

CLINICAL PHARMACIST READINESS IN TRASTUZUMAB THERAPY MANAGEMENT FOR HER2-POSITIVE BREAST CANCER PATIENTS: PERSPECTIVES ON THERAPEUTIC MONITORING, DRUG ACCESSIBILITY, AND ECONOMIC CHALLENGES**Fatimah Syam¹, Umar Idris Ibrahim², Zalina binti Zahari², Julia Reveny¹**¹Fakultas Farmasi, Universitas Sumatera Utara, Jl.Tridharma No.5, Medan Selayang, Sumatera Utara 20155, Indonesia,²Universiti Sultan Zainal Abidin, Kampus Besut, 22200, Terengganu 22200, Malaysia[*fatimahsyam088@gmail.com](mailto:fatimahsyam088@gmail.com)**ABSTRACT**

Breast cancer with human epidermal growth factor receptor 2 positivity requires complex treatment management due to the need for continuous therapeutic monitoring, sustained medication access, and the high economic burden associated with targeted therapy. Clinical pharmacists play an important role in supporting treatment effectiveness, patient safety, and continuity of care. This study aimed to assess clinical pharmacist readiness in trastuzumab therapy management for patients with human epidermal growth factor receptor 2-positive breast cancer, focusing on therapeutic monitoring, drug accessibility, and economic challenges. A quantitative cross-sectional survey was conducted among 150 pharmacists involved in oncology services who were recruited using purposive sampling. Data were collected using a structured online questionnaire and analyzed using descriptive and correlational statistics. The findings showed that overall pharmacist readiness was high. Therapeutic monitoring readiness achieved the highest score, indicating strong confidence in monitoring treatment outcomes and managing medication-related issues. Drug accessibility readiness and economic challenge readiness demonstrated comparatively lower scores, reflecting ongoing concerns regarding medication availability, reimbursement processes, affordability, and healthcare financing. Positive correlations were observed among all readiness domains, suggesting that clinical, accessibility, and economic competencies are closely interconnected. The study concludes that pharmacists are generally well prepared to support trastuzumab therapy management; however, strengthening competencies related to medication access and economic evaluation remains essential to optimize oncology pharmacy services and improve the sustainability of cancer care.

Keywords: clinical pharmacist readiness; drug accessibility; economic challenges; her2-positive breast cancer; trastuzumab therapy

INTRODUCTION

Breast cancer remains the most frequently diagnosed malignancy among women worldwide and continues to represent a major contributor to cancer-related morbidity and mortality despite substantial advances in targeted therapy (Wang & Wu, 2023). Approximately 15–20% of breast cancer cases are characterized by overexpression or amplification of the human epidermal growth factor receptor 2 (HER2), a molecular subtype historically associated with aggressive tumor behavior, higher recurrence rates, and poorer survival outcomes (Zhang et al., 2022). The introduction of trastuzumab has fundamentally transformed the therapeutic landscape of HER2-positive breast cancer by significantly improving progression-free survival (Marra et al., 2024), overall survival, and disease-free survival across both early-stage and metastatic settings (Yoon & Oh, 2024). Yet the clinical benefits of trastuzumab are highly dependent on sustained treatment adherence, timely therapeutic monitoring, management of treatment-related toxicities, and uninterrupted access to therapy (Gupta et al., 2022). These requirements have elevated the role of pharmacists from traditional medication dispensers to integral members of multidisciplinary oncology teams responsible for optimizing pharmacotherapy outcomes. Clinical pharmacists contribute to treatment planning, medication review, adverse event surveillance (Unnissa et al., 2025), patient counseling, adherence support, and coordination of medication access pathways, positioning them as critical stakeholders in trastuzumab therapy management (Ahmed & Tamim, 2025).

