Digital Skills of Radiation Therapists/Therapeutic Radiographers (RTT/TRs) - an investigation for a European educational curriculum

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❖ **Background**

- Evolution of radiotherapy
- Society's digitalisation
- European initiatives
- RTT/TRs European regulation

❖ **1st phase: Literature search**

- Materials and methods
- Results

❖ **2nd phase: Survey**

- Materials and methods
- Preliminary results

❖ **Discussion/Conclusion**

❖ **Future directions**
Evolution of radiotherapy

Increase in complexity

Computer's processing power

- boost RT precision
- lead to changes in clinical practice
- contribute to better outcomes for patients

Modern RT

- RTT/TRs need specialized skills
Society's digitalisation

Industry 4.0

- Autonomous Robots
- Big Data and Analytics
- Simulation
- System Integration
- Augmented Reality
- Industrial Internet of Things
- Additive Manufacturing
- Cloud
- Cybersecurity

Image acquisition  Evaluation  Planning  QA  Delivery
European initiatives

- Given the need for digital skills, several European initiatives have emerged.
RTT/TRs European Regulation

- differences in skills
- variation in care level

AIM: identify RTT/TRs’ digital skills through the analysis of published literature.
1st phase: Materials and methods

- Literature search

  - Systematic search of the white literature
  - Identification of relevant grey literature

Databases and journals:
- PMC
- Science Direct
- PubMed
- ERIC
- Cochrane Library
- IEEE Xplore
- Radiography
- tipsRO

Query:
(digital) AND (competenc* OR task* OR skill*) AND ("therapeutic radiographer" OR "therapeutic radiography" OR radiographer* OR radiotherapist* OR RTT* OR "radiation therapist" OR "radiation technologist" OR "radiation therapy technician" OR "Radiological technologist" OR "Radiological technician") AND (radiotherapy OR "radiation therapy" OR "radiation oncology")

- Educational guidelines
- Recommendation and benchmark documents
- Reports, projects and frameworks
- Technical support manuals
### Inclusion criteria:
- Last 10 years
- English language
- Focus on digital skills or tasks performed digitally by RTT/TRs

### Exclusion criteria:
- Other healthcare professionals
- Non-digital skills of RTT/TRs
1st phase: Results

195 digital skills

6 themes

34 sub-themes
1st phase: Results

Transversal Digital Skills

Management, Education and Research

Quality, Safety and Risk Management

RT Treatment Image

RT Treatment Planning

RT Administration
### 1st phase: Results

#### Transversal Digital Skills
- Technologies/Information Systems (IS)
- Communication
- Electronic Patient Record (EPR)
- Patient Agenda
- Workstation

#### RT Planning Image
- Computerised Tomography (CT)
- 4D Computerised Tomography
- Image Processing and Enhancement
- Image Registration and Correlation
- Image Segmentation and Contouring

#### RT Treatment Planning
- Plan Treatment
- Plan Parameters (forward planning)
- Inverse Planning (IMRT/VMAT)
- 4D Planning
- SRS/SBRT Planning
- Dose Calculation
- Plan Evaluation
- Prerequisites for Treatment

#### RT Treatment Administration
- System Setup
- Treatment Delivery Preparation
- Treatment Verification: Conventional Techniques
- Treatment Verification: Advanced Techniques
- Image Matching
- Image Analysis
- Treatment Delivery
- Respiratory Gating Treatment Delivery
- SRS/SBRT Treatment Delivery

#### Quality, Safety and Risk Management
- Quality Assurance
- Security
- Risk Management
- Data Protection
- Information Integrity

