therefore, the variables were considered normally or approximately normally distributed. Multivariate normality, which represents an additional assumption of structural equation modeling, was evaluated in AMOS using Mardia's multivariate kurtosis coefficient. The Mardia coefficient obtained for the present data was -4.68 . Because its absolute magnitude was below the criterion of 5 used to indicate substantial multivariate non-normality, the assumption of multivariate normality was considered adequately satisfied. Consequently, maximum likelihood estimation was considered appropriate for estimating the structural equation model.

Pearson correlation coefficients among the principal study variables are presented in Table 2. Self-efficacy was positively and significantly correlated with health locus of

control ($r = .34, p < .01$), sense of coherence ($r = .43, p < .01$), and meaning in life ($r = .35, p < .01$), whereas it was negatively associated with death anxiety ($r = -.43, p < .01$). Health locus of control was positively related to sense of coherence ($r = .39, p < .01$) and meaning in life ($r = .36, p < .05$), while showing a significant negative association with death anxiety ($r = -.41, p < .01$). Sense of coherence was

positively correlated with meaning in life ($r = .38, p < .01$) and negatively correlated with death anxiety ($r = -.40, p < .01$). The strongest bivariate association was observed between meaning in life and death anxiety ($r = -.69, p < .01$), indicating that a greater sense of meaning in life was associated with substantially lower death anxiety.

Table 2

Pearson Correlations Among the Main Study Variables

Variable	1	2	3	4	5
1. Self-efficacy	1				
2. Health locus of control	.34**	1			
3. Sense of coherence	.43**	.39**	1		
4. Meaning in life	.35**	.36*	.38**	1	
5. Death anxiety	-.43**	-.41**	-.40**	-.69**	1

Linearity was examined using scatterplots of the study variables. Visual examination of the scatterplots indicated approximately linear patterns between the variables, supporting the assumption of linearity required for the subsequent structural equation analyses. The absence of problematic multicollinearity among the predictor variables was assessed using tolerance and variance inflation factor (VIF) statistics. As presented in Table 3, tolerance

coefficients ranged from .378 to .459, all of which were considerably greater than the minimum criterion of .10. VIF values ranged from 2.17 to 2.64 and were therefore substantially below the conventional upper criterion of 10. These results indicated that severe multicollinearity was not present among the predictor variables and that the variables could be included simultaneously in the structural model.

