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ORIGINAL RESEARCH

Physicians' Knowledge, Attitudes, and Barriers Toward Clinical Trial Participation in Türkiye: A Cross-Sectional Survey and Implications for Oncology Research Capacity

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Background: Physicians influence clinical trial conduct and patient referral, yet country-specific evidence regarding their knowledge, attitudes, and perceived barriers in Türkiye remains limited. This evidence gap is especially relevant to oncology, where clinical trials are closely linked to therapeutic innovation and access to novel treatments.

Objective: This study evaluated physicians' clinical trial knowledge, experience, attitudes, perceived barriers, and motivational factors, and identified variables associated with positive attitudes toward clinical research.

Methods: A cross-sectional online survey was conducted between January 20 and March 7, 2025, targeting practicing physicians across Türkiye. Using a structured 23-item questionnaire, demographics, clinical trial experience, education, knowledge, attitudes, and perceived barriers were assessed. Descriptive statistics and ordinal regression analysis were performed.

Results: Among 195 respondents (54.4% female; median age, 39 years), 61.0% had participated in a clinical trial. No knowledge of suspected unexpected serious adverse reaction terminology and Phase I/early-phase trials was reported by 56.4% and 26.7%, respectively, whereas 89.8% considered clinical trials essential for generating medical knowledge. Frequently reported barriers included lack of sponsors (89.3%) and financial constraints (83.1%). Greater clinical trial knowledge was associated with more favorable attitudes ($\beta = 1.051$, SE = 0.237, $p < 0.001$). Oncology physicians had higher prior clinical trial participation than non-oncology physicians (85.5% vs 49.6%, $p < 0.001$), including after multivariable adjustment (OR 3.46, 95% CI 1.37–8.74, $p = 0.009$).

Conclusion: Physicians in Türkiye have favorable attitudes toward clinical trials but face important knowledge, logistical, and institutional barriers. Strengthening clinical research education and organizational support may improve physician engagement and contribute to oncology research capacity.

Keywords: clinical trials, physician attitudes, clinical research education, barriers to clinical research, oncology research capacity, cancer clinical trials, Türkiye, physician engagement

