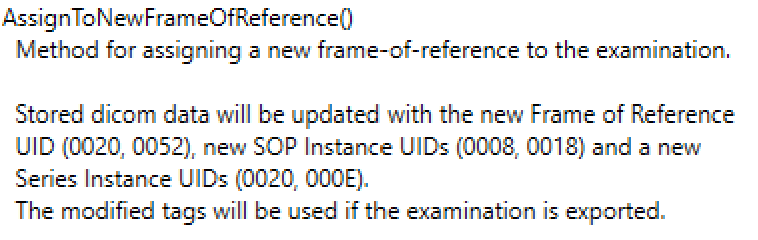
Reviewer Comments:  
Associate Editor (General Comments (Required)):  
  
There are some clinical problems in practicing IGRT and adaptive radiation therapy when it comes to multi-modality image registration in a multi-vendor clinical setting. There are multiple reasons why problems could occur 1) various DICOM standard conformance state of different vendors; 2) insufficient clinical practice modeling in the standard itself because standards are always lag behind new technologies. Authors of this manuscript are trying to solve one of those problems by "hacking" a few DICOM tags. It works for their clinical setting, but may not work for other clinics in different settings. In addition, it was not done in a way to conform to DICOM standards.  
  
Associate Editor (Specific Comments):  
  
1. Some systems allow image registration even image sets are in the same FoR. In other words, changing FoR UID is not even needed.

Thank you for the comments. While it is possible that certain systems allow for registration to be performed between images with the same Frame of Reference (MIM), it is not inclusive with RayStation or Eclipse, which represent the majority of treatment planning systems present in radiation oncology clinics in the United States. While MIM allows this, it is less likely to be available in rural clinics than the aforementioned systems.

2. Authors misunderstood the real meaning of a UID in DICOM world, it presents a unique entity when it is created. It captures an event in the process of diagnosis, planning and delivery. So, basically it is not meant to be modified later.

Thank you again for the comment, although the authors would like to respectfully disagree that this entity is not meant to be changed. In systems where registration is not allowed between images with the same frame of reference, RayStation, the treatment planning system enables specifically changing the Frame of Reference UID on the examination.



This is specifically meant to be changed in the case where registration is required between the examinations, although as you later pointed out, it also changes the SeriesInstanceUIDs and SOP Instance UIDs.

3. It only changed three UIDs (study instance, series instance and FoR), however, SOP instance UIDs were left intact, it could pose problems for some systems.

Thank you for the feedback, we agree that SOP Instance UIDs should be available for change to represent a new DICOM occurrence of the object. This was not initially changed so that previously defined objects (plan, structures, dose files) would lose their association. We have now added an additional check-box to allow the user to change the SOP Instance UIDs if they should so choose, and this will automatically be selected unless otherwise specified (updated Figure 2).



Associate Editor (Minor comments):  
  
It is a short tech note which was written well.  
  
  
Reviewer #1 (General Comments (Required)):  
  
This is a short article, really a technical note, that describes a tool created to allow modification of DICOM datasets to break the frame of reference linkage between two datasets and more easily allow re-registration of image datasets that are not correctly registered. This is a situation that routinely occurs in collections of images that are assumed by the imaging device to be in the same frame of reference as part of a single imaging session, but anatomically are not due to inter-series motion or other issue. I do not believe that there is much science in this manuscript.

Thank you for the comment, we would like to note that this is a technical note, not an article.  
  
While this tool appears to be functional as described, the manuscript could benefit from some additional details:  
1. Three attributes are shown to be modifiable. Why these three; FoR UID is a logical one, but the authors do not indicate why the other two attributes might need to be changed.

Thank you for the comment, we have added further explanation as to why the other attributes may wish to be changed.

“Users may wish to change both the Frame Of Reference UID and Series Instance UID if multiple registrations are required. For example, when registering a PET/CT to a new simulation scan, it can be useful to register both about the nasal cavity and also about the neck region. Two rigid registrations are sometimes not possible (within RayStation), and so having two distinct image sets which each has a unique registration can be advantageous.”

2. The software appears to break some DICOM rules such as the requirements for creation of new UIDs (no details are given), and the existence of two images with the same Instance UID but different content. Some information on the content of the new UIDs created and if they preserve the uniqueness requirement (or not) is needed.

Thank you for the comment, we apologize that the statement regarding the creation of new UIDs was not made more clear. The new UIDs generated are created using the FellowOak DICOM generator. <https://github.com/fo-dicom/fo-dicom>

This has been elaborated on within the text, and associated text underlined.  
  
