

Received: 29.08.2026

Accepted: 20.09.2026

UDC: 616-006:614.2

IRSTI: 76.29.49

DOI: [10.24412/1609-8692-2026-3-34-47](https://doi.org/10.24412/1609-8692-2026-3-34-47)

Article type: Review article

ADHERENCE TO ONCOLOGY CLINICAL PRACTICE GUIDELINES: INTERNATIONAL EVIDENCE AND A CAUSE-BASED AUDIT FRAMEWORK FOR KAZAKHSTAN

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Introduction. Clinical practice guidelines and national clinical protocols are intended to standardize cancer care and reduce unwarranted variation. However, guideline publication alone does not guarantee implementation, particularly when access to medicines, molecular diagnostics, radiotherapy, surgery, qualified personnel, financing, and referral pathways is limited.

Objective. To synthesize international evidence on adherence to oncology clinical practice guidelines, assess its association with clinical outcomes and resource constraints, and develop a cause-based framework for auditing deviations from recommended care.

Materials and Methods. A targeted narrative review and conceptual policy analysis were conducted using PubMed/MEDLINE, PubMed Central, official World Health Organization resources, the European Observatory on Health Systems and Policies, and the legal and regulatory database of the Republic of Kazakhstan. English- and Russian-language sources available through 27 July 2026 were considered. Priority was given to systematic reviews, meta-analyses, population-based and cohort studies, implementation research, and official policy documents. Evidence was synthesized according to clinical outcomes, determinants of guideline concordance, resource-dependent access, and implementation strategies.

Results. Guideline-concordant cancer care was consistently associated with better survival, although most available evidence was observational and susceptible to confounding by age, comorbidity, disease stage, performance status, and access to specialist services. Adherence varied substantially according to tumour type, treatment modality, and health-system setting. The greatest implementation gaps were observed for costly medicines, molecular diagnostics, radiotherapy, and other interventions requiring specialized infrastructure. Based on the reviewed evidence, four categories of deviation were distinguished: clinically justified, patient decision-related, system-induced, and potentially preventable.

Discussion. Binary classification of care as adherent or non-adherent may obscure fundamentally different causes of deviation and may incorrectly attribute health-system failures to individual clinicians. A cause-based approach incorporating clinical applicability, patient autonomy, intervention availability, timeliness, and pathway completion may provide a more informative basis for quality assessment. The proposed framework is conceptual and requires prospective validation before use as a performance or sanctioning instrument.

Conclusion. Evaluation of adherence to oncology protocols should assess not only whether a recommendation was followed but also whether it was clinically applicable and whether the health system made the recommended intervention available within an appropriate timeframe. Cause-based audit may improve the identification of barriers to evidence-based cancer care and support targeted clinical, organizational, and policy interventions.

Keywords: clinical practice guidelines; oncology; guideline adherence; quality of care; resource constraints; access to treatment; clinical audit.

ОНКОЛОГИЯДАҒЫ ҰЛТТЫҚ КЛИНИКАЛЫҚ ХАТТАМАЛАРДЫ САҚТАУ: КЛИНИКАЛЫҚ НӘТИЖЕЛЕР, РЕСУРСТЫҚ ШЕКТЕУЛЕР ЖӘНЕ АУДИТ ТӘСІЛДЕРІ

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Кіріспе. Клиникалық ұсынымдар мен ұлттық клиникалық хаттамалар онкологиялық көмекті стандарттауға және клиникалық тәжірибедегі негізсіз айырмашылықтарды азайтуға бағытталған. Алайда бекітілген хаттаманың болуы оның іс жүзінде орындалуына кепілдік бермейді, әсіресе дәрілік препараттарға, молекулалық диагностикаға, сәулелік терапияға, хирургиялық емге, білікті мамандарға, қаржыландыруға және пациенттерді тиімді бағыттау жүйесіне қолжетімділік шектеулі болған жағдайда.

Мақсаты. Онкологиядағы клиникалық ұсынымдарды сақтау жөніндегі халықаралық деректерді жинақтау, олардың клиникалық нәтижелермен және ресурстық шектеулермен байланысын бағалау және ұсынылған медициналық көмектен ауытқуларды аудиттеуге арналған себепке негізделген модель әзірлеу.

