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Real-World Experience of Perioperative Chemotherapy for Gastric Cancer in Kazakhstan: Clinical Outcomes and Economic Considerations

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Abstract

Introduction. Gastric cancer remains a major public health burden in Kazakhstan. Perioperative FLOT is the standard for locally advanced, resectable disease, yet real-world evidence from Central Asia - particularly on treatment exposure, pathological response, toxicity, and costs has been limited.

Objective. This study aimed to evaluate real-world outcomes and economic aspects of perioperative FLOT chemotherapy in resectable gastric cancer in Kazakhstan.

Methods. We conducted a retrospective single-center cohort study of patients with resectable gastric adenocarcinoma treated with perioperative chemotherapy at the National Research Oncology Center (Astana) between 2020 and 2024. Clinical data (baseline characteristics, chemotherapy delivery, adverse events), surgical outcomes, histopathologic tumor regression, and regimen-level costs were extracted from medical records and national tariff documents.

Results. Seventy-four patients (mean age 57.4 years; 71.6% male) were analyzed. Neoadjuvant FLOT was completed in 86.5% (four cycles in 81.1%); total gastrectomy was performed in 74.3%, and R0 margins were achieved in 82.4%. Histopathologic

regression was observed in a substantial proportion, although complete responses were uncommon and residual locally advanced and/or node-positive disease remained frequent. Most patients-initiated adjuvant chemotherapy. During neoadjuvant therapy, toxicities were recorded in 62.1%, with grade 3-4 neutropenia in 18.9% and hospitalizations in 12.2%. Economic analysis showed XELOX had the lowest direct costs; versus XELOX, FOLFOX and FLOT were approximately 13% and 31% higher, respectively, with the widest variability for FLOT amid national tariff volatility.

Conclusions. Perioperative FLOT is feasible in routine practice, yielding frequent R0 resection and meaningful regression, though complete responses are uncommon. Given higher direct costs and tariff volatility, priorities include aligning reimbursement with real-world expenditures and evaluating biomarker-guided, supportive-care–optimized approaches in prospective multicenter studies.

Keywords: gastric cancer, perioperative chemotherapy, FLOT, pathological response, real-world evidence, health economics, Kazakhstan.

1. Introduction

Gastric cancer remains one of the leading causes of cancer-related mortality worldwide and poses a major public health burden in Kazakhstan. According to GLOBOCAN 2022, it is the second most common malignancy among men and the fifth among women in the country, accounting for 3,085 new cases annually and 8.5% of the total cancer burden [1]. These figures highlight the persistent relevance of gastric cancer in the region, particularly amid limited screening programs and late-stage diagnoses.

While global incidence and mortality rates of gastric cancer have generally declined over recent decades, recent projections using CI5 and WHO mortality data suggest that the absolute number of deaths is expected to rise due to population aging and growth, particularly in individuals under 45 years of age [2]. This trend underscores the continued need for optimized treatment strategies.

Historically, a variety of chemotherapy regimens have been explored for resectable gastric cancer, including epirubicin-based combinations such as ECF (epirubicin, cisplatin, and fluorouracil), DCF (docetaxel, cisplatin, and fluorouracil), and S-1–based regimens used predominantly in East Asia. However, many of these protocols were associated with modest survival benefits and considerable toxicity. The introduction of the FLOT regimen (5-fluorouracil, leucovorin, oxaliplatin, and docetaxel) marked a significant shift in perioperative management. The pivotal FLOT4-AIO trial demonstrated a clear survival advantage of FLOT over ECF/ECX, with a median overall survival of 50 months versus 35 months [3], leading to its adoption as the new standard in many countries.

Despite these advances, most real-world data on perioperative chemotherapy originate from high-income countries. There remains a significant evidence gap in low- and middle-income regions, including Central Asia. Kazakhstan, in particular, lacks published data on treatment exposure, adverse event profiles, and pathological responses in everyday clinical settings. This gap limits the applicability of international findings to the local context and hampers evidence-based decision-making for clinicians and policymakers.

