Patterns of SBRT Utilization and Clinical Outcomes: Temporal Trends, Survival, and Early Mortality

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Introduction

- **Stereotactic body radiotherapy (SBRT)** has been increasingly established as an important treatment option with advances in technology and emerging evidence
- While clinical trials have reported outcomes in selected patient populations, real-world data remain limited
- **This study aims to analyze patterns of SBRT utilization and associated clinical outcomes in a single academic institution, with the goal of providing insights into clinical practice and patient selection**

Methods

Cohort Identification
- Patients treated with SBRT between **2008-24** at single center
- SBRT defined by **AAPM TG-101 recommendations** (e.g., ≤ 5 fx, dose/fx ≥ 6 Gy) with site-specific considerations[1]

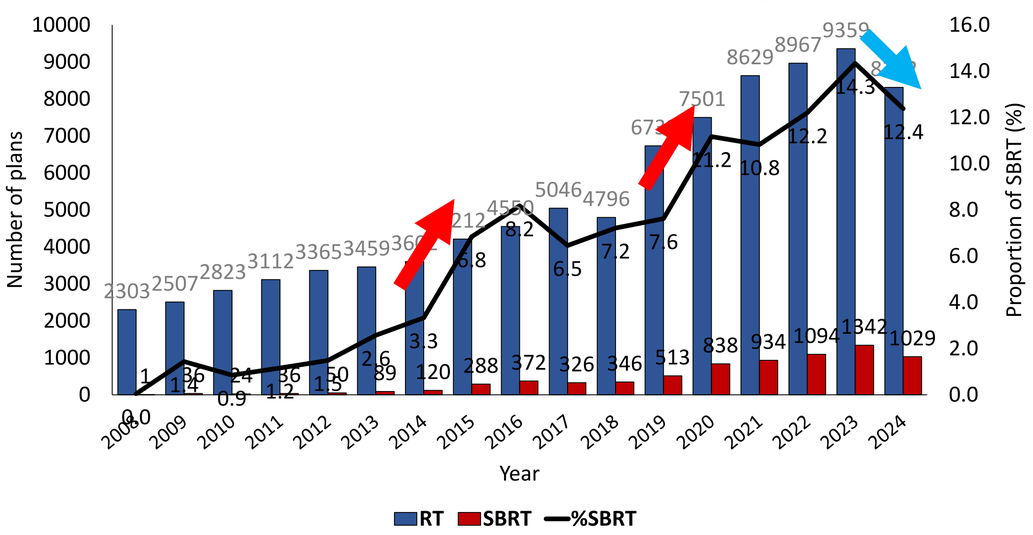
Utilization Trend Analysis
- Analysis by **year, treatment site, tumor type, metastatic status, metastatic class, number of metastatic lesions**, and **overall survival**

Early Mortality Evaluation
- **Early mortality (<3m)** was specifically assessed, with identification of **causes of early death**
- **Logistic regression** analysis was performed

Predictive Model Application
- **Application of in-house early-mortality risk model** to evaluate 3m mortality prediction

