HELP OF ARTIFICIAL INTELLIGENCE (AI) IN CLINICAL PRACTICE: PRO & CONTRO

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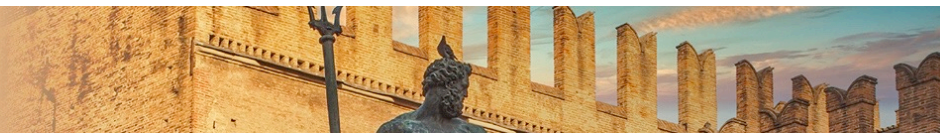
DICHIARAZIONE

Relatore: LORENA DRAGHINI

Come da nuova regolamentazione della Commissione Nazionale per la Formazione Continua del Ministero della Salute, è richiesta la trasparenza delle fonti di finanziamento e dei rapporti con soggetti portatori di interessi commerciali in campo sanitario.

- Posizione di dipendente in aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Consulenza ad aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Fondi per la ricerca da aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Partecipazione ad Advisory Board **(NIENTE DA DICHIARARE)**
- Titolarità di brevetti in compartecipazione ad aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Partecipazioni azionarie in aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
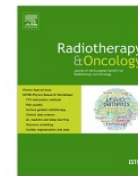- Altro

- Recently, a survey on the clinical use of AI in radiotherapy, revealed that most popular AI supported applications were automatic segmentation and treatment planning, followed by synthetic CT (sCT) generation.

- European recommendations of AI application in radiotherapy

Contents lists available at ScienceDirect

Radiotherapy and Oncology

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2020

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Review Article

Overview of artificial intelligence-based applications in radiotherapy: Recommendations for implementation and quality assurance

Liesbeth Vandewinckele [a,b,1], Michaël Claessens [c,d,1], Anna Dinkla [e,1,*], Charlotte Brouwer [f], Wouter Crijns [a,b], Dirk Verellen [c,d], Wouter van Elmpt [g]

Brouwer CL, et al. Artificial Intelligence in Radiation Oncology: Current use and needs to support clinical implementation. PhiRO 2020.

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- **European recommendations of AI application in radiotherapy**

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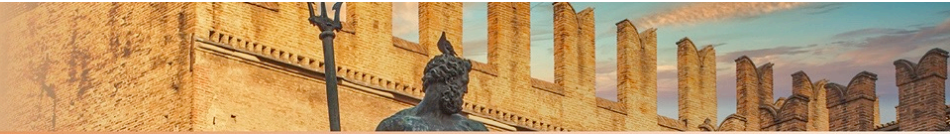*2020*

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Review Article

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Check for updates

Liesbeth Vandewinckele [a,b,1], Michaël Claessens [c,d,1], Anna Dinkla [e,1,*], Charlotte Brouwer [f], Wouter Crijns [a,b], Dirk Verellen [c,d], Wouter van Elmpt [g]

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AUTO-CONTOURING

- authors insist on the need to ask to the provider of the algorithm about the **variability of the clinical data used to train the model**, including variability in acquisition parameters/devices, with the objective **to evaluate its generalizability**.

- They set **the minimal number of patients** to be included in **the local test set to 10**, notifying this number should be increased in case of large variations in the similarity metrics considered for performance evaluation (**typically around 20 patients**).

- methods have been proposed in the literature to ease **quality checks of the proposed contours** and were mentioned by the authors as solutions to be implemented for case-specific QA (statistical models characterizing shape, volume or spatial location of the generated contours have been proposed, e.g.overlap contour volume/surface (dice similarity coefficient), head-to head comparison scoring of the aouto-contouring as "pass" or "fail", knowing how much manual editing is required (or not) is an important result, or secondary independent segmentation method)

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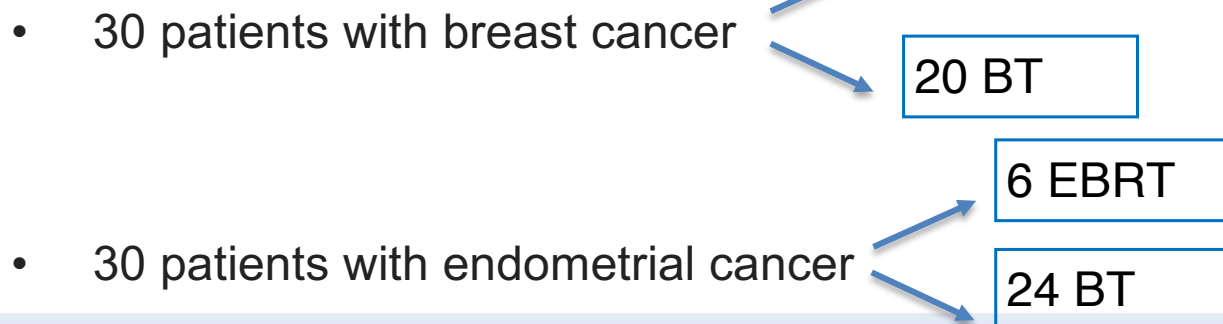BOLOGNA, 25-27 NOVEMBRE
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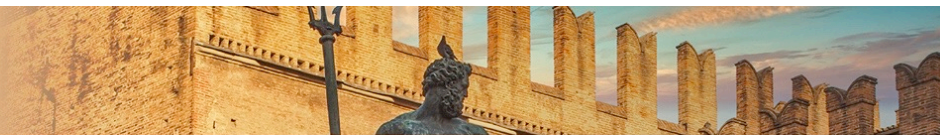
- Every automatically generated contour should be **reviewed, corrected if necessary, and approved by clinical staff.**