Материалдар мен әдістер. Мақсатты нарративтік әдеби шолу және денсаулық сақтау саясатына концептуалдық талдау жүргізілді. PubMed/MEDLINE, PubMed Central, Дүниежүзілік денсаулық сақтау ұйымының ресми ресурстары, Денсаулық сақтау жүйелері мен саясаты жөніндегі Еуропалық обсерватория және Қазақстан Республикасының нормативтік-құқықтық дерекқоры пайдаланылды. 2026 жылғы 27 шілдеге дейін қолжетімді ағылшын және орыс тілдеріндегі дереккөздер қарастырылды. Жүйелі шолуларға, мета-талдауларға, популяциялық және когорттық зерттеулерге, клиникалық ұсынымдарды енгізу жөніндегі зерттеулерге және ресми бағдарламалық-нормативтік құжаттарға басымдық берілді. Деректер клиникалық нәтижелер, ұсынымдарды сақтау факторлары, ресурстық қолжетімділік және енгізу стратегиялары бойынша талданды.

Нәтижелер. Клиникалық ұсынымдарға сәйкес көрсетілген онкологиялық көмек көптеген зерттеулерде өмір сүру көрсеткіштерінің жақсаруымен байланысты болды, алайда дәлелдердің басым бөлігі бақылаулық зерттеулерден алынған және араластырушы факторлардың әсеріне бейім. Ұсынымдарды сақтау деңгейі ісік түріне, емдеу әдісіне және денсаулық сақтау жүйесінің жағдайына байланысты айтарлықтай өзгерді. Ең үлкен алшақтықтар қымбат дәрілік препараттарға, молекулалық диагностикаға, сәулелік терапияға және мамандандырылған инфрақұрылымды талап ететін технологияларға қатысты анықталды. Талдау негізінде ауытқулардың төрт санаты ұсынылды: клиникалық тұрғыдан негізделген, пациенттің шешіміне байланысты, денсаулық сақтау жүйесінен туындаған және ықтимал алдын алуға болатын ауытқулар.

Талқылау. «Сақталған/сақталмаған» деген бинарлық бағалау клиникалық тұрғыдан негізделген жеке шешімдерді, пациент таңдауын, ресурстық тапшылықты және ықтимал алдын алуға болатын қателерді ажыратуға мүмкіндік бермейді. Себепке негізделген аудит ұсынымның клиникалық қолданылуын, пациент автономиясын, араласудың нақты қолжетімділігін, оның уақтылы орындалуын және медициналық көмек көрсету маршрутының сақталуын бағалауы тиіс. Ұсынылған модель концептуалдық сипатта және тиімділікті бағалау немесе санкциялық құрал ретінде пайдаланылғанға дейін проспективті валидацияны қажет етеді.

Қорытынды. Онкологиялық клиникалық хаттамалардың сақталуын бағалау ұсынымның орындалу фактісімен ғана шектелмеуі тиіс. Оның нақты пациентке клиникалық қолданылуы және денсаулық сақтау жүйесінің қажетті араласуды клиникалық тұрғыдан қолайлы мерзімде қамтамасыз ету мүмкіндігі де ескерілуі қажет. Ауытқуларды себептері бойынша жіктеу клиникалық аудиттің қпараттық құндылығын арттырып, клиникалық ұйымдастырушылық және басқарушылық шараларды мақсатты түрде жоспарлауға мүмкіндік береді.

Түйінді сөздер: клиникалық ұсынымдар; клиникалық хаттамалар; онкология; ұсынымдарды сақтау; медициналық көмектің сапасы; ресурстық шектеулер; емге қолжетімділік; клиникалық аудит.

СОБЛЮДЕНИЕ НАЦИОНАЛЬНЫХ КЛИНИЧЕСКИХ ПРОТОКОЛОВ В ОНКОЛОГИИ:
КЛИНИЧЕСКИЕ ИСХОДЫ, РЕСУРСНЫЕ ОГРАНИЧЕНИЯ И ПОДХОДЫ К АУДИТУ

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Введение. Клинические рекомендации и национальные клинические протоколы предназначены для стандартизации онкологической помощи и сокращения необоснованной вариабельности клинической практики. Однако наличие утвержденного протокола само по себе не гарантирует его практического выполнения, особенно при ограниченной доступности лекарственных препаратов, молекулярной диагностики, лучевой терапии, хирургического лечения, квалифицированных специалистов, финансирования и эффективной маршрутизации пациентов.

Цель. Обобщить международные данные о соблюдении клинических рекомендаций в онкологии, оценить их связь с клиническими исходами и ресурсными ограничениями, а также разработать причинно-ориентированную модель аудита отклонений от рекомендованной медицинской помощи.

