

Introduction

- Radiation therapy is used independently or in combination with other oncology modalities to treat or relieve symptoms of cancer patients. High-intensity radiation interacts with the tumor while sparing healthy tissue.
- Depending on tumor location, life expectancy, and severity of symptoms, the oncology team must coordinate this information into treatment planning.
- Those with terminal cancer have decreasing end-of-life qualities. The goal of radiation therapy then becomes symptom relief rather than cancer treatment and survival. (Bussman-Yeakel, 2016, p. 480)

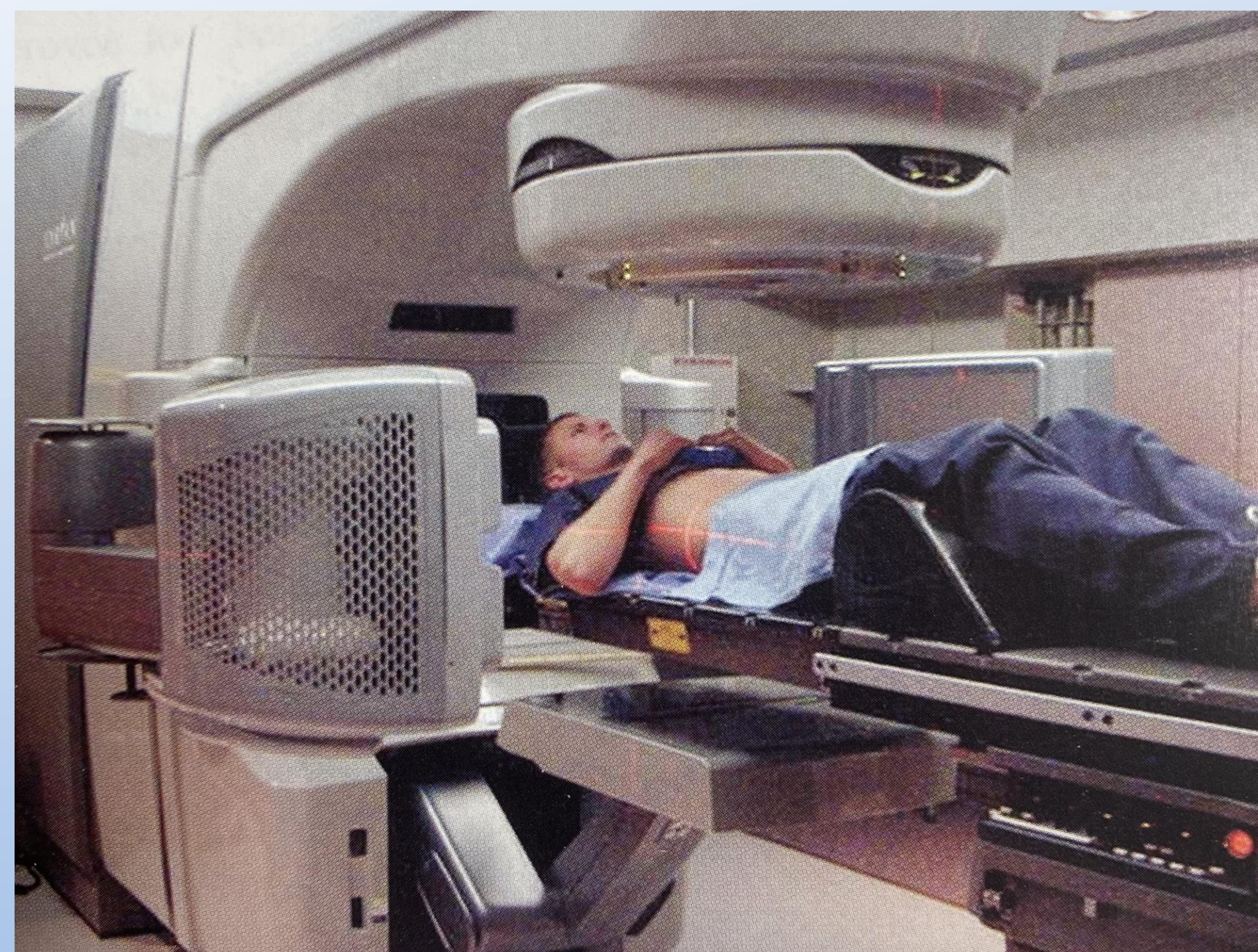


Image of a linear accelerator used for patients with external beam radiation therapy treatments (Bussman-Yeakel, 2016)