Table 3

Tolerance and Variance Inflation Factor Statistics for Predictor Variables

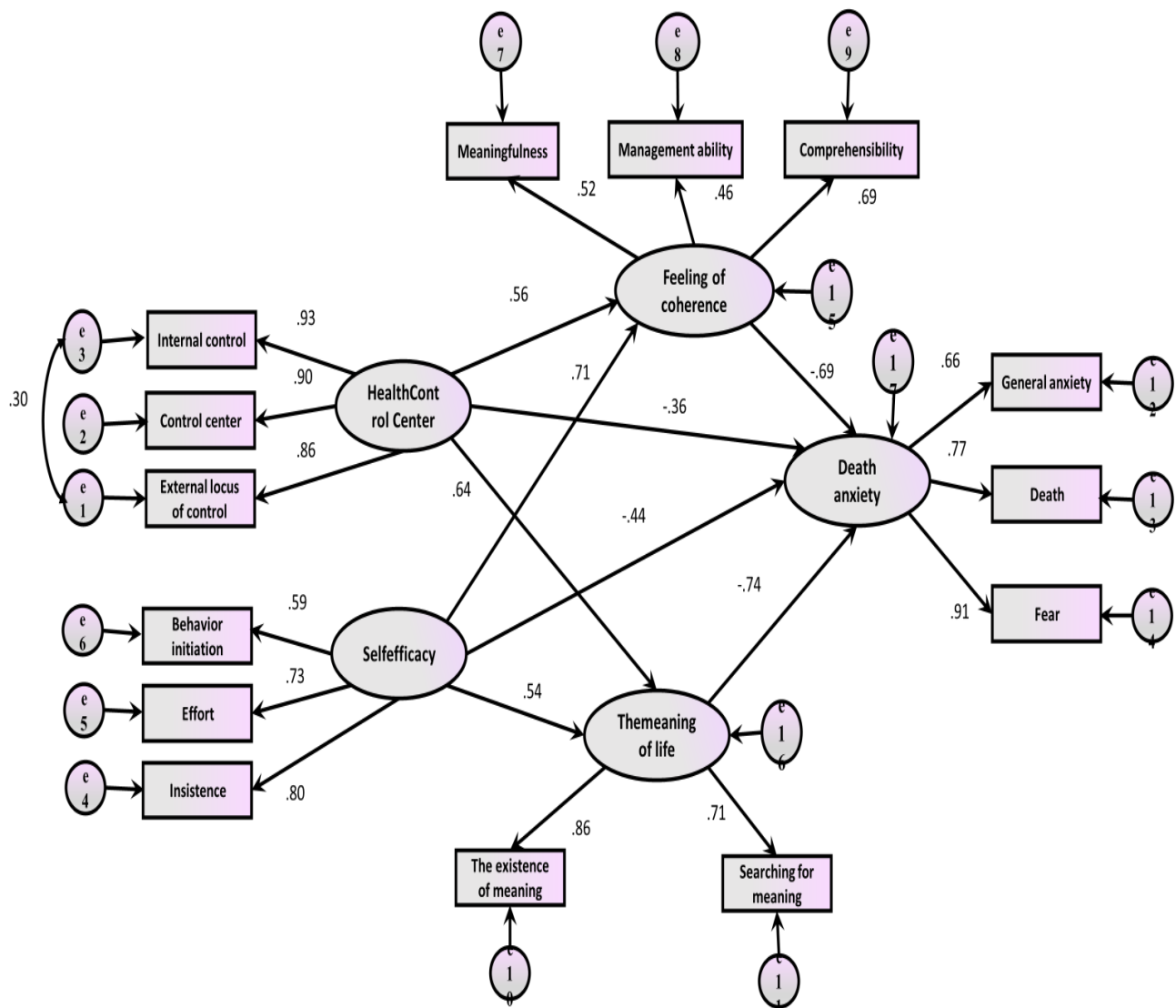
Predictor variable	Tolerance	VIF
Initiative in behavior	.407	2.45
Effort persistence	.454	2.20
Persistence in the face of failure	.447	2.23
Internal health control	.431	2.32
Powerful others control	.399	2.50
Chance health control	.459	2.17
Comprehensibility	.425	2.35
Manageability	.449	2.22
Meaningfulness	.451	2.21
Search for meaning	.435	2.29
Presence of meaning in life	.378	2.64

The main research question concerned whether the proposed model predicting death anxiety from self-efficacy and health locus of control through the mediating roles of sense of coherence and meaning in life demonstrated

adequate fit among patients with gastrointestinal cancer. Structural equation modeling was performed in AMOS to evaluate this model.

Figure 1

Proposed Structural Model with Standardized Path Coefficients



The fit indices for the structural model, together with standardized factor loadings for the measurement model, are presented in Table 4. The chi-square to degrees-of-freedom ratio was 2.10, which was below the recommended maximum of 3. The RMSEA was .05, below the criterion of .10, while the CFI, NFI, GFI, and AGFI values were .94, .91, .96, and .94, respectively, all meeting the specified criterion of .90 or higher. Considered collectively, these indices demonstrated that the proposed model had an acceptable overall fit to the observed data.

The measurement component of the model was also supported. All standardized factor loadings were statistically

significant at $p = .001$. Factor loadings ranged from .46 to .93, indicating that all observed components contributed significantly to their respective latent constructs. Within self-efficacy, standardized loadings ranged from .59 to .80. For health locus of control, the loadings ranged from .86 to .93. Sense of coherence indicators had standardized loadings ranging from .46 to .69, while the two indicators of meaning in life had loadings of .71 and .86. The death anxiety indicators had standardized factor loadings ranging from .66 to .91. Accordingly, the measurement model provided adequate support for retaining the specified indicators in the structural analysis.

