

Postoperative Outcomes following a Multidisciplinary Approach to HIV-positive Breast Cancer Patients

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Background: Improvements in human immunodeficiency virus (HIV) treatment resulted in drastic increases in the lifespan of HIV-positive individuals, resulting in higher rates of non-AIDS-defining cancers. We describe our postoperative outcomes in HIV+ breast cancer (BC) patients, highlighting our multidisciplinary experience with this high-risk population.

Methods: A 7-year multi-institutional retrospective review of all HIV+ BC patients who underwent surgical intervention was performed. Patient demographics, therapeutic interventions, and treatment outcomes were collected.

Results: Twenty-four patients were identified, including one male patient (4.2%). Most patients were African American (83.3%). Mean age was 52.1 + 9.7 years at the time of diagnosis in HIV+ BC patients. Surgical interventions included lumpectomy (n = 16, 66.7%), simple mastectomy (n = 3, 12.5%), and skin-sparing mastectomy (n = 5, 20.8%). All patients were on antiretroviral therapy, and 81.3% had undetectable viral loads at the time of operation. Seventeen patients (70.8%) underwent breast reconstruction, with three (17.7%) undergoing delayed reconstruction. Thirty-day postoperative complications occurred in three patients (17.6%), including flap necrosis (11.8%), infection (11.8%), dehiscence (5.9%), and return to OR (11.8%). Three patients (12.5%) experienced recurrence at a median of 18 months since operation. Mean follow-up was 51.4 + 33.3 months since BC diagnosis.

Conclusions: While postoperative complication rates in HIV+ patients trended higher (17.6%) compared with the existing data on breast reconstruction patients overall (10.1%), HIV+ patients did not exhibit increased risk of BC recurrence (12.5%) compared with BC patients overall (12-27%). This highlights the importance of a combined multidisciplinary approach involving infectious disease, breast surgery, and plastic and reconstructive surgery to optimize surgical and oncologic outcomes in these high-risk patients. (*Plast Reconstr Surg Glob Open* 2022;10:e4552; doi: 10.1097/GOX.0000000000004552; Published online 28 September 2022.)

INTRODUCTION

Improvements in human immunodeficiency virus (HIV) treatment modalities have led to drastic increases

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in the lifespan of HIV-positive individuals. Consequently, increased survival has resulted in higher rates of non-AIDS-defining cancer among HIV-positive individuals.¹ Unfortunately, care of these patients is complicated by a lack of guidelines specific to the treatment of cancer in HIV-positive individuals. Therefore, it is essential to understand the optimal management of HIV-positive individuals with non-AIDS-defining cancers, particularly those with the highest incidences: head and neck, anal, liver, lung, and breast cancers.²

Given the complex multimodal treatment required in breast cancer (BC), a multidisciplinary team (MDT)-based approach is recommended for the management of breast cancer, especially in HIV-positive patients. Even with a well-controlled viral load, HIV-positive patients can still develop severe postoperative infections and complications that may worsen outcomes of breast reconstruction

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procedures.³ It is therefore essential to identify strategies that address preoperative risk factors, apart from HIV infection, that may hinder postoperative outcomes in HIV-positive patients with breast cancer. Despite an abundance of literature examining postoperative complications in HIV-infected persons, to the best of our knowledge, few studies have investigated complications specific to oncologic mastectomy or reconstructive surgery as they relate to HIV infection. The purpose of the present work is to describe our post-mastectomy surgical and oncologic outcomes in the management of HIV-positive breast cancer patients, through the lens of a multidisciplinary team-based approach.

METHODS

A multi-institutional retrospective review of all HIV-positive patients with a history of breast cancer between January 2013 and January 2020 was performed (IRB: 050117). Institutions included MedStar Georgetown University Hospital and MedStar Washington Hospital Center. Patients were identified using the International Classification of Diseases 10th revision and Current Procedural Terminology codes. Patients were excluded if complete records were not available, they underwent prior surgical interventions at outside institutions, were lost to follow-up, or were diagnosed with HIV after the onset of their breast cancer. All qualifying patients had an HIV diagnosis that preceded their breast cancer diagnosis and treatment. Using the electronic medical record, patient demographics, HIV and breast cancer history, operative details, and postoperative outcomes were collected. All qualifying patients were followed up by an oncology team regularly. Documentation regarding additional specialties seen (eg, oncology, infectious disease) were also recorded to address the MDT aspect of care.