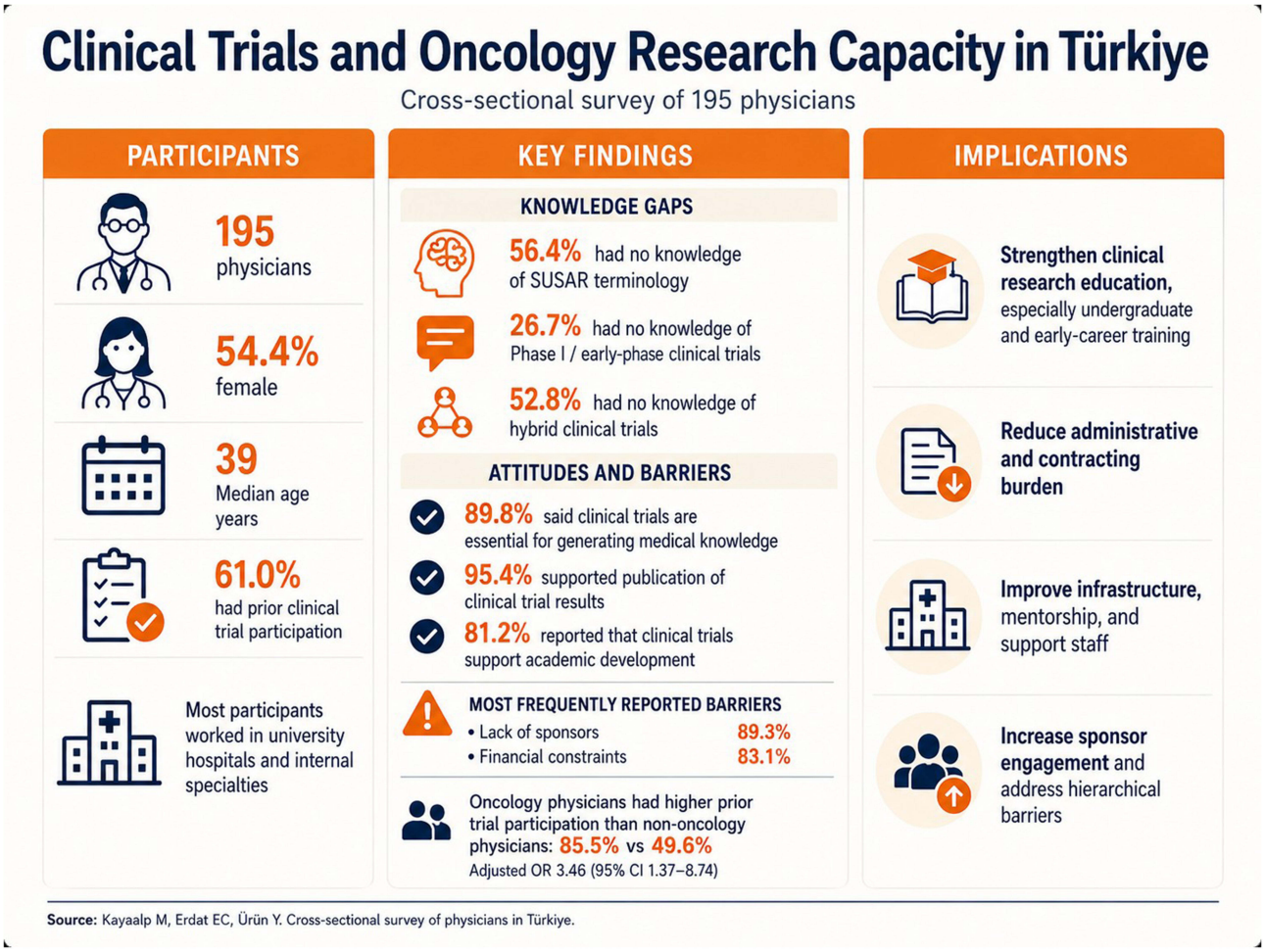
Introduction

Clinical trials are studies that generate high-quality scientific evidence and evaluate the safety and effectiveness of new treatment methods. Clinicians' knowledge, motivation, and potential concerns about clinical trials are key factors influencing research conduct and continuity. The role of clinicians is crucial not only in managing the conduct of clinical trials but also in appropriately referring eligible patients during the pre-trial phase.[1,2] This role is especially important in oncology, where biomarker-driven treatments, immunotherapy, targeted agents, and precision medicine have made clinical trial participation a central pathway for evidence generation and access to innovative therapies. Therefore, barriers that limit physicians' engagement in clinical trials may have direct implications for cancer research capacity and oncology care.

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Graphical Abstract



Clinicians' knowledge of clinical research is essential for the advancement of scientific studies. To enhance this, it is important to integrate research-focused training into undergraduate education, postdoctoral programs, and to offer dedicated seminars and workshops aimed at building research skills among clinicians.[3] In countries where these trainings are not mandatory, studies have shown that principal investigators, who are expected to lead clinical trials, do not have as much knowledge about clinical research as clinical research coordinators (CRCs) or clinical research monitors (CRMs).[4]

Clinicians tend to hold highly favorable attitudes toward clinical trials, viewing participation as both a means to deliver high-quality patient care and an opportunity for professional growth.[5]

Clinicians generally show interest in participating in clinical trials; however, they express concerns such as lack of time, difficulty in patient recruitment, bureaucratic barriers, administrative paperwork burden, and fear of losing their patients during the trial process.[6] Lack of knowledge about clinical trials, the additional workload imposed on clinicians—such as not knowing which trials are available, not having time to identify suitable studies, or being unable to discuss research with patients—and the lack of support regarding clinical trials create concerns not only among hospital-based clinicians but also among primary care providers.[7] Importantly, even when patients are eligible for a trial, physicians may sometimes choose not to offer participation due to time pressures, personal treatment preferences, or concerns about negatively affecting the physician-patient relationship.[8] Participation in clinical research and patient referral rates are subject to variation according to the specific branch. Studies have demonstrated that medical oncologists refer a greater number of patients compared to surgeons.[9] Moreover, research has shown that clinicians working in specialist cancer centers and physicians (as opposed to

surgeons) demonstrate higher research orientation and are more actively involved in clinical trials compared to those working in district general hospitals.[10] Clinical and academic workload credits, clinical trial alert systems, regular protocol review meetings, the use of patient screening logs, and increased availability of support staff have been identified as key motivational factors that could enhance clinician participation in clinical trials.[11]

In Türkiye, data on physicians' knowledge, attitudes, experiences, and perceived barriers regarding clinical trials remain limited. This gap is particularly important for oncology, where clinical trials are closely linked to access to novel treatments, biomarker-based therapeutic strategies, and the development of national cancer research capacity. The present study aimed to evaluate the knowledge levels, attitudes, experiences, and perceived barriers of physicians practicing in Türkiye regarding clinical trials. In addition, the study sought to identify factors associated with positive attitudes toward clinical trials and to explore physicians' qualitative perspectives on clinical research, with particular emphasis on the implications of these findings for oncology research and cancer care.

Materials and Methods

Participants and Data Collection

This cross-sectional survey study was conducted online using the Microsoft Forms platform between January 20, 2025, and March 7, 2025. Participants were recruited using convenience and snowball sampling. The survey link was distributed through various physician networks, medical professional associations, and specialty groups to ensure broad representation across different medical specialties and practice settings.

Inclusion criteria comprised licensed physicians currently practicing in clinical settings, regardless of their specialty or level of experience with clinical trials. Participation was voluntary and anonymous, with no financial incentives provided.

Before accessing the questionnaire, participants were presented with the study information and provided electronic written informed consent by affirming consent in the first survey item. No verbal consent was obtained.

Survey Instrument

The questionnaire was not directly adapted from a previously validated instrument. We developed the survey instrument based on a review of the relevant literature and consultation with clinical trial experts. The instrument comprised 23 questions. The first question addressed informed consent and consent to participate. Questions 2–8 captured participant demographics, while questions 9–15 focused on clinical trial experience. Questions 16–19 pertained to the educational status regarding clinical trials, and questions 20–22 explored attitudes towards clinical trials. The final question was open-ended, inviting participants to share their thoughts and attitudes about clinical trials. We incorporated 5-point Likert scales for educational status, experience and attitudes. English translation of survey instrument is available in the Appendix.