The increasing complexity of HER2-targeted treatment has intensified the need for clinical pharmacist readiness across multiple dimensions of oncology practice. Readiness extends beyond pharmacological knowledge and encompasses competencies in therapeutic monitoring (Pharmacy, 2023), interpretation of clinical and laboratory parameters, management of cardiotoxicity risks

(Iloabanafo et al., 2025), navigation of biosimilar implementation, patient-centered communication, and participation in evidence-based decision-making processes (Umeano, 2023; Umeh et al., 2025). Equally important are challenges related to drug accessibility and affordability, which continue to influence treatment continuity in many healthcare systems (Umeano, 2023). The high acquisition cost of trastuzumab, reimbursement restrictions, disparities in healthcare infrastructure, and variable availability of biosimilars have created persistent barriers to equitable treatment access (Mroczek et al., 2024; Sathyan et al., 2025). Clinical pharmacists frequently serve as intermediaries between patients, prescribers, healthcare institutions, and reimbursement agencies (Hubar & Sholoiko, 2025), requiring not only clinical competence but also a comprehensive understanding of economic and policy-related considerations affecting treatment delivery (Vogenberg & Marcoux, n.d.). Consequently, pharmacist readiness has emerged as a multidimensional construct that encompasses clinical expertise, health-system navigation capabilities, and awareness of economic constraints influencing oncology care (Sulashvili et al., 2023).

Despite growing recognition of pharmacists' contributions to oncology services, current evidence remains fragmented and predominantly focused on isolated aspects of pharmaceutical care, such as medication adherence interventions, adverse drug reaction management, or pharmacoeconomic evaluations (Keller & Carrascoza-Bolanos, 2023). Existing studies rarely examine readiness as an integrated construct that simultaneously incorporates therapeutic monitoring responsibilities, drug accessibility considerations, and economic challenges associated with trastuzumab treatment (Pei et al., 2025). Much of the available literature also emphasizes patient outcomes or physician perspectives, leaving limited understanding of how pharmacists perceive their preparedness to address increasingly complex demands in HER2-positive breast cancer management (Pirolli et al., 2022). This limitation is particularly relevant as healthcare systems continue to expand access to targeted therapies and biosimilars while expecting pharmacists to assume broader clinical responsibilities. A comprehensive assessment of clinical pharmacist readiness may therefore provide novel insights into workforce preparedness, competency gaps, and system-level factors that influence the effectiveness of trastuzumab therapy management. Such an approach offers a more holistic perspective than previous investigations that have addressed these domains separately.

This study aims to evaluate clinical pharmacist readiness in the management of trastuzumab therapy for patients with HER2-positive breast cancer, with particular emphasis on therapeutic monitoring, drug accessibility, and economic challenges. By exploring pharmacists' perspectives across these interconnected domains, the study seeks to generate evidence regarding the strengths and limitations of current oncology pharmacy practice and identify areas requiring professional development and institutional support. The findings are expected to inform workforce capacity-building initiatives, guide the development of targeted educational programs, support policy formulation related to oncology pharmaceutical services, and strengthen the integration of clinical pharmacists into multidisciplinary cancer care models. Ultimately, a deeper understanding of pharmacist readiness may contribute to more effective, accessible, and economically sustainable trastuzumab therapy management for HER2-positive breast cancer patients.

METHOD

Research Design

This study employed a quantitative cross-sectional survey design to evaluate clinical pharmacist readiness in trastuzumab therapy management for HER2-positive breast cancer patients. The survey approach was selected because it enables the assessment of pharmacists' perceptions, competencies, and preparedness regarding therapeutic monitoring, drug accessibility, and economic challenges at a single point in time. The study focused on identifying the current level of readiness among clinical pharmacists and exploring factors that may influence their preparedness in supporting trastuzumab therapy management within oncology practice settings.

Study Setting and Period

The study was conducted among clinical pharmacists working in hospitals and healthcare facilities that provide oncology services and manage patients receiving trastuzumab therapy. Participants

were recruited from various healthcare institutions, including public hospitals, private hospitals, teaching hospitals, and cancer referral centers. Data collection was conducted over a three-month period from January-March 2026.

Population and Sample

The study population consisted of pharmacists involved in oncology-related pharmaceutical services in hospitals and healthcare facilities. Eligible participants were pharmacists who had experience in providing clinical pharmacy services for cancer patients and were familiar with trastuzumab therapy management. A purposive sampling technique was employed to recruit participants who met the inclusion criteria. Considering the specialized characteristics of oncology pharmacy practice and the exploratory nature of the study, a minimum target of 150 respondents was established. This sample size was considered adequate to provide a representative overview of clinical pharmacist readiness regarding therapeutic monitoring, drug accessibility, and economic challenges associated with trastuzumab therapy management.

