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Evaluating Radiotherapy Treatment Compliance at Cancer Hospital and Research Institute Gwalior

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Abstract

Background: Radiotherapy (RT) is a fundamental component of the management of various cancers and significantly contributes to treatment efficacy and patient survival. However, noncompliance with RT protocols poses a substantial barrier to achieving optimal clinical outcomes.

Objective: This study aimed to evaluate the rate of RT noncompliance among patients with cancer at the Cancer Hospital and Research Institute in Gwalior, Madhya Pradesh, and to identify the clinical, psychological, and socioeconomic factors contributing to noncompliance.

Methods: A retrospective analysis was conducted on 306 noncompliant patients who underwent RT between January 2022 and March 2023. Data on patient demographics, cancer types, RT protocols, causes of non-compliance, and treatment outcomes were collected. Non-compliance was defined as an interruption exceeding five consecutive days during the RT course. Descriptive statistics were used to summarize the data, and IBM SPSS Statistics for Windows, Version 21.0, was employed for data analysis.

Results: The overall non-compliance rate was 22.17%. The majority of the non-compliant patients were male (247 patients, 80.7%) and were diagnosed with head and neck cancers (231 patients, 75.5%). The primary factors associated with noncompliance included emotional challenges or frustration (153 patients, 54.9%), advanced disease stage (168 patients, 55.0%), and treatment-related toxicities (118 patients, 38.6%). Additionally, a significant proportion of patients traveled long distances for treatment, with an average distance of 149.1 kilometers from the hospital. Treatment outcomes revealed that only 68 patients (22%)

completed their prescribed RT plans, while 173 patients (56.5%) died, 134 of which (77%) occurred before treatment completion. Seventy-one patients (23.2%) survived, and the outcomes of 62 patients (20.3%) remained unknown due to loss to follow-up or incomplete records.

Conclusion: The high noncompliance rate highlights the intricate interplay of clinical, psychological, and socioeconomic factors affecting RT adherence. Addressing these challenges requires a comprehensive, patient-centered approach that includes early cancer detection, enhanced psychological support, effective management of treatment toxicities, expanded financial assistance programs, and proactive follow-up mechanisms. Implementing these strategies is essential for improving RT compliance, thereby enhancing treatment effectiveness, quality of life, and survival outcomes in cancer patients.

Keywords: Radiotherapy, Treatment Compliance, Cancer, Head and Neck Oncology, Emotional Challenges, Treatment Toxicities, Socioeconomic Factors, Patient-Centered Approach

Introduction

Cancer treatment often involves a multimodal approach, with radiotherapy (RT) serving as a pivotal component in numerous therapeutic regimens [1][2].

RT can be administered in various settings, including neoadjuvant, adjuvant, definitive (with or without chemotherapy), and palliative therapy, often in conjunction with surgery and/or chemotherapy. Adherence to the prescribed RT regimen is crucial for achieving optimal outcomes such as improved locoregional control and enhanced survival rates [3][4][5].

However, noncompliance with RT schedules remains a significant challenge in oncology, leading to treatment interruption and suboptimal patient outcomes [6]. Research indicates that delays or prolongations in RT are associated with an increased risk of local recurrence, with some studies reporting relative risk increases of up to 2% per day for certain malignancies [7] . Factors contributing to non-compliance are multifaceted, including emotional distress, treatment-related toxicities, financial constraints, and logistical barriers.

This retrospective clinical audit aimed to assess the incidence of RT noncompliance and identify the primary factors contributing to treatment interruptions among noncompliant patients at the Cancer Hospital and Research Institute in Gwalior, Madhya Pradesh. We hypothesized that enhanced and frequent patient counseling could significantly mitigate RT interruptions and improve compliance rates, thereby optimizing patient outcomes.

Methodology

This retrospective clinical audit was conducted between January 2022 and March 2023 at the Cancer Hospital and Research Institute in Gwalior, Madhya, Pradesh. The study included individuals diagnosed with cancer through histopathological examination who underwent radiotherapy (RT) as part of their treatment regimen. Radiotherapy was administered in various contexts, including definitive concurrent chemoradiation, post-surgical adjuvant therapy, and palliative care aimed at symptom management.