Questionnaire Scoring

Each composite was calculated as the unweighted mean of its component items on the original five-point scale and therefore had a theoretical range of 1–5: knowledge (12 items; 1=no knowledge to 5=know very well), attitude (14 items; 1=strongly disagree to 5=strongly agree, with four negatively worded items reverse-scored so that higher values consistently indicated more favorable attitudes), and perceived barriers (17 items; 1=not at all important to 5=extremely important). All items in these three domains were mandatory, and no responses were missing; therefore, no imputation or prorating was required. No thresholds were applied to dichotomize the composite scores. Categorical results reported for individual items represent the original response categories.

Statistical Analysis

Descriptive statistics were calculated for demographic variables and survey responses. Continuous variables were presented as medians with interquartile ranges (IQR), while categorical variables were expressed as frequencies and percentages. Although formal pilot testing and psychometric validation were not performed, internal consistency was

assessed using Cronbach's alpha. Subgroup comparisons of individual knowledge and perceived barrier items were performed using Fisher's exact test, with p values adjusted for multiple testing using the Benjamini–Hochberg false discovery rate.

Group-level comparisons between oncology and non-oncology physicians were performed using the Mann–Whitney *U*-test for continuous variables and the chi-square or Fisher's exact test for categorical variables, as appropriate.

Ordinal regression analysis was conducted to identify factors associated with positive attitudes toward clinical trials. Independent variables were specified a priori on the basis of the study objectives and comprised age, gender, clinical trial participation status, clinical trial experience and clinical trial knowledge score; no stepwise or other data-driven selection procedure was applied. Results are reported as coefficients with standard errors and as adjusted odds ratios with 95% confidence intervals. Multicollinearity was assessed using variance inflation factors, the proportional-odds assumption was examined using a test of parallel lines, and model fit was summarised using the likelihood ratio test against the null model together with McFadden's and Nagelkerke's pseudo-R^2.

Two additional multivariable models were fitted for the oncology-focused subgroup analysis. Prior clinical trial participation was modelled using binary logistic regression, and the positive attitude composite score was modelled using linear regression, with oncology specialty as the exposure of interest in both models. The logistic model was adjusted for age, sex, academic seniority, academic center status, clinical trial knowledge score and positive attitude score, and the linear model was adjusted for age, sex, academic seniority, academic center status, prior clinical trial participation and clinical trial knowledge score. Results are reported as adjusted odds ratios or adjusted beta coefficients with 95% confidence intervals (Supplementary Table 1).

Thematic analysis was employed to identify recurring themes and patterns in participants' responses regarding their thoughts and attitudes about clinical trials.

The quantitative statistics were done with R version 4.4 (R Foundation for Statistical Computing, Vienna, Austria) and qualitative statistics were done with MAXQDA 24 (Verbi GMBH, Berlin, Germany).

Ethics Approval and Consent to Participate

The study protocol was approved by the Ankara University Faculty of Medicine Clinical Research Ethics Committee (AUTF-KAEK 2024/792, approval date: 17.12.2024). The study was conducted in compliance with the Declaration of Helsinki. All participants provided electronic written informed consent before completing the survey. No verbal consent was obtained.

Results

Participant Demographics

A total of 195 participants completed the survey. The median age of the respondents was 39 years (interquartile range: 33–47), with a gender distribution of 106 females (54.4%) and 89 males (45.6%). Participants had a median of 14 years of experience as physicians (interquartile range: 8–23). The academic titles among them were as follows: professor (28, 14.4%), associate professor (35, 17.9%), assistant professor (13, 6.7%), specialist (58, 29.7%), resident/fellow (47, 24.1%), and general practitioner (14, 7.2%). Regarding their centers of practice, 80 participants (41.0%) worked in university hospitals, 64 (32.8%) in training and research hospitals, 19 (9.7%) in private hospitals, 16 (8.2%) in state hospitals, 12 (6.2%) in primary care, and 4 (2.1%) in private clinics. Specialties were predominantly internal specialties (158, 81.0%), followed by surgical specialties (26, 13.3%), general medical practice (7, 3.6%), and basic sciences (4, 2.1%). Details of participant demographics are presented in Table 1 and Supplementary Table 1.

Experience and Education Over Clinical Trials

A total of 54.9% of respondents reported having experience with dissertation theses, while 47.7% were involved in retrospective clinical trials, and 34.4% participated in prospective clinical trials. Additional experiences included undergraduate projects (17.9%), preclinical studies (14.6%), and other academic activities (3.1%). Moreover, 27.2% of respondents indicated having no prior experience.

Table 1 Demographics of the Participants

Age, median (IQR)	38.5 (33–47)
Gender, n (%)	
Female	106 (54.4%)
Male	89 (45.6%)
Years as physician, median (IQR)	14 (8–23)
Academic title, n (%)	
Professor	28 (14.4%)
Associate professor	35 (17.9%)
Assistant professor	13 (6.7%)
Specialist	58 (29.7%)
Resident/fellow	47 (24.1%)
General practitioner	14 (7.2%)
Center of practice, n (%)	
University hospital	80 (41.0%)
Training and research hospital	64 (32.8%)
Private hospital	19 (9.7%)
State hospital	16 (8.2%)
Primary care	12 (6.2%)
Private clinic	4 (2.1%)
Main specialties, n (%)	
Internal specialties	158 (81.0%)
Surgical specialties	26 (13.3%)
General medical practice	7 (3.6%)
Basic sciences	4 (2.1%)

Abbreviation: IQR, interquartile range.