Cancer Severity

Stage 0	Abnormal cells begin to form but are not or minimally detected.
Stage 1	Localized tumor with no additional spread.
Stage 2	Tumor has grown to a size less than 5 cm. Lymph nodes start to become effected.
Stage 3	Tumor has grown to a size larger than 5 cm. Spreads into deeper structures.
Stage 4	Cancer has metastasized to other areas of the body.

(Bussman-Yeakel, 2016, p. 483)

What is Palliative Radiotherapy?

- Palliative radiotherapy practices are widely utilized in 30-40% of all cancer treatments (Huynh & Spektor, 2019, p. 326)
- Quality of life can be increased with the proper use of palliative radiotherapy
- If used properly, can achieve:
 - Decreased symptoms
 - Decreased hospitalizations
 - A preferred environment at the time of death
 - Avoiding end-of-life chemotherapy treatments
 - Access to strong opioids
 - Those who receive palliative radiotherapy are 2x more likely to have access than those who refuse palliative radiotherapy (Ziegler et al., 2017, p. 7).

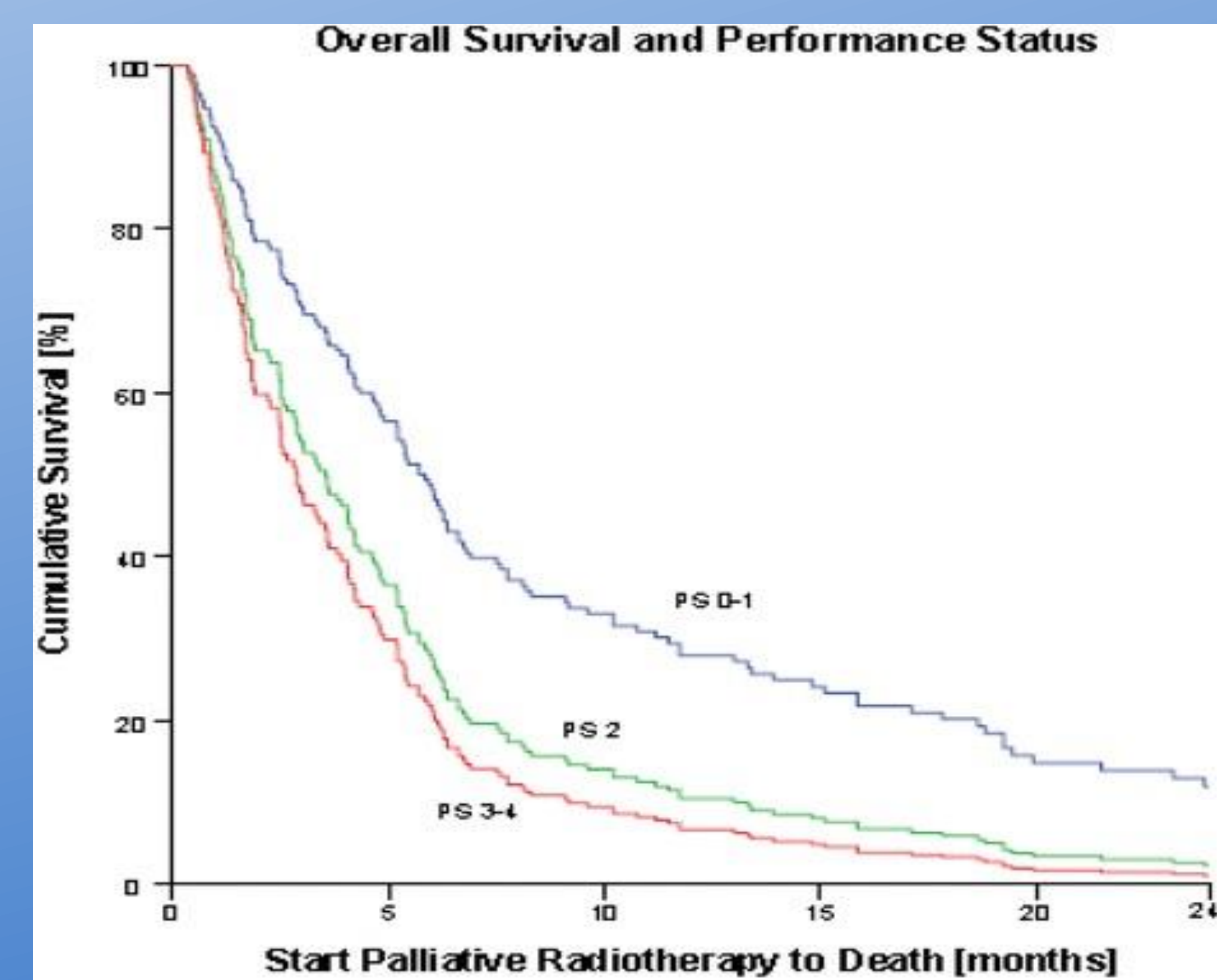
Determining a Guideline

- Performance status (PS) has been found to be the “predominant prognostic factor and a significant predictor for futile radiotherapy at the end of life” (Støchkel Frank et al., 2018, p. 2)
 - Those with better performance status results in longer survival after treatment when given fractionalized palliative radiotherapy compared to those with worse performance status.
- Palliative radiotherapy may be futile in types of cancer that only show symptoms in a later stage. This causes the diagnosis to be delayed, thus pushing off appropriate treatment.
 - This includes metastasized cancers with multiple lesions throughout the body.
- The microenvironments of the cancer site must be considered when planning.
 - In lower dose palliative radiotherapy, there is preserved vasculature which allows the tumor to start reconstructing to normal tissue characteristics. In higher doses, there is overall tumor ablation which results in programmed vasculature cell death.
 - Fibroblastic microenvironments require a higher dose per fraction to speed up the radiation response.

(Huynh & Spektor, 2019, pp. 328-329)