#### Management, Education and Research
- Department Administration and Management
- Education
- Research
### Examples

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<thead>
<tr>
<th>Transversal Digital Skills</th>
<th>Communication</th>
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<tr>
<td>Use an internal communication channel</td>
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<td>Create multimedia content for patient education</td>
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<tr>
<th>RT Planning Image</th>
<th>Computerised Tomography (CT)</th>
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<tr>
<td>Create scan protocols</td>
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<td>Set acquisition parameters</td>
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<tr>
<th>RT Treatment Planning</th>
<th>Dose Calculation</th>
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<tr>
<td>Select calculation parameters</td>
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<tr>
<td>Calculate dose distribution</td>
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<th>RT Treatment Administration</th>
<th>Image Analysis</th>
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<tr>
<td>View online/offline images</td>
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<tr>
<td>Use analysis tools</td>
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<th>Quality, Safety and Risk Management</th>
<th>Security</th>
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<td>Record all procedures concerning the radiation delivered</td>
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<td>Review LINAC, MLC and imaging system failures/interlocks</td>
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<th>Management, Education and Research</th>
<th>Research</th>
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<tr>
<td>Use search engines and digital libraries</td>
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<tr>
<td>Use data analysis software</td>
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AIM: Assess the level of development and training needs of RTT/TRs regarding digital skills.

Survey divided into 2 parts:

1. professionals’ socio-demographic characteristics (education level, age, gender, work experience, ICT);
2. level of development of RTT/TRs’ skills and identify at what stage these skills are developed.

Materials and methods

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Academic level to practice RT (EQF)

- EQF 4 - Secondary level course: 76.6%
- EQF 5 - Short higher education programme: 7.8%
- EQF 6 - Bachelor's degree: 12.5%
- EQF 7 - Master's degree
- EQF 8 - Doctoral degree

Highest academic level (EQF)

- EQF 4 - Secondary level course: 54.5%
- EQF 5 - Short higher education programme: 18.2%
- EQF 6 - Bachelor's degree: 18.2%
- EQF 7 - Master's degree: 21.2%
- EQF 8 - Doctoral Degree
- Other
2nd phase: Preliminary Results

- Information processing
  - Basic user: 36.5%
  - Independent user: 60.3%
  - Proficient user: 3.2%

- Communication
  - Basic user: 22.2%
  - Independent user: 66.7%
  - Proficient user: 11.1%

- Content creation
  - Basic user: 47.6%
  - Independent user: 34.9%
  - Proficient user: 17.5%

- Safety
  - Basic user: 41.2%
  - Independent user: 31.8%
  - Proficient user: 26.9%

- Problem solving
  - Basic user: 46.0%
  - Independent user: 30.2%
  - Proficient user: 23.8%
2nd phase: Preliminary Results

4D planning Skills - development level

- Set respiratory gating parameters
- Set reconstruction for planning
- Create setup fields
- Add cine images to setup fields

Image analysis skills - development level

- View online/offline images
- Use analysis tools
- Add notes to images
- Select and compare current and previous images
- Change the shift (e.g. NAL correction protocol)
- Edit image status
Digital skills' development - contexts

- Mandatory CPD
- Voluntary CPD
- Informal CPD
  - Basic radiographer education
  - Postgraduate education

80 to 100%
Discussion

✓ Successful implementation of digital technology depends on the healthcare professionals digital skills.

✓ Ensure that RTT/TRs are trained with the necessary skills, to adopt the best practice across Europe.

✓ It is the first study to present a dedicated list of the digital skills of the RTT/TRs.

✓ Closing the digital skills gaps will improve the quality of practice which will result in better patient outcomes.
Discussion

✓ Survey preliminary results:

- Areas of intervention (ICT): content creation and problem-solving skills.
- Undeveloped digital skills in the dimension “Treatment Planning”;

✓ RTT/TRs must have a good level of digital skills, or risk losing autonomy and influence.

✓ This set of digital skills will also allow for the anticipation of future needs, regarding the new technologies (ML, big data and cybersecurity).

✓ Make RTT/TRs co-developers of digital solutions for RT workflow.
Future directions

✓ Focus group interviews design:
  ➢ Based on the European survey
  ➢ Stakeholders: RTT Managers, Lecturers, Vendors representatives, Supervisors, Students

✓ Recommendations and webinars:
  ➢ Sessions based on the gaps identified
  ➢ Ensure that the RTT/TRs are educated with the necessary skills to enable them to practice across Europe

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"You can have the most technologically advanced device in the world, but if you don't know how to operate it, it will be as useful as jumbo-jet without a pilot".


Thank you

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