OPTIMIZATION OF PATIENT SCHEDULING BASED ON AI ALGORITHM OF THE RADIOTHERAPY DEPARTMENT OF LIEGE UNIVERSITY HOSPITAL: PRESENTATION OF SELECTED KEY PERFORMANCE INDICATORS (KPIs) (HOSMARTAI – HORIZON 2020 FUNDED)

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Background

- Artificial intelligence (AI) is mentioned as a facilitator for more personalized and safer healthcare services.
- Key Performance Indicators (KPIs) have long been utilized as measurable landmarks to evaluate the benefit for patients and society of AI.
- HosmartAI project combines in one platform an agglomeration of AI technologies, disease areas and healthcare settings.
- One of the HosmartAI technologies deals with a radiotherapy unit with an increasing number of patients of different diagnosis and different needs based on tumor type, aggressivity, size and location.
- Currently, patient scheduling is performed physically by applying patient-centric multifaceted and multiparametric considerations based on oncological, psychological and organizational context of the patients, the physician/machine availability, machine maintenance, patient absence following the specific therapeutic guidelines for each patient and disease area. Staff have reached the limit of human processing capacity to meet the number and weighting of all these variables.

Objective

The objective of the study was to identify the proper KPIs in order to establish an AI algorithm for optimizing patient scheduling at the radiotherapy department of the hospital.

Methods

- Literature review was performed followed by a detailed recoding and classification of physical scheduling procedures to identify and map the most important parameters (KPIs) to be used in the AI algorithm.
- Upon implementation of the AI algorithm an incremental analysis was performed to estimate the difference of the current practice versus the new AI scheduling.
- To enable the full potential of the AI technologies, a comprehensive selection of KPIs were identified, to cover the whole spectrum of outcomes and involved stakeholders of the healthcare sector and decision-making bodies. The HosmartAI KPIs pillars is presented in Figure 1 and the representation of all involved stakeholders at Figure 2.