Research Instrument

Data were collected using a structured questionnaire developed through a comprehensive review of literature related to oncology pharmacy services, targeted cancer therapy, medication accessibility, and pharmacoeconomic challenges associated with biologic agents. The questionnaire was designed to measure clinical pharmacist readiness across three principal domains, namely therapeutic monitoring readiness, drug accessibility management readiness, and economic challenge management readiness. The instrument consisted of two major sections. The first section gathered respondents' demographic and professional characteristics, while the second section measured readiness using a series of statements evaluated through a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The operational definition of the study variables is presented in Table 1.

Table 1.
Operational Definition of Study Variables

Variable	Operational Definition	Indicators
Therapeutic Monitoring Readiness	The pharmacist's preparedness to monitor the effectiveness and safety of trastuzumab therapy	Monitoring treatment response, identifying adverse drug reactions, monitoring cardiotoxicity, interpreting laboratory findings, evaluating medication adherence
Drug Accessibility Readiness	The pharmacist's preparedness to facilitate patient access to trastuzumab therapy	Drug procurement, reimbursement support, biosimilar utilization, management of drug availability, coordination with healthcare providers
Economic Challenge Readiness	The pharmacist's preparedness to address financial aspects related to trastuzumab therapy	Understanding treatment costs, pharmacoeconomic considerations, affordability assessment, cost-effectiveness awareness, financial counseling support
Overall Clinical Readiness	The overall preparedness of pharmacists in managing trastuzumab therapy	Integration of clinical, accessibility, and economic competencies

Prior to implementation, the questionnaire underwent content validation by experts in clinical pharmacy, oncology, and pharmacoeconomics. Revisions were made based on expert recommendations to improve clarity and relevance. A pilot test involving a limited number of pharmacists was subsequently conducted to assess comprehensibility and reliability. Internal consistency reliability was evaluated using Cronbach's alpha coefficient, with a value of 0.70 or higher considered acceptable.

Data Collection Procedure

Data were collected electronically using Google Forms. The survey link was distributed through professional pharmacist associations, hospital pharmacy networks, social media groups, and

professional communication platforms. Before completing the questionnaire, participants were provided with information regarding the study objectives, voluntary participation, anonymity, and confidentiality of responses. Electronic informed consent was obtained from all participants prior to survey completion. To reduce the possibility of duplicate responses, the survey settings were configured to limit multiple submissions from a single account. Responses were monitored periodically throughout the data collection period, and incomplete submissions were excluded from the final analysis.

Data Analysis

Data obtained from Google Forms were exported and analyzed using Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics were used to summarize respondent characteristics and readiness scores. Categorical variables were presented as frequencies and percentages, whereas continuous variables were reported as means and standard deviations. The readiness score for each domain was calculated by summing item scores and converting them into percentage values. Readiness levels were categorized as low (<60%), moderate (60–79%), and high ($\geq 80\%$). The internal consistency of the questionnaire was evaluated using Cronbach's alpha coefficient. A coefficient value of 0.70 or higher was considered acceptable. Pearson correlation analysis was performed to examine the relationships among therapeutic monitoring readiness, drug accessibility readiness, economic challenge readiness, and overall readiness. When normality assumptions were not met, Spearman rank correlation analysis was applied. Statistical significance was established at a p-value of less than 0.05.

Interpretation of Findings

The findings were interpreted based on the readiness levels obtained from each assessment domain. Higher scores reflected greater preparedness in managing trastuzumab therapy, including clinical monitoring, facilitation of treatment access, and management of economic challenges. Lower scores indicated potential competency gaps requiring further professional development and institutional support. Interpretation of the results also considered professional characteristics, workplace environments, and the broader healthcare system factors that may influence pharmacists' readiness to participate effectively in multidisciplinary management of HER2-positive breast cancer patients.

RESULT

A total of 150 clinical pharmacists participated in this study and met the inclusion criteria. The respondents represented various healthcare institutions providing oncology-related pharmaceutical services, including public hospitals, private hospitals, teaching hospitals, and specialized cancer centers. Their demographic and professional characteristics were analyzed to provide an overview of the study population and to facilitate interpretation of readiness levels in trastuzumab therapy management. The characteristics of the respondents are presented in Table 1.

Table 1.