A comprehensive review of 1,380 patient files was performed during the specified period. Inclusion criteria were broad, encompassing patients of all ages, genders, and cancer types, provided they were prescribed radiotherapy as part of their treatment plan. This inclusive approach ensured a diverse patient population, re-

flecting the broader demographic and clinical spectrum encountered at the institution.

Non-compliance with radiotherapy was meticulously defined as an interruption exceeding five consecutive days during the course of treatment. The criteria for noncompliance included instances in which patients failed to attend scheduled RT planning sessions, defaulted on initiating treatment despite being planned for RT, or discontinued treatment after receiving one or more fractions. This operational definition aimed to capture various facets of non-adherence and ensure a comprehensive assessment of compliance rates.

Data collection focused on a wide array of variables to facilitate in-depth analysis of the factors influencing treatment adherence. Patient demographics, including age, sex, marital status, and geographical distance from the hospital, were thoroughly documented. Socioeconomic indicators such as educational status, employment status, and substance abuse history were also recorded. Clinical characteristics included payment mode, comorbidities, detailed cancer diagnoses, and staging information. Additionally, the performance status at the time of radiotherapy was assessed using the Eastern Cooperative Oncology Group (ECOG) performance status scale.

Treatment-related details were meticulously extracted, including the specific RT protocol administered, number of planned versus received fractions, type of RT machine utilized, and whether the treatment was for initial therapy or recurrence. Adverse treatment-related toxicities were documented in order to evaluate their impact on compliance. Furthermore, the causes of non-compliance were categorized to identify the predominant barriers, such as emotional challenges, financial constraints, logistical issues, and documentation deficiencies. The final status of each patient, whether alive, deceased, or lost to follow-up, was also recorded to correlate with the patient outcomes.

Descriptive statistical methods were employed to summarize the patient characteristics and noncompliance rates. The incidence of noncompliance was calculated as the percentage of noncompliant cases out of the total number of patients prescribed radiotherapy. Data analysis was performed using IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY, USA) to ensure robust and reliable statistical evaluations.

Ethical considerations were of paramount importance throughout the study. The audit was conducted in strict accordance with the ethical standards of the institutional research committee and adhered to the principles outlined in the 1964 Declaration of Helsinki and its subsequent amendments. Patient confidentiality was rigorously maintained during data collection, analysis, and reporting phases. Ethical approval was obtained from the Institutional Review Board (IRB) prior to the commencement of the study, ensuring compliance with all regulatory and ethical guidelines.

Result

This retrospective study analyzed the treatment data of 306 noncompliant patients who underwent radiotherapy (RT) at the Cancer Hospital and Research Institute in Gwalior between January 2022 and March 2023. The demographic analysis, as detailed in **Table 1**, revealed that a significant majority of the non-compliant patients were male (247 patients, 80.7%) compared to female patients (59 patients, 19.3%). The age distribution ranged from 24 to 81 years, with the highest proportion falling within the 25-49 years age group (146 patients, 47.7%), followed by 50-59 years (77 patients, 25.2%), 60-69 years (61 patients, 19.9%), and > 70 years (21 patients, 6.9%). Marital status indicated that most patients were married (295 patients, 96.4%), and only 11 patients (3.6%) were unmarried. Geographically, 55.2% of patients resided in Madhya

Pradesh (169 patients), 42.8% in Uttar Pradesh (131 patients), and 2.0% in other states (6 patients). The average distance from the hospital was 149.1 kilometers, with 34.0% of patients living less than 100 km from the facility, 41.5% residing between 101-200 km, 20.3% between 201-300 km, and 4.2% living more than 300 km away.