In addition to clinical outcomes, the financial implications of cancer treatment are increasingly relevant. The global economic burden of oncology care continues to grow due to increasing incidence, expanded diagnostic capabilities, and the introduction of costly therapies [4]. Perioperative chemotherapy imposes a substantial burden on healthcare systems, encompassing

drug acquisition, hospitalization, and supportive care [5]. However, no published studies have evaluated the economic impact or cost-effectiveness of perioperative chemotherapy for gastric cancer in Kazakhstan.

This study aimed to evaluate real-world treatment exposure, toxicity profile, pathological response, and the economic implications of perioperative chemotherapy with the FLOT regimen in patients with resectable gastric cancer in Kazakhstan.

2. Materials and Methods

Design and Population

This retrospective, single-center cohort study included patients with histologically confirmed gastric adenocarcinoma treated with curative intent at the National Research Oncology Center in Astana, Kazakhstan, from 2020 to 2024. Eligible patients were adults (≥18 years) who received perioperative chemotherapy followed by radical gastrectomy. Patients with distant metastases or non-adenocarcinoma histology were excluded.

Data were extracted from electronic medical records. Collected variables including demographic characteristics (age, sex), clinical and pathological staging according to the 8th edition of the TNM classification [6], chemotherapy regimens, surgical procedures performed, and histopathological findings including tumor regression grading according to Miller & Payne Tumor Regression Grading system [7].

Data collection and analysis were approved by the Local Bioethical Commission of National Research Oncology Center, and patient confidentially was maintained according to local regulations.

Treatment Protocol

All patients received neoadjuvant chemotherapy with the FLOT regimen (5-fluorouracil 2600mg/m2, leucovorin (200mg/m2), oxaliplatin 85mg/m2, and docetaxel 50mg/m2) administered every two weeks. The standard plan included four cycles before and four cycles after surgery. Adjuvant chemotherapy regimens varied based on patient performance, response to neoadjuvant therapy, and physician discretion.

Economic considerations

The economic analysis assessed the costs of perioperative chemotherapy for gastric cancer using three regimens: FOLFOX, FLOT, and XELOX. Actual costs per treated case were calculated based on four standard courses of chemotherapy and included the following categories: (1) antitumor drugs, (2) medical services, (3) hospital stay (calculated as number of bed-days × tariff), and (4) indirect costs.

For comparison with state reimbursement mechanisms, we used the Order of the Minister of Healthcare of the Republic of Kazakhstan dated October 30, 2020, № RK MoH-170/2020 "On approval of tariffs for medical services provided within the framework of the guaranteed volume of free medical care and in the system of compulsory social health insurance" [8]. This order remains the legislative basis for tariff-setting and is periodically updated with new prices. Archived versions of the order were analyzed for the following periods: March 18, 2022; January 1, 2023; January 1, 2024; and August 9, 2025. These values were used to assess the dynamics of tariffs in the category G01C ("Malignant neoplasms of the digestive organs with chemotherapy") for inpatient and inpatient-replacing conditions [8].

Statistical Analysis

All statistical analyses were performed using R (version 2025.05.1+513) [9]. Descriptive statistics were applied to summarize patient characteristics, treatment exposures, and pathological responses. Categorical variables were reported as frequencies and percentages. Continuous variables, including treatment costs, were summarized using means, medians, standard deviations (SD), minimums, and maximums. Cost analyses included per-regimen statistical summaries, relative cost comparisons, and evaluation of tariff trends over time.

3. Results and discussion

Patient Characteristics

A total of 74 patients were included in the analysis. The mean age was 57.4 years (SD 8.8), with a predominance of male patients (71.6%). Regarding tumor localization, nearly half of the cases were situated in the upper third of the stomach (47.3%), followed by the middle third (33.8%) and the lower third (18.9%). The majority of patients presented with locally advanced disease at diagnosis. Specifically, 79.7% were classified as cT3 tumors, while smaller proportions were staged as cT2 (4.1%) or cT4 (16.2%). Nodal involvement was frequent, with 78.4% of patients being clinically node-positive (cN+), compared with 14.9% node-negative (cN0). According to the AJCC 8th edition staging system [10], most patients (79.7%) were categorized as stage III at baseline, with only 20.3% at stage II.