The Key: Timing and Fractionation

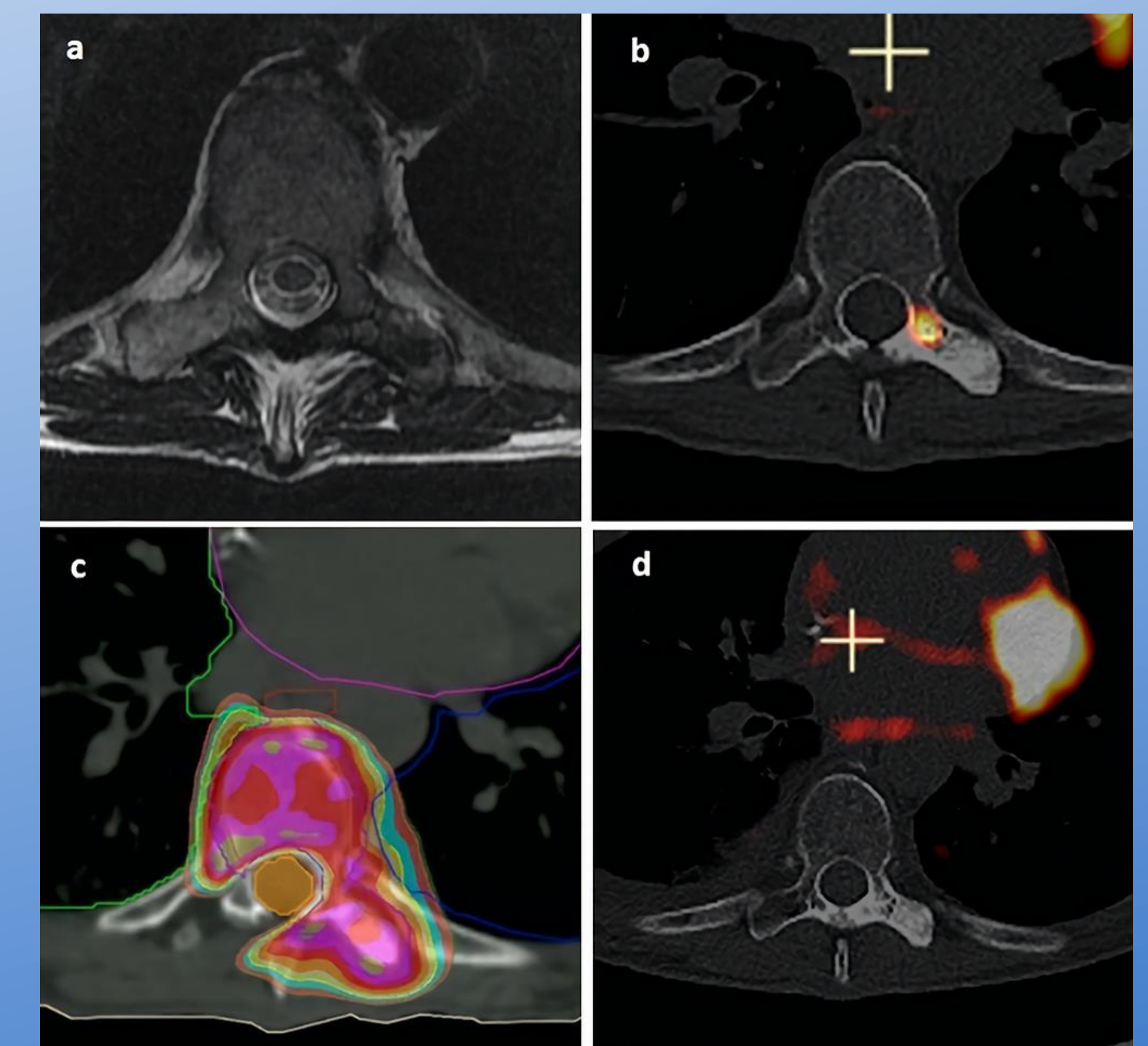
- Studies have found that the “association between longer interval[s] from first contact with palliative care to death” results in increased end-of-life qualities (Ziegler et al., 2018, p.8)
 - If palliative care is not administered until the last four weeks of life, it will not be as effective compared to those who have undergone palliative radiotherapy for a longer period (Ziegler et al, 2018, p. 8)
 - The earlier the stage at diagnosis, the sooner palliative radiotherapy can be deemed necessary and administered.
- A treatment’s effects with more dose per fraction for less fractions are found to be relieved two weeks quicker than a treatment with less dose per fraction for more fractions (Støchkel Frank et al., 2018, p. 6)
 - This results in relief of symptoms with high dose and low toxicity.



- Graph showing the correlation between time from prescription of palliative radiotherapy to death with chance of survival.
- Colored lines represent the PS of patients undergoing palliative radiotherapy. The difference between PS 2 and PS 3-4 was not statistically significant. Those with a PS of 2 or more were found to have less time of survival throughout treatment compared to those with better PS. This graph shows that when diagnosis and palliative treatment is delayed, action becomes futile and there is no benefit against terminal cancer effects. (Støchkel Frank et al., 2018)

In the Future

- Few studies have been conducted to evaluate how to maximize effectiveness of palliative radiotherapy.
 - Multiple articles have found that earlier and proper diagnosis by physicians is crucial.
- Advanced technologies are being used to further assess prognosis. The use of biomarkers is a non-invasive way to determine biological changes (responsiveness) throughout treatment as well as tumor relapse. (Huynh & Spektor, 2019, p. 332)



Images show a single-fraction treatment plan for a breast cancer patient with bone metastases. Picture B & D can be compared to show the response after treatment. (Loi, Nuyttens, Desideri, Greto, & Livi, 2019)

Conclusion

- Palliative radiotherapy is only effective when planned and administered appropriately. It is important for the radiation therapy team to have a dialogue about treatment plans for each individual patient. Those with advanced cancer and developed symptoms need higher doses at less fractions to feel quicker relief than those with less severe symptoms for the same type of cancer.
- It is important to assess PS when determining the prescription. The timing of palliative radiotherapy is crucial for positive effects to occur in the patient. Palliative radiotherapy is futile with near end-of-life prognoses because of delayed treatment. Instead, these patients should be given supportive care or hospice services (Puckett, Luitweiler, Potters, & Teckie, 2017, p. 788).