Материалы и методы. Проведены целевой нарративный обзор литературы и концептуальный анализ организации медицинской помощи. Использованы PubMed/MEDLINE, PubMed Central, официальные ресурсы Всемирной организации здравоохранения, Европейской обсерватории по системам и политике здравоохранения и нормативно-правовая база Республики Казахстан. Рассматривались англо- и русскоязычные источники, доступные по состоянию на 27 июля 2026 года. Приоритет отдавался систематическим обзорам, метаанализам, популяционным и когортным исследованиям, исследованиям внедрения клинических рекомендаций и официальным программным и нормативным документам. Данные анализировали по четырем направлениям: клинические исходы, факторы соблюдения рекомендаций, ресурсная доступность медицинской помощи и стратегии внедрения.

Результаты. Оказание онкологической помощи в соответствии с клиническими рекомендациями в большинстве исследований ассоциировалось с лучшей выживаемостью, однако преобладающая часть доказательств получена в наблюдательных исследованиях и подвержена влиянию смешивающих факторов. Уровень соблюдения рекомендаций существенно различался в зависимости от локализации опухоли, метода лечения и характеристик системы здравоохранения. Наиболее значимые разрывы выявлялись в отношении дорогостоящих лекарственных препаратов, молекулярной диагностики, лучевой терапии и технологий, требующих специализированной инфраструктуры. На основании анализа выделены четыре категории отклонений: клинически обоснованные, связанные с решением пациента, обусловленные системой здравоохранения и потенциально предотвратимые.

Обсуждение. Бинарная оценка «соблюдено/не соблюдено» не отражает различий между клинически обоснованной индивидуализацией лечения, выбором пациента, дефицитом ресурсов и потенциально предотвратимыми нарушениями. Причинно-ориентированный аудит должен учитывать применимость рекомендации, автономию пациента, фактическую доступность вмешательства, сроки его предоставления и выполнение маршрута оказания помощи. Предлагаемая модель является концептуальной и требует проспективной валидации до ее использования в качестве инструмента оценки эффективности или применения санкций.

Заключение. Аудит соблюдения онкологических клинических протоколов должен оценивать не только факт выполнения рекомендации, но и ее клиническую применимость, а также реальную способность системы здравоохранения обеспечить необходимое вмешательство в клинически приемлемые сроки. Причинная классификация отклонений может повысить информативность клинического аудита и способствовать разработке целевых клинических, организационных и управленческих мер.

Ключевые слова: клинические рекомендации; клинические протоколы; онкология; соблюдение рекомендаций; качество медицинской помощи; ресурсные ограничения; доступность лечения; клинический аудит.

Introduction

Clinical protocols and practice guidelines are central instruments of evidence-based medicine. They synthesize research evidence, define recommended diagnostic and therapeutic interventions, and seek to reduce

unwarranted variation attributable to the preferences or experience of individual clinicians. In Kazakhstan, a clinical protocol is defined as a set of evidence-based recommendations for prevention, diagnosis, treatment, medical rehabilitation, and

palliative care. National rules require both appraisal of evidence and alignment of protocol content with the country's clinical practice [1]. The national oncology-care standard also emphasizes territorial accessibility and coordination across levels of care [2].

Nevertheless, a persistent gap separates an approved document from the care actually received by a patient. Between a recommendation and its implementation lie the medicine, pathology and molecular laboratory, equipment, trained specialist, tariff, procurement process, hospital capacity, referral pathway, and time. Consequently, a crude adherence rate cannot be interpreted automatically as a measure of clinician discipline or competence.

This issue is especially important in oncology. Contemporary cancer care may require coordinated pathology and molecular testing, surgery, radiotherapy, systemic anticancer therapy, supportive care, and surveillance. Failure or delay at one point can alter the entire treatment trajectory. Yet retrospective chart review often records only the final discordance and does not establish whether it arose from appropriate individualization, an informed patient decision, lack of access, or a preventable error.

This review aimed to synthesize international evidence on adherence to oncology guidelines and its association with clinical outcomes, examine the contribution of resource constraints, and develop a practical, cause-based approach to auditing deviations from national protocols.