Clinical Outcomes

The majority of patients were able to complete the planned perioperative treatment. Neoadjuvant chemotherapy was successfully completed in 86.5% of the cohort, with 81.1% receiving all four cycles of FLOT as intended. A smaller proportion (12.2%) discontinued therapy before completing four cycles, while treatment details were unavailable for 6.8%. Surgical resection was predominantly performed as total gastrectomy (74.3%). Curative-intent surgery was achieved in most patients, with an R0 resection rate of 82.4%, whereas 17.6% had microscopically or macroscopically positive margins (R1–R2). Adjuvant chemotherapy was administered to 79.7% of patients, reflecting good overall compliance with postoperative systemic therapy. Nearly half of these patients (47.3%) received adjuvant FLOT, while the remainder were treated with alternative or unspecified regimens (52.7%) (table 1).

Tumor regression grading showed that 37.9% achieved TRG 3–5. Complete pathological response (TRG 5) was observed in 4.1% and subtotal regression (TRG 4) in 4.1%. Most patients had residual ypT3 (44.6%) or ypT4 (21.6%) tumors, and only 33.8% had nodal clearance (ypN0).

Treatment-related toxicity was reported in 62.1% of patients during neoadjuvant therapy. The most frequent grade 3–4 adverse event was neutropenia (18.9%), followed by mucositis (10.8%) and diarrhea (8.1%). In addition, 12.2% of patients required hospitalization due to chemotherapy-related complications.

Table 1 - Treatment Exposure and Pathological Outcomes of the Study Cohort

Variable	n	%
Neoadjuvant Chemotherapy		
FLOT cycles – 4	**60**	**81.1**
FLOT cycles – <4	**9**	**12.2**
Other / Unknown	**5**	**6.8**
Completion – Complete	**64**	**86.5**
Completion – Incomplete	**9**	**12.2**
Adjuvant Chemotherapy		
Received adjuvant CTx – Yes	**59**	**79.7**
Received adjuvant CTx – No / Unknown	**15**	**20.3**
Regimen – FLOT	**35**	**47.3**
Regimen – Other / Unknown	**39**	**52.7**

Pathological Findings		
Resection margin – R0	**61**	**82.4**
Resection margin – R1–R2	**13**	**17.6**

** CTx = chemotherapy; R0 = microscopically margin-negative resection; R1–R2 = microscopically or macroscopically margin-positive resection*

Economic Evaluation

Financing of oncological care in Kazakhstan is carried out within the framework of the guaranteed volume of free medical care (GVFMC) and the compulsory social health insurance system [11]. According to the Order of the Minister of Healthcare of the Republic of Kazakhstan dated October 30, 2020 № RK MoH-170/2020, tariffs are determined on the basis of clinical cost groups, taking into account the complexity of the treated case [8]. For the category "Malignant neoplasms of the digestive organs with chemotherapy (G01C)," a single tariff is applied, with differentiation by care setting: inpatient conditions, which include the costs of round-the-clock stay and the full range of medical services, and inpatient-replacing conditions (outpatient chemotherapy), where costs are lower due to reduced length of stay. Although the tariff is formally fixed, in practice the real expenditures of the healthcare system per patient are influenced by clinical and organizational factors such as hospitalization duration, composition of supportive therapy, and the nosological subtype of digestive malignancies.

Analysis of archived updates of Order № RK MoH-170/2020 demonstrates notable fluctuations in tariff levels between 2022 and 2025 [8]. In March 2022, tariffs amounted to 433,215 tenge for both inpatient and outpatient (inpatient-replacing) care. By October 2022, tariffs had increased to 468,008 tenge for inpatient care and 450,273 tenge for outpatient care. A sharp rise occurred in January 2023, with both tariffs reaching 521,348 tenge—approximately a 20% increase from March 2022. The upward trend continued through January 2024, where tariffs peaked at 540,383 tenge for both categories.

However, this peak was followed by a significant decline: in October 2024, tariffs dropped to 432,305 tenge for inpatient and 415,924 tenge for outpatient care, reflecting a decrease of approximately 20% from the January 2024 high. In February 2025, a slight correction raised tariffs to 438,611 tenge (inpatient) and 421,990 tenge (outpatient). Most recently, the August 2025 update equalized them at 438,611 tenge for both care types.