Participation in clinical trials was noted by 61.0% of respondents, with 24.1% serving as principal investigators (PI), and 51.8% as subinvestigators (SubI), with a median participation duration of 6.5 years (interquartile range: 3–13.8 years). Concerning the number of clinical trials attended, 54.6% took part in 1 to 5 trials, 15.1% in 6 to 10 trials, and 30.3% in more than 10 trials. Participants engaged in a variety of clinical trial activities, such as data collection and processing (83.1%), patient management (75.6%), ethics approval (58.8%), trial design (57.1%), study coordination (56.3%), presentation of results (49.6%), and statistical analysis (36.1%). The motivations behind participation included career development (79.8%), contributing to science and society (70.6%), peer pressure or academic obligations (16.8%), financial income (10.9%), and other reasons (3.3%). Details for experience in research and development projects and clinical trials are presented in Table 2.

Knowledge levels across various aspects of clinical trials revealed significant gaps among participants. Notably, a high proportion reported no knowledge in key areas: for Phase I or early-phase clinical trials, 26.7% had no knowledge, and for phase trials beyond Phase I, 25.6% lacked any understanding. Non-interventional clinical trials showed 17.4% of

Table 2 Experience Status in Research and Development Projects and Clinical Trials

Experience in R&D Projects, n (%)	
Dissertation thesis	107 (54.9%)
Retrospective clinical trials	93 (47.7%)
Prospective clinical trials	67 (34.4%)
Undergraduate projects	35 (17.9%)
Preclinical studies	28 (14.6%)
Other	6 (3.1%)
None	53 (27.2%)
Participation in clinical trial, n (%)*	119 (61.0%)
Participation in clinical trial as PI, n (%)*	47 (24.1%)
Participation in clinical trial as SubI, n (%)*	101 (51.8%)
Years in clinical trial participation, median (IQR)	6.5 (3–13.8)
How many clinical trials did you participate on, n (%)**	
1 to 5	65 (54.6%)
6 to 10	18 (15.1%)
Above 10	36 (30.3%)
Experience categories in participated clinical trials, n (%)**	
Data collection and processing	99 (83.1%)
Patient management	90 (75.6%)
Ethics approval	70 (58.8%)
Trial design	68 (57.1%)
Study coordination	67 (56.3%)
Presentation of results	59 (49.6%)
Statistical analysis	43 (36.1%)
Motivation for participation, n (%)***	
Career development	95 (79.8%)
Contribution to science and society	84 (70.6%)
Peer pressure or academic obligations	20 (16.8%)
Financial income	13 (10.9%)
Other	4 (3.3%)
Received clinical trial education, n (%)*	
Good medical practice	108 (55.4%)
Medical and clinical trial ethics	51 (26.2%)

(*Continued*)

Table 2 (Continued).

Investigator meeting	47 (24.1%)
Clinical trial design	39 (20.0%)
Non-interventional clinical trials	30 (15.4%)
Phase trials (excluding phase I and early phase)	26 (13.3%)
Phase I or early phase trials	21 (10.8%)
None	66 (33.8%)
When did you receive clinical trial education, n (%)*	
In specialty or subspecialty residency	102 (52.3%)
Online or continuous medical education	59 (30.3%)
Scientific meetings	53 (27.8%)
Undergraduate education	52 (26.7%)

Notes: *Percentages given for all participants, **Percentages given for answered participants. ***Percentages calculated among participants with prior clinical trial participation (n=119).
Abbreviations: PI, principal investigator; R&D, research and development; SubI, Subinvestigator.

participants entirely unacquainted with the concept. Similarly, clinical trial protocols and ethics presented gaps, with 20% and 15.4% respectively reporting no knowledge.

The lowest levels of knowledge were observed in specialized areas such as clinical trial terminologies like SUSAR, where 56.4% had no knowledge. Participants who reported high levels of knowledge ("knowing very well") were also minimal: only 2.6% for phase I trials, 5.1% for phase trials beyond phase I, and 7.7% for non-interventional trials. Hybrid clinical trials demonstrated 52.8% without knowledge, with just 2.1% knowing very well. Regulatory mechanisms showed 39% uninformed and only 3.6% very knowledgeable, while legal aspects and design and analyses of clinical trials revealed similarly low figures, with 2.1% and 1.5% respectively stating they knew very well about these areas.

The self-assessed knowledge levels are presented in Figure 1A.

Internal consistency was excellent for the knowledge items (Cronbach's α=0.976) and perceived-barrier items (α=0.907) and good for the attitude items (α=0.819).

Attitudes Towards Clinical Trials and Perceived Barriers

Clinical trials are widely regarded as essential for generating new medical knowledge, with 89.8% of participants expressing agreement or strong agreement. Furthermore, a significant majority of 88.2% recognize the critical role of clinical trials in advancing public and patient health. Participants also highlight the necessity of clinical trials in the development of novel treatments, with 84.6% supporting or strongly supporting this idea.