Materials and Methods

Design and information sources. This work is a targeted narrative review and conceptual policy analysis rather than a systematic review. Searches were conducted in PubMed/MEDLINE and PubMed Central and supplemented with official publications from the World Health Organization (WHO), the European Observatory on Health Systems and Policies, and the legal and regulatory database of the Republic of Kazakhstan. The search covered sources available through 27 July 2026.

Search concepts and source selection. Search

terms were combined around the concepts of clinical practice guideline adherence, guideline-concordant cancer care, oncology guideline compliance, implementation barriers and facilitators, resource constraints, access to cancer medicines, resource-stratified guidelines, and low- and middle-income countries. Priority was given to systematic reviews and meta-analyses; population-based, cohort, and implementation studies reporting adherence, survival, access, or organizational barriers; and authoritative policy documents. Sources were selected for relevance to the review questions rather than through exhaustive duplicate screening. Accordingly, no pooled estimate was calculated, and the findings are interpreted as a structured narrative synthesis.

Terminology and analytic approach. "Protocol adherence" is used as an umbrella term. The international literature variously uses adherence, compliance, concordance, and guideline-concordant care. These constructs are not interchangeable: some studies evaluate a single treatment decision, others an entire care pathway, and others a composite set of quality indicators. We therefore compared direction and context of findings rather than treating reported percentages as directly equivalent. Evidence was organized into four domains: clinical outcomes, frequency and determinants of concordance, resource-dependent access, and implementation strategies. The proposed audit classification was then derived conceptually by distinguishing clinical applicability, patient autonomy, system availability, and preventability.

Results

Guideline concordance and clinical outcomes

The most consistent finding is that guideline-concordant cancer care is associated with more favorable outcomes. A systematic review and meta-analysis of observational studies in European Union countries reported better overall and recurrence-free survival among patients with breast cancer who received guideline-concordant care [3]. A broader 2025 systematic review and meta-analysis similarly found an overall association between guideline

adherence and improved oncology outcomes, while emphasizing heterogeneity and the predominantly observational nature of the evidence [4]. These associations are clinically important but should not be interpreted as proof that every deviation causes a poor outcome.

Song et al. evaluated a locally adapted national protocol in a resource-limited Malaysian setting. Among 3,100 women with nonmetastatic breast cancer, concordance was 61.7% for chemotherapy, 79.2% for radiotherapy, 85.1% for endocrine therapy, and only 26.2% for targeted therapy. Nonconcordant care was associated with higher mortality: adjusted hazard ratios were 1.69 for chemotherapy, 2.59 for radiotherapy, 3.08 for endocrine therapy, and 4.48 for targeted therapy [5]. The pattern illustrates two parallel phenomena: concordance matters clinically, and the likelihood of concordance depends on the cost and infrastructure required. In that study, access to HER2-directed treatment in the public sector was constrained by an annual budget, meaning that a proportion of recorded nonconcordance

reflected lack of access rather than rejection of evidence-based care by clinicians.

A systematic review by Putri et al. found cervical-cancer treatment concordance of approximately 42-54% across included studies, with higher five-year survival among patients receiving guideline-concordant treatment [6]. Interpretation still requires attention to disease stage, performance status, radiotherapy access, and treatment completion within the recommended interval.

In a population-based US study of more than 42,000 older adults with lung cancer, only 44.7% received guideline-concordant care. Nonconcordant care was associated with a higher adjusted risk of lung-cancer death (hazard ratio 1.91; 95% CI 1.82-2.00), while increasing age, non-White race, greater comorbidity, and lower income were associated with lower likelihood of concordant treatment [7]. The study demonstrates that guideline-practice gaps are not confined to low-resource countries; they can also reflect inequity, comorbidity, site of care, and pathway organization within high-income systems.

Table 1 - Selected evidence on adherence to oncology guidelines

Study	Population/setting	Measure	Main finding
Song et al. [5]	3,100 women; Malaysia	Four adjuvant modalities	Concordance 26.2-85.1%; nonconcordance associated with higher mortality.
Putri et al. [6]	Cervical cancer; systematic review	Treatment concordance	Approximately 42-54%; higher survival with concordant care.
Nadpara et al. [7]	>42,000 older adults; United States	Lung-cancer guideline concordance	44.7% concordant; nonconcordance associated with higher lung-cancer mortality.
Canelo-Aybar et al. [3]	Breast cancer; EU countries	Systematic review/meta-analysis	Concordance associated with better overall and recurrence-free survival.
Ismaila et al. [4]	Multiple cancers	Systematic review/meta-analysis	Overall benefit associated with concordance; substantial heterogeneity.

