ABSTRACT SUBMISSION FORM
Please email to: info@mriinrt2018.com with ‘abstract’ as the subject

<table>
<thead>
<tr>
<th>Name (First, last)</th>
<th>Christian Gustafsson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mailing address (including province/state, country, postal/zip code)</td>
<td>Klinikgatan 5, 221 85 Lund, Sweden</td>
</tr>
<tr>
<td>Institution/organization</td>
<td>Skåne University Hospital</td>
</tr>
<tr>
<td>Position</td>
<td>Medical Physicist / PhD student</td>
</tr>
<tr>
<td>Telephone (including country prefix)</td>
<td>+46 46 177647</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:christian.k.gustafsson@skane.se">christian.k.gustafsson@skane.se</a></td>
</tr>
</tbody>
</table>

The submission is to be considered in the following category
☐ Oral presentation preferred
☐ Poster presentation only

Trainee status
☐ I am a trainee (student or postdoctoral fellow)
☐ I wish to be a candidate for best student paper/poster

PRESENTATION TITLE
Indication of accurate gold fiducial marker identification in a prostate MRI only radiotherapy workflow using C-Arm X-ray imaging

AUTHOR(S)
C. GUSTAFSSON*1,2, E. PERSSON1,2, A. GUNNLAUGSSON1, and LE. OLSSON1,2

1) Department of Hematology, Oncology and Radiation Physics, Skåne University Hospital, Lund, 221 85, Sweden
2) Department of Translational Medicine, Medical Radiation Physics, Lund University, Malmö, 205 02, Sweden

ABSTRACT
Please type in your abstract up to a MAXIMUM of 500 words. Figures may be included.

Purpose:
Prostate cancer radiotherapy workflows solely based on magnetic resonance imaging (MRI), are now being clinically used. Intra-prostatic gold fiducial markers (GFM), appear as signal voids in MRI-images while calcifications and bleedings show similar signal behavior. Achieving accurate identification of GFM in an MRI-based workflow thereby constitute a major challenge. Several identification methods have been presented but none has reached an accuracy of 100%. C-arm X-ray images (CkV-images), acquired at GFM implantation, could provide GFM position information and be used to indicate correct identification. This would require negligible GFM migration. The aim of this study was to: 1) study the GFM migration 2) show the feasibility of using CkV-images as an indicator of accurate GFM identification.

Materials & Methods:
Frontal digitally reconstructed radiographs (DRR)- and CkV-images were acquired two weeks apart for 31 patients in a CT-based radiotherapy workflow and for 16 patients in an MRI-based radiotherapy workflow. A common image geometry was defined between the DRR- and CkV-image for each patient. For each image, a point cloud was defined from the GFM center of mass coordinates. A rigid registration between the point clouds was performed and the distance between each of the GFM in the DRR- and registered CkV-image was calculated. The distance calculated in the CT-based patient
cohort was considered a measure of GFM migration. A statistical test was performed to assess any difference between the cohorts.

Frontal DRR-image generated from sCT with burned in synthetic markers (a), frontal CkV-image acquired in connection to GFM implantation (b). A common image geometry between the CkV-image and DRR-image was defined using the horizontal distance from left to right over the pubic symphysis (line in a and b). The CkV-image and DRR-image was rigidly co-registered and the distance between each of the GFM was calculated (c).

**Results:**
The mean GFM migration assessed in the CT-based patient cohort was 1.2±0.7 mm. The mean absolute distance difference for the GFM center of mass in the MRI-based cohort was 1.7±1.4 mm. No significant difference between the measured total distances of the two patient cohorts could be detected (p-value = 0.37).

**Conclusions:**
A C-Arm X-ray image acquired from the GFM implantation procedure could be used as an indicator of accurate GFM identification. GFM migration was present but did not constitute a problem for the proposed method.