Thus, while the period from 2022 to early 2024 was characterized by steady indexation reflecting rising costs of medicines and services, the reductions observed in late 2024 and maintained into 2025—amounting to around a 19% decline from peak levels—create a potential gap between standard reimbursement rates and the actual expenditures of medical organizations, especially when modern, resource-intensive regimens such as FLOT are used.

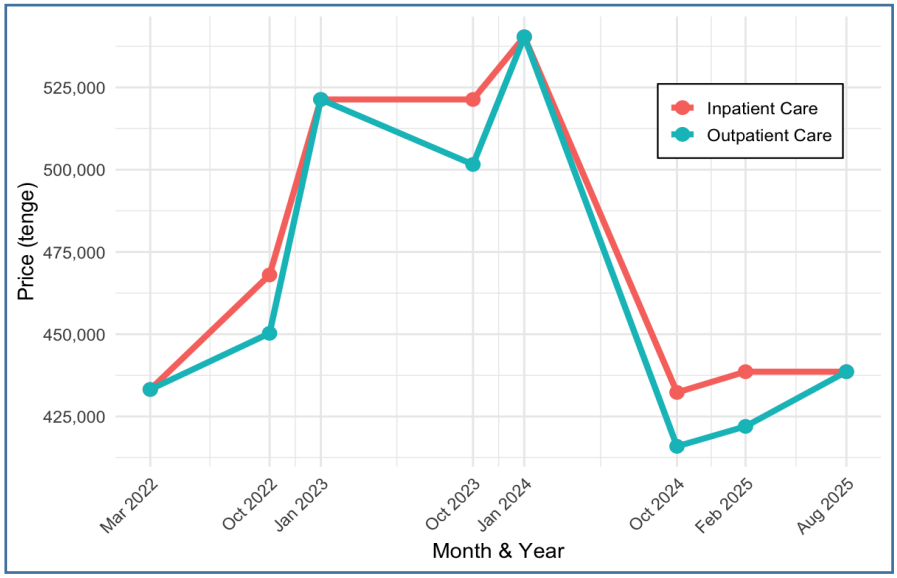

Figure 1 - Inpatient and outpatient care tariffs in Kazakhstan (2022-2025 years)

The analysis of actual costs by regimen revealed substantial differences in the financial burden of chemotherapy. Each patient received four courses of treatment, and the mean per-patient costs were 245.6 thousand tenge for FLOT, 211.8 thousand tenge for FOLFOX, and 187.5 thousand tenge for XELOX. Median values were similar to the means (219.5, 214.8, and 187.5 thousand tenge, respectively). FLOT was associated with the widest cost range (138.2–405.3 thousand tenge), reflecting variability in hospitalization and supportive care, whereas FOLFOX demonstrated the most stable distribution (198.4–219.2 thousand tenge). XELOX was consistently the least expensive regimen, with moderate variability (150.6–224.3 thousand tenge). In relative terms, taking XELOX as the reference (1.0), the costs of FOLFOX were 13% higher and those of FLOT 31% higher (table 2).

Table 2 - Costs for each chemotherapy regimen

Regimen	mean	median	min	max	SD
FLOT	245 642	219 519	138 219	405 309	113 193
FOLFOX	211 784	214 763	198 394	219 215	9 291
XELOX	187 494	187 543	150 639	224 251	35 474

Overall, these findings indicate that the choice of chemotherapy regimen substantially influences the economic burden on the healthcare system. XELOX appears to be the most cost-saving option in terms of direct medical expenses, while FLOT is associated with higher costs and greater variability but remains the internationally recommended standard for resectable gastric cancer. This discrepancy between clinical efficacy and economic burden highlights the importance of aligning tariff-setting mechanisms with real-world treatment expenditures. A comprehensive assessment of economic feasibility in the Kazakhstani context will require further pharmacoeconomic analyses, including cost per life-year gained and comparative effectiveness of regimens.