How frequently are guidelines followed?

Reported concordance varies substantially by tumour type, intervention, setting, and definition. An Australian systematic review found a wide range of adherence rates; age, comorbidity, place of residence, institution type, and access to specialist care were recurrent determinants [8]. A Dutch analysis of 15 recommendations across five cancers reported adherence ranging from 40% to 99%

[9].

The broader CareTrack Australia study found that appropriate care, defined against evidence- or consensus-based indicators, was delivered in approximately 57% of eligible encounters [10]. Publication of a protocol should therefore be regarded as the beginning of implementation rather than evidence that the standard has become routine practice. Cross-country comparisons require caution. A

high percentage may reflect a narrow, easily measured indicator, whereas a low percentage may reflect a complex pathway involving diagnosis, time targets, and multiple treatment modalities. Some studies classify only underuse of indicated care as nonadherence; others also capture overuse or contraindicated interventions. Denominator definitions and patient eligibility must therefore accompany any reported performance indicator.

Why clinicians and health systems deviate from protocols

The classic Cabana framework categorizes barriers as lack of awareness or familiarity, disagreement, low self-efficacy, low outcome expectancy, inertia of previous practice, and external constraints [11]. Subsequent reviews confirm that barriers operate at multiple levels: patient, clinician, team, organization, and health system [12-14].

In oncology, Bierbaum et al. identified clinicians' attitudes, applicability to the individual patient, accessibility and clarity of the guideline, available resources, organizational culture, and professional-society engagement as important factors [15]. Interviews with Australian oncology clinicians further emphasized rapid access to recommendations, multidisciplinary collaboration, and alignment with real-world practice [16]. In low- and middle-income settings, organizational and system constraints assume greater importance, including inconsistent policy, limited training and financing, and weak infrastructure [17, 18].

The same observed endpoint-failure to receive a recommended intervention-can therefore arise through fundamentally different mechanisms. A clinician may be unaware of the recommendation; the recommendation may be clinically inappropriate because of comorbidity; a well-informed patient may decline; a medicine or radiotherapy slot may be unavailable; or referral may occur but treatment may not start in time. Combining these mechanisms into a single nonadherence category is statistically convenient but operationally uninformative.

Access to medicines and technology as a prerequisite for concordance

An international survey by Fundytus et al.,

involving 948 oncologists from 82 countries, documented major income-related differences in access to priority anticancer medicines [19]. Inclusion of a medicine on an essential-medicines list did not guarantee universal availability.

Audits should distinguish a recommendation, a prescription or multidisciplinary decision, and actual treatment receipt. A clinician may establish an indication and submit a request, yet the patient may not start therapy because of procurement delay, budget ceilings, or stock-out. Administrative data may then classify the patient as untreated even though the clinical decision was appropriate.

For this reason, an audit must reconstruct the timeline: date of eligibility, date of multidisciplinary decision, date of referral or request, date the technology became available, and date treatment started. Without this chronology, neither responsibility nor preventability can be assessed reliably.

Resource-stratified guidelines

Resource stratification is one response to implementation gaps. Its purpose is not to legitimize inferior care, but to specify the best feasible option at a given resource level while establishing a transparent path toward optimal care. A stratified guideline may define basic, limited, enhanced, and maximal resource levels, together with criteria for referral to a higher-capability center [20]. Reference [20] describes a scoping review protocol, not completed validation of resource-stratified guidelines.

The Malaysian study indicates that a locally adapted protocol can retain clinical value [5]. Two opposing risks should be avoided: mechanically importing a maximal international standard without financing or infrastructure, and simplifying a national protocol so extensively that systemic underdevelopment becomes normalized. Adaptation should be evidence-based, transparent, and linked to a measurable plan for service expansion.

WHO's fair-priority-setting framework for universal health coverage emphasizes effectiveness, equity, and financial protection [21]. In oncology, adding a technology to a national protocol should therefore be

synchronized with the medicines formulary, reimbursement tariff, diagnostic capacity, workforce, and service throughput.

Implications for Kazakhstan

In Kazakhstan, implementation must be considered against a large territory, urban-rural disparities, and concentration of specialist personnel. The European Observatory reports that 82.8% of physicians work in urban areas, while territorial accessibility and sustainable financing remain important health-system concerns [22].