Demographic and Professional Characteristics of Respondents (n = 150)

Characteristic	Category	f	%
Gender	Male	42	28.0
	Female	108	72.0
Age (years)	21–30	48	32.0
	31–40	63	42.0
	41–50	28	18.7
	>50	11	7.3
Educational level	Bachelor of Pharmacy + Pharmacist Degree	122	81.3
	Master's Degree	26	17.3
	Doctoral Degree	2	1.3

Years of professional experience	<5 years	39	26.0
	5–10 years	57	38.0
	11–15 years	31	20.7
	>15 years	23	15.3
Type of healthcare institution	Public hospital	68	45.3
	Private hospital	47	31.3
	Teaching hospital	23	15.3
	Cancer center/specialized hospital	12	8.0
Involvement in oncology services	<1 year	24	16.0
	1–5 years	66	44.0
	6–10 years	39	26.0
	>10 years	21	14.0
Experience related to trastuzumab therapy management	Yes	118	78.7
	No	32	21.3
Oncology-related training/certification	Yes	91	60.7
	No	59	39.3

The respondents were predominantly female pharmacists aged 31–40 years with professional pharmacist qualifications and moderate professional experience. Most participants worked in public hospitals, had been involved in oncology pharmacy services for one to five years, and reported direct experience in trastuzumab therapy management. More than half had also completed oncology-related training or certification programs. Overall, the respondent profile indicates substantial exposure to oncology practice and trastuzumab-related services, supporting the suitability of the study population for evaluating readiness in trastuzumab therapy management.

Clinical Pharmacist Readiness in Trastuzumab Therapy Management

The assessment of clinical pharmacist readiness revealed differences across the three evaluated domains, namely therapeutic monitoring readiness, drug accessibility readiness, and economic challenge readiness. Overall, respondents demonstrated a favorable level of preparedness in supporting trastuzumab therapy management for patients with HER2-positive breast cancer. Detailed readiness scores are presented in Table 2.

Table 2.

Clinical Pharmacist Readiness in Trastuzumab Therapy Management (n = 150)

Domain	Number of Items	Mean Score $\pm$ SD	Percentage (%)	Category
Therapeutic Monitoring Readiness	10	42.36 $\pm$ 4.85	84.72	High
Drug Accessibility Readiness	8	31.84 $\pm$ 4.12	79.60	Moderate
Economic Challenge Readiness	8	30.52 $\pm$ 4.38	76.30	Moderate
Overall Readiness	26	104.72 $\pm$ 10.21	80.55	High

The findings presented in table 2 indicate that therapeutic monitoring readiness achieved the highest score among all assessed domains, with a mean percentage of 84.72%, corresponding to a high readiness category. This result suggests that pharmacists generally perceived themselves as well prepared to participate in monitoring treatment effectiveness, identifying adverse drug reactions, assessing medication adherence, and supporting patient safety during trastuzumab therapy. Drug accessibility readiness yielded a mean percentage score of 79.60%, placing it within the upper range of the moderate category. Although respondents expressed confidence in facilitating medication procurement and supporting reimbursement processes, the findings suggest that challenges related to medication availability, administrative procedures, and access pathways remain important concerns in clinical practice. Economic challenge readiness recorded the lowest score among the three domains, with a mean percentage of 76.30%. While the score still reflected a moderate level of preparedness, it indicates comparatively lower confidence in addressing affordability issues, understanding pharmacoeconomic considerations, and assisting patients in navigating financial barriers associated with trastuzumab therapy. The overall readiness score reached 80.55%, indicating a high level of preparedness among participating pharmacists. These findings suggest that pharmacists involved in oncology services generally possess adequate competencies to support

trastuzumab therapy management. Nevertheless, the comparatively lower scores observed in the drug accessibility and economic challenge domains highlight areas that may benefit from additional professional development, institutional support, and healthcare policy interventions.

Correlations Among Readiness Domains

To further explore the relationships among the assessed domains, correlation analysis was performed between therapeutic monitoring readiness, drug accessibility readiness, economic challenge readiness, and overall readiness. The results are presented in Table 3.

Table 3.

Correlations Among Readiness Domains

Variable	1	2	3	4
1. Therapeutic Monitoring Readiness	1			
2. Drug Accessibility Readiness	0.562**	1		
3. Economic Challenge Readiness	0.487**	0.638**	1	
4. Overall Readiness	0.846**	0.781**	0.734**	1

$p < 0.01$.

