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Managing diagnostic uncertainty in primary care: a mixed-methods study of family physicians' experiences in Türkiye

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Abstract

Background Clinical uncertainty is an inherent component of primary care practice. Family physicians frequently face diagnostic ambiguity, time pressure, and limited access to diagnostic resources, which may affect decision-making and patient outcomes. However, evidence on how family physicians in Türkiye manage diagnostic uncertainty remains limited.

Methods This mixed-methods study included 20 family physicians practicing in primary care settings in Türkiye. Quantitative data were collected using the Physicians' Reactions to Uncertainty Scale (PRUS) and the Melbourne Decision-Making Questionnaire I-II (MDMQ). Semi-structured interviews were then conducted and analyzed thematically using the Braun and Clarke framework.

Results Quantitative findings showed moderate-to-high emotional reactions to uncertainty and variation in decision-making styles among participants. Thematic analysis of the interviews revealed six key themes: diagnostic challenges and systemic barriers as major sources of uncertainty; specialist consultation, peer support, and patient communication as the main coping strategies; and the significant influence of patient compliance, physicians' experience, and time pressure on decision-making. High patient load, referral difficulties, and inadequate digital systems were identified as major health system challenges. Physicians consistently emphasized the importance of case-based training and professional development, while also highlighting the role of transparent physician–patient communication in reducing uncertainty.

Conclusions Diagnostic uncertainty is a multifaceted challenge in primary care in Türkiye, influenced by individual, systemic, and patient-related factors. Strengthening case-based educational programs, improving referral processes, and reducing patient load may enhance physicians' ability to manage uncertainty and improve patient outcomes.

Clinical trial number Not applicable.

Keywords Clinical uncertainty, Family physicians, Primary care, Decision-making, Mixed-methods

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Introduction

Clinical uncertainty is an inherent and unavoidable aspect of medical practice, particularly evident in primary care settings where family physicians frequently encounter undifferentiated symptoms, diagnostic ambiguities, and complex patient presentations [1, 2]. Effectively managing clinical uncertainty is crucial for family physicians, as inadequacies in handling uncertainty can lead to diagnostic errors, inappropriate treatments, unnecessary referrals, and diminished patient trust [3, 4]. Given its central role in first-contact care—where clinicians must make decisions with limited time, incomplete information, and broad differential diagnoses—, uncertainty remains a challenging and often stressful component of clinical decision-making, shaped by individual factors, systemic constraints, and patient-related complexities such as comorbidities, communication barriers, and functional limitations [4, 5].

Existing literature emphasizes various cognitive and emotional coping strategies physicians employ to manage uncertainty, including information-seeking, peer consultations, and adherence to clinical guidelines [4, 6, 7]. However, physician responses to uncertainty are highly variable, with some demonstrating resilience and high tolerance, while others experience anxiety, defensive practices, or avoidance behaviors [3, 6, 8, 9]. These differences may be explained by varying levels of adaptive expertise, as physicians with greater adaptive expertise are better able to tolerate and learn from uncertainty [10]. Although varying levels of adaptive expertise may contribute to these differences, resilience is also shaped by social support (e.g., psychological and instrumental support from peers and colleagues) [11], as well as team dynamics and broader workplace culture (e.g., team coordination, psychological safety, inclusive leadership) [12]. Standardized tools such as the Physicians' Reactions to Uncertainty Scale (PRUS) and the Melbourne Decision-Making Questionnaire (MDMQ) have been utilized effectively to measure these varied responses, providing valuable insights into the emotional, cognitive, and behavioral aspects of clinical uncertainty management [13, 14].

In Türkiye, family physicians operate within a healthcare system characterized by high patient volumes, restricted consultation times, and limited access to advanced diagnostic tools and specialist referrals [15, 16]. These structural constraints can exacerbate clinical uncertainty, highlighting the need to examine how family physicians navigate complex clinical situations within this specific context. Although extensive research on uncertainty management exists within Western healthcare systems, evidence from Türkiye remains limited [4–6]. In particular, both qualitative and mixed-methods studies that adequately capture the contextual challenges

of Turkish primary care and integrate standardized measures of uncertainty with in-depth qualitative exploration are scarce.