Descriptive statistics were used to describe study subjects. Continuous variables were described by mean and SD or median and interquartile range (IQR) as determined by the Shapiro-Wilk test of normality. Categorical variables were described by frequencies and percentages. Statistical analysis was performed using STATA v.17 (StataCorp, College Station, Tex.).

RESULTS

Twenty-four HIV-positive BC patients were identified, including one male patient (4.2%; [Table 1](#)). Mean age at the time of BC diagnosis was 52.1+9.7 years, with a mean body mass index of 29.3+6.4 kg/m². Patients were predominantly African American (n = 20, 83.3%). Twelve patients (50.0%) had a smoking history.

The average time elapsed from HIV diagnosis to breast cancer diagnosis was 13+9.1 years ([Table 2](#)). One patient experienced bilateral BC (4.2%). The most common cancer histology was invasive ductal carcinoma (n = 17, 70.8%), with most exhibiting estrogen receptor (ER; n = 16, 66.7%) and progesterone receptor (n = 14, 58.3%) positivity. Four patients experienced triple-negative BC (TNBC; n = 14, 16.7%). The majority of cancers were

Takeaways

Question: What are the postoperative outcomes in HIV-positive breast cancer patients receiving multidisciplinary care?

Findings: A 7-year multi-institutional retrospective review of 24 HIV-positive breast cancer patients who underwent surgical intervention was performed. HIV-positive breast cancer patients experienced higher postoperative complications compared with patients undergoing breast cancer overall but did not experience higher rates of breast cancer recurrence compared with breast cancer patients overall.

Meaning: A multidisciplinary team optimizes postoperative outcomes in HIV-positive patients with breast cancer.

Table 1. Patient Demographics

Variable	Value, %
Total patients	24
Age at BC diagnosis	52.1 + 9.7
Gender	
Women	23 (95.8)
Men	1 (4.2)
Race	
African American	20 (83.3)
White	2 (8.3)
Other	2 (8.3)
BMI (kg/m ²)	29.3 + 6.4
Smoking history	12 (50.0)
Multidisciplinary care	22 (91.7)

Abbreviations: BC, breast cancer; BMI, body mass index.

high-grade at the time of diagnosis (n = 12, 54.6%), with a mean tumor size of 1.5+0.8cm². Regarding therapy, most did not undergo chemotherapy (n = 10, 41.7%) or hormone therapy (n = 14, 58.3%), with most receiving adjuvant radiation therapy (n = 16, 66.7%).

Among patients with reported modes of HIV transmission (n = 11), sexual transmission was most commonly cited (n = 7, 63.6%; [Table 3](#)), followed by sexual assault (n = 2, 18.2%), intravenous drug use (n = 1, 9.1%), and dental procedures (n = 1, 9.1%). All patients were on antiretroviral therapy at the time of oncologic procedure (n = 24). Mean CD4 count within 6 months of oncologic procedure was 518.8 + 288.2 cells per mm (n = 12), with 81.3% of patients having an undetectable viral load (<20 copies/mL; n = 13). Two patients progressed to AIDS before oncologic surgery (8.3%).

Median time from BC diagnosis to oncologic surgery was 2.4 months (IQR: 1.6, 4.1; [Table 4](#)). Most patients underwent lumpectomy (n = 16, 66.7%). The next most common procedures were skin-sparing mastectomy (n=5, 20.8%) and simple mastectomy (n = 3, 12.5%). Twenty patients underwent lymphatic surgery, of which 18 (90%) underwent sentinel lymph node dissection and two (10%) underwent axillary dissection. The majority of patients underwent breast reconstruction (n = 17, 70.8%), most frequently immediate (n = 14, 82.4%). Most patients opted for an oncoplastic-based reconstruction (n = 10, 58.8%), followed by implant-based reconstruction (IBR; n = 6, 35.3%), with only one patient opting for autologous-based reconstruction (5.9%). Of the patients who chose to