Significant positive correlations were observed among all readiness domains. The strongest correlation was identified between drug accessibility readiness and economic challenge readiness ($r = 0.638$, $p < 0.01$), indicating a close relationship between competencies related to medication access and financial management. All domains were also strongly associated with overall readiness, with therapeutic monitoring readiness demonstrating the highest correlation ($r = 0.846$, $p < 0.01$), followed by drug accessibility readiness ($r = 0.781$, $p < 0.01$) and economic challenge readiness ($r = 0.734$, $p < 0.01$). These findings suggest that clinical pharmacist readiness in trastuzumab therapy management is a multidimensional construct in which clinical, accessibility, and economic competencies are closely interconnected.

DISCUSSION

This study evaluated clinical pharmacist readiness in trastuzumab therapy management for patients with HER2-positive breast cancer through three key domains, namely therapeutic monitoring readiness, drug accessibility readiness, and economic challenge readiness. The findings demonstrated an overall high level of readiness among respondents, indicating that pharmacists involved in oncology services generally perceive themselves as adequately prepared to support trastuzumab therapy management. Nevertheless, notable differences were observed among the assessed domains, suggesting that readiness is not uniformly distributed across all aspects of oncology pharmacy practice. Therapeutic monitoring readiness achieved the highest score among the three domains. This finding reflects the increasingly established role of clinical pharmacists within multidisciplinary oncology teams. Contemporary oncology practice recognizes pharmacists as essential contributors to medication review, treatment monitoring, toxicity management, dose optimization, and patient education. Their involvement extends throughout the continuum of cancer care, from treatment selection and procurement to monitoring therapeutic effectiveness and ensuring patient safety. The high readiness observed in the present study may therefore be attributed to pharmacists' frequent engagement in clinical activities directly related to trastuzumab therapy (Staynova et al., 2024).

The result is particularly relevant considering the unique characteristics of trastuzumab treatment. Although trastuzumab has substantially improved outcomes for patients with HER2-positive breast cancer, its use requires continuous monitoring to evaluate treatment response and detect adverse events, particularly cardiotoxicity (Farina & Rattu, 2022). Clinical pharmacists are often involved in reviewing treatment protocols, assessing medication-related problems, monitoring adherence, and providing recommendations to optimize therapeutic outcomes. The high readiness score in this domain suggests that respondents generally possess confidence in performing these responsibilities (Farina & Rattu, 2022). This finding aligns with reports emphasizing that oncology pharmacists

have become increasingly integrated into patient-centered cancer care and contribute significantly to improving treatment safety and effectiveness (Zacholski et al., 2025).

Drug accessibility readiness demonstrated a lower score than therapeutic monitoring readiness, although it remained within the moderate-to-high range. This finding suggests that pharmacists perceive greater challenges when dealing with issues related to medication availability, procurement processes, reimbursement mechanisms, and access pathways. Access to oncology medicines remains a global concern, particularly for targeted therapies and biologic agents that require substantial healthcare resources. Evidence from international studies indicates that barriers to cancer medicine access arise from multiple factors, including reimbursement policies, administrative requirements, budget limitations, infrastructure constraints, and delays in medicine availability (Mansour et al., 2024). The comparatively lower readiness in this domain may reflect the complexity of ensuring uninterrupted access to trastuzumab therapy. Unlike therapeutic monitoring activities that are largely under the pharmacist's direct control, accessibility challenges often involve institutional, regulatory, and financing factors (Barrios et al., 2023). Pharmacists may possess adequate clinical knowledge yet encounter difficulties navigating procurement systems, insurance procedures, or medicine shortages. Previous literature has highlighted that oncology pharmacists frequently assume responsibilities related to procurement and sourcing alternative treatment options when access barriers occur, illustrating the expanding scope of pharmacy practice beyond traditional clinical functions (Unnissa et al., 2025).