The aim of this study is to explore how family physicians in Türkiye experience and manage diagnostic uncertainty in primary care. By identifying the main sources of uncertainty, the coping strategies physicians adopt, and the systemic factors that shape their decision-making, the study seeks to address an important research gap and generate evidence that can inform educational initiatives and healthcare policies.

Materials and methods

Study design

This study employed a mixed-methods design to explore family physicians' experiences of diagnostic uncertainty and the clinical decisions it informs, including diagnostic testing, treatment initiation, referral, and follow-up planning. The study process was structured in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist [17].

Participants and sampling

Participants were selected using purposive sampling from among family physicians actively practicing in Erzincan, Türkiye, each with at least one year of primary healthcare service experience. The sampling frame comprised family physicians working in the province (approximately $n = 82$ at the time of the study). As family medicine clinician–academics working in the same province, H.K. approached family physicians in person at their family health centers and provided a brief study information sheet. Eligibility (≥ 1 year of service in primary care) was confirmed by participant self-report during the initial approach and was not independently verified using administrative records. Physicians who expressed interest were contacted to schedule participation, and written informed consent was obtained prior to data collection. To support maximum variation, we aimed to recruit across different family health centers, where feasible inviting at least one physician from each center. Recruitment and data collection continued until thematic saturation was reached, where no new codes or concepts were identified in subsequent interviews. A total of 20 family physicians were interviewed.

Data collection process

Data collection was conducted in two stages: (1) administration of standardized scales (PRUS and MDMQ I–II), and (2) face-to-face semi-structured interviews.

Scale administration

Two standardized scales were applied to participants.

Physicians' Reactions to Uncertainty Scale (PRUS)

This scale consists of 15 items rated on a 6-point Likert scale ranging from “strongly disagree” to “strongly agree” [13]. It measures physicians' cognitive, emotional, and behavioral responses to diagnostic uncertainty. The Turkish version of the scale consists of 15 items and four subscales: Anxiety Due to Uncertainty (5 items), Concern About Bad Outcomes (3 items), Reluctance to Disclose Uncertainty to Patients (5 items), and Reluctance to Disclose Mistakes to Physicians (2 items). Items are rated on a 6-point Likert scale ranging from 1 = strongly disagree to 6 = strongly agree. Higher scores indicate greater emotional response or reluctance related to clinical uncertainty. The total score ranges from 15 to 90. Maximum subscale scores are 30 (Anxiety Due to Uncertainty), 18 (Concern About Bad Outcomes), 30 (Reluctance to Disclose Uncertainty to Patients), and 12 (Reluctance to Disclose Mistakes to Physicians) [18]. The Turkish version of the Physicians' Reactions to Uncertainty Scale (PRUS) has demonstrated acceptable psychometric properties (validity and reliability) in physician samples, supporting its use in the Turkish healthcare context [18].

Melbourne decision-making questionnaire I- II (MDMQ I-II)

MDMQ I is a Likert-type scale consisting of six items [14]. Participants respond using a 3-point scale (“true for me,” “sometimes true,” “not true for me”). The maximum score that can be obtained from the scale is 12. High scores indicate high self-esteem in decision-making.

The MDMQ-II is a 22-item Likert-type questionnaire designed to evaluate individual decision-making styles [14]. It has four subscales. It comprises four subscales: Cautious, procrastinating, shifting responsibility, and panicking, and the maximum possible scores for these subscales are 12, 10, 12, and 10, respectively. Higher scores indicate the use of the relevant decision-making style. The answer options are “true for me,” “sometimes true,” “not true for me,” as in scale 1. The Turkish adaptation of the MDMQ I-II has demonstrated satisfactory psychometric properties, including reliability and factor structure consistent with the original version [19].

Semi-structured interviews

Face-to-face, semi-structured in-depth interviews were conducted with the participants. The interview guide consisted of 24 questions developed based on literature review and expert opinions, finalized following a pilot study. A pilot study involving two family medicine residents was conducted to assess the clarity, flow, and feasibility of the interview guide, and the pilot interviews were excluded from the main analysis. The semi-structured interview guide used in this study was previously developed and published by our research team and is openly accessible at DOI: <https://doi.org/10.5281/zenodo.16810359>.