Transparency remains a key factor in clinical trials, with 55.9% of respondents indicating agreement or total agreement on its importance. Active participation in clinical trials is perceived positively, as evidenced by 82.6% of participants agreeing or strongly agreeing with its value. Similarly, many individuals—64.1%—feel comfortable referring a relative to a clinical trial for treatment, showcasing a considerable level of trust in the process.

The participants demonstrate significant dedication to informing patients about the importance of clinical trials, with 75.9% expressing their agreement. Participation in these trials is also viewed as personally beneficial, contributing to academic development and happiness; this sentiment is reflected by 81.2% and 81.1% of participants, respectively. Lastly, the importance of publishing clinical trial results is overwhelmingly recognized, with an impressive 95.4% of respondents agreeing or strongly agreeing with this necessity.

The summaries of attitudes towards clinical trials are presented in Figure 1B.

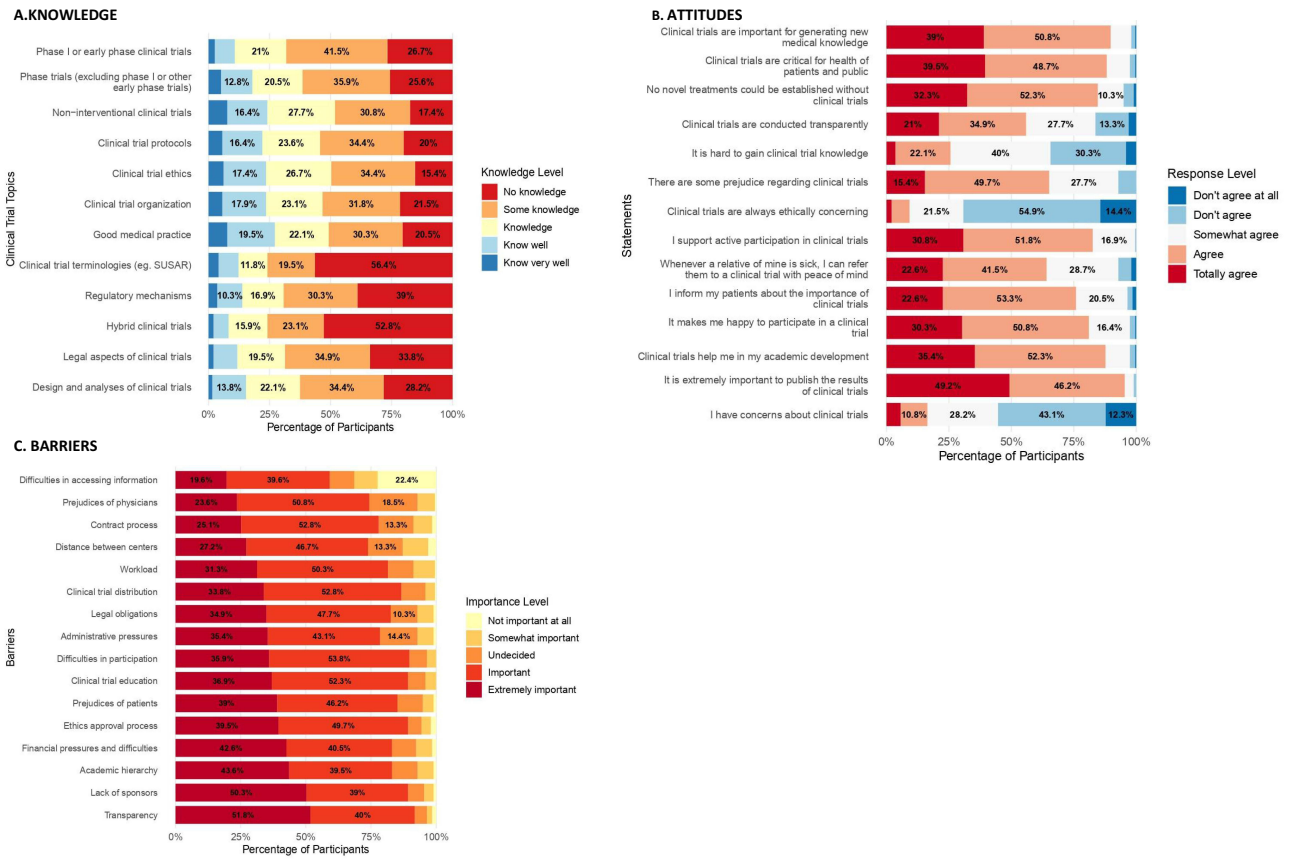


Figure 1 Physicians' self-assessed knowledge, attitudes, and perceived barriers regarding clinical trials (n = 195). (**A**) Self-assessed level of knowledge across 12 clinical trial domains, rated on a five-point scale from "no knowledge" to "know very well". (**B**) Level of agreement with 14 statements on attitudes toward clinical trials, rated on a five-point scale from "don't agree at all" to "totally agree". (**C**) Perceived importance of barriers to the conduct and development of clinical trials, rated on a five-point scale from "not important at all" to "extremely important". Bars show the percentage of respondents in each response category.

Motivation and Barriers Regarding Clinical Trials

Financial constraints were identified as critical factors, with 40.5% of participants rating them as "important" and 42.6% as "extremely important". Similarly, the lack of sponsors was reported as a significant issue, with 39% of respondents classifying it as "important" and 50.3% as "extremely important". Administrative pressures and legal obligations were also frequently cited as barriers to participation, with 39.5% and 43.6% of respondents respectively identifying them as "important" or "extremely important".