Economic challenge readiness recorded the lowest score among all evaluated domains. This finding is unsurprising given the substantial financial burden associated with targeted cancer therapies. Trastuzumab is recognized as one of the most clinically valuable biologic agents in breast cancer management; however, its acquisition and delivery costs remain significant concerns for healthcare systems worldwide. Numerous studies have reported that affordability and reimbursement issues continue to influence access to oncology medicines, even in high-income countries with established healthcare systems (Ahmed & Tamim, 2025). The findings may also reflect limitations in pharmacists' exposure to pharmacoeconomic evaluation and healthcare financing. Pharmacy education traditionally emphasizes pharmacotherapy and clinical decision-making, whereas economic assessment, health technology assessment, and reimbursement policy analysis often receive less attention in routine professional training. Consequently, pharmacists may feel less confident when required to evaluate treatment affordability, discuss financial implications with patients, or contribute to formulary and reimbursement decisions. Similar observations have been reported in oncology pharmacy practice, where clinical competencies tend to develop more rapidly than competencies related to economic evaluation and healthcare resource allocation (Vogenberg & Marcoux, n.d.).

The relatively lower score observed in the economic domain is particularly important in the context of developing healthcare systems. Financial sustainability remains a critical issue in cancer care, and discrepancies between actual treatment costs and reimbursement mechanisms may affect treatment accessibility and continuity. Evidence from Indonesia has shown that hospital-incurred costs for breast cancer treatment frequently exceed reimbursement values, creating financial pressures for healthcare institutions and potentially influencing service delivery. These conditions highlight the growing need for pharmacists who are capable of integrating clinical expertise with an understanding of healthcare financing and cost-management principles. The correlation analysis further demonstrated that all readiness domains were positively associated with one another. Pharmacists who reported higher therapeutic monitoring readiness also tended to demonstrate greater readiness regarding medication access and economic challenges. These findings suggest that readiness in trastuzumab therapy management should be viewed as a multidimensional construct rather than a purely clinical competency. Effective management of HER2-positive breast cancer requires pharmacists to integrate knowledge related to pharmacotherapy, patient monitoring,

medication accessibility, and healthcare resource utilization. Such integration is increasingly recognized as an essential characteristic of modern oncology pharmacy practice. Among the evaluated domains, therapeutic monitoring readiness exhibited the strongest association with overall readiness. This finding indicates that clinical competence remains the foundation upon which broader readiness is built. Pharmacists who possess confidence in evaluating treatment outcomes and managing medication-related problems appear more likely to develop competencies related to accessibility and economic considerations. The result supports current perspectives that position oncology pharmacists as medication experts whose clinical expertise serves as the basis for wider contributions to healthcare quality, treatment access, and value-based cancer care (Pharmacy, 2023).

Several practical implications emerge from this study. Healthcare institutions should continue strengthening pharmacists' competencies in therapeutic monitoring while simultaneously expanding opportunities for training in pharmacoeconomics, reimbursement systems, and medication access management. Professional organizations and educational institutions may also contribute by incorporating healthcare financing and access-related topics into oncology pharmacy training programs. Such efforts would help prepare pharmacists to address the increasingly complex challenges associated with targeted cancer therapies and support more equitable access to trastuzumab treatment. This study has several limitations that should be acknowledged. The cross-sectional design does not permit causal inferences regarding the relationships among readiness domains. The use of self-reported questionnaires may introduce response bias and may not fully reflect actual clinical performance. Furthermore, purposive sampling and online data collection may limit the generalizability of the findings to all pharmacists involved in oncology practice. Despite these limitations, the study provides valuable evidence regarding pharmacist readiness in trastuzumab therapy management and highlights areas requiring further professional development, particularly in relation to medication accessibility and economic decision-making.

CONCLUSION

The findings of this study indicate that clinical pharmacists involved in oncology services generally demonstrate a high level of readiness in managing trastuzumab therapy for patients with HER2-positive breast cancer. Readiness was most evident in the domain of therapeutic monitoring, reflecting pharmacists' confidence in supporting treatment effectiveness, patient safety, adverse event management, and medication adherence. Lower levels of readiness were observed in the domains of drug accessibility and economic challenges, suggesting that issues related to medication availability, reimbursement processes, affordability, and healthcare financing remain important areas requiring further attention within oncology pharmacy practice. The positive relationships identified among therapeutic monitoring readiness, drug accessibility readiness, and economic challenge readiness suggest that pharmacist preparedness in trastuzumab therapy management is multidimensional and interconnected. Effective support for trastuzumab therapy requires not only strong clinical competencies but also the ability to navigate medication access pathways and address economic factors that influence treatment continuity. Strengthening pharmacists' competencies in these areas through professional development initiatives and institutional support may enhance their contribution to multidisciplinary cancer care and promote more effective, accessible, and sustainable management of HER2-positive breast cancer treatment.

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