Interviews were audio-recorded and lasted approximately 30–45 min. All interviews were conducted face-to-face in the clinic in Turkish, in a private consultation room to ensure privacy and confidentiality. Audio recordings were transcribed and analysed in Turkish, and selected excerpts were subsequently translated into English for presentation in this manuscript. Translation was carried out by a bilingual researcher experienced in qualitative research, and the translated excerpts were reviewed by additional members of the research team to ensure accuracy and preservation of meaning.

Research team

The research team comprised three authors (M.A.N., E.G., and H.K.). Recruitment and field coordination in the study province were managed by E.G. and H.K. Semi-structured interviews were conducted by H.K. (male, family medicine specialist). H.K. was involved solely in data collection and did not participate in qualitative coding or theme development. Qualitative coding and theme development were undertaken independently by two researchers (E.G. and M.A.N.), with disagreements resolved through discussion and consensus among the researchers.

Data analysis

The qualitative data were analyzed using the thematic analysis method as outlined by Braun and Clarke [20]. Interview recordings were transcribed verbatim and coded using NVivo software. Coding was performed independently by two researchers. The coding results were then compared, and consensus was reached through discussions between the researchers. Any discrepancies were resolved through joint meetings. As a result of the final analysis, six main themes were identified.

For the quantitative data, descriptive statistics (mean, standard deviation, median, minimum, and maximum values) were calculated for the total and subscale scores of the PRUS and MDMQ-I/II. In addition, the predominant clinical decision-making style of each participant was determined based on the highest subscale score of the MDMQ-II.

Ethics, methodological rigor and trustworthiness

Ethical approval for the study was obtained from the Erzincan Binali Yıldırım University Clinical Research Ethics Committee (date: 12.06.2025, approval number: 2025-11/04). Written informed consent was obtained from all participants. Personal information was anonymized, and all data were securely stored in compliance with confidentiality principles. Scientific quality criteria specific to qualitative research were observed throughout the study. The researchers paid attention to reflexivity, considering their own professional and academic positions and their

potential influence on the data collection and interpretation processes. Participants were selected to support diversity in professional experience, age, gender, and workplace characteristics. To enhance trustworthiness, member checking was conducted by sharing interview transcripts with participants, and findings were supported with direct participant quotations.

Results

A total of 20 family physicians participated in the study, completing the PRUS and MDMQ scales and taking part in semi-structured interviews. Participants' scores on the Physicians' Reactions to Uncertainty Scale (PRUS), Melbourne Decision-Making Questionnaire I (MDMQ-I), and the four subscales of MDMQ-II reflecting different decision-making styles (Cautious, Shifting Responsibility, Procrastinating, and Panicking) are presented in Table 1. Participants' PRUS scores ranged from 26 to 85, with a mean score of 52.3 ± 13.8 indicating a moderate level of perceived uncertainty across the sample. The MDMQ-I scores showed a similar pattern, with an overall mean of 9.2 ± 2.6 , suggesting that participants generally perceived themselves as engaged in thoughtful, rather than impulsive, decision-making processes.

Across the four decision-making style subscales, the cautious style had the highest mean score (9.35 ± 2.1), followed by shifting responsibility (4.6 ± 3.3), procrastinating (3.5 ± 2.7), and panicking (3.85 ± 2.5).

Overall, PRUS and MDMQ-II scores indicated a predominance of cautious decision-making styles alongside

variability in reactions to clinical uncertainty. These quantitative patterns provide context for the qualitative findings presented below. Themes 1–6 are presented with a concise in-text synthesis and are supported by Tables 2, 3, 4, 5, 6 and 7, which summarise sub-themes and provide representative anonymised quotations; identifying details were removed.