Table 2. Breast Cancer Characteristics

Variable	Value, %
Time from HIV diagnosis to BC diagnosis (yr)	13.0 + 9.1
Occurrence	
Primary	23 (95.8)
Recurrence	1 (4.2)
Laterality	
Unilateral	23 (95.8)
Bilateral	1 (4.2)
Cancer histology	
DCIS	4 (16.7)
Invasive ductal CA	17 (70.8)
Invasive lobular CA	1 (4.2)
Other	2 (8.3)
BC types	
ER-positive	16 (66.7)
PR-positive	14 (58.3)
HER2-positive	3 (13.6)
Triple negative	4 (16.7)
Tumor size (cm ²)	1.5 + 0.8
Tumor grade (n = 22)	
Low	4 (18.2)
Moderate	6 (27.3)
High	12 (54.6)
Tumor stage	
0	5 (22.7)
1	8 (36.4)
2	6 (27.3)
3	3 (13.6)
Chemotherapy	
None	10 (41.7)
Neoadjuvant	6 (25.0)
Adjuvant	8 (33.3)
Radiation	
None	8 (33.3)
Neoadjuvant	0 (0.0)
Adjuvant	16 (66.7)
Hormone therapy	
None	14 (58.3)
Neoadjuvant	2 (8.3)
Adjuvant	8 (33.3)

Abbreviations: BC, breast cancer; CA, carcinoma; DCIS, ductal carcinoma in situ; ER, estrogen receptor; HER2, human epidermal growth factor receptor 2; PR, progesterone receptor.

Table 3. HIV Details

Variable	Value, %
Year of diagnosis (n = 18)	
1990–1999	6 (33.3)
2000–2009	7 (38.9)
2010–2019	5 (27.8)
HIV transmission (n = 11)	
Sexual transmission	7 (63.6)
Sexual assault	2 (18.2)
IVDU	1 (9.1)
Dental procedure	1 (9.1)
Antiretroviral therapy	24 (100.0)
CD4 count (mean, cells/mm ³)*	518.8 + 288.2
Viral load (copies/mL) (n = 16)*	
Undetectable (<20)	13 (81.3)
Detectable	3 (18.8)
Progression to AIDS before surgery	2 (8.3)

*Within 6 months of oncologic breast surgery.

Abbreviations: AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus; IVDU, intravenous drug use.

have implant-based reconstruction, all but one chose silicone implants (83.3%).

Three patients (17.6%) experienced complications within 30 days following post-mastectomy reconstructive surgery; all three underwent lumpectomy before reconstruction. One patient who underwent oncoplastic reduction experienced a wound infection, which resolved

uneventfully following administration of ciprofloxacin. Of note, this patient reported tobacco use at the time. Another patient experienced flap necrosis following oncoplastic reconstruction, necessitating return to the OR for debridement and a subsequent rotational flap reconstruction. The final patient experienced flap necrosis and dehiscence following a delayed transverse rectus abdominis myocutaneous (TRAM) flap. They returned to the OR for excision of flap necrosis, and ultimately received a split-thickness skin graft (STSG) from the thigh to provide coverage of the breast. A total of three patients experienced breast cancer recurrence (12.5%), with a mean time to recurrence of 51.4+33 months. Recurrence was most commonly distant (n = 2, 8.3%). Mortality rate was 21.7% (n = 5).

DISCUSSION

This study reviews postoperative outcomes in HIV+ BC patients who underwent oncologic surgery with or without reconstruction. Our institution is in the unique position of being located in Washington, D.C., a city with one of the highest HIV rates in the United States. We therefore encounter a higher proportion of HIV-positive patients, including those who may experience BC.⁴ The majority of our patients (70.8%) underwent breast reconstruction at a rate higher than the national average (42%) for all BC patients undergoing mastectomy.^{5,6} HIV-positive patients undergoing reconstruction experienced higher rates of complications (17.6%) compared with the existing data on patients undergoing breast reconstruction overall (10.1%).⁷ However, HIV+ patients did not exhibit an increased risk of BC recurrence (12.5%) compared with BC patients overall (12–27%).⁸ The majority of patients received multidisciplinary care (91.7%), with common specialties in addition to breast surgery including primary care, plastic surgery, infectious disease, oncology, and psychiatry. The two patients who did not receive MDT care experienced poorer outcomes, with one patient progressing to AIDS and both patients dying within the study period. The multifaceted nature of disease in patients experiencing concomitant HIV infection and breast cancer requires the application of a combined multidisciplinary approach involving the coordination of multiple specialties to optimize outcomes in these high-risk patients.

