

# The Impact of Brainlab Technology Implementation on the Department Performance

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## Background

Two new Elekta Versa HD linear accelerators (LAs), both with ExacTrac and Elements treatment planning system were installed in October 2019 and October 2020 replacing 2 out of three aging LAs. Parallel to cranial treatments, the variety of stereotactic body radiotherapy programs soon became implemented. This process was facilitated by Covid pandemic and radiotherapy practice change driven mostly by the preference of ultrahypofractionation.

## Purpose

The aim of the study was to analyse the temporal development of performance indicators in respect of Brainlab technology implementation at the Department of radiation oncology of the East Slovakia Institute of Oncology (VOU).

## Materials and Methods

We summarized annual frequency statistics of variety of stereotactic indications since the installation of Brainlab technology and the total number of patients and fractions treated at 3 LAs at VOU based on the National annual health statistics report<sup>1</sup>. The calculated number of fractions per patient may be considered a radiotherapy (RT) delivery effectiveness indicator. We analysed the mean duration of consequent phases of RT planning and delivery process (time intervals between RT indication, CT scanning, contouring, planning, plan approval, 1st fraction, and end of treatment) for all patients from the records in the departmental information system in 2018 – 2022 and summarized the principal change in clinical practice at the department.

Table 1: Stereotactic indications and the number of patients treated per year.

Indication	Number of Patients			IGRT Technology
	2020	2021	2022	
Cranial SRS	42*	94	127	ExacTrac
Prostate	41*	193	177	ExacTrac
Spinal Mets	9*	42	66	ExacTrac
Lung Tumors	17	20	25	CBCT/ExacTrac
Liver Tumors	8	6	6	CBCT/ExacTrac
Other (Bones, LAP)	8	32	38	CBCT/ExacTrac

\* A new indication

## Results

Three new stereotactic radiotherapy indications were introduced into the clinical practice (cranial SRS, spinal SBRT and prostate SBRT) and the annual numbers of treated patients with stereotactic interventions increased for most indications between 2020 and 2022 (Table 1). The total number of patients increased while the total number of fractions decreased between 2019 and 2022 resulting in decreased number of fractions per patient from 16.1 to 11.6 (Figure 1). The number of personnel and extent of working hours have not changed over time. The mean duration of consequent phases of radiotherapy planning and delivery process remained on similar level, except of decreased treatment time (Figure 2). The following change in clinical practice reflected the use of ExacTrac based IGRT and the surface camera for pre-positioning and patient motion control:

- Tattoo-less workflow in >80% of patients.
- Shortening of time for patient positioning at CT planning and treatment.
- Higher precision and reproducibility of patient positioning.
- Substantial reduction of integral absorbed dose related to imaging.
- Deep inspiration breath hold irradiation for left-sided breast and mediastinal lymphoma patients.

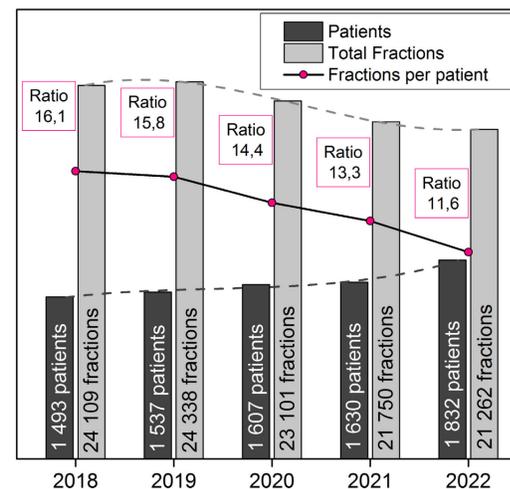


Figure 1: The total number of patients and fractions per year treated with external RT (2 + 1 linear accelerators) and the number of fractions per patient.

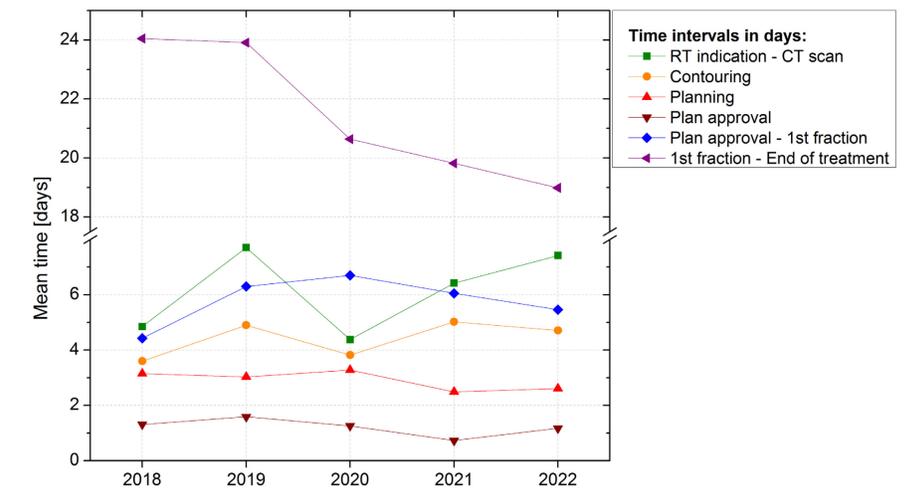


Figure 2: Change of mean duration of consequent phases of RT planning and delivery process.

## Conclusion

BrainLab technology implementation allowed new cranial and extracranial stereotactic treatments, increased performance of the department and improved effectiveness and safety of treatment planning and delivery.

## References

<sup>1</sup>National Health Information Centre: Oncology (nczi.sk), accessed July 17, 2023.