Theme 1: types and sources of uncertainty

The theme of Types and Sources of Uncertainty synthesises how clinicians commonly encounter and make sense of diagnostic ambiguity in everyday primary care, while a divergent perspective underscores alternative interpretations of the same cues (Table 2). Family physicians working in primary healthcare settings encounter various forms of uncertainty during clinical decision-making processes. These include diagnostic difficulties, insufficient or ambiguous patient information, the complexity of managing multiple comorbidities and treatment plans, as well as system-related constraints. Limited access to laboratory and imaging facilities, unclear or contradictory patient histories, multimorbidity, and healthcare policy-driven practice restrictions are among the main factors that complicate decision-making (Table 2).

Theme 2: physicians' responses and strategies in the face of uncertainty

The theme of Physicians' Responses and Strategies in the Face of Uncertainty captures how clinicians navigate uncertainty through stepwise reasoning, observation,

Table 1 Participants' scores on PRUS, MDMQ-I and participants' decision-making styles

No	PRUS	MDMQ - I	Decision-making style			
			Cautious	Shifting responsibility	Procrastinating	Panicking
D1	43	8	11	6	6	4
D2	41	9	6	2	4	7
D3	63	6	11	6	7	6
D4	42	6	4	4	3	3
D5	56	10	9	6	2	4
D6	69	3	9	8	7	8
D7	85	5	12	11	7	7
D8	48	6	6	4	2	3
D9	58	11	11	4	4	3
D10	40	11	8	7	6	2
D11	49	10	10	3	5	7
D12	52	12	11	8	3	7
D13	61	10	11	11	8	5
D14	44	12	11	0	0	1
D15	26	10	9	0	0	1
D16	44	11	8	2	0	0
D17	65	11	12	2	5	5
D18	65	10	9	5	1	2
D19	61	12	10	3	0	2
D20	34	11	9	0	0	0

Table 2 Sub-themes and representative quotations related to types and sources of uncertainty

Sub-Themes	Representative Quotations
Diagnostic Difficulties	"Not being able to reach a definitive diagnosis; when laboratory results and symptoms do not align, failing to reach a clear conclusion. In primary care, we face more difficulties in accessing laboratory tests and diagnostic procedures. Compared to specialist colleagues, they can obtain these much more easily, which puts us at a disadvantage. These are the uncertainties I encounter most frequently." (D1) "When several conditions contribute to an illness, it becomes difficult to distinguish which factor is predominant." (D5)
Insufficient Or Ambiguous Patient Information	"The greatest uncertainty I face is when the patient cannot clearly describe their condition. For instance, there is uncertainty—say, with abdominal pain... Since we cannot always access imaging such as CT scans, this creates a level of uncertainty." (D2) "In elderly patients, overlapping illnesses and compounded complaints make it hard to determine who is affected by which symptom." (D5)
Complexity Of Managing Multiple Comorbidities And Treatments	"There is uncertainty in adjusting medications for patients with multiple illnesses; while a drug may benefit one condition, it might harm another, creating a constant need for balance." (D12) "In very complicated cases, you prescribe a medication for a upper track infections, then gastroenteritis develops; you prescribe for that, and then an allergy occurs—these cascading effects create uncertainty." (D5)
System-Related Constraints	"If there is an uncertainty in family medicine, most of the time we cannot resolve it. The lack of sufficient tests and advanced diagnostic options leaves us helpless." (D20) "Due to inadequate laboratory and imaging facilities, trying to make a diagnosis feels like solving a puzzle with missing pieces." (D11) "There are situations where we do not even know which department to refer the patient to, becoming stuck between specialties." (D12) "Policy-related changes in reimbursement, restrictions on prescribing medications... All these create uncertainty in meeting both our and the patients' expectations." (D19)

and risk checks, while a divergent perspective emphasises earlier escalation or referral (Table 3). When confronted with clinical uncertainty, family physicians develop various strategies to prioritize patient safety. These strategies include seeking specialist opinions, referring patients to higher-level care, consulting information resources, obtaining support from colleagues, and maintaining open communication with patients. The choice of strategy depends on the degree of uncertainty, available resources, and the physician's level of experience. In situations where patient safety is at risk, there is a tendency toward rapid decision-making and prompt referral (Table 3).