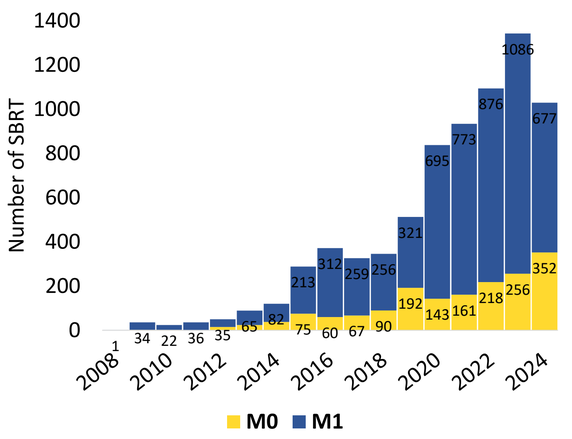
Results & Discussion

Temporal trends in SBRT utilization among RT plans

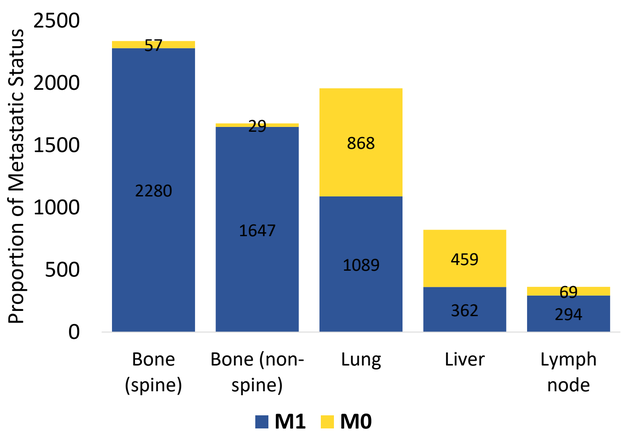


- Proportion of SBRT among all RT plans steadily increased (0% to 12.4%)
- **Inflection points in SBRT utilization**:
  - **2014** ↑ – **Nationwide insurance coverage for IMRT/SBRT**
    → rapid adoption (3.3% to 6.8%)
  - **2019** ↑ – Evidence boost following **SABR-COMET**
    → wider use in oligometastatic disease (7.6% to 11.2%)
  - **2024** ↓ –Physician–government conflicts (14.3 to 12.4%)
    – **Reimbursement cuts** targeting advanced modalities(IMRT/SBRT)

