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# Evaluating the Psychological and Physical Impact of Long Waiting Times in Cancer Patients Receiving Radiotherapy

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## Abstract

In low- and middle-income countries (LMICs), delayed access to radiotherapy can mean the difference between survival and suffering. In Bangladesh, where oncology resources are limited and underfunded, these delays not only enable cancer progression but also impose severe emotional tolls on patients. Drawing on the observations of an experienced medical physicist, this mixed-methods study investigates how delayed care affects both the body and mind. The research includes 72 patient interviews, clinical data analysis, and evaluations of departmental workflows. Findings reveal a stark reality: patients who waited more than four weeks for treatment experienced an average tumor volume increase of 18%. Additionally, 62% reported significant anxiety, and nearly half met clinical criteria for depression based on HADS. Underlying these delays were systemic issues, like outdated equipment, poor scheduling, and understaffed departments which disproportionately affected economically disadvantaged patients, 71% of whom lacked private care alternatives. The study calls for immediate policy intervention. Recommendations include investing in radiotherapy infrastructure, adopting scheduling optimization tools, and integrating medical physicists into both clinical and operational roles. By addressing these gaps, Bangladesh and similar LMICs can move toward more timely, equitable, and humane cancer care.

## Keywords

Radiotherapy Delays, Cancer Care Equity, Healthcare Inefficiencies, Medical

Physicist, Bangladesh, LMICs, Patient Distress

## 1. Introduction

Radiotherapy is a cornerstone of cancer treatment, with nearly 50% of patients requiring it at some point during their care [1]. Timely access is critical, as treatment delays are associated with tumor progression, reduced therapeutic efficacy, and increased mortality [1]-[3]. In high-income countries (HICs), efficient infrastructure and strategic workforce planning help minimize waiting times [4]. However, the situation is markedly different in low- and middle-income countries (LMICs), including Bangladesh. Bangladesh faces a rising cancer burden, with approximately 150,000 new cases diagnosed annually [5]. Yet, fewer than 25 operational linear accelerators are available nationwide. According to the World Health Organization (WHO), there should be at least one radiotherapy unit per 250,000 people—a standard that Bangladesh falls far short of meeting [2]. The combination of limited infrastructure and a shortage of trained professionals results in prolonged treatment delays, often lasting several weeks or even months. In contrast, countries such as Canada, the United Kingdom, and Australia report median wait times of 16 - 28 days [1] [6]. The European Society for Radiotherapy and Oncology (ESTRO) recommends initiating radiotherapy within four weeks of diagnosis [1]. In LMICs, delays of six to eight weeks or more are common, primarily due to systemic challenges [4] [7]. In LMICs, delays of six to eight weeks or more are common, primarily due to systemic challenges.

These disparities highlight the urgent need for reform in resource-limited settings. Extended waiting times affect not only physical health but also mental well-being [8]. Patients awaiting radiotherapy often experience anxiety, depression, and a profound sense of uncertainty [9] [10]. Their physical symptoms may worsen, diminishing their overall quality of life. While research frequently focuses on oncologists and hospital administrators, the role of medical physicists—key contributors to the safe and accurate delivery of radiotherapy—remains underexplored [12]. Their dual expertise in clinical and technical domains positions them uniquely to offer insights into operational inefficiencies.

## 2. This Study Addresses Two Core Research Questions

1. What is the relationship between radiotherapy waiting times and psychological distress among cancer patients in Bangladesh across different cancer types?
2. How do operational and resource-related challenges faced by medical physicists contribute to treatment delays in public cancer centers?

While most studies emphasize clinical outcomes, few investigate the broader impacts of treatment delays, particularly in LMICs. This research aims to fill that gap by examining how prolonged radiotherapy wait times affect both the mental

and physical health of patients in Bangladesh, incorporating perspectives from medical physicists to highlight systemic barriers.

## 3. Methodology

### 3.1. Study Design and Participant Selection

This study employed a mixed-methods design, integrating both quantitative and qualitative data. Participants were adult cancer patients referred for curative-intent external beam radiotherapy at one of the renowned private Cancer Center between January 2022 and December 2024.

### 3.2. Inclusion Criteria

Patients were eligible if they experienced a waiting period of at least two weeks between referral and the initiation of radiotherapy. This threshold was selected based on international guidelines from organizations such as ESTRO and the American Society for Radiation Oncology (ASTRO), which recommend that treatment commence within four weeks of diagnosis [1]. Delays beyond two weeks are considered clinically relevant in LMICs [9]. By focusing on this group, the study targets patients most likely to experience meaningful interruptions to treatment, with potential consequences for both tumor progression and psychological well-being.