Table 3 Sub-themes and representative quotations related to physicians' responses and strategies in the face of uncertainty

Sub-Themes	Representative Quotations
Referral and specialist consultation	"When symptoms, laboratory results, and clinical findings do not correlate, we refer the patient to a specialist." (D1) "If I cannot make a decision, I immediately refer the patient." (D2) "We try to take a detailed patient history and rely on diagnostic tests whenever possible. Our main strategy is the history... and when we are stuck, we turn to investigations. We also draw on our own knowledge and experience, and if possible, we consult colleagues—there's always some level of professional discussion. We guide the patient accordingly, either by issuing a referral or, if it's urgent, directing them to the emergency department." (D9)
Obtaining Support From Colleagues	"I send test results to specialist colleagues and seek their support." (D1) "When I am unsure, especially with complex patients, I prefer to consult a specialist before making the final decision." (D7)
Consulting Information Resources	"In the face of uncertainty, I consult UpToDate, guidelines... I check every available resource." (D1) "We rely on our medical knowledge as much as it allows, and we also consult resources... UpToDate is what we use most frequently, and we refer to our own national guidelines as well. In situations where there is significant uncertainty and I cannot make a definite decision, I consider referring the patient." (D15)
Maintaining Open Communication With Patients	"I clearly explain the situation to the patient and specify the reason for the referral." (D7) "I have adopted the principle of 'first, do no harm' as my guiding approach." (D17) "I write down the reason for the referral, and when patients understand why they are being referred, they feel reassured and appreciate it. If I'm completely unfamiliar with the condition, I tell the patient, 'We are not very skilled in this area, so I need to refer you,' and then I proceed with the referral." (D7)

Theme 3: factors influencing the decision-making process

The theme of Factors Influencing the Decision-Making Process highlights how patient-related factors, physicians' knowledge and experience, time pressure, and the availability of system resources shape clinical decision-making under diagnostic uncertainty (Table 4). In clinical situations involving uncertainty, family physicians' decision-making processes are shaped by the patient's condition, the physician's knowledge and experience, time pressure, and the availability of system resources. Factors such as the clarity of the patient's clinical status and the quality of communication, as well as the physician's level of experience and access to clinical guidelines, play a significant role in facilitating decision-making. On the other hand, high patient volume and limited consultation time represent major challenges in this process (Table 4).

Table 4 Sub-themes and representative quotations related to factors influencing the decision-making process

Sub-Themes	Representative Quotations
Clinical Findings and Patient Compliance/Communication	"The key factor when making a decision is the patient's test results and clinical findings; having clear information makes my job easier." (D1) "Non-compliance or communication difficulties make things much more challenging." (D3) "The patient's attitude is important... non-compliance and communication problems make things more difficult." (D18)
Knowledge and Experience	"The main factor is my knowledge; the more cases you see, the more confidently you can make decisions." (D15) "Thanks to my experience, I can make quick decisions." (D16)
Time Pressure, Patient Volume, and System Constraints	"Limited time pushes us to resolve uncertainty rapidly and sometimes prematurely." (D2) "Due to high patient traffic, I have to make decisions quickly." (D7) "There are helpful guidelines... they reduce uncertainty." (D7) "Referral processes and resource constraints sometimes delay decision-making." (D11)
Quality of Communication	"When I have good communication with the patient, making decisions becomes easier." (D10) "Good communication reduces uncertainty; misunderstanding makes everything harder." (D17)

Theme 4: health system and institutional factors

The theme of Health System and Institutional Factors outlines how thresholds for testing, referral, and follow-up are set under uncertainty, while a divergent perspective favours lower thresholds and faster action (Table 5). Family physicians' approaches to managing uncertainty are shaped not only by individual competencies but also by the functioning of the health system and institutional regulations. Participants identified key challenges such as high patient volume, limited consultation time, digital system malfunctions, referral processes, and difficulties in accessing specialists. Performance-based practices were also noted to negatively affect both decision-making processes and professional motivation (Table 5).