Table 4

Model Fit Indices and Standardized Factor Loadings of the Measurement Model

Model component / index	Estimate	Recommended criterion / <i>p</i>
Overall model fit		
χ^2/df	2.10	< 3
RMSEA	.05	< .10
CFI	.94	> .90
NFI	.91	> .90
GFI	.96	> .90
AGFI	.94	> .90
Standardized factor loadings		
Initiative in behavior	.59	.001
Effort persistence	.73	.001
Persistence in the face of failure	.80	.001
Internal health control	.93	.001
Powerful others control	.90	.001
Chance health control	.86	.001
Comprehensibility	.46	.001
Manageability	.69	.001
Meaningfulness	.52	.001
Search for meaning	.71	.001
Presence of meaning in life	.86	.001
General anxiety	.66	.001
Death-related anxiety	.77	.001
Fear of surgery	.91	.001

To further examine the hypothesized mediation processes, the indirect pathways were assessed. The mediation analysis was based on the Sobel approach, in which the significance of an indirect effect is evaluated by dividing the product of the two unstandardized path coefficients involved in the mediation process by the standard error of that product. The general expression used for the test was $z = ab / \sqrt{(b^2 s_a^2 + a^2 s_b^2 + s_a^2 s_b^2)}$, where a and b denote the unstandardized coefficients of the two component paths and s_a and s_b represent their respective standard errors. A Sobel statistic with an absolute value greater than 1.96 was considered statistically significant at the .05 level in large samples.

The direct and indirect structural effects are summarized in Table 5. Health locus of control significantly and negatively predicted death anxiety directly, with a standardized coefficient of $\beta = -.36$ ($t = -6.15$, $p = .001$). Thus, higher levels of health locus of control were associated with lower death anxiety. Self-efficacy also demonstrated a significant negative direct effect on death anxiety, $\beta = -.44$ ($t = -7.81$, $p = .001$), indicating that individuals with stronger self-efficacy tended to report lower levels of death anxiety.

Meaning in life significantly mediated the relationship between health locus of control and death anxiety. The standardized indirect effect was $\beta = -.39$ ($p = .001$), indicating that health locus of control was indirectly associated with lower death anxiety through its relationship with meaning in life. Similarly, meaning in life significantly mediated the association between self-efficacy and death anxiety, with a standardized indirect effect of $\beta = -.40$ ($p = .001$). This result indicated that part of the association between higher self-efficacy and lower death anxiety was transmitted through increased meaning in life.

Sense of coherence also played a significant mediating role in the model. The indirect effect of health locus of control on death anxiety through sense of coherence was statistically significant, $\beta = -.39$ ($p = .001$). Thus, part of the effect of health locus of control on death anxiety could be explained through differences in patients' sense of coherence. Finally, the indirect effect of self-efficacy on death anxiety through sense of coherence was $\beta = -.49$ ($p = .001$), indicating a significant mediating effect. Among the reported indirect pathways, the self-efficacy–sense of coherence–death anxiety pathway demonstrated the largest standardized indirect coefficient.

Table 5

Direct and Indirect Effects in the Structural Model Predicting Death Anxiety

Outcome	Predictor	Mediator / effect type	Standardized β	Test statistic	p
Death anxiety	Health locus of control	Direct	-.36	-6.15	.001
Death anxiety	Self-efficacy	Direct	-.44	-7.81	.001
Death anxiety	Health locus of control	Indirect through meaning in life	-.39	—	.001
Death anxiety	Self-efficacy	Indirect through meaning in life	-.40	—	.001
Death anxiety	Health locus of control	Indirect through sense of coherence	-.39	—	.001
Death anxiety	Self-efficacy	Indirect through sense of coherence	-.49	—	.001

Overall, the findings supported the adequacy of the proposed structural model for predicting death anxiety among patients with gastrointestinal cancer. The combination of acceptable goodness-of-fit indices, statistically significant measurement-model factor loadings, significant negative direct effects of self-efficacy and health locus of control on death anxiety, and significant indirect effects through sense of coherence and meaning in life provided empirical support for the hypothesized relationships. Specifically, greater self-efficacy and stronger health-related control beliefs were associated with lower death anxiety both directly and indirectly, while sense of coherence and meaning in life constituted significant psychological mechanisms through which these predictor variables were related to death anxiety.