4. Discussion

This study represents the first detailed real-world analysis of perioperative chemotherapy for gastric cancer in Kazakhstan. Our results confirm the feasibility and tolerability of the FLOT regimen in clinical practice, demonstrated by high rates of neoadjuvant treatment completion (86.5%). Curative-intent surgery was achieved in most patients, with an R0 rate of 82.4%, comparable to several Western real-world reports (R0 ~78–85%) and somewhat lower than some Japanese experiences that combine FLOT with standardized D2 surgery (>95%) [12-14]. Differences likely reflect patient mix, surgical practice, and baseline stage.

Adjuvant therapy was administered in 79.7% of patients higher than many real-world reports where the proportion starting adjuvant cycles after gastrectomy is frequently ~50–60%, and the proportion completing all planned adjuvant cycles is even lower. This likely reflects careful selection, centralized postoperative care, and multidisciplinary follow-up in our center [15, 16]

Our observed grade 3-4 neutropenia during neoadjuvant FLOT (18.9%) appears lower than in the phase II/III FLOT4 program, where grade 3-4 neutropenia approached ~50% in the neoadjuvant phase. Under-capture is possible in retrospective series; alternatively, local practice patterns such as prophylactic G-CSF - can reduce severe neutropenia, as reported in an Asian real-world cohort [17, 18.].

Clinically, the persistence of ypT3-4 and/or ypN+ disease in many patients despite neoadjuvant FLOT underscores the need for treatment optimization. Several strategies are being explored: (1) Maintaining dose intensity and proactive supportive care (including primary G-CSF where appropriate) to maximize pathologic response; (2) Total neoadjuvant approaches that may deepen regression in selected patients; and (3) Chemo-immunotherapy in the perioperative setting. Notably, the phase III MATTERHORN trial reported improved event-free survival with durvalumab added to perioperative FLOT, while KEYNOTE-585 increased pCR rates with pembrolizumab but showed mixed or modest effects on EFS/OS across analyses-highlighting that biomarker-guided selection will likely be essential as evidence evolves [19-21].

These clinical patterns carry clear resource implications: perioperative FLOT and high rates of curative surgery require reliable access to drugs, perioperative support, and inpatient capacity, while residual advanced disease often entails adjuvant therapy and closer follow-up. Accordingly, our outcomes should be interpreted alongside the evolving reimbursement environment in Kazakhstan, where recent tariff shifts may affect the affordability and sustainability of modern perioperative care.

The observed decline in tariffs for oncological care in late 2024 and 2025 requires interpretation within the broader context of health policy reforms in Kazakhstan. Recent regulatory changes have introduced new mechanisms for medicine and medical device pricing. Specifically, Order № 110 (December 2024) revised the rules on price regulation by narrowing the definition of the registered price to include only the manufacturer's maximum price, while excluding costs such as marketing, customs clearance, and transportation. In parallel, the list of reference countries for external price benchmarking was modified, and documentation requirements for pricing approvals were simplified. These changes may have resulted in overall cost reductions reflected in the updated tariffs [22, 23]

Moreover, Kazakhstan is implementing a multi-stage deregulation of pharmaceutical pricing between 2022 and 2026. The phased withdrawal of state control beginning with over-the-counter medicines, followed by prescription drugs and antibiotics is intended to stimulate market competition. While primarily focused on pharmaceuticals, this broader shift in pricing policy likely influenced tariff calculations for clinical cost groups, contributing to the downward adjustments observed in oncology service reimbursement [24].

Although tariff reductions align with governmental efforts to optimize health expenditures, their practical implications for oncology care are complex. The ~19% decline in inpatient and outpatient

tariffs from peak levels in January 2024 risks creating a mismatch between reimbursement rates and the actual cost of delivering modern, resource-intensive regimens such as FLOT [8]. These regimens not only require high-cost cytotoxic agents but also extensive supportive care, imaging, and prolonged inpatient stays. If tariffs do not adequately reflect these expenditures, medical organizations may face financial strain, leading to cross-subsidization from other service areas or potential limitations in access to advanced treatment protocols.

At the health system level, sustained underfunding relative to actual costs could undermine quality of care, discourage adoption of innovative therapies, and exacerbate regional disparities in access to cancer treatment. Conversely, proponents of tariff reduction argue that aligning reimbursement with simplified pricing structures can improve efficiency and curb excessive spending. Balancing these perspectives remains a critical challenge for policymakers in ensuring equitable and sustainable oncology care financing.