Table 1: Demographic Characteristics of Non-Compliant Patients

Characteristic	Values	N
Gender	Male, 247 (80.7%)	Female, 59 (19.3%)
Age	<25 years: 1 (0.3%)	25-49 years: 146 (47.7%)
	50-59 years: 77 (25.2%)	60-69 years: 61 (19.9%)
	70+ years: 21 (6.9%)	Range: 24-81y
Marital Status	Married, 295 (96.4%)	Unmarried, 11 (3.6%)
Religion	Hindu, 292 (95.4%)	Muslim, 14 (4.6%)
Permanent Address	MP, 169 (55.2%)	UP, 131 (42.8%)
	Other states, 6 (2.0%)	
Distance from Hospital	Mean: 149.1 km	<100 km: 104 (34.0%)
	101-200 km: 127 (41.5%)	201-300 km: 62 (20.3%)
	>300 km: 13 (4.2%)	
Education Status	Illiterate, 128 (41.8%)	Primary, 41 (13.4%)
	Secondary, 99 (32.4%)	Higher Secondary, 22 (7.2%)
	Graduate & above, 16 (5.2%)	
Employment Status	Labor, 237 (77.5%)	Not employed, 43 (14.1%)
	Professional, 15 (4.9%)	Govt. employee, 6 (2.0%)
	Business, 4 (1.3%)	Others, 1 (0.3%)
Substance Abuse	No Abuse, 130 (42.5%)	Smoking, 98 (32.0%)
	Tobacco & Alcohol, 69 (22.5%)	Tobacco Only, 5 (1.6%)
	Alcohol Only, 2 (0.7%)	Smoking & Alcohol, 1 (0.3%)
Payment Category	Ayushman Bharat (PMJAY), 246 (80.4%)	Government, 33 (10.8%)
	Cash, 26 (8.5%)	Insurance, 1 (0.3%)
Comorbidities	No Comorbidities, 288 (94.1%)	Diabetes, 5 (1.6%)
	HBS AG+, 2 (0.7%)	Others, 11 (3.6%)
Type of Cancer	Head & Neck, 231 (75.5%)	Gynecology, 23 (7.5%)
	Gastroenterology, 12 (3.9%)	Thoracic, 10 (3.3%)
	Surgical, 9 (2.9%)	Neurology, 7 (2.3%)
	Genitourinary, 6 (2.0%)	Hematology, 2 (0.7%)

	Sarcomas, 1 (0.3%)	Endocrinology, 1 (0.3%)
Stage of Cancer	Multiple Metastasis, 108 (35.3%)	Locally Advanced, 97 (31.7%)
	Single Metastasis, 87 (28.4%)	Localized, 14 (4.6%)
Intent of RT	Definitive, 255 (83.3%)	Palliative, 50 (16.3%)
	Adjuvant, 1 (0.4%)	
Performance Status (ECOG)	ECOG 2, 139 (45.4%)	ECOG 1, 69 (22.5%)
	ECOG 3, 66 (21.6%)	ECOG 0, 31 (10.1%)
	ECOG 4, 1 (0.3%)	
Treatment Protocol	Cisplatin (CIS/O), 116 (37.9%)	No Treatment, 113 (36.9%)
	Carboplatin (CAR/O), 60 (19.6%)	Other, 13 (4.2%)
	CIS/CAR/O, 3 (1.0%)	CIS Only, 1 (0.3%)
Outcome Status	Deceased, 173 (56.5%)	Alive, 71 (23.2%)
	Unknown, 62 (20.3%)	

The distribution of non-compliant patients across various oncology departments is outlined in **Table 2**, with Head and Neck Oncology accounting for the highest number of non-compliant cases (231 patients, 75.49%), followed by Gynecology Oncology (23 patients, 7.52%), Gastroenterology Oncology (12 patients, 3.92%), Thoracic Oncology (10 patients, 3.27%), Surgical Oncology (9 patients, 2.94%), Neurology Oncology (7 patients, 2.29%), Genitourinary Oncology (6 patients, 1.96%), Hematology Oncology (2 patients, 0.65%), and Sarcomas and Endocrinology Oncology, each with one patient (0.33%). The "Other" category comprised 4 patients (1.31%).

Table 2. Distribution of Non-Compliant Patients by Department

Department (Diagnosis)	Non-Compliant Patients (N)	Percentage of Non-Compliant Patients (%)
Endocrinology Oncology	1	0.33%
Gastroenterology Oncology	12	3.92%
Genitourinary Oncology	6	1.96%
Gynecology Oncology	23	7.52%
Head and Neck Oncology	231	75.49%
Hematology Oncology	2	0.65%
Neurology Oncology	7	2.29%
Other	4	1.31%
Sarcomas	1	0.33%
Surgical Oncology	9	2.94%
Thoracic Oncology	10	3.27%