Annual Trends by M0/M1

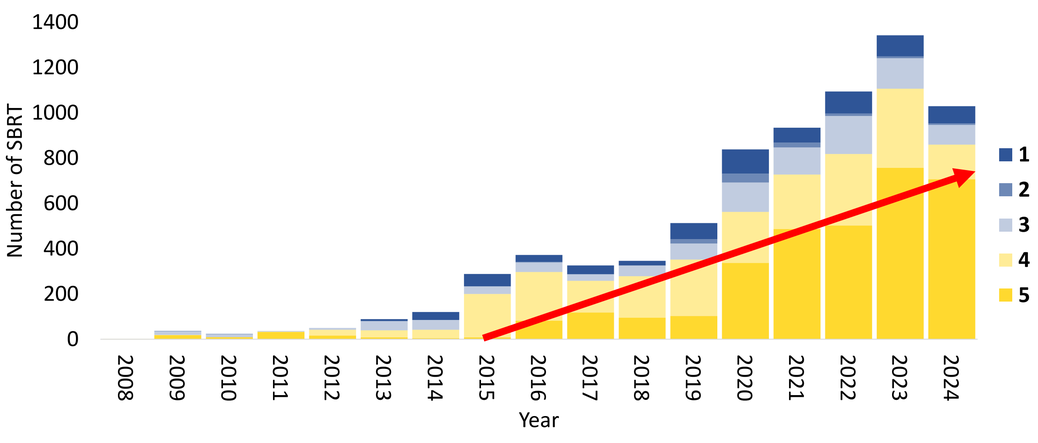


M0/M1 by Treatment Site



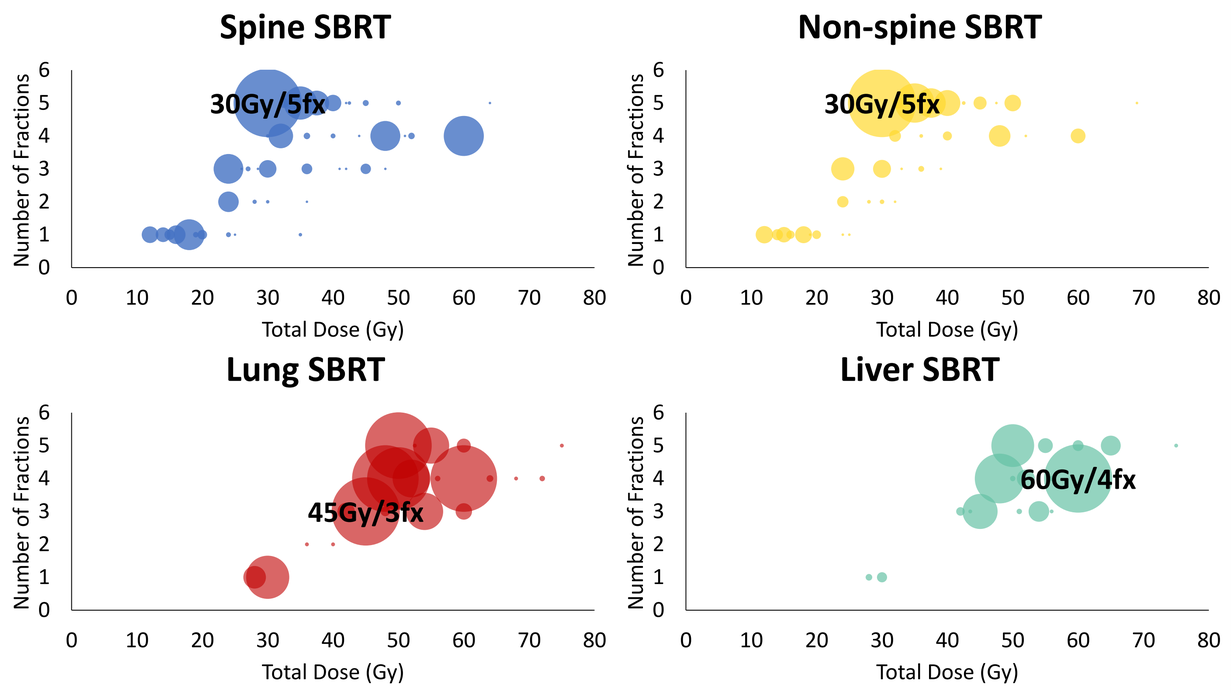
- Rapid increase, especially in **M1** (d/t insurance expansion & rising evidence)
- **Bone SBRT:** most common in M1
- **Lung/Liver SBRT:** most common in M0

Annual Trends of SBRT by Number of Fractions



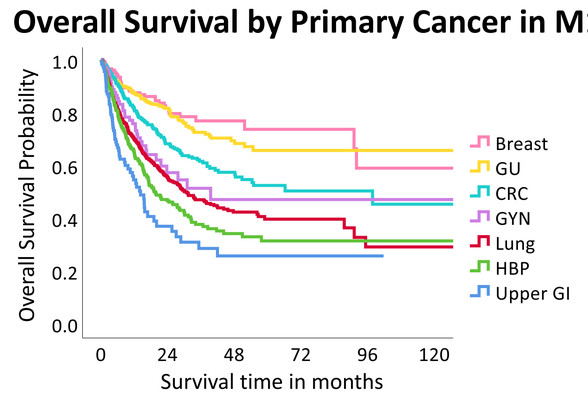
- **5 fx** regimen is becoming most common
- Driven by **insurance approval** for 5 fx
- Despite rising evidence for shorter regimens (Single Fr SBRT, SC24 trial, etc.)

Dose-fractionation Regimen by Treatment Site

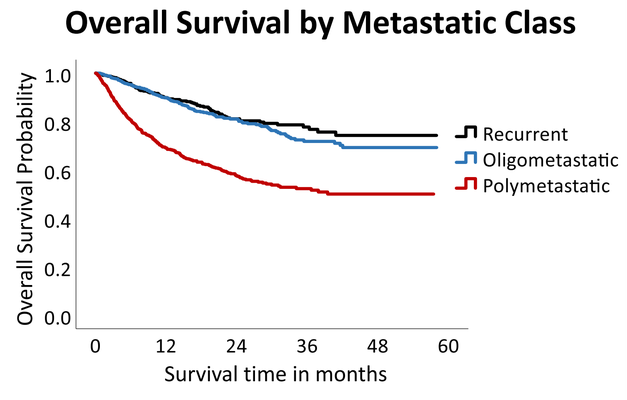


- Dose/Fx clusters were **site-dependant**
- Main regimens: Spine 30/5, Non-spine bone 30/5, Lung 45/3, Liver 60/4, Lymph node 35/5
- Regimens mostly **cluster around 5fx**, and **1-2fx regimens were rare**