An analysis of household out-of-pocket expenditure from 2018 to 2021 identified improvements in financial protection but also a continuing need to assess the distribution of costs and the role of public financing [23]. For a patient with cancer, affordability extends beyond the price of an anticancer medicine and may include transport, accommodation in another city, repeat testing, lost income, and supportive medicines.

National rules require clinical protocols to reflect practice in Kazakhstan [1]. This should mean more than editorial localization: the system should know where, by whom, and within what timeframe each mandatory investigation and treatment is available, how it is financed, and which referral route applies

when a technology is unavailable locally.

A national audit should therefore move beyond the binary label “adherent/nonadherent” and analyze reasons. Separate measurement of medicine shortages, unavailable diagnostics, workforce gaps, organizational delay, and clinically unjustified decisions would direct corrective action to the appropriate level rather than defaulting to clinician blame.

A Cause-Based Classification of Protocol Deviations

For practical audit, deviations from a national clinical protocol can be divided into four mutually informative categories. The classification distinguishes clinical applicability, patient autonomy, system availability, and preventability. It is a proposed analytic framework and requires prospective validation before use as a performance or sanctioning instrument. The proposed framework represents a conceptual model developed by the authors from the reviewed evidence and has not yet undergone prospective validation. The proposed framework represents a conceptual model developed by the authors on the basis of the reviewed evidence and has not yet undergone prospective validation.

Table 2 - Proposed classification of deviations from a national clinical protocol

Category	Decision rule	Typical examples	Audit response
Clinically justified	Recommendation is inapplicable or expected harm exceeds benefit.	Contraindication, organ dysfunction, severe toxicity, substantial comorbidity.	Document rationale; multidisciplinary review when appropriate.
Patient decision-related	An informed patient declines or selects an alternative.	Declining surgery, radiotherapy, or systemic therapy.	Document information, risks, alternatives, and patient preference.
System-induced	Indication is established, but the intervention is unavailable or delayed.	No medicine, test, specialist, bed, tariff, or viable referral route.	Record cause and delay; escalate; arrange an alternative pathway.
Potentially preventable	The recommendation could have been delivered but was not.	Unjustified decision, missed investigation, referral error, absent follow-up.	Clinical audit, education, process redesign, and decision support.

Practical Audit Framework

Case review should begin by confirming that the specific recommendation applied to the patient at the relevant time. The auditor should then assess contraindications and competing risks, the patient’s informed decision, actual

availability of the intervention, and adherence to the organizational pathway. A deviation should be classified as potentially preventable only after these competing explanations have been evaluated. The resulting cause-based decision pathway is summarized in *Figure 1*.