4. Discussion and Conclusion

The present study examined a predictive model of death anxiety based on self-efficacy and health locus of control, with the mediating roles of sense of coherence and meaning in life, among patients with gastrointestinal cancer. Overall, the structural model demonstrated acceptable fit, indicating that the proposed relationships among the study variables were consistent with the observed data. The findings showed that both self-efficacy and health locus of control had significant direct negative effects on death anxiety. In addition, sense of coherence and meaning in life significantly mediated the relationships of self-efficacy and health locus of control with death anxiety. These findings suggest that death anxiety in patients with gastrointestinal cancer is not determined solely by the severity or threatening nature of the disease but is also associated with patients' beliefs about their personal capabilities, perceptions of control over health-related outcomes, ability to perceive stressful experiences as coherent and manageable, and capacity to maintain a sense of meaning in life.

One of the principal findings was that health locus of control significantly predicted death anxiety, such that stronger health locus of control was associated with lower death anxiety. This finding is consistent with previous evidence demonstrating that health locus of control is an important psychological determinant of adaptation, health-related behavior, symptom experience, and decision-making. Dopelt and colleagues showed that locus-of-control beliefs influence how cancer patients engage in treatment decisions and interpret the roles of themselves and their oncologists in controlling health outcomes (Dopelt et al., 2022). Similarly, Lee and colleagues reported that coping mechanisms and health locus of control were associated with anxiety and quality of life among patients with gastrointestinal cancer (J. A. Lee et al., 2023). The present finding is also supported by evidence indicating that health locus of control is related to health behaviors (Kim & Lee, 2024) and may shape responses to medical behavioral interventions (Mozafari et al., 2024). More recent findings further suggest that health locus of control is associated with quality of life and life satisfaction in individuals with chronic disease (Saiki et al., 2026), while internal health locus of control can function as a mechanism connecting personal characteristics to health outcomes (Shaffer, 2025). Taken together, these findings support the interpretation that perceiving some degree of control over health-related circumstances can reduce the sense of helplessness that often accompanies cancer and thereby diminish mortality-related fear.

This association can be explained by considering the role of perceived agency in the cancer experience. Gastrointestinal cancer exposes patients to many factors that may appear uncontrollable, including disease progression, treatment side effects, uncertainty regarding prognosis, invasive procedures, and possible recurrence. When patients believe that their behaviors, treatment adherence, coping strategies, communication with healthcare professionals,

and personal decisions can meaningfully influence their health trajectory, they may experience greater psychological stability. By contrast, when health outcomes are perceived primarily as the result of chance or uncontrollable forces, uncertainty may become more threatening and death-related concerns may intensify. This interpretation is compatible with findings from patients with acute leukemia showing that health locus of control was related to symptom distress through illness acceptance and symptom severity (Qi et al., 2024). Thus, health locus of control may influence death anxiety not simply through beliefs about control themselves, but through the broader interpretive framework patients use to understand symptoms, treatment, and prognosis.

The second major finding was that self-efficacy had a significant direct negative effect on death anxiety. Patients with higher self-efficacy reported lower death anxiety, and the magnitude of this direct relationship was substantial. This finding is consistent with the general conceptualization of self-efficacy as a belief in one's capacity to organize and execute behaviors needed to manage difficult situations (Usher & Morris, 2023). In the context of cancer, self-efficacy reflects confidence in managing symptoms, dealing with treatment demands, regulating emotional reactions, seeking assistance, maintaining functioning, and coping with uncertainty. Previous research has shown that greater cancer-related coping self-efficacy is associated with better quality of life (Li et al., 2025). More directly, studies among cancer patients have demonstrated that cancer self-efficacy is associated with death anxiety and can mediate the relationship between mindfulness and mortality-related fear (Khanbabai Ghaleie, Farzaneh, et al., 2024; Khanbabai Ghaleie, Naderi, et al., 2024). The present findings are also consistent with evidence that both self-efficacy and sense of coherence are associated with reduced death anxiety among patients with cancer (S. H. Lee et al., 2023).