Overall Survival by Primary Cancer in M1



Overall Survival by Metastatic Class



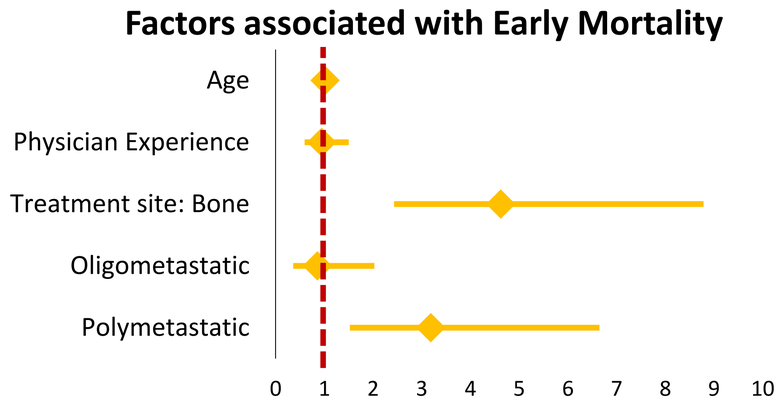
- **Best survival: Breast, GU** vs **Poorer survival: Lung, HBP, Upper GI**
- Primary site strongly stratifies prognosis even within metastatic SBRT candidates
- **Recurrent** and **OMD** patients show markedly better OS than **PMD**
- **5-yr OS:** recurrent ≈ 75 %, oligometastatic ≈ 69 %, polymetastatic ≈ 50 %

Early Mortality after SBRT

Cause of Death	#	%
Cancer progression	**232**	**4.5**
SBRT-related	**5**	**0.1**
Others	39	0.8
Total	**276**	**5.4**

- **Early mortality (<3m) was mostly caused by cancer progression**, and only a few were caused by SBRT-related toxicities
- → **Most could be prevented by careful patient selection**

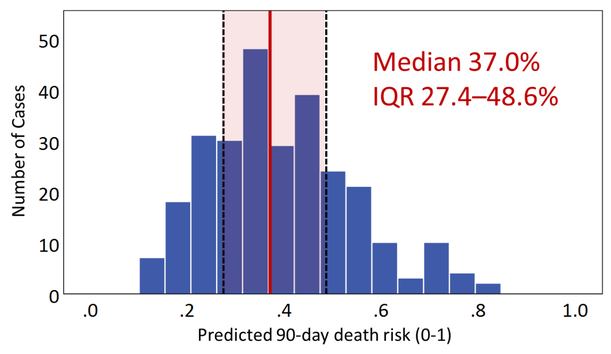
Factors associated with Early Mortality

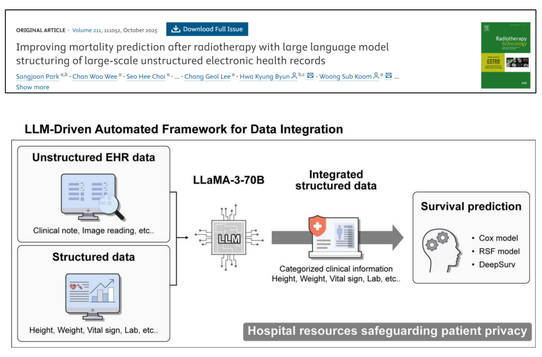


	p-value	OR
Age	0.048	1.02 [1.00, 1.03]
Physician Experience	0.813	0.95 [0.60, 1.50]
Treatment site: Bone	0.001	4.62 [2.43, 8.79]
Oligometastatic	0.725	0.86 [0.36, 2.03]
Polymetastatic	0.002	3.19 [1.53, 6.65]

- **SBRT to bone mets** and **PMD** independently associate with higher early mortality
- **Physician experience** showed **no significant association**

Predicted 3m death risk of Early Mortality Patients





- 276 early mortality patients analyzed using our **in-house prediction model**[2]
- Showed a median 3-month death risk of 37%, indicating high baseline risk
- Such tools may assist **patient selection** for SBRT in clinical practice

Conclusion

- Variability in dose-fractionation suggests **value in further standardization aligned with international recommendations.**
- **Higher early mortality in polymetastatic/bone cases underscores the importance of rigorous, criteria-based selection** and the **potential role of prediction tools**.

Reference

1. Kuncman Ł et al. Definition and requirements for stereotactic radiotherapy: a systematic review. Radiother Oncol. 2025;211:111107.
2. Sangjoon Park et al. Improving mortality prediction after RT with LLM structuring of large-scale unstructured EHR. Radiother Oncol. 2025 211, 111052