Figure 1. HosmartAI KPI Pillars

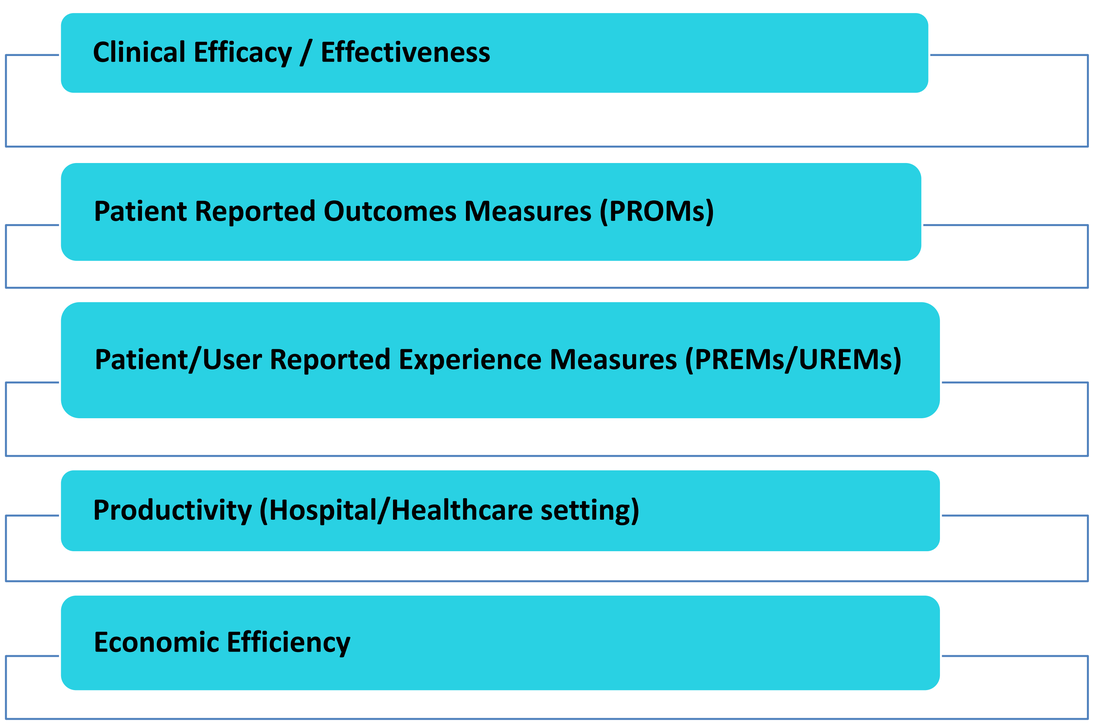

Figure 2. KPIs Representation of all Involved Stakeholders

References

1. Voets M, et al. (2021). Systematic Review of Health Economic Evaluations Focused on Artificial Intelligence in Healthcare: The Tortoise and the Cheetah. Value in health.
2. Secinaro S, et al. (2021). The role of artificial intelligence in healthcare: a structured literature review. BMC Medical Informatics and Decision Making, 21(1), 1-23
3. Wolff J, et al. (2020). The economic impact of artificial intelligence in health care: systematic review. *JMIR*, 22(2), e16866
4. https://www.hosmartai.eu/

Results

The current manual scheduling reported the following performance:

- Number of days for irradiation of breast and lung tumour, according to respective guidelines.
- 1 irradiation for urgent bone metastasis treatment.
- The number of variables considered currently for appointment scheduling are 10. In the future, an increase of 10 other variables is expected (20 in total) while helping to decrease the time of manual planning by hospital staff.

At present, The duration for the appointment scheduling is the following:

- 20 minutes for a single breast cancer tumour,
- 23 minutes for bilateral breast tumours,
- 30 minutes for single lung tumour without chemotherapy,
- 45 minutes for a single lung tumour with concomitant chemo-radiotherapy,
- 30 minutes for several lung tumors and
- 6 minutes for a bone metastasis.
- Currently 3 employees perform the appointment co-ordination. The time spent by these employees to generate an appointment scheduling is between 16 and 55 min depending on the planning irradiation for one or multiple tumors. The total number of treatments/sessions for 2022 were 2.768 (584 for breast cancer and 357 for lung cancer).

Table 1. KPIs Used and Scoring of Manual Scheduling vs. AI Scheduling and Incremental Difference of both technologies

KPIs Reported	Score of Manual Scheduling (considered as Baseline)
Number of parameters identified to schedule the use of radiotherapy	10
Time required (duration) to schedule a treatment series by the secretarial staff (a single breast tumour)	A single breast tumor: 20 min
Time required (duration) to schedule a treatment series by the secretarial staff (a bilateral breast tumour)	Bilateral breast tumours: 23 min
Time required (duration) to schedule a treatment series by the secretarial staff (a single lung tumour with chemo)	A single lung tumor without chemotherapy: 30 min
Time required (duration) to schedule a treatment series by the secretarial staff (a single lung tumour with concomitant chemo-radiotherapy)	A single lung tumor with concomitant chemo-radiotherapy: 45 min
Time required (duration) to schedule a treatment series by the secretarial staff (several lung tumors)	Several lung tumors: 30 min
Time required (duration) to schedule a treatment series by the secretarial staff (bone metastases)	Bone metastases: 6 min
Average weeks of radiotherapy treatment for lung cancer (33 irradiations) data year 2019	7 weeks per treatment
Average number of consultation at the radiotherapy unit for lung cancer (33 irradiations) data year 2019	8 consutations per treatment
Average weeks of radiotherapy treatment for breast cancer (33 irradiations) data year 2019	5,5 weeks per treatment
Average number of consultation at the radiotherapy unit for breast cancer (33 irradiations) data year 2019	5,5 consultations per year
N° of lung cancer patients to be scheduled with this technology per year (data 2019 for patients with 33 irradiations)	103 patients per year
N° of breast cancer patients to be scheduled with this technology per year (data 2019)	591 patients per year
N° of patients with bone metastasis to be scheduled with this technology per year (data 2019)	150 patients per year
Number of Personnel involved in radiotherapy	Radiotherapists n= 17 Physicists n= 8 Nurses n= 43 Dosimetrists n=6 Technicians n=2 Administrative staff (for appointments) n= 3

Conclusions

The new promising AI algorithm will pave the way for the optimal and efficient use of resources. The algorithm is expected to increase personalized radiotherapy, improve hospital efficiency and patients' satisfaction levels without compromising the quality of care.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101016834