Our data reveal ongoing challenges in achieving nodal clearance and tumor downstaging despite modern perioperative chemotherapy. This may reflect inherent tumor biology, patient comorbidities, or treatment delays. Incorporation of molecular and predictive biomarkers could refine patient selection, enabling a more personalized approach to perioperative treatment.

This study provides the first comprehensive, real-world dataset on perioperative FLOT chemotherapy in Central Asia, addressing a critical knowledge gap in an underrepresented region. By incorporating economic considerations, it offers valuable insights into the financial impact and resource allocation challenges associated with advanced gastric cancer treatment in Kazakhstan. Furthermore, the detailed reporting of treatment exposure, pathological response, and toxicity contributes to a deeper understanding of the real-world feasibility and safety of perioperative chemotherapy beyond the confines of controlled clinical trial settings.

Limitations. Being a single-center retrospective analysis, it is prone to inherent selection and information biases, which may restrict the broader applicability of the results. The absence of long-term survival data restricts the ability to draw conclusions regarding ultimate clinical benefit and comparative effectiveness of the perioperative chemotherapy regimen. Additionally, limited molecular and biomarker analyses prevented exploration of personalized treatment strategies. Finally, treatment-related toxicity was not systematically assessed, as such data were inconsistently captured in medical records, and the lack of patient-reported outcomes may have led to underestimation of the true treatment burden.

Prospective multicenter studies with longer follow-up are needed to validate these findings and assess survival outcomes. Further research should focus on optimizing perioperative regimens, integrating predictive biomarkers, and enhancing supportive care measures tailored to resource-limited healthcare settings like Kazakhstan. Future prospective studies should incorporate comprehensive toxicity evaluation to better inform supportive care strategies and optimize treatment outcomes. Economic evaluations embedded within such studies will be critical to inform sustainable policy decisions.

5. Conclusion

In this first real-world evaluation from Kazakhstan, perioperative FLOT proved feasible and deliverable in routine practice, yielding frequent curative resections and meaningful tumor regression, although complete pathologic response was uncommon and residual locally advanced disease remained frequent. Regimen choice substantially affected direct costs, and recent tariff volatility suggests a mismatch between reimbursement and actual expenditures for modern perioperative care. These findings support continued use of FLOT as the clinical standard while underscoring the need to align tariffs with real-world costs, strengthen supportive care to maintain dose intensity, and expand biomarker-guided strategies. Prospective, multi-center

studies capturing survival, toxicity, patient-reported outcomes, and formal cost-effectiveness are needed to inform policy and optimize outcomes in the Kazakhstani context.

Conflict of Interest. The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Data Availability Statement. The data that support the findings of this study are available from the corresponding author upon reasonable request.

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8. Об утверждении Правил закупки услуг у организаций здравоохранения по оказанию медицинской помощи в рамках гарантированного объема бесплатной медицинской помощи и (или) в системе обязательного социального медицинского страхования. Приказ Министра здравоохранения Республики Казахстан от 8 декабря 2020 года № ДСМ-242/2020. Зарегистрирован в Министерстве юстиции Республики Казахстан 10 декабря 2020 года под № 21744. https://adilet.zan.kz/rus/docs/V2000021744

Ob utverzhdenii Pravil zakupki uslug u organizacij zdravooxraneniya po okazaniyu medicinskoj pomoshhi v ramkax garantirovannogo ob``ema besplatnoj medicinskoj pomoshhi i (ili) v sisteme obyazatel`nogo social`nogo medicinskogo straxovaniya (On approval of the Rules for the procurement of services from healthcare organizations for the provision of medical care within the framework of the guaranteed volume of free medical care and (or) in the system of compulsory social health insurance) [in Russian]. Prikaz Ministra zdravooxraneniya Respubliki Kazaxstan ot 8 dekabrya 2020 goda № DSM-242/2020. Zaregistrirovan v Ministerstve yusticii Respubliki Kazaxstan 10 dekabrya 2020 goda pod № 21744. https://adilet.zan.kz/rus/docs/V2000021744

