**ABSTRACT SUBMISSION FORM**

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<table>
<thead>
<tr>
<th>Name (First, last)</th>
<th>Jonathan Wyatt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mailing address (including province/state, country, postal/zip code)</td>
<td>Radiotherapy Physics, Northern Centre for Cancer Care, Newcastle upon Tyne Hospitals NHS Foundation Trust, Freeman Hospital, Freeman Road, Newcastle, NE7 7DN, UK.</td>
</tr>
<tr>
<td>Institution/organization</td>
<td>Northern Centre for Cancer Care, Newcastle upon Tyne Hospitals NHS Foundation Trust</td>
</tr>
<tr>
<td>Position</td>
<td>Clinical Scientist</td>
</tr>
<tr>
<td>Telephone (including country prefix)</td>
<td>+441912138108</td>
</tr>
</tbody>
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**PRESENTATION TITLE**

Investigating the impact of training on delineation variability with two MR sequences for prostate radiotherapy

**AUTHOR(S)**

J Wyatt\(^1\), J Frew\(^1\), A Henry\(^2,3\), L Murray\(^2\), R Pearson\(^1\), E Johnstone\(^2\), R Speight\(^3\), H McCallum\(^1\)

\(^1\)Northern Centre for Cancer Care, Newcastle upon Tyne Hospitals NHS Foundation Trust, UK
\(^2\)Leeds Institute of Cancer and Pathology, University of Leeds, UK
\(^3\)Leeds Cancer Centre, Leeds Teaching Hospitals, UK

**ABSTRACT**

**Purpose:**

MR is increasingly the preferred modality for prostate delineation in radiotherapy due to its superb soft-tissue contrast. However, MR has a wide range of acquisition sequences available and many oncologists are unfamiliar with using MR images for delineation. This study aimed to investigate the impact of oncologists receiving training from an expert radiologist on the variability of prostate delineation for two different MR acquisition sequences.

**Materials & Methods:**

CT (Siemens Sensation Open) and MR (Siemens 1.5 T Magnetom Espree) scans for radiotherapy planning were acquired in the treatment planning position for two cohorts of five patients each. A 3D T2-weighted turbo spin echo sequence (SPACE) and a 2D T2-weighted combined multiple gradient echo sequence (MEDIC) were acquired in the same MR session. The SPACE was acquired with Field Of View (FOV) 45 x 45 x 18 cm\(^3\) and voxel size 1.4 x 1.4 x 1.5 mm\(^3\); the MEDIC with FOV 26 x 26 x 11 cm\(^3\) and voxel size 0.5 x 0.5 x 3.0 mm\(^3\). Four consultant oncologists from two institutions delineated the combined prostate and seminal vesicles volume on each image set independently for the first patient cohort. All delineations were performed using Oncentra MasterPlan (Elekta, Stockholm, Sweden) and the time taken recorded. These delineations were then reviewed by an expert urology radiologist and discussed with the oncologists. Subsequently, the same oncologists will delineate the second patient cohort, utilizing the same acquisition sequences.

The delineation variability was quantified using a generalised conformity index, which is the intersection volume divided by the union volume generalised to be independent of the number of observers [1]. The mean ratio of volumes delineated on each MR sequence to the volumes delineated on CT was calculated.
Results:

The pre-training results are shown in figure 1. The MEDIC sequence gave the highest conformity index for 3 out of the 5 patients delineated, although the differences were small in most cases. Both MR prostate volumes were consistently smaller than the CT. The SPACE-CT volume ratio was the smallest, $0.73 \pm 0.03$ (mean ± s.e.m.) compared to $0.86 \pm 0.03$ for the MEDIC-CT ratio.

![Figure 1](image1.png)

Figure 1 Generalised conformity index for each image and patient. 1 indicates complete overlap, 0 no overlap.

The MEDIC sequence was preferred by all delineators and was the quickest to delineate, taking $10 \pm 1$ minutes (mean ± s.e.m.). The CT and SPACE took similar lengths of time, $13 \pm 1$ minutes and $14 \pm 1$ minutes respectively.

The results post-training will be compared to the pre-training results to assess the impact of radiologist training on delineation variability and efficiency.

Conclusions:

The MEDIC sequence appears the most efficient for radiotherapy prostate delineation and was preferred by all oncologists in this study. Volumes delineated on MR were significantly smaller (> 25% for the SPACE sequence) than those delineated on CT, with the SPACE sequence giving smaller volumes than the MEDIC. The MEDIC-based and CT-based delineations had a similar variability, with the SPACE being more variable, though the differences were small for most patients. The impact of radiologist training on the delineation variability and efficiency for each image type will be assessed.

References