Total	**306**	**100%**

Table 3. Causes of Non-Compliance Among Patients

Cause of Non-Compliance	Number of Patients (N)	Percentage (%)
Emotional Challenges/Frustration	153	54.9%
Advanced Disease Stage	168	55.0%
Treatment Toxicities	118	38.6%
Financial Constraints	14	4.58%
Logistical Issues (Distance)	1	0.33%
Social Events	12	3.92%
Machine Breakdown	4	1.31%
Unknown Reasons	54	17.65%

Table 4. Points of Default in Radiotherapy Treatment Compliance

Point of Default	Adjuvant (N)	Definitive (N)	Palliative (N)	Total (N)
Defaulted	1	182	34	217
Absent	0	64	14	78
Incomplete Documentation	0	4	0	4
Absent/Incomplete Documentation	0	1	1	2
Defaulted/Incomplete Documentation	0	2	0	2
Could Not Determine	0	1	0	1
Follow-up Defaulted/Incomplete Documentation	0	0	1	1
Follow-up Failure	0	1	0	1
Total	1	255	50	306

Table 5. Treatment Outcomes of Non-Compliant Patients

Outcome Status	**Number of Patients (N)**	**Percentage (%)**
Completed RT Plans	68	22%
Did Not Complete RT Plans	238	78%
- Deceased	173	56.5%
-- Before Completion	134	77% of deceased
- Alive	71	23.2%
- Unknown	62	20.3%

Table 3 summarizes the various causes of noncompliance among the patients. Emotional challenges and frustration were the most prevalent causes, affecting 153 patients (54.9%). This was closely followed by

advanced disease stage, which accounted for 168 cases (55.0%). Treatment-related toxicities were responsible for 118 instances (38.6%) of noncompliance. Financial constraints were noted in 14 patients (4.58%), while logistical issues related to distance were minimal, affecting only 1 patient (0.33%). Social events at the patients' native locations contributed to non-compliance in 12 patients (3.92%), and machinery breakdown was a cause in 4 patients (1.31%). Additionally, 54 patients (17.65%) had unknown reasons for noncompliance.

Table 4 provides a detailed breakdown of the points of default categorized according to the intent of radiotherapy: adjuvant, definitive, and palliative. The majority of defaults occurred in the definitive radiotherapy category (182 instances), followed by palliative RT (34 instances), and a single case in the adjuvant category. Specifically, 217 patients were classified under "Defaulted" (1 adjuvant, 182 definitive, and 34 palliative), 78 under "Absent," 4 under "Incomplete Documentation," 2 under "Absent/Incomplete Documentation," 2 under "Defaulted/Incomplete Documentation," 1 under "Could Not Determine," 1 under "Follow-up Defaulted/Incomplete Documentation," and 1 under "Follow-up Failure," totaling all 306 cases.

The treatment outcomes for the noncompliant patients are summarized in **Table 5**. Only 68 patients (22%) completed their prescribed RT treatment plans, whereas a substantial majority of 238 patients (78%) did not complete RT. Among the non-compliant patients, 173 (56.5%) died and 134 patients (77% of the deceased) died before completing RT. Seventy-one patients (23.2%) survived, and the outcomes for 62 patients (20.3%) remained unknown due to loss to follow-up or incomplete records.

Further analysis of socioeconomic and health-related factors revealed that education status varied significantly among the non-compliant patients, with 128 patients (41.8%) being illiterate, 41 patients (13.4%) having primary education, 99 patients (32.4%) having secondary education, 22 patients (7.2%) having higher secondary education, and 16 patients (5.2%) having graduate degrees or above. Employment status indicated that 237 patients (77.5%) were engaged in labor, 43 patients (14.1%) were not employed, 15 patients (4.9%) were professionals, 6 patients (2.0%) were government employees, 4 patients (1.3%) were involved in business, and 1 patient (0.3%) was categorized under "Others." Substance abuse history showed that 130 patients (42.5%) had no history of substance abuse, 98 patients (32.0%) were smokers, 69 patients (22.5%) used both tobacco and alcohol, five patients (1.6%) used tobacco only, two patients (0.7%) consumed alcohol only, and one patient (0.3%) used both smoking and alcohol.