Multidisciplinary Team Composition

The MDT model of HIV care evolved from necessity due to the diverse characteristics and disease course in HIV-positive patients and is now accepted as the international standard of care for management of HIV disease.⁹ With the added component of breast cancer positivity in these complex patients, a discussion regarding the MDT implementation within an academic institution is warranted. We review the organizational framework regarding the team composition and roles.

The team should be composed of both a core and adjunct group of specialists (Fig. 1). Although the

Table 4. Operative Details and Outcomes

Variable	Value, %
Operative details	
Time from BC diagnosis to oncologic surgery (mo)*	2.4 (1.6, 4.1)
Lymphatic surgery	
None	4 (16.7)
Sentinel lymph node dissection	18 (75.0)
Axillary dissection	2 (8.3)
Oncologic surgery	
Lumpectomy	16 (66.7)
Simple mastectomy	3 (12.5)
Skin-sparing mastectomy	5 (20.8)
Breast reconstruction	17/24 (70.8)
ABR	1 (5.9)
IBR	6 (35.3)
Oncoplasty	10 (58.8)
Timing of reconstruction	
Immediate	14 (82.4)
Delayed	3 (17.7)
Postoperative reconstruction outcomes	
30-day complications†	3/17 (17.6)
Infection	1 (5.9)
Dehiscence	1 (5.9)
Flap necrosis	2 (11.8)
Seroma	0 (0.0)
Hematoma	0 (0.0)
30-day return to OR	2/17 (11.8)
Oncologic outcomes	
Recurrence	
Local	1 (4.2)
Distant	2 (8.3)
Time to recurrence (mo)*	18 (12.7, 17.6)
Mortality (n = 23)	5 (21.7)
Follow-up (mo)	51.4 + 33.3

*Median, IQR.

†n = total number of patients experiencing complications within 30d.

Abbreviations: ABR, autologous-based reconstruction; BC, breast cancer; IBR, implant-based reconstruction; mo, months; OR, operating room.

composition can vary between institutions, we propose that the core group consist of breast surgery, infectious disease, and oncology. This team should work closely with an adjunct group of specialists, which can include plastic surgery, psychiatry, internal medicine, primary care, social work, palliative, nurse practitioners, physician assistants, dieticians, and other essential personnel (Table 5).

Core Member Roles

Breast Surgery: Provides therapeutic cancer resection, either via breast-conserving surgery or mastectomy. Coordinates timing of the procedure closely with oncology to determine if surgery should be primary or occur following neoadjuvant chemotherapy.

Oncology: Coordinates chemotherapy, radiation therapy, and hormone therapy in the management of cancer.

Infectious Disease (ID): Provides medical management, evaluates drug interactions, and maintains viral load.

Adjunct Member Roles

Plastic and Reconstructive Surgery (PRS): This offers delayed or immediate breast reconstruction in the form of oncoplasty, autologous-based reconstruction, or implant-based reconstruction.

Psychiatry: This offers provision of therapy or medical management for psychological conditions resulting from HIV+ and/or BC diagnosis and medical course.

Internal Medicine (IM): Additional patient comorbidities should be managed by IM to prevent further

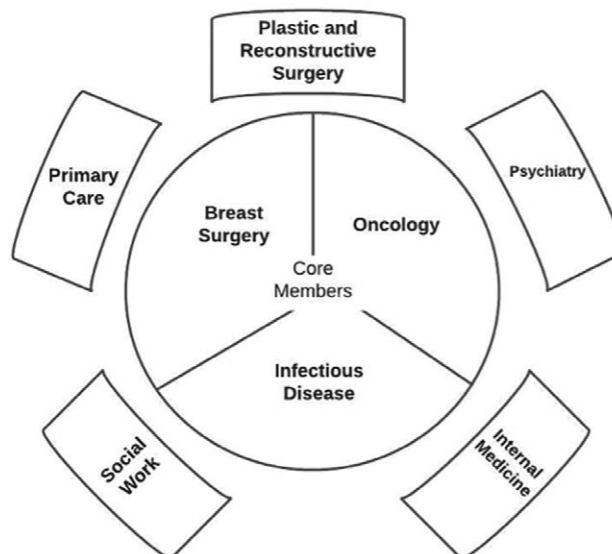


Figure 1. The multidisciplinary breast cancer care team.