Theme 5: need for training and professional development

The theme of Need for Training and Professional Development examines views on training and ongoing professional development in handling uncertainty, while a divergent perspective stresses system-level constraints

Table 5 Sub-themes and representative quotations related to health system and institutional factors

Sub-Themes	Representative Quotations
Time Constraints and High Patient Volume	"Every five minutes... sometimes we can only allocate two or three minutes per patient. When there is not enough time, uncertainty is felt more intensely." (D1) "High patient volume increases uncertainty." (D5)
Digital Platform Dysfunction and Irregular Patient Records	"Almost none of the health system's digital platforms function properly. e-Nabiz takes up a lot of our time." (D2) "Irregular patient records cause problems." (D15) "Fragmented and irregular patient records make it very exhausting to deal with uncertainty. Patients do not keep track of their own medical information anymore; everything is left to us." (D17)
Referral and Appointment Barriers	"The health system's performance-based structure negatively affects how we manage uncertainty." (D13) "We still cannot get appointments for some departments; we often face difficulties, especially in specialties like neurology." (D14)
Policy Changes, Technical Disruptions, and Performance Pressure	"There are frequent disruptions in the system—policy changes and technical issues complicate our work." (D3) "The way the health system operates negatively affects how we manage uncertainty; it is unclear whether we should focus on patient care or performance scores." (D13)

Table 6 Sub-Themes and representative quotations related to the need for training and professional development

Sub-Themes	Representative Quotations
Contribution of Specialty and In-Service Training	"I am working as a contracted family medicine specialist. I believe such training programs enhance decision-making skills." (D1) "At the beginning of my career, I had shortcomings; with training, the process became more manageable." (D11)
Case-Based Training and Learning From Real Cases	"In case-based trainings, I think much more emphasis should be placed on real cases. If so, uncertainty in our daily practice would be reduced." (D1) "Diagnosing and referring a patient with aortic dissection made me really happy... that case taught me a lot." (D20)
Ongoing Need for Further Education After Residency	"Training is essential. Even now, I would still want further education, because not much training is provided after residency." (D7) "I constantly read and update my knowledge... congresses as well." (D16) "We need training especially in cardiology cases and trauma management." (D17) "I constantly read and try to update my knowledge. We live in an age of information—every kind of resource is easily accessible online now, and congresses are helpful as well." (D18)
Skepticism Toward Training	"I don't feel a strong need for training; the problem lies in the system itself." (D2)

Table 7 Sub-themes and representative quotations related to physician–patient communication

Sub-Themes	Representative Quotations
Openly Sharing Uncertainty With Patients	"I openly share uncertainty with patients and usually receive positive reactions." (D1) "I prefer to share my uncertainty. If something doesn't feel right to me, and I don't express it, I later blame myself — because if there is uncertainty, I think it should be communicated to the patient; I'm not completely sure." (D4) "Telling patients about uncertainties builds trust." (D9)
Shared Decision-Making and Patient Preferences	"Involving patients in the decision-making process leads to better outcomes." (D7) "I make treatment decisions by considering patient preferences." (D12) "In some situations, we make the decision together with the patient... I ask, 'How would you prefer this to be managed?' If the condition is not severe, we engage in dialogue and decide collaboratively." (D13)
Patient Reactions to Communicating Uncertainty	"If the patient is cooperative, they thank me... but if there is a negative reaction, it affects me." (D6) "In our country, saying 'I don't know' is often considered shameful... although admitting uncertainty is actually a virtue, unfortunately it is not perceived that way." (D19) "When I explain uncertainties effectively, patients are understanding." (D20)

over individual training (Table 6). Family physicians' capacity to manage uncertainty is closely linked to their knowledge base and professional experience. Participants indicated that both specialty training and in-service courses contribute positively to clinical decision-making processes, highlighting the greater effectiveness of case-based and practice-oriented learning formats. Professional development is primarily maintained through personal effort and following clinical guidelines; however, gaps in training and system-related limitations in certain areas were also noted. (Table 6) A divergent perspective (see Table 6, D2) highlights variation in how clinicians view training versus system constraints and provides context for making watchful waiting + safety-netting explicit (see Discussion).

Theme 6: physician–patient communication

The theme of Physician–Patient Communication highlights the emotional and cognitive work of sitting with uncertainty and the coping routines used, while a divergent perspective questions the value of dwelling on uncertainty versus moving swiftly to closure (Table 7). Physician–patient communication emerges as a key factor in family physicians' processes of managing uncertainty. Participants emphasized that conveying uncertainty to patients in a clear and understandable manner enhances patient trust and facilitates the decision-making process. However, communication does not

always proceed ideally; some patients' negative reactions or communication difficulties lead physicians to adopt a more cautious approach. Physicians also differed in their approaches to involving patients in the decision-making process (Table 7).