A plausible explanation for this result is that self-efficacy affects the cognitive appraisal of cancer-related threats. Patients with high self-efficacy are more likely to view difficult treatment experiences as challenges that can be managed rather than as entirely overwhelming threats. Greater confidence in one's coping capacity may reduce catastrophic thinking, helplessness, avoidance, and excessive focus on death. In contrast, low self-efficacy can strengthen the perception that one lacks sufficient resources to confront pain, physical decline, complex treatment, or uncertainty about the future. This is particularly relevant in gastrointestinal cancer, in which patients may experience surgery, altered nutritional functioning, physical weakness,

and other significant treatment-related challenges. Contemporary gastrointestinal cancer care has advanced considerably through targeted and immune therapies (Chen et al., 2025), yet the complexity of treatment itself may increase the need for patients to feel competent in managing their illness. Likewise, physical burdens such as sarcopenia and postoperative complications may further challenge patients' confidence in their capacity to cope (Budai et al., 2026; Zhang et al., 2024). Under such circumstances, self-efficacy may serve as a psychological resource that buffers the perceived threat of mortality.

Another important finding was that sense of coherence significantly mediated the relationship between health locus of control and death anxiety. In other words, health locus of control was associated with lower death anxiety partly through its relationship with patients' sense of coherence. This finding is compatible with research showing that sense of coherence is strongly related to psychological adjustment among cancer patients and is associated with psychological characteristics, lifestyle variables, and personal understandings of illness (Bargehr et al., 2023). It is also consistent with broader evidence suggesting that sense of coherence may operate as an intermediary psychological resource linking life experiences with subsequent well-being (Erus et al., 2024). The present results therefore extend previous findings by suggesting that perceived health control may influence death anxiety partly because it enables patients to experience their illness as more understandable, manageable, and psychologically organized.

This mediating relationship can be interpreted through the three dimensions of sense of coherence. Patients who believe that health outcomes are at least partly influenced by identifiable actions or controllable processes may find the illness more comprehensible because its course is not interpreted as entirely random. They may also perceive the illness as more manageable when they believe that personal, interpersonal, or medical resources can be mobilized effectively. Finally, a stronger sense of control may facilitate meaningful engagement with treatment and coping tasks. When these processes occur, the cancer experience may be perceived as less chaotic and less psychologically overwhelming, thereby decreasing death anxiety. Conversely, if patients perceive their condition as unpredictable, uncontrollable, and incomprehensible, mortality-related fear may become more intense even when medical care is available. This interpretation is particularly relevant given evidence that early diagnosis remains challenging in gastrointestinal cancers (Marin et al., 2023)

and that prognostic biomarkers and increasingly complex treatment decisions can introduce considerable uncertainty into the patient experience (Zhang et al., 2023). Sense of coherence may therefore help patients integrate complex medical information into a more stable psychological framework.

The findings also showed that sense of coherence significantly mediated the relationship between self-efficacy and death anxiety, and this pathway yielded the strongest reported indirect coefficient. Thus, part of the protective association between self-efficacy and death anxiety appears to operate through the patient's capacity to experience life and illness as coherent. This result is consistent with Lee and colleagues, who found that self-efficacy and sense of coherence were both associated with lower death anxiety among cancer patients (S. H. Lee et al., 2023). It can be argued that self-efficacy supplies confidence in personal capability, whereas sense of coherence organizes that confidence into a broader appraisal of the environment and illness. A patient may believe that he or she can manage a particular symptom or treatment task, but this confidence may have a stronger protective effect when the overall cancer experience is also perceived as understandable and manageable. Therefore, self-efficacy may reduce death anxiety both directly and by strengthening a coherent psychological orientation toward illness.

The mediation results involving meaning in life were also significant. Meaning in life mediated the relationship between health locus of control and death anxiety, indicating that stronger health-control beliefs were associated with lower death anxiety partly through a greater sense of meaning. Meaning in life also mediated the relationship between self-efficacy and death anxiety. These findings are consistent with growing evidence that existential meaning is an important component of psychological adaptation to cancer. Medeiros and colleagues demonstrated that a logotherapy-based intervention focused on meaning in life could positively affect the psychological experience of patients with cancer (Medeiros et al., 2025). Meaning may be especially important in the context of death anxiety because serious illness can disrupt assumptions about the future, personal identity, valued roles, and continuity of life. When individuals preserve or reconstruct a sense of purpose despite illness, awareness of mortality may remain emotionally difficult but may become more tolerable.