Table 5. Composition of Core and Adjunct Multidisciplinary Teams

Specialty	Role
<i>Core members</i>	
Breast surgery	Cancer resection, champions communication within MDT team
Oncology	Coordination of chemotherapy, radiation therapy, and hormone therapy
Infectious disease	Management of HAART and drug-drug interactions
<i>Adjunct members</i>	
Plastic and reconstructive surgery	Breast reconstruction
Psychiatry	Management of psychiatric comorbidities
Internal medicine	Management of medical comorbidities
Primary care	Preventive care
Social work	Coordinating access to services and financial and care assistance.

Abbreviations: HAART, highly active antiretroviral therapy.

complications in these high-risk patients (eg, cardiac or pulmonary conditions).

Primary Care: Close coordination with primary care helps ensure patients receive preventive care (eg, immunizations, risk assessments, screenings), and are managed for additional comorbidities or life changes (eg, pregnancy, employment change, travel) to prevent additional burden or complications.

Social Work: Social workers play a critical role in assisting patients in gaining access to services, understanding service guidelines, and applying for financial and care assistance.¹⁰

A core principle to effective breast cancer management is awareness that no single provider can deliver comprehensive breast cancer care. HIV-positive status in breast cancer patients prohibits a monocular perspective. The strength of an MDT approach to HIV-breast cancer management lies in the combined insight of several professionals who offer different areas of education and experience

that can contribute equally to patient care. With responsibility of the patient distributed among all team members, a team encompassing various combinations of these specialties helped ensure that our patients received individualized care tailored to their unique medical situations. A key principle of MDT care involves an individual whose role is to champion communication between members of the multidisciplinary care team, pose innovative ideas, and serve as the overarching champion fostering collaboration between the team's many members.¹¹ Although one member should champion the effort, it is essential to recognize that all members should be fully committed to the overarching goal and mission of the group.

Multidisciplinary Approach to Primary Prevention

Since the advent of highly active antiretroviral therapy (HAART), HIV-positive patients have experienced significant improvements in morbidity and mortality, with expected life spans free of opportunistic disease approaching those of persons living without HIV.¹² The use of effective antiretroviral therapies has resulted in a large HIV-positive population susceptible to non-AIDS-defining malignancies, such as BC.¹ A resulting shift in causes of mortality in HIV patients warrants close coordination with primary care to ensure these patients undergo proper preventive care, including scheduled cancer screenings. The most recent 2020 primary care guidance for HIV-positive patients recommended BC screenings follow standard USPSTF guidelines: mammography performed every two years for women aged 50–75 years.^{12,13} While BC does not occur at an increased prevalence in HIV-positive women, it has been reported to have unusual clinical presentations and a rapid progressive nature, suggesting a more aggressive form of BC in these patients.¹² This necessitates close follow-up by primary care and early detection of BC to augment its aggressive course.

Breast Cancer Management Pathway: Multidisciplinary Framework

Immediately following recognition and confirmation of a breast neoplasm, the patient should be referred to the multidisciplinary team, most commonly through the outpatient setting. The initial visit should ideally occur with members of each specialty of the core team being present: breast surgery, oncology, and ID. Their availability ensures comprehensive discussions surrounding the unique aspects of BC care in HIV-positive patients, resulting in the appropriate therapeutic processes not being delayed. Completion of this first visit is reliant on the presence of a well-established referral system and coordination between providers. Upon culmination of the visit, a specialty should adopt a leadership role to champion multidisciplinary care by overseeing and coordinating future care for the patient. In our experience, the breast surgery team, which provides close patient follow-up, can help coordinate care.

Oncology and ID play a collaborative role in the management of HIV patients, through careful medication management to balance HIV-associated immunosuppression with cancer therapy-associated immunosuppression. HAART is associated with improved cancer outcomes

through maintenance and reduction of viral loads but has also been associated with increased adverse events during BC treatment,¹⁴ possibly due to drug-drug interactions with chemotherapy.¹⁵ Prior studies have also reported possible delays in treatment initiation and reduction in chemotherapy and hormone therapy dosage due to possible toxicity and no standardized guidelines for care.¹⁵⁻¹⁷ This requires close coordination between oncology and ID, and an emphasis on adherence to HAART in HIV-positive patients to augment the BC course.