Additional factors included challenges related to participation logistics, biases from both physicians and patients, and the distribution mechanisms for clinical trials. Transparency and accessibility of information emerged as noteworthy barriers, albeit with varying levels of importance across respondents. The ethics approval process and contracting procedures were also frequently endorsed, being rated as important or extremely important by 89.2% and 77.9% of participants, respectively.

Workload, hierarchical structures within academia, and geographic distance between centers were also reported as influencing factors with varying degrees of impact.

Figure 1C presents an analysis of factors influencing participation in clinical trials.

Expectations from Clinical Trials and Organizations

Table 3 summarizes participants' expectations from clinical trials and their organizing bodies. The most commonly cited expectations included academic and career development (79.0%) and receiving academic guidance (77.4%). Additionally, 74.4% of respondents emphasized the need for improved center infrastructure, while 71.8% highlighted

Table 3 Participant Expectations from Clinical Trials and Organizations

Expectations, n (%)	
Academic and career development	154 (79.0%)
Academic guidance	151 (77.4%)
Center infrastructure development	145 (74.4%)
Finding sponsors	140 (71.8%)
Financial benefits	134 (68.7%)
Alleviating workload	132 (67.7%)
Clinical trial education	128 (65.6%)
Facilitating ethics approval process	128 (65.6%)
Providing assurance for clinical research	127 (65.1%)
Acceleration of administrative process	115 (59.0%)

the importance of securing sponsors. Financial benefits were identified by 68.7% of participants, and 67.7% prioritized alleviating workload. Education on clinical trials and facilitation of the ethics approval process were both noted by 65.6% of respondents. Similarly, 65.1% of participants expressed the importance of providing assurance for clinical research, and 59.0% stressed the acceleration of administrative processes.

Ordinal Regression Analyses for Factors Affecting Attitudes Regarding Clinical Trials

The analysis revealed that age exhibited a ß estimate of 0.022 (SE = 0.021, p = 0.300), suggesting no statistically significant association with positive attitudes. Similarly, gender, when comparing females to males, showed a ß estimate of 0.406 (SE = 0.337, p = 0.228), also indicating a lack of statistical significance in this context.

Participation in clinical trials, as analyzed, presented a ß estimate of 0.145 (SE = 0.415, p = 0.727), further underscoring the absence of a significant relationship with the attitudes evaluated. Likewise, experience in clinical trials demonstrated a ß estimate of 0.143 (SE = 0.438, p = 0.745), again reflecting no significant impact on attitudes.

Conversely, knowledge of clinical trials was the only variable significantly associated with positive attitudes. This factor yielded a ß estimate of 1.051 (SE = 0.237, $p < 0.001$), indicating that each one-point increase on the Likert scale measuring clinical trial knowledge is significantly associated with more favorable attitudes. The full ordinal regression model is presented in Table 4. Variance inflation factors were all below 2.7, the proportional-odds assumption was not rejected (p = 0.067), and the model explained a modest proportion of the variance (McFadden $R^2 = 0.130$; Nagelkerke $R^2 = 0.230$).

Qualitative Analysis of Open-Ended Question

A total of 15 participant filled the open-ended question about their thoughts about clinical trials. Qualitative analysis showed, all participants expressed their thoughts about ethical concerns, academic development, obligations, accessibility problems, lack of education and encouragement, distribution imbalance and potential to abuse. One participant each outlined the cross-interaction for ethical concerns and academic development, potential to abuse or distribution imbalance, and lack of encouragement and distribution imbalance. Seven participants told the distribution imbalance and lack of education and encouragement, six participants distribution imbalance and ethical concerns, and four participants distribution imbalance and accessibility in same sentence.

Table 4 Ordinal Regression for Factors Affecting Attitudes Towards Clinical Trials

Factor	ß*	SE	aOR	p**
Age	0.022	0.021	1.02 (0.98–1.07)	0.300
Gender (female vs male)	0.406	0.337	1.50 (0.78–2.91)	0.228
Participation in clinical trials	0.145	0.415	1.16 (0.51–2.61)	0.727
Experience in clinical trials	0.143	0.438	1.15 (0.49–2.72)	0.745
Clinical trial knowledge***	1.051	0.237	2.86 (1.80–4.55)	**< 0.001**

Notes: Ordinal logistic regression (proportional odds model). The dependent variable was the attitude composite score rounded to the nearest integer, yielding three ordered categories (n = 44, 138 and 13). All covariates were specified a priori and entered simultaneously. Variance inflation factors were all below 2.7, indicating no problematic collinearity. The test of parallel lines did not reject the proportional-odds assumption (χ^2 = 10.32, *df* = 5, p = 0.067). Model fit: likelihood ratio χ^2 = 38.58, p < 0.001; McFadden R^2 = 0.130; Nagelkerke R^2 = 0.230; n = 195. β estimates were calculated for positive attitudes; significant p values are shown in bold; knowledge is expressed per 1-point increase on the Likert scale. *β estimates were calculated for positive attitudes; **significant p values are shown in bold; ***clinical trial knowledge is expressed per 1-point increase on the Likert scale.

Abbreviations: β, beta estimate; aOR, adjusted odds ratio; CI, confidence interval; SE, standard error.