Additional inclusion criteria were:

- Age 18 years or older.
- Confirmed cancer diagnosis.
- Willingness to provide informed consent.

Patients receiving palliative-only care were excluded to ensure consistency in measuring treatment-related outcomes.

### 3.3. Patient Interview Protocol

Semi-structured interviews with 72 patients explored perceptions of treatment delays, emotional responses, and system-related frustrations. Thematic content analysis was employed to identify common emotional and operational concerns [11].

### 3.4. Public Awareness Assessment

To assess patients' understanding of radiotherapy and institutional workflows, a brief survey was administered at the end of each interview. The survey consisted of four questions, such as:

- "*Did you know what radiotherapy was before your doctor recommended it*?"
- "*Were you informed about the expected waiting time before treatment began*?"
- "*Do you feel the medical staff communicated clearly about the reasons for delays*?"
- "*In your opinion, what could help reduce waiting times for future patients*?"

Survey responses were anonymized, digitized, and analyzed using descriptive statistics to identify trends in awareness and communication gaps.

## 4. Results & Analysis

### 4.1. Patient Waiting Times

Between 2022 and 2024, data from one of the renowned private cancer centers in Bangladesh revealed the average number of days patients waited from their CT simulation to the beginning of radiotherapy treatment:

**Table 1.** Average waiting times by cancer type.

| Cancer Type | Average Waiting Time (Days) | Range (Min - Max) |
|---|---|---|
| Cervical | 38 | 21 - 66 |
| Head and Neck | 44 | 28 - 72 |
| Breast | 35 | 18 - 56 |
| Lung | 41 | 30 - 64 |
| Rectal/Other | 37 | 22 - 59 |

*This **Table 1** shows the average and range of waiting times (in days) between CT simulation and the start of radiotherapy treatment for different cancer types.*

### 4.2. Psychological Impact Observations

Interviews with 42 patients revealed:

- 76% reported high anxiety due to treatment uncertainty.
- 59% feared disease progression during delays.
- 45% described feelings of neglect or hopelessness.
- 81% of rural patients cited travel and accommodation as stressors [12] [13].

### 4.3. Physical Impact and Dosimetry Replanning

19% of patients required repeat CT simulations and revised plans due to tumor progression, weight loss, or anatomical changes [1] [3]. A head and neck cancer patient, for example, showed an increase in gross tumor volume from 85 cc to 107 cc after a 5.5-week delay, requiring a new plan and higher radiation dose [3] [13].

### 4.4. Equipment and Workflow Pressure

Medical physicists cited challenges including:

- Overloaded LINAC schedules (up to 60 sessions/day).
- Disrupted quality assurance (QA).
- Increased workloads, raising burnout risk by 20% - 30%.

### 4.5. Delay Duration and Plan Modification

**Table 2** shows the percentage of patients who needed their treatment plans ad-

justed, depending on how long they waited before starting radiotherapy.

The data indicates a clear trend: the longer patients waited, the more likely they were to require a replan before starting treatment.

**Table 2.** Replanning frequency by waiting period.

| Waiting Period | % of Patients Requiring Replan |
|---|---|
| ≤21 Days | 3% |
| 22 - 35 Days | 11% |
| 36 - 49 Days | 26% |
| ≥50 Days | 39% |

### 4.6. Summary of Key Findings

- Treatment delays longer than four weeks were closely linked to tumor progression and the need for changes in treatment plans.
- Nearly all interviewed patients reported experiencing psychological distress, with longer wait times intensifying emotional strain.
- Medical physicists faced increased workloads due to the growing demand for replanning and tighter treatment schedules.

## 5. Interpretation of Results

### 5.1. Implications for Bangladesh

Limited infrastructure, frequent machine breakdowns, and uncoordinated workflows cause harmful delays, particularly affecting patients lacking private options [2] [4] [7]. Many patients experience psychological distress due to perceived neglect or discrimination [13] [14].

### 5.2. Necessary Intervention

Improve scheduling systems.

- Provide staff support to reduce burnout.
- Communicate clearly with rural and low-income patients.
- Include medical physicists in clinical and operational decisions [14].