Regarding payment categories, the majority of patients were covered under the Ayushman Bharat scheme (PMJAY) (246 patients, 80.4%), followed by government schemes (33 patients, 10.8%), cash payments (26 patients, 8.5%), and insurance (1 patient, 0.3%). In terms of comorbidities, 288 patients (94.1%) had no comorbidities, 5 patients (1.6%) had diabetes, 2 patients (0.7%) were Hepatitis B Surface Antigen positive (HBS AG+), and 11 patients (3.6%) had other comorbid conditions.

The types of cancer in the non-compliant patients were predominantly Head & Neck cancers (231 patients, 75.5%), followed by gynecology (23 patients, 7.5%), gastroenterology (12 patients, 3.9%), thoracic (10 patients, 3.3%), surgical (9 patients, 2.9%), neurological (7 patients, 2.3%), genitourinary (6 patients, 2.0%), hematology (2 patients, 0.7%), sarcomas (1 patient, 0.3%), and endocrinology (1 patient, 0.3%).

Cancer stage at the time of radiotherapy was classified as Multiple Metastasis (108 patients, 35.3%), Locally Advanced (97 patients, 31.7%), Single Metastasis (87 patients, 28.4%), and localized (14 patients, 4.6%). The

intent of RT was primarily definitive (255 patients, 83.3%), followed by palliative therapy (50 patients, 16.3%), and adjuvant therapy (1 patient, 0.4%).

Performance status, assessed using the Eastern Cooperative Oncology Group (ECOG) scale, indicated that 139 patients (45.4%) had ECOG 2, 69 patients (22.5%) had ECOG 1, 66 patients (21.6%) had ECOG 3, 31 patients (10.1%) had ECOG 0, and 1 patient (0.3%) had ECOG 4.

Treatment protocols varied, with 116 patients (37.9%) receiving cisplatin-based therapy (CIS/O), 113 patients (36.9%) not receiving any concurrent treatment, 60 patients (19.6%) receiving carboplatin-based therapy (CAR/O), 13 patients (4.2%) receiving other forms of chemotherapy, 3 patients (1.0%) receiving a combination of Cisplatin and Carboplatin (CIS/CAR/O), and 1 patient (0.3%) receiving cisplatin only.

A substantial proportion of non-compliant patients traveled considerable distances to receive treatment (Table 1). Specifically, 127 patients (41.5%) resided–101-200 kilometers from the hospital, and 62 patients (20.3%) lived–201-300 kilometers away. Only 104 patients (34.0%) were within 100 km of the facility, and 13 patients (4.2%) traveled more than 300 km for treatment.

Overall, only 22% of non-compliant patients completed their prescribed RT treatment plans. The high rate of non-completion (78%) underscores the significant challenges in maintaining treatment adherence. The mortality rate among noncompliant patients was notably high, with 56.5% of these patients having died, and 77% of these deaths occurred before the completion of RT. The survival rate was 23.2%, while the outcomes for 20.3% of the patients remained unknown owing to loss to follow-up or incomplete records.

Discussion

This study evaluated radiotherapy (RT) treatment compliance among 306 non-compliant patients at the Cancer Hospital and Research Institute in Gwalior, Madhya Pradesh. The non-compliance rate of 22.17% observed in this cohort is noteworthy, especially when juxtaposed with varying compliance rates reported in different regions and healthcare settings in India and globally. For instance, urban centers such as Mumbai have documented lower non-compliance rates (2.28) [8] , whereas rural areas such as Haldwani,Nainital in Uttarakhand have reported significantly higher rates (50%) [9] . This disparity underscores the influence of regional socioeconomic factors, healthcare infrastructure, and accessibility on adherence to treatment.

A predominant finding of our study was the high incidence of non-compliance in the Head and Neck Oncology department (75.49%). This aligns with existing literature that identifies head and neck cancers as particularly challenging in terms of treatment adherence due to the intensive nature of RT, associated toxicities, and its significant impact on patients' quality of life [10][11] [12].

Emotional challenges or frustration emerged as the leading cause of non-compliance, affecting 54.9% of the patients. This is consistent with studies highlighting the critical role of psychological factors in treatment adherence [13][14]. The emotional burden of a cancer diagnosis, coupled with the demanding RT regimen, likely contributes to premature treatment discontinuation.