Oncology-Focused Subgroup Analysis

In an oncology-focused subgroup analysis, oncology physicians had higher prior active participation in clinical trials than non-oncology physicians (85.5% vs 49.6%, p<0.001), as well as higher self-assessed clinical trial knowledge scores and positive attitude scores. Perceived barrier scores were similar between groups. In multivariable logistic regression, oncology specialty remained independently associated with prior clinical trial participation (OR 3.46, 95% CI 1.37–8.74, p=0.009; Supplementary Table 1).

At the individual-item level, oncology physicians showed lower rates of complete unfamiliarity than non-oncology physicians in 8 of the 12 knowledge areas after false discovery rate adjustment. The most pronounced differences were seen for Phase II–IV trials (8.1% vs 33.8%, q = 0.001) and SUSAR terminology (40.3% vs 63.9%, q = 0.012) (Supplementary Table 2). By comparison, none of the 17 perceived barriers showed significant differences according to oncology specialty or previous clinical trial participation after correction for multiple testing (Supplementary Table 3).

Discussion

Our study is the first comprehensive research known to us on the knowledge levels, experiences, attitudes, and barriers of physicians in Türkiye regarding clinical research. Physicians' approaches affect not only themselves, but also indirectly influence patient participation and perspectives. Therefore, identifying physicians' views, reinforcing positive aspects, and addressing negative ones is crucial for optimizing participation in clinical research.

Physicians' knowledge level plays an important role in the conduct of clinical research. Even short-term training of clinicians about clinical research has been shown to lead to positive changes in clinician behavior.[12] The association we observed between physicians' knowledge and their positive attitudes toward clinical trials is consistent with these findings, although our cross-sectional design cannot establish the direction of this relationship.

A significant variation is observed among participants regarding the pathways through which they acquired knowledge about clinical research. The fact that a large proportion of respondents (54.9%) reported gaining their first clinical research experience during their specialty training period, and that more than half of the physicians (52.3%) received clinical research education during residency or fellowship programs, appears to be interrelated. This finding suggests the need for improvements in undergraduate medical education to enhance knowledge and awareness about clinical research

processes at earlier stages. Research has shown that education about clinical research during medical school significantly changes students' views and attitudes.[13]

The findings indicate a significant disparity in the level of information regarding Phase I clinical trials, with a mere 2.6% of the participants indicating a high degree of awareness, while a substantial proportion, amounting to 56.4%, demonstrated a lack of familiarity with fundamental research terminology, such as SUSAR. This observation signifies a notable absence of educational preparedness in this domain.

Clinicians generally have a positive view of clinical research, which our study confirms. While clinicians generally acknowledge the significance of clinical research, the motivational factors that drive individuals to engage in this research vary significantly. In the present study, the publication of clinical trial results as an article was identified as a significant motivational factor for participants, aligning with the extant literature.[14]

Subgroup analysis results between oncologist and non-oncologist groups suggest that more positive knowledge and attitudes may be due to the rapid application of clinical research knowledge in oncology and the frequent referral of patients to clinical research options due to inadequacies in treatment. Although the experience of clinical trials did not differ significantly between the groups, the higher overall level of active participation in clinical trials among oncology physicians may have contributed to their greater familiarity with the trial processes. Because knowledge and attitude scores may themselves lie on the pathway between oncology specialisation and trial participation rather than confound it, adjusting for them is likely to yield a conservative estimate of the specialty effect.

Perceived barriers, however, did not show a similar pattern. Barrier scores were nearly identical between oncology and non-oncology physicians, and no individual barrier differed significantly by specialty or prior clinical trial participation. This contrast between specialty-related differences in knowledge and broadly similar perceptions of barriers suggests that these obstacles may primarily reflect structural features of the research environment rather than differences in individual physician preparedness.

Clinician referrals of patients to clinical trials are critically important; however, approximately 50% to 80% of eligible patients do not participate in suitable clinical studies due to a lack of referral by clinicians.[3] Although clinicians' barriers to participation in clinical research are influenced by specialty, academic setting (primary care, university, public hospital), and local conditions, core obstacles include rigid protocol designs, administrative burden (eg, difficulties obtaining informed consent), time constraints, and the potential risk of placebo assignment.[15] Additionally, systemic barriers—such as lack of organizational support, inadequate infrastructure, limited financial resources, and poor internal communication—further hinder clinicians from enrolling patients in clinical studies.[5] Furthermore, individual-level factors such as physicians' discomfort with clinical uncertainty or limited tolerance for perceived risk—particularly in trials evaluating treatment de-intensification—may also hinder trial discussions and enrollment decisions.[16] These barriers are even more pronounced in developing countries, where financial limitations, lack of experienced human resources, obstacles related to ethical and regulatory systems, insufficient research infrastructure, and the heavy burden of patient care responsibilities among clinicians compound the challenges faced in clinical research participation when compared to developed countries.[17]

Transparency, lack of sponsorship, academic hierarchy, financial pressures and challenges, and the ethics approval process were among the most frequently reported barriers by participants. Transparency, lack of sponsorship, financial difficulties, and the ethics approval process have been commonly highlighted in previous studies and can be considered expected barriers in countries like Türkiye, which lie between developed and developing nations. Notably, unlike previous studies, academic hierarchy was identified as a barrier for the first time in our research. This novel finding may reflect specific structural or institutional dynamics within the Turkish healthcare or academic environment, warranting further investigation.