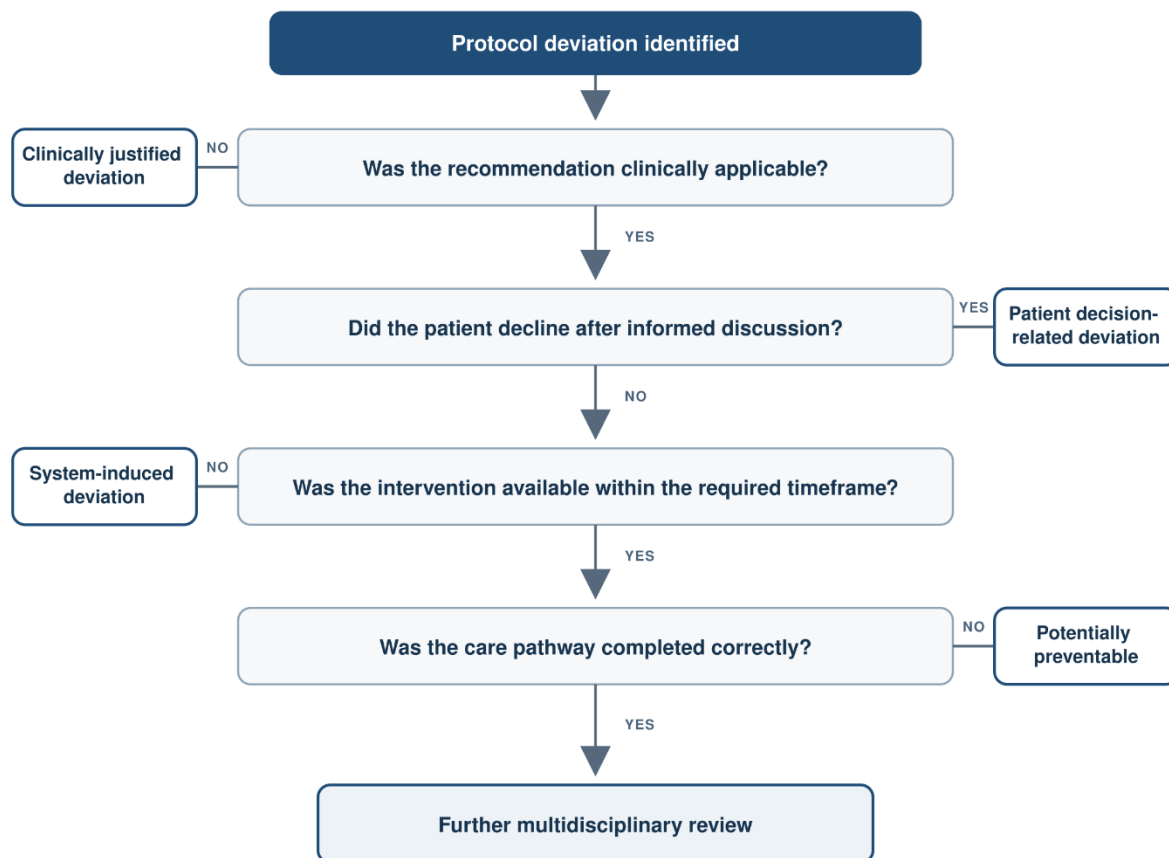


Figure 1 - Cause-based audit pathway for evaluating deviations from national oncology clinical protocols

The sequence distinguishes clinically justified, patient decision-related, system-induced, and potentially preventable deviations before further multidisciplinary review.

A minimum dataset should include tumour site, stage, and relevant biological characteristics, performance status and major comorbidities, the recommended intervention and multidisciplinary-team decision, the documented reason for deviation, the dates on which the indication arose, the referral or request was made, and treatment was actually initiated, available alternatives, and the effects on timeliness, continuity, or treatment intent.

For system-induced deviations, the accountable operational level should be recorded—for example, the treating organization, regional coordinator, payer, procurement or distribution system, diagnostic service, or referral center. This shifts audit from individual blame toward actionable management of access.

Candidate indicators include the proportion of eligible patients receiving guideline-recommended care, the median time from

multidisciplinary decision to treatment initiation, the proportion of system-induced deviations, medicine or diagnostic stock-out rates, the proportion of clinically justified individualizations, the proportion of deviations without a documented reason, and the proportion of patients referred to another capable organization within the target interval. Each indicator should have an explicitly defined numerator, denominator, eligibility criteria, and time window.

Strategies to Improve Real-World Adherence

Evidence for individual implementation strategies remains heterogeneous. Reviews report frequent use of multicomponent interventions, including education, printed or digital materials, local opinion leaders, audit and feedback, electronic decision support, and organizational change [24-26]. Effects are more plausible when the intervention is matched to a documented barrier.

First, protocols should be synchronized with resources. Before a new mandatory recommendation is approved, medicine

supply, diagnostics, workforce, equipment, tariffs, and regional referral capacity should be assessed. A recommendation without an implementation mechanism creates a standard that is predictably unattainable.

Second, digital systems can support-not replace-clinical judgment. They can prompt required investigations, track time targets, detect missed treatment cycles, and require selection of a standardized reason for deviation. Alerts should be clinically governed to avoid administrative burden and indiscriminate blame.

Third, multidisciplinary decisions should document not only the selected regimen but also eligibility, protocol concordance, alternatives considered, contraindications, availability, and a contingency plan if the preferred technology cannot be delivered.

Fourth, repeated system-induced deviations should trigger feedback at organizational and policy levels. A recurring shortage or diagnostic bottleneck is not a collection of unrelated clinical exceptions; it is a measurable access failure requiring a system response.

Discussion

The reviewed evidence supports the clinical importance of guideline-concordant oncology care while exposing the limitations of a binary adherence metric. Associations with survival do not establish that every deviation causes an adverse outcome. Observational studies are susceptible to confounding by indication and prognosis: older patients, those with major comorbidity, poor performance status, advanced disease, or limited access are simultaneously less likely to receive standard treatment and more likely to experience poor outcomes.

Nevertheless, systematic underuse of an indicated intervention is an important quality signal. The key task is causal attribution. If an intervention was available but was omitted without justification, clinical audit is warranted. If it was indicated but not supplied, a managerial or policy response is required. If the patient declined, the quality of informed communication and shared decision-making should be assessed.