9. Об утверждении тарифов на медицинские услуги, предоставляемые в рамках гарантированного объема бесплатной медицинской помощи и в системе обязательного социального медицинского страхования. Приказ и.о. Министра здравоохранения Республики Казахстан от 30 октября 2020 года № ҚР ДСМ-170/2020. Зарегистрирован в Министерстве юстиции Республики Казахстан 30 октября 2020 года № 21550. https://adilet.zan.kz/rus/docs/V2000021550

Ob utverzhdenii tarifov na medicinskie uslugi, predostavlyaemy`e v ramkax garantirovannogo ob``ema besplatnoj medicinskoj pomoshhi i v sisteme obyazatel`nogo social`nogo medicinskogo straxovaniya (On approval of tariffs for medical services provided within the framework of the guaranteed volume of free medical care and in the system of compulsory social health insurance) [in Russian]. Prikaz i.o. Ministra zdravooxraneniya Respubliki Kazaxstan ot 30 oktyabrya 2020 goda № ҚR DSM-170/2020. Zaregistrirovan v Ministerstve yusticii Respubliki Kazaxstan 30 oktyabrya 2020 goda № 21550. https://adilet.zan.kz/rus/docs/V2000021550

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O vnesenii izmenenij v prikaz Ministra zdravooxraneniya Respubliki Kazaxstan ot 11 dekabrya 2020 goda № ҚR DSM-247/2020 Ob utverzhdenii pravil regulirovaniya, formirovaniya predel`ny`x cen i nacenki na lekarstvenny`e sredstva, a takzhe medicinskie izdeliya v ramkax garantirovannogo ob``ema besplatnoj medicinskoj pomoshhi i (ili) v sisteme obyazatel`nogo social`nogo medicinskogo straxovaniya (On approval of the rules for regulation, formation of maximum prices and markups for medicines, as well as medical devices within the framework of the guaranteed volume of free medical care and (or) in the system of compulsory social health insurance) [in Russian]. Prikaz i.o. Ministra zdravooxraneniya Respubliki Kazaxstan ot 25 dekabrya 2024 goda № 110. Zaregistrirovan v Ministerstve yusticii Respubliki Kazaxstan 25 dekabrya 2024 goda № 35521. https://adilet.zan.kz/rus/docs/V2400035521/history

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Қазақстандағы асқазан обырына отадан кейінгі химиотерапияның нақты өмірлік тәжірибесі: Клиникалық нәтижелер және экономикалық аспектілер

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Түйіндеме

Кіріспе. Қазақстанда асқазан обыры қоғамдық денсаулық сақтау үшін маңызды мәселе болып отыр. Жергілікті таралған, резектабельді ісіктерде отаға дейінгі FLOT стандарт болып саналады, алайда Орталық Азиядан нақты клиникалық деректер емнің ұзақтығы, патологиялық жауап, уыттылық және шығындар бойынша шектеулі.

Зерттеудің мақсаты. Қазақстандағы резектабельді асқазан обыры бар науқастарда отаға дейінгі FLOT химиотерапиясының нақты клиникалық нәтижелерін және экономикалық қырларын бағалау.

Әдістері. 2020–2024 жылдары Астана қаласындағы Ұлттық ғылыми онкология орталығында резектабельді асқазан аденокарциномасы бар науқастарға жүргізілген отаға дейінгі химиотерапияға ретроспективті бір-орталықты когорттық зерттеу жүргізілді. Медициналық құжаттар мен ұлттық тарифтік деректерден бастапқы клиникалық сипаттамалар, химиотерапия курстары, жанама әсерлер, хирургиялық нәтижелер, ісік регрессі және емдеу схемаларының шығындары алынды.