Discussion

This study explored how family physicians in Türkiye perceive, manage, and respond to diagnostic uncertainty, examining their decision-making strategies and the systemic and individual factors influencing these processes. Therefore, the patterns observed in physicians' approaches to managing uncertainty should be interpreted in light of the structural characteristics of the Turkish primary care system. The findings illustrate that clinical uncertainty remains a significant and multifaceted challenge in primary healthcare, consistent with existing international literature [1, 3, 4]. Family physicians identified diagnostic difficulties, patient-related issues, complexities arising from multimorbidity, and systemic constraints as primary sources of uncertainty. These findings resonate with previous studies highlighting that family physicians frequently encounter ambiguous clinical scenarios due to diverse patient presentations, limited diagnostic resources, and constraints within the healthcare system [21, 22].

Our results are parallel through Han's classification of uncertainty, which distinguishes between uncertainty arising from probability, ambiguity, and complexity [23, 24]. The difficulties physicians reported when symptoms were unclear reflect ambiguity, while the management of patients with multimorbidity corresponds to complexity. Concerns about missing a diagnosis relate to probability-based uncertainty. Therefore, the "cautious" decision-making style observed in our quantitative results can be seen not as an indicator of lack of confidence or knowledge, but as a strategy for navigating these different forms of uncertainty. This pattern suggests that family physicians may preferentially adopt a cautious decision-making style when facing diagnostic uncertainty, possibly as a strategy to minimize clinical risk in complex primary care settings.

Participants employed a range of strategies to manage diagnostic uncertainty, predominantly relying on specialist consultations, referrals, collegial support, and using evidence-based information resources such as clinical guidelines and databases. Consistent with existing research, these strategies reflect commonly reported coping mechanisms among primary care providers internationally, emphasizing the practical necessity of peer collaboration and external knowledge sources to compensate for limited diagnostic tools or expertise [25, 26]. Notably, family physicians emphasized open patient communication and shared decision-making as pivotal

strategies in mitigating uncertainty. Transparency about diagnostic and therapeutic uncertainties fostered trust, improved patient engagement, and ultimately facilitated more informed and cooperative decision-making processes [27, 28].

Our finding that some physicians seek immediate certainty and feel uneasy “sitting with” uncertainty underscores the value of watchful waiting paired with safety-netting. Effective safety-netting is a structured process—clarifying the expected natural history, listing red-flag symptoms, specifying re-consultation routes, and arranging timely planned follow-up—and works best when diagnostic uncertainty is named explicitly. In our setting, brief 24–48-hour review appointments and standard “red-flag” checklists may reduce unnecessary escalation while maintaining vigilance [29–31].

The decision-making processes of family physicians were significantly influenced by multiple factors including patient compliance and cooperation, the physician's individual knowledge and clinical experience, time availability, and healthcare system resources. Specifically, systemic challenges such as time constraints and high patient volumes emerged as critical barriers, echoing findings from other healthcare settings where resource limitations contribute significantly to clinical uncertainty [3, 27]. Digital system inefficiencies and cumbersome referral processes further compounded these challenges, underscoring the urgent need for structural reforms to streamline administrative tasks, enhance digital infrastructure, and improve access to specialist support [32].

A crucial insight from this research was the clear articulation of the necessity for targeted training and continuous professional development. Family physicians identified significant gaps in specialty training, highlighting a strong preference for practice-oriented, case-based educational methods. These findings align with prior evidence indicating that hands-on, experiential training programs effectively enhance clinical decision-making skills, reduce perceived uncertainty, and boost physician confidence [33]. Moreover, physicians expressed an explicit desire for ongoing professional development, especially in specific clinical domains such as cardiology, trauma management, and the management of complex chronic conditions, indicating areas where future training initiatives could be concentrated.

