Potential Krippendorff’s At 30 The Patients Daily Krippendorff’s Three Image CARO 2016

**Background**
- Breast boost following whole breast radiotherapy (RT) in breast-conserving therapy can reduce local recurrence.
- At our institution, breast boosts are delivered with 1000 cGy over 5 fractions using a conformal, photon field technique (Figure 1).
- Daily cone beam computed tomography (CBCT) is used for image guidance.
- At time of this study, the IGRT registration protocol at our institution was manual match to the breast contour and ipsilateral lung interface.

The aim of this study is to identify appropriate and reliable surrogates to optimize cone beam computed tomography (CBCT) image registration for breast boost patients to reduce inter-observer variability.

**Results**
- Thirty breast boost patients, 10 in each cavity visualization category, were included for analysis. 150 CBCT images were analyzed by each observer.
  - Chestwall/breast registration median RMS error was 0.1989 between observers. Direct cavity registration median RMS error was 0.1784.
  - Limited variability between manual registration methods was observed (Figure 2). The largest variation was noted in the Sup/Inf axis.
  - Krippendorff’s alpha for cavity scores was calculated between observers (Figure 3).
    - The highest agreement/alpha was observed in the Left/Right axis and cavity Group 1.
    - The lowest agreement/alpha was observed in the Ant/Post axis and cavity Group 3.

**Materials & Methods**
**Patients:**
- 30 patients that completed breast boost RT between Oct - Dec 2014.
- Patients categorized into 3 groups based on their cavity visibility on CT:
  - **Group 1** No visible cavity or indistinct margins
  - **Group 2** Moderately visible cavity with some distinct margins
  - **Group 3** Highly visible cavity or mostly distinct margins

**Data Collection:**
- Three independent therapists *manually* registered CBCTs via 2 methods:
  - **Manual Method 1:** Registration to breast & lung interface (yellow)
  - **Manual Method 2:** Registration to seroma cavity (red)
  - Krippendorff’s alpha was used to assess agreement between the 2 methods.
  - Root mean square (RMS) was calculated to assess the difference between observers.
  - *Automatic* image registration on the ipsilateral breast/chest wall and lung interface was also performed for all patients’ treatment fractions.

**Automatic Registration** to breast & lung interface via shaped region of interest (yellow breast contour + 5 mm red mask)

**Conclusions**
- Image registration to the ipsilateral breast/chest wall and lung interface for breast boost RT was more consistent than direct registration to the cavity, resulting in the least amount of inter-observer variability for breast boost IGRT.
- Direct registration to the breast cavity is limited by visibility on CBCT images.
- Automatic registration using a shaped region of interest reduces inter-observer variability and is recommended.