This initial assessment should be followed by further addressing factors that may affect care. Extensive discussion with the patient should involve (1) HIV disease course and antiretroviral regimen; (2) barriers to care such as transportation, insurance, and home support; (3) additional medical or psychiatric comorbidities; and (4) establishment of a shared decision-making process to optimize care. Following this, core team members should meet to discuss whether the patient intake dictates involvement of additional adjunct team members.

Most patients (54.7%) in the current series had a prior history of psychiatric disease (eg, major depressive disorder, anxiety, bipolar disorder), with three patients developing posttraumatic stress disorder following HIV transmission through sexual assault. Psychiatric comorbidity is common with HIV infection, with reported rates of 50% or greater in HIV-positive patients.¹⁸⁻²⁰ This is further compounded by the psychological distress experienced by patients with a BC diagnosis (30–75% of patients).²¹⁻²³ The combination of disease processes may exacerbate underlying mental illness, which, if left untreated, could impact compliance and follow-up of care. Consultation with a psychiatrist would therefore be warranted in patients with a prior history of psychiatric disease or in patients who develop a need for psychiatric care during their BC course.

Additional adjunct members who may be consulted include PRS. Given the improved emotional and physical quality of life afforded through reconstruction, PRS consults should be provided to all HIV+ BC patients.²⁴ Due to the risk for increased postoperative complications, special considerations should be made for these high-risk patients to help minimize reconstruction-related outcomes.

Based on a careful assessment of patient needs, an individualized care plan is created and executed with the goal of optimizing BC therapy while minimizing complications that could arise from other aspects of the patient's history (eg, HIV, comorbidities, barriers to accessing care). The patient should be followed up closely during the primary treatment course; upon BC eradication, they should receive continued follow-up to ensure disease-free survival. In the event of a recurrence, the patient will already have an established care team knowledgeable in their unique history and prepared to treat the recurrence.

Additional attention should be paid to ensuring patients have access to care. Socioeconomic status greatly impacts chances of HIV contraction, availability of treatment, and therapeutic outcomes.²⁵ With the majority of patients in our series being African American, it is important to address racial disparities existing in access to HIV-related healthcare utilization and the socioeconomic barriers these patients may

experience.²⁵ The National Health Disparities Report found HIV-positive African Americans to be less likely to receive standard HIV care, including antiretroviral therapy, monitoring of immune function, and outpatient appointments when compared to White patients.²⁶ Among HIV-positive individuals, access to care is impacted by psychological, social, and economic factors.²⁵ The role of an in-house social worker therefore becomes increasingly crucial as they can assist patients in these aspects of care. Given the financial stresses and immense cost of treatment, patients can be assisted through referrals to community resources, financial assistance plans, and legal aid as needed. Social workers can aid in discharge planning to arrange for in-home care, ensure suitable follow-up times when patients have availability from work, and provide accessible transportation options as needed. By meeting these needs, the team enables access to close follow-up to optimize care in these complex patients

LIMITATIONS

Inherent limitations of this study include a relatively small sample size of qualifying patients ($n = 24$), the largest we were able to glean from our hospital network. We were also limited by the retrospective chart review study design, which was dependent on the quality of data reported within patients' medical records. Additionally, while this study reported complications related to breast reconstruction, those resulting directly from oncologic surgery (eg, lumpectomy or mastectomy) were not included. Many treatment-related details and outcomes were less available in patient medical records, possibly due to specialists being seen who were outside of our hospital network. The social stigma and emotional stress of an HIV diagnosis could additionally lessen the likelihood to report, follow up, or provide medical information to physicians without prompting.

CONCLUSIONS

While postoperative complication rates in HIV-positive patients trended higher (17.6%) compared with existing data on patients undergoing breast reconstruction overall (10.1%),⁷ HIV-positive patients did not exhibit an increased risk of BC recurrence (12.5%) compared with BC patients overall (12–27%).⁸ We highlight the importance of a combined multidisciplinary approach involving infectious disease, breast, and plastic and reconstructive surgery to optimize both surgical and oncologic outcomes in these high-risk patients. A multidisciplinary team consisting of a core group of breast surgery, oncology, and infectious disease and an adjunct group consisting of, but not limited to, internal medicine, primary care, social work, psychiatry, and plastic and reconstructive surgery can optimize outcomes in HIV-positive patients with breast cancer.

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