Physician–patient communication emerged as a pivotal factor influencing uncertainty management. Effective communication strategies involving clear and transparent dialogues about uncertainty positively influenced patient trust and facilitated more patient-centered decisions. Conversely, poor communication or adverse patient reactions often led to defensive or overly cautious clinical behaviors. These findings align with literature emphasizing that effective patient engagement and communication

are critical competencies for family physicians, particularly under conditions of uncertainty [34, 35]. Studies have shown that encouraging open communication with patients can strengthen primary care physicians' ability to manage diagnostic uncertainty [36]. Rather than avoiding uncertainty, using patient-centered communication strategies together with explicit acknowledgment of uncertainty has been suggested to enhance both patient satisfaction and mutual understanding. Accordingly, increasing primary care physicians' awareness of how to express diagnostic uncertainty may help them reflect on and, when necessary, adapt their communication practices when faced with uncertain clinical situations [37].

Similar patterns of diagnostic uncertainty have been described in other healthcare settings, including emergency departments, where time pressure and clinical acuity can intensify ambiguity and risk [38–40]. Developing skills for managing uncertainty can be supported through structured educational strategies that strengthen communication [38]. In this context, delivering training through an interdisciplinary team that includes experts from both medicine and the humanities may enrich participants' approaches to navigating uncertainty [41]. Such an educational approach can help clinicians reflect more consciously on their communication practices when encountering uncertainty in different clinical settings and adapt these practices when necessary.

Limitations

This study has several limitations that warrant acknowledgment. First, the qualitative nature of the study inherently limits the generalizability of findings to broader populations. While purposive sampling and data saturation methods were employed, these findings may not comprehensively represent the experiences of all family physicians in Türkiye or other regions with different healthcare infrastructures. Second, the study primarily relied on self-reported qualitative and quantitative measures, potentially introducing bias related to participant recall or social desirability. Third, the sample was limited to specific provinces, which may restrict the transferability of the findings to other geographical areas with different organizational and systemic characteristics.

Study implications and directions for future research

Based on the findings of this study, training in uncertainty management should be more explicitly integrated into family medicine education. Structured, case-based learning and supervised clinical practice may enhance physicians' self-efficacy and support the development of adaptive decision-making skills. At a systems level, addressing structural constraints—particularly high patient load and limited consultation time—is essential for enabling effective clinical reasoning under conditions

of uncertainty. Future research should further examine how professional culture, collegial support networks, and institutional contexts shape physicians' tolerance for uncertainty, as well as how communication about uncertainty influences therapeutic relationships and shared decision-making. Additionally, future research could enhance validity through observational or longitudinal studies, encompassing more diverse geographical areas and clinical settings to confirm and expand these findings.

Conclusion

Clinical uncertainty is an integral, yet complex challenge in primary care, deeply influenced by systemic, individual, and patient-related factors. This study underscores the need for targeted educational interventions, continuous professional development programs, and systemic reforms aimed at enhancing family physicians' ability to manage clinical uncertainty effectively in Türkiye. By improving physician–patient communication, addressing systemic barriers such as high patient volumes, limited consultation times, and inadequate healthcare infrastructures, it is possible to significantly mitigate clinical uncertainty, thereby enhancing decision-making quality and improving patient outcomes in Türkiye's primary healthcare system.

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Authors' contributions

- **Ersan Gürsoy: ** Conceptualization, methodology, data analysis, writing—original draft, and final editing. - **Harun Karahan: ** Data collection, validation, and manuscript review. - **Mehmet Akif Nas: ** Supervision, validation, data analysis, and manuscript review. All authors have read and approved the final version of the manuscript.

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Data availability

The datasets generated and analyzed during the current study are not publicly available to protect participant confidentiality. Only anonymized quotations have been included in the manuscript. Additional data may be available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Erzincan Binali Yıldırım University Clinical Research Ethics Committee (Approval Number: 2025-11/04, Approval Date: 12 June 2025). Written informed consent was obtained from all participants prior to their inclusion in the study, in line with the principles of the revised Declaration of Helsinki.

Consent for publication

Not applicable. This study does not contain any individual person's data in any form (including individual details, images, or videos).

Competing interests

The authors declare no competing interests.

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