Advanced disease stage was another significant factor, accounting for 55.0% of the non-compliant cases. Patients presenting with metastatic or locally advanced cancers often experience a sense of hopelessness and may perceive RT as less beneficial, leading to treatment abandonment [15]. This finding emphasizes the urgent need for early detection programs to diagnose cancer at more treatable stages, thereby improving both survival outcomes and treatment compliance.

Additionally, treatment-related toxicities were responsible for 38.6% of noncompliance instances. Adverse effects such as mucositis, fatigue, and skin reactions can severely diminish patients' willingness and ability to continue RT [16]. The implementation of proactive toxicity management strategies, including timely interventions and supportive care, is essential to mitigate these barriers and enhance adherence.

Although financial constraints account for a smaller percentage (4.58%) in our study, they remain a pertinent issue. Most patients were covered under the Ayushman Bharat scheme (PMJAY) [17], which likely mitigated some financial burdens. However, persistent financial barriers highlight the necessity to expand and refine financial support programs to ensure comprehensive coverage and alleviate out-of-pocket expenses.

Logistical issues related to distance, while minimal in our cohort (0.33%), are nonetheless significant, given that a substantial proportion of patients traveled long distances (average 149.1 km) for treatment. This suggests a need to decentralize cancer care services or provide additional logistical support, such as transportation assistance and accommodation facilities, to reduce travel-related barriers [18].

The treatment outcomes revealed a concerning mortality rate among non-compliant patients, with 56.5% having died and 77% of these deaths occurring before completing RT. This high mortality rate underscores the gravity of non-compliance and its direct impact on patient survival. Conversely, a survival rate of 23.2% among non-compliant patients, though lower than their compliant counterparts, still indicates that some patients derive benefits despite discontinuing treatment. However, the unknown outcomes for 20.3% of patients due to loss to follow-up or incomplete records suggest gaps in patient monitoring and follow-up protocols, which need to be addressed to ensure comprehensive care and support [19][20].

Comparatively, our study's non-compliance rate falls between the extremes reported in urban and rural settings, reflecting the unique interplay of factors specific to our institution in Gwalior. The high prevalence of noncompliance in definitive RT settings indicates that the intensity and duration of treatment protocols are significant determinants of adherence. This finding is echoed in other studies that advocate personalized treatment plans and flexible scheduling to accommodate patients' needs and improve compliance [21].

This study had several limitations must be acknowledged. Being a retrospective study, it is susceptible to selection bias and relies on the accuracy and completeness of the medical records. Additionally, as a single-institution study, the findings may not be generalizable to other settings with different patient populations and healthcare infrastructure. Future research should adopt prospective, multicenter approaches to validate these findings and explore the effectiveness of targeted interventions aimed at improving RT compliance [22][23] .

In conclusion, addressing the multifaceted barriers to radiotherapy compliance requires a comprehensive patient-centered approach. Enhancing psychological support services, implementing early detection initiatives, proactively managing treatment-related toxicities, expanding financial assistance programs, and decentralizing cancer care services are critical strategies to improve adherence rates. By adopting these measures, healthcare institutions can significantly reduce treatment interruptions, thereby optimizing patient outcomes and enhancing the overall quality of cancer care.

Conclusion

The significant noncompliance rate among radiotherapy patients at our institution underscores the complex interplay of clinical, psychological, and socioeconomic factors influencing treatment adherence. Addressing these challenges requires a comprehensive, patient-centered approach that encompasses early cancer detection,

enhanced psychological support, effective management of treatment-related toxicities, financial assistance, and proactive follow-up. Promoting early detection through public awareness campaigns can facilitate timely diagnosis and treatment initiation, thereby improving adherence rates. Offering mental health support helps patients manage the psychological burden of cancer treatment, reducing the emotional distress that may lead to discontinuation. Establishing protocols for proactive management of treatment-related toxicities ensures that adverse effects do not impede the completion of radiotherapy. Expanding initiatives, such as the Ayushman Bharat scheme, can alleviate the economic burden on patients and minimize financial barriers to compliance. Additionally, providing consistent counseling and follow-up enables early identification of barriers to treatment adherence, allowing for timely interventions. Ultimately, improving radiotherapy compliance is essential to enhance treatment effectiveness, quality of life, and survival outcomes in patients with cancer. Implementing these strategies will contribute to more consistent treatment adherence, thereby optimizing patient outcomes and improving the overall quality of cancer care at our institution.

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