“New DICOM UIDs are generated using the FellowOak4 C# package.”

“All DICOM manipulation was facilitated with the FellowOak DICOM package4 and SimpleITK5”

3. There are numerous tools available, including MIM software, that are able to achieve the goal of this manuscript. I do agree that using MIM is not as straightforward as the tool described.

Thank you for the comment. We agree that tools are available, but not for free and not often straightforward to use.

4. At least some TPS systems would not accept a modified set of images with the same SOP Instance UIDs as existing ones. This would be a problem if image datasets are exported from a TPS, modified by the tool, and then re-import into the TPS is attempted.

Thank you for the comment, we agree and have included the ability to edit SOP Instance UIDs.

Note: Both RayStation and MIM are trademarks that need to be referenced. The authors should indicate the versions of those products used in their testing. Also, in this era of CyberSecurity, some discussion of processes used to validate the integrity of the tool would be an appropriate part of the discussion.

Thank you for the comment, we have updated the manuscript to include versions tested in our use cases.

Reviewer #1 (Specific Comments):  
  
line 15: The full URL is really not appropriate in the abstract. The authors should just indicate that publicly available datasets were used. A reference at the bottom of the abstract or just referenced in the body of the manuscript is more appropriate

Thank you for the comment, we have removed the URL from the abstract.  
  
Reviewer #2 (General Comments (Required)):  
  
The overall approach is good, as indeed it would require quite some knowledge and expertise to perform these changes manually. Therefore, such a tool is very helpful to avoid errors.  
  
Still though, the basic assumption is not fully correct from a DICOM Standard perspective as the proposed changes may be performed, but are actually not required as the article implies.  
And also the conclusion how to implement the solution is not correct from a DICOM Standard perspective.  
  
Reviewer #2 (Specific Comments):  
  
1. The basic assumption that if multiple image series share the same Frame of Reference would mean that an additional/manual registration is not possible and that the inherent registration needs to be broken is not fully correct. It can be done, but there is no need. The Spatial Registration allows to not only include the Frame of Reference, but also the referenced images. This way, a Frame of Reference can be registered to itself, by specifying the corresponding set of SOP Instance UIDs of the corresponding Series. Whereas the IHE-RO Multi-Modality Registration profile does explicitly not include this use case, it states that creating a new Frame of Reference may be done. But by explicitly including the Frame of Reference AND the image references in the actor's DICOM definition, creating a new Frame of Reference is just one option, but not the only one.

Thank you for the comment, you are certainly correct, but the steps described for this process are generally above the technical abilities of most purely clinical physicists.

2. The actual implementation of the solution has a flaw, that it only adapts the Frame of Reference UID, the Study Instance UID, and the Series Instance UID. But it is required to assign a new SOP Instance UID to adapted Instances. This is based on the definition in the DICOM Standard Part 5, Section 9 Unique Identifiers:  
  
"Unique Identifiers (UIDs) provide the capability to uniquely identify a wide variety of items. They guarantee uniqueness across multiple countries, sites, vendors and equipment. Different classes of objects, instance of objects and information entities can be distinguished from one another across the DICOM universe of discourse irrespective of any semantic context."  
  
This states that a SOP Instance shall be uniquely identifiable. By changing the Frame of Reference and keeping the original SOP Instance UID this capability is lost. In some cases such changes are allowed (e.g. coercion), but in this case it may even introduce a hazardous situation to the patient as the Frame of Reference includes a coordinate system definition and it is now unclear with two SOP Instances having the same SOP Instance UID which Frame of Reference is now the valid one. Especially in the area of radiotherapy this may have dangerous implications when it comes to targeting and positioning.  
Another aspect is that a SOP Instance UID is unique and this means with respect to its Series and the Series is unique with respect to its Study. Therefore, a change of the Study Instance UID and/or Series Instance UID also implies the change of the SOP Instance UID.  
From a pure practical perspective as experienced over 20 years at IHE-RO Connectathons, there are quite some systems available, that actually cannot deal with the fact that a SOP Instance UID is present in two different Series (as it is not intended). Therefore, this solution also has very practical interoperability issues.  
  
It is therefore recommended to the authors, to also adapt the SOP Instance UIDs to reflect the semantic change in the Instances. For the software it could basically mean, whatever is selected from top down under "Things you want to change", the check-boxes below need to be automatically selected, too, and the SOP Instance UID is not a to-be-selected option, as this always has to be changed whenever one of the options is selected.

Thank you very much for the recommendation, this has been implemented in that whenever one option is selected, the SOP Instance UID change box is auto-selected and must be de-selected.

This change is reflected in the updated Figure 2