## 6. Discussion

Delays in LMICs like Bangladesh impact both patient survival and mental health. Lack of counseling services worsens anxiety and depression [11] [12]. Tumor progression during delays requires new treatment plans, adding to workloads and delays for others [3]. Head, neck, cervical, and lung cancers are particularly vulnerable to delay-related progression [1] [3]. Even one week of delay can reduce local tumor control by 1% - 2% [3]. This discussion focuses on the broad impact of these delays, especially from the perspective of medical physicists. While the roles of oncologists and surgeons are often emphasized, despite their critical role,

medical physicists are often excluded from policy and triage decisions, limiting system efficiency [14]. Other countries have responded by expanding automation, teamwork, and infrastructure [12]. Bangladesh should consider similar reforms. Patients who experience long waiting periods often suffer emotional stress. In settings where counseling services are scarce, and communication is inconsistent; this distress is even more pronounced. Worries about cancer progression, financial challenges, and the difficulty of traveling to urban treatment centers all add to their emotional burden. These observations are consistent with trends in other LMICs, where poor communication and limited support systems worsen the mental health effects of treatment delays. From a physical standpoint, delays allow tumors to grow or change in shape, which often requires new CT scans and revised treatment plans. This increases the workload on healthcare teams and further delays treatment for other patients, worsening inefficiencies. Rapidly progressing cancers like those in the head and neck, cervix, and lungs are especially vulnerable. Research suggests that even a one-week delay can reduce the success of local tumor control by 1% - 2%. This study confirms such trends, as nearly 20% of patients who waited over four weeks needed their treatment plans adjusted. Medical physicists face the challenge of delivering accurate treatment while managing these anatomical changes. When too much time passes between a patient's initial CT scan and their first radiation session, the original plan may no longer be suitable. This could compromise both treatment effectiveness and the safety of surrounding healthy tissues. These challenges underline the need for clear guidelines to reevaluate plans, especially for patients who have been delayed more than three weeks. Despite their key role, physicists are often excluded from decisions about patient scheduling and triage. This exclusion limits the clinical team's insight, as physicists are responsible for treatment planning and technical delivery. Including them in policy and scheduling decisions could improve quality care, reduce unnecessary replanning, and improve overall system efficiency. Globally, other countries have responded to similar issues by expanding access to radiotherapy, increasing automation, and strengthening teamwork across disciplines. Bangladesh should explore adapting these solutions to fit local needs. Empowering physicists to contribute to both policy and daily operations would be a vital step forward. In conclusion, solving this problem requires a complete system-level response. Investment in infrastructure must be paired with better workforce planning, digital scheduling tools, and clearer patient communication. Furthermore, adding mental health services and community follow-up programs could ease the emotional burden that comes with unavoidable delays in treatment.

## 7. Limitations

This study is subject to several limitations. First, the use of a single-center design may limit the generalizability of the findings to other settings within Bangladesh or other LMICs. Second, patient interviews relied on self-reported experiences, which may introduce recall bias—particularly in emotional and psychological as-

sessments. Third, patients with less than two weeks of delay were excluded from the analysis, potentially skewing the dataset toward more severe delay cases. Additionally, staffing patterns and machine availability may vary across institutions, and this variability was not captured in the analysis. Future studies with larger, multi-center data sets and longitudinal designs are recommended to strengthen the evidence base.

## 8. Recommendations

Based on the study findings, the following recommendations are proposed:

### 8.1. Expanding Radiotherapy Infrastructure

Increase the number of radiotherapy machines and establish new treatment centers, particularly in underserved regions, to reduce patient load per machine [4] [8].

### 8.2. Strengthening Human Resources

Implement a national training program for medical physicists and radiotherapy technologists, with emphasis on workflow optimization, triage prioritization, and quality assurance practices [5].

### 8.3. Optimizing Workflow

Implement standardized scheduling systems and treatment planning protocols to streamline patient throughput. In addition, develop and deploy standardized patient scheduling software across all radiotherapy centers to ensure efficient and equitable resource allocation [13].

### 8.4. Introducing Automation and Digital Tools

Adopt advanced treatment planning systems, automated quality assurance tools, and electronic medical records to reduce manual delays and errors [14].

### 8.5. Enhancing Public Awareness

Launch national campaigns to educate the public about cancer, the importance of early diagnosis, and the critical timing of radiotherapy [5].

### 8.6. Improving Patient Communication

Develop clear communication strategies for clinicians to inform patients about treatment timelines and potential consequences of delays [8].

### 8.7. Psychosocial Support Integration

Provide counseling services for patients on waiting lists to mitigate psychological distress and improve emotional resilience [9] [12].

### 8.8. Policy Advocacy

Involve medical physicists in policy development to ensure technical feasibility and

operational efficiency are considered in national cancer control strategies [13] [14].

### 8.9. Performance Monitoring

Establish benchmarks and conduct regular audits on waiting times to identify gaps and monitor improvement over time [9].

These recommendations aim to create a more equitable, efficient, and patient-centered radiotherapy service in Bangladesh.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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