The mediating role of meaning can also be understood in relation to self-efficacy. Patients with greater self-efficacy may remain more engaged with valued activities, treatment

decisions, relationships, and personal goals. This continued engagement may help sustain a sense that life retains purpose despite illness. In turn, stronger meaning may reduce excessive preoccupation with death and support psychological accommodation to the possibility of mortality. Similarly, patients with stronger health locus of control may experience themselves as active participants rather than passive recipients of illness, which can preserve purpose and agency. These processes may be especially relevant among patients with advanced gastrointestinal cancer, for whom concerns about prognosis and mortality may be prominent. Previous evidence has emphasized the clinical relevance of death anxiety in advanced gastrointestinal disease (Timmermans et al., 2024) and among terminal cancer patients more generally (Dunn et al., 2023; Maddox et al., 2023). The present results suggest that preserving meaning may be one mechanism through which patients can psychologically confront these concerns.

The observed negative association between meaning in life and death anxiety was particularly strong at the correlational level. This finding supports an existential interpretation of death anxiety in which fear of death may intensify when patients perceive diminished purpose, disconnection from valued goals, or disruption of their life narrative. The finding is also consistent with previous research emphasizing coping processes in gastrointestinal cancer (Fitzgerald et al., 2023). Meaning-making can itself be conceptualized as a coping process because it enables patients to reinterpret suffering, prioritize important relationships, and construct a broader narrative around illness. This does not imply that meaning eliminates fear of death; rather, it may provide a psychological framework that prevents mortality awareness from becoming wholly destabilizing.

The overall model fit provides additional support for considering death anxiety as the outcome of an interconnected set of psychological processes. The acceptable values of χ^2/df , RMSEA, CFI, NFI, GFI, and AGFI indicated that the proposed pattern of relationships was compatible with the empirical data. Furthermore, all measurement indicators loaded significantly on their corresponding constructs, suggesting that the latent variables were adequately represented by their measured dimensions. The findings are consistent with a broader trend in psycho-oncology toward multifactorial models of distress rather than single-variable explanations. Psychological interventions have been shown to reduce anxiety and depression among patients with gastrointestinal cancer

(Chen et al., 2024), and supportive care research increasingly emphasizes the need to address multidimensional emotional and psychosocial needs among cancer survivors (R. Song et al., 2024). The present model contributes to this perspective by highlighting specific psychological resources that may be relevant to mortality-related distress.

The findings should also be interpreted within the increasingly complex clinical environment of gastrointestinal cancer. Advances in molecular treatment, immunotherapy, supportive care, and palliative care have expanded therapeutic options (Adenis et al., 2024; Chen et al., 2025), yet improved treatment possibilities do not necessarily eliminate existential uncertainty. Genetic and environmental heterogeneity contribute to variation in disease occurrence and progression (Liu et al., 2024), while physical complications and treatment burdens may remain substantial (Budai et al., 2026; Zhang et al., 2024). Patients therefore have to adapt simultaneously to medical uncertainty, bodily changes, therapeutic demands, and mortality awareness. The present results suggest that self-efficacy, health locus of control, coherence, and meaning may constitute an interconnected psychological system through which this adaptation occurs.

Moreover, cancer does not affect patients in isolation. Gastrointestinal cancer can impose substantial burdens on family caregivers, and caregiver resilience has been shown to influence quality of life in the context of adjuvant chemotherapy (H. J. Song et al., 2024). This broader interpersonal context may be relevant to the study variables because perceived manageability and control can depend partly on the availability of family and healthcare resources. A patient's sense of coherence may therefore reflect not only internal psychological characteristics but also the extent to which supportive relationships make illness demands appear manageable. Similarly, a health locus of control involving appropriate confidence in healthcare professionals may be adaptive rather than simply external, particularly in complex cancer treatment. These nuances indicate that the relationships found in the present study should be interpreted dynamically rather than assuming that one type of control belief is universally beneficial.