The proposed classification avoids two errors:

using resource scarcity to excuse all deviations, and holding clinicians responsible for implementing care that the system did not make available. A resource constraint does not erase the standard; it should be recorded as a distinct access failure, with its duration, consequence, and accountable level.

For Kazakhstan, a feasible next step would be a pilot audit within one common cancer pathway. Breast cancer is a practical example because the pathway may require molecular testing, radiotherapy, endocrine treatment, and targeted therapy. Linking multidisciplinary decisions to actual test and treatment dates would allow clinical, patient-related, organizational, and medicine-access causes of discordance to be quantified.

Limitations

This review has several limitations. It was designed as a targeted narrative review rather than a systematic review and did not include duplicate independent screening or formal risk-of-bias assessment. The literature was heterogeneous with respect to tumour types, populations, healthcare settings, definitions of guideline adherence, and measured outcomes. Most evidence linking guideline concordance with clinical outcomes was observational and therefore susceptible to residual confounding and selection bias. The findings of international studies cannot be directly extrapolated to Kazakhstan without validation using national cancer registry, medical information system, procurement, referral, and audit data. Finally, the proposed cause-based audit framework is conceptual and has not yet undergone prospective assessment of reliability, validity, feasibility, or impact on clinical outcomes.

Conclusion

Adherence to national clinical protocols is an important component of oncology quality and is generally associated with better survival. Yet concordant care depends not only on clinician knowledge and decisions, but also on timely access to medicines, diagnostics, surgery, radiotherapy, personnel, financing, and referral. A defensible audit must answer two questions: Was the recommendation clinically applicable? Did the health system make the recommended intervention genuinely

available within the required timeframe? Distinguishing clinically justified, patient decision-related, system-induced, and potentially preventable deviations can identify the appropriate level of accountability and

corrective action. Used in this way, protocol audit becomes a tool for improving access, timeliness, and outcomes rather than a formal inspection of documentation.

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Transparency of the study: Authors take full responsibility for the content of this manuscript.

Conflict of interest: The authors declare no conflict of interest.

Funding: This research is funded by the Program-targeted financing project "Development of innovative technologies and creation of modern infrastructure for sustainable development of the South Kazakhstan region" (No. BR24992814).

Ethics Statement: Not applicable. This article is based exclusively on published literature and publicly available regulatory and policy documents and did not involve human participants or identifiable patient data.

Informed Consent Statement: Not applicable.

Authors' input: conceptualization - A.S. Abdrashov, Y.Y. Yeltay, N.S. Nurdinov; study design - A.S. Abdrashov, A.M. Akter, D.M. Musirali; implementation of the research - A.S. Abdrashov, Y.Y. Yeltay, A.M. Akter, S.B. Almetov, D.M. Musirali; data interpretation - S.B. Almetov, A.S. Abdrashov; manuscript drafting - N.S. Nurdinov, A.M. Akter, A.S. Seisenbay.

Зерттеудің ашықтығы: Авторлар осы қолжазбаның мазмұны үшін толық жауапкершілікті өз мойнына алады.

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Қаржыландыру: Зерттеу «Оңтүстік Қазақстан өңірінің тұрақты дамуы үшін инновациялық технологияларды дамыту және заманауи инфрақұрылым құру» бағдарламалық-нысаналы қаржыландыру жобасы аясында қаржыландырылды (№ BR24992814).

Этикалық мәлімдеме: Қолданылмайды. Мақала тек жарияланған әдебиеттер мен жалпыға қолжетімді нормативтік және бағдарламалық құжаттарға негізделген; зерттеуге адамдар немесе сәйкестендірілетін пациент деректері қатыстырылған жоқ.

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Прозрачность исследования: Авторы несут полную ответственность за содержание настоящей рукописи.

Конфликт интересов: Авторы заявляют об отсутствии конфликта интересов.

Финансирование: Исследование выполнено при финансовой поддержке программно-целевого финансирования в рамках проекта «Развитие инновационных технологий и создание современной инфраструктуры для устойчивого развития Южно-Казахстанского региона» (№ BR24992814).

Этическое одобрение: Не применимо. Статья основана исключительно на опубликованной литературе и общедоступных нормативных и программных документах; исследование не включало участников-людей или идентифицируемые данные пациентов.

Информированное согласие: Не применимо.

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