To address these barriers and foster the positive attitudes identified, several strategies should be considered. First, policies that incentivize the publication of clinical trial results could further encourage clinician engagement. Second, more effective research education—particularly during undergraduate medical training—would strengthen baseline knowledge and prepare future physicians for active research roles. For physicians who missed such training and work in institutions with limited resources, structured mentorship programs could offer support and practical guidance.

From a systemic perspective, bureaucratic hurdles—especially those related to trial approval and monitoring—should be simplified through more streamlined regulatory frameworks. Increasing the number of study coordinators and trial administrators could help alleviate the workload of physicians. Institutional and national authorities also have a critical role in offering logistical and strategic support for clinical trials.

Finally, artificial intelligence is rapidly advancing in the field of cancer, and its use in technological solutions such as electronic informed consent systems, AI-assisted patient recruitment platforms, and automated data capture systems may help reduce the administrative burden on clinicians.[18–20]

Limitations

This study has several limitations that should be acknowledged. First, due to its cross-sectional design, the study captures attitudes, knowledge levels, and experiences at a single point in time, preventing the establishment of causal relationships between variables. In particular, the association between clinical trial knowledge and favourable attitudes should not be interpreted as evidence that increasing knowledge produces more favourable attitudes. The relationship is plausibly bidirectional: physicians who already hold favourable views of clinical research may be more likely to seek out training and to participate in trials, thereby acquiring greater knowledge. Longitudinal or interventional studies would be required to establish the direction of this association.

Second, participation was voluntary and recruitment was conducted via online platforms, which may have introduced selection bias. Physicians who are more interested in or experienced with clinical research may have been more likely to participate, limiting the generalizability of the findings. Because the open survey link could be forwarded and the number of unique recipients was not recorded, the total number of physicians invited and the response rate could not be determined. Considering all these factors, it should be acknowledged that the study sample may not represent the views of all physicians in Türkiye.

Third, the data relied entirely on self-reported responses, which may be subject to recall bias, response bias, or social desirability bias. Fourth, the use of an online survey platform may have excluded physicians with limited internet access or those less comfortable with digital technologies.

Additionally, despite efforts to reach a broad sample, certain specialties (such as surgical disciplines and basic sciences) were underrepresented in the sample, potentially affecting the representativeness of the results. In spite of the good results of the internal consistency analysis, the lack of formal pilot testing and psychometric validation of the questionnaire should also be considered a limitation. In addition, the questionnaire did not capture physicians' access to research infrastructure, such as the availability of dedicated research staff, clinical trial units, or institutional research support. This variable could therefore not be included as a covariate in the multivariable comparison of oncology and non-oncology physicians, and residual confounding by differences in access to research infrastructure cannot be excluded.

Finally, as the study was conducted solely within Türkiye, the findings may not be generalizable to physician populations in other countries with different healthcare systems, regulatory environments, and clinical research infrastructures.

Conclusion

This study provides the first comprehensive insight into Turkish physicians' knowledge, attitudes, experiences, and perceived barriers regarding clinical trials. The findings demonstrate that despite limited knowledge—particularly in early-phase trials and regulatory processes—physicians generally hold positive attitudes toward clinical research. The variable most strongly associated with favorable attitudes was clinical trial knowledge, underscoring the potential value of education for clinician engagement.

However, systemic and institutional barriers such as administrative burden, lack of sponsorship, insufficient infrastructure, and hierarchical academic structures continue to hinder active physician participation. Notably, our study identified academic hierarchy as a novel barrier not commonly reported in previous literature. Oncology physicians had higher prior participation, knowledge, and positive attitude scores than non-oncology physicians, and oncology specialty was independently associated with prior clinical trial participation. However, perceived barriers were not different

between specialties or between physicians with and without previous trial experience, suggesting that they are structural rather than a function of individual knowledge or preparedness.

These two categories of obstacle call for different remedies. Knowledge gaps varied by specialty and are amenable to targeted education, particularly in early-phase trial design, regulatory processes and pharmacovigilance terminology. Structural barriers will not be resolved by training alone and require system-level action: expanding sponsor engagement, reducing administrative and contracting burden, funding dedicated research staff and infrastructure, and addressing the hierarchical constraints that limit participation by junior physicians. Increasing physician participation in clinical research in Türkiye will depend on pursuing both in parallel.

Abbreviations

AI, Artificial Intelligence; CRC, Clinical Research Coordinator; CRM, Clinical Research Monitor; GCP, Good Clinical Practice; IQR, Interquartile Range; PI, Principal Investigator; R&D, Research and Development; SE, Standard Error; SubI, Subinvestigator; SUSAR, Suspected Unexpected Serious Adverse Reaction.

Data Sharing Statement

The datasets generated and/or analysed during the current study are not publicly available due to ethical restrictions and protection of participant confidentiality, but are available from the corresponding author on reasonable request and with permission from the Ethics Committee.

Ethics Approval and Consent to Participate

Institutional ethics committee approved the study protocol (AUTF-KAEK 2024/792, approval date: 17.12.2024). The study was conducted in compliance with the Helsinki Declaration. All participants provided informed consent before completing the survey.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The researchers reported no conflict of interest.

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