Taken together, the results indicate that lower death anxiety among patients with gastrointestinal cancer is associated with stronger self-efficacy and more adaptive health-control beliefs, while sense of coherence and meaning in life appear to represent important pathways through which these resources are translated into psychological adjustment.

These findings are compatible with previous research linking self-efficacy, locus of control, coping, coherence, and meaning to anxiety, quality of life, symptom distress, and death anxiety in cancer populations (Bargehr et al., 2023; Khanbabai Ghaleie, Naderi, et al., 2024; J. A. Lee et al., 2023; S. H. Lee et al., 2023; Qi et al., 2024). Accordingly, death anxiety may be most effectively understood not simply as a reaction to disease severity, but as an outcome shaped by how patients perceive their capacity to cope, their degree of influence over health, the coherence of their illness experience, and the meaning they continue to derive from life.

The present study had several limitations that should be considered when interpreting its findings. First, the descriptive-correlational and cross-sectional design limits causal inference; therefore, although the structural model specified directional relationships among the variables, it cannot establish temporal or causal effects. Second, participants were recruited purposively from teaching and treatment hospitals affiliated with one medical university in Tehran, which may restrict the generalizability of the findings to patients receiving care in other regions, healthcare systems, or cultural settings. Third, all major psychological variables were assessed using self-report instruments, which may be affected by response styles, social desirability, current emotional state, or misunderstanding of questionnaire items. Fourth, the sample included patients with gastrointestinal cancer as a broad clinical group, without modeling potentially important differences according to cancer site, disease stage, treatment modality, time since diagnosis, recurrence status, pain, functional status, or prognosis. Fifth, although missing data and outliers were statistically managed, replacement procedures may have reduced some of the natural variability in the dataset. Finally, other potentially important determinants of death anxiety, including social support, spirituality, depression, pain severity, coping style, attachment, family functioning, and perceived prognosis, were not incorporated into the proposed model.

Future studies should evaluate the proposed model using longitudinal designs in order to determine whether self-efficacy, health locus of control, sense of coherence, and meaning in life prospectively predict changes in death anxiety across diagnosis, treatment, remission, recurrence, and advanced disease. Replication with larger and more geographically diverse samples would improve generalizability and permit subgroup analyses based on cancer type, disease stage, sex, age, treatment modality, and

socioeconomic characteristics. Future research could also compare alternative structural models and examine whether sense of coherence and meaning in life operate as parallel, sequential, or moderated mediators. Incorporating clinical indicators such as stage of disease, treatment intensity, symptom burden, performance status, pain, nutritional status, and prognosis could clarify the relative contribution of psychological and medical factors. Studies using multi-method assessment, including clinical interviews and reports from healthcare professionals or caregivers, may reduce reliance on self-report data. Experimental and intervention studies are also warranted to determine whether increasing self-efficacy, strengthening adaptive control beliefs, enhancing coherence, or facilitating meaning-making can causally reduce death anxiety.

The findings suggest that psychological screening in oncology settings should include assessment of death anxiety alongside patients' perceived self-efficacy, health-control beliefs, sense of coherence, and perceived meaning in life. Psycho-oncology services may benefit from interventions designed to strengthen patients' confidence in managing symptoms, treatment demands, emotional distress, and communication with healthcare professionals. Clinicians can also help patients distinguish between aspects of illness that can be actively managed and those that require acceptance, thereby promoting a realistic and adaptive sense of control rather than either helplessness or unrealistic responsibility. Counseling approaches may focus on helping patients organize complex medical experiences into a more understandable and manageable framework while identifying personal, family, and healthcare resources available to them. Meaning-centered interventions may be particularly useful for patients showing high death anxiety, loss of purpose, or existential distress. Finally, multidisciplinary cancer care teams should consider integrating psychological and existential support with medical treatment so that management of gastrointestinal cancer addresses not only survival and physical symptoms but also patients' capacity to cope with mortality-related concerns and maintain psychological stability.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the interview and participated in the research with informed consent.

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