Нәтижесі. 74 науқас (орташа жас - 57,4 жас; 71,6% ер адамдар) талданды. Неоадъювантты FLOT курсын 86,5% аяқтады (төрт цикл - 81,1%); 74,3%-ына тотальды гастрэктомия жасалды, ал R0 резекциясына 82,4%-ында қол жеткізілді. Гистопатологиялық регресс науқастардың едәуір бөлігінде байқалды, бірақ толық жауаптар сирек кездесіп, жиі жергілікті таралған және/немесе лимфа түйіндері зақымдалған ауру сақталды. Көпшілік науқастар адъювантты химиотерапияны бастады. Неоадъювантты ем кезінде уыттылық 62,1%-ында тіркелді, оның ішінде 3-4 дәрежелі нейтропения - 18,9%, ауруханаға жатқызу - 12,2%. Экономикалық талдау бойынша XELOX ең төмен тікелей шығынды көрсетті; XELOX-пен салыстырғанда, FOLFOX пен FLOT шығындары сәйкесінше шамамен 13% және 31% жоғары болды, ал FLOT үшін тарифтік тұрақсыздық аясында ең үлкен өзгергіштік байқалды.

Қорытынды. Отаға дейінгі FLOT күнделікті тәжірибеде қолдануға қолайлы, ол жиі R0 резекциясына және ісіктің айтарлықтай регрессіне қол жеткізеді, бірақ толық жауаптар сирек. Жоғары тікелей шығындар мен тарифтік тұрақсыздықты ескере отырып, басымдықтар шығындарды өтеуді нақты шығындармен сәйкестендіру және биомаркерге негізделген, қолдау терапиясы оңтайландырылған тәсілдерді көп-орталықты проспективті зерттеулерде бағалау.

Түйін сөздер: асқазан обыры, отаға дейінгі химиотерапия, FLOT, патологиялық жауап, нақты деректер, денсаулық сақтау экономикасы, Қазақстан.

Опыт применения периоперационной химиотерапии при раке желудка в реальной клинической практике в Казахстане: Клинические исходы и экономические аспекты

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Резюме

Введение. Рак желудка остается серьезной проблемой общественного здравоохранения в Казахстане. Периоперационная схема FLOT является стандартом при местно-распространенном резектабельном заболевании, однако реальные данные из Центральной Азии - особенно по вопросам интенсивности лечения, патологического ответа, токсичности и затрат - ограничены.

Цель исследования. Оценить реальные клинические результаты и экономические аспекты применения периоперационной химиотерапии по схеме FLOT у пациентов с резектабельным раком желудка в Казахстане.

Методы. Проведено ретроспективное одноцентровое когортное исследование пациентов с резектабельной аденокарциномой желудка, получавших периоперационную химиотерапию в Национальном научном онкологическом центре (Астана) в 2020–2024 гг. Из медицинских записей и национальных тарифных документов были собраны данные о клинических характеристиках, проведении химиотерапии, нежелательных явлениях, хирургических исходах, гистопатологическом регрессе опухоли и прямых затратах на схемы лечения.

Результаты. В анализ включены 74 пациента (средний возраст 57,4 года; 71,6% мужчины). Неоадъювантный FLOT завершили 86,5% (четыре цикла - 81,1%); тотальная гастрэктомия выполнена у 74,3%, резекция R0 достигнута в 82,4%. Гистопатологический регресс отмечен у значительной части пациентов, хотя полные ответы встречались редко, и часто сохранялось местно-распространенное и/или узловое поражение. Большинство пациентов начали адъювантную химиотерапию. Во время неоадъювантного лечения токсичность зарегистрирована у 62,1%, включая нейтропению 3–4 степени у 18,9% и госпитализации у 12,2%. Экономический анализ показал, что схема XELOX имела наименьшие прямые затраты; по сравнению с XELOX, расходы для FOLFOX и FLOT были выше примерно на 13% и 31% соответственно, при наибольшей вариабельности для FLOT на фоне колебаний национальных тарифов.

Выводы. Периоперационный FLOT осуществим в рутинной практике, обеспечивая высокую частоту резекций R0 и значимый регресс опухоли, хотя полные ответы остаются редкостью. С учетом более высоких прямых затрат и тарифной нестабильности приоритетами являются согласование возмещения расходов с реальными затратами и проведение проспективных многоцентровых исследований с оценкой биомаркеров и оптимизированной поддерживающей терапии.

Ключевые слова: рак желудка, периоперационная химиотерапия, FLOT, патологический ответ, реальные данные, фармакоэкономика, Казахстан.