- **Regular test should be performed** to ensure that the model does not vary with time even in case of software's version update

- they suggested the idea of creating a **repository of patient cases** for **which contouring was suboptimal to identify limitations of the proposed model** and ease adjustments by the developers of the algorithm.

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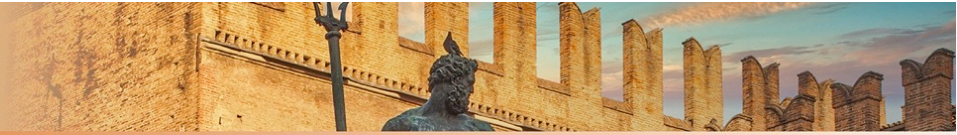BOLOGNA, 25-27 NOVEMBRE
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OUR EXPERIENCE

- To evaluate performance and clinical utility of auto-contour generated by AI-based software on CT studies

- The structures, identified on CT scan were contoured manually and by deep-learning based auto-contouring software **(Limbus)** for adjuvant breast and pelvis brachytherapy (BT) and external beam radiotherapy (ERT) treatment planes (considering that the software was not primary educated for BT treatments)
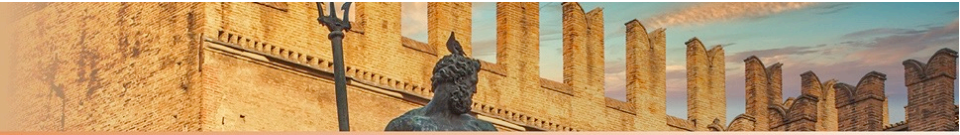
- 30 patients with breast cancer → 10 EBRT
- → 20 BT

- 30 patients with endometrial cancer → 6 EBRT
- → 24 BT

- In all CT scan OARs were contoured by **AI** and then by a **single radiation oncologist (RO).**

- Each contour (including manual) was visually evaluated in a **blinded test**. After examination of AI OARs contouring, **a RO (other than the reference one)** assigned a **score proportional to the degree of correction** needed for clinical acceptability: 0 (no corrections), 1 (minor corrections), 2 (major corrections).

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RESULTS

- About performance of OARs volumes AI contours have a **high degree of clinical acceptability (score 0)** in case of **thorax and pelvis ERT**.

- **For thorax BT plans**, AI contours have **medium degree of clinical acceptability (score 1)** and **high degree (score 0)** for **breast** and **others thorax OARs**, respectively.

- Indeed, **for pelvis BT plans**, AI contours have **low degree of clinical acceptability (score 2)** for **rectum and bladder volumes** and **high degree (score 0)** for **others pelvis OARs**.

- Probably these last results are related to interference of BT catheters or vaginal applicator.

- **In BT planes, AI breast, rectum and bladder volumes were corrected by RO in median 12 minutes.**

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RESULTS

- The **median time** of **OARs auto-contouring** in all cases was **2 minutes**.

- On the contrary, in case of **manual contouring** the median time was **15-20 and 30 minutes for right breast, left breast cancer and endometrial cancer**, respectively.

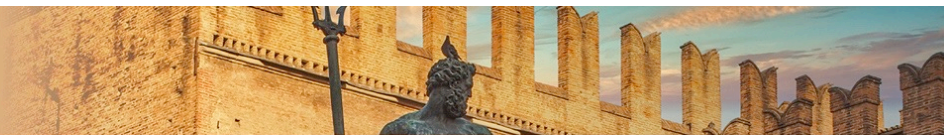- The **median time saved with AI was about 90%.**
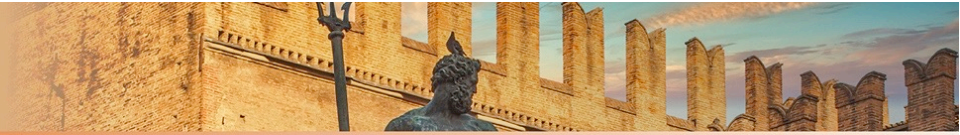
CONCLUSIONS

- AI as auto-contouring tool is a valid and safety help for clinical practice of ROs, it allows you to reduce contouring-time.

- Auto-contours have a quality comparable to manual contours, however it cannot completely replace the physician who must supervision always AI work.

- The observed differences in the software performances could be due to different training levels, particularly for BT treatment planes.

- We look forward to training AI to obtain an optimal auto-contouring tool also with BT applicators.

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THANK YOU

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