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## Purpose

The purpose of this study was to establish clinical treatment site specific Conformity Index criteria for four different types of pelvic volumetric modulated arc therapy (VMAT) treatments.

## Materials and methods

A retrospective database analysis was performed in our clinic to find curative VMAT treatments for patients that were treated between 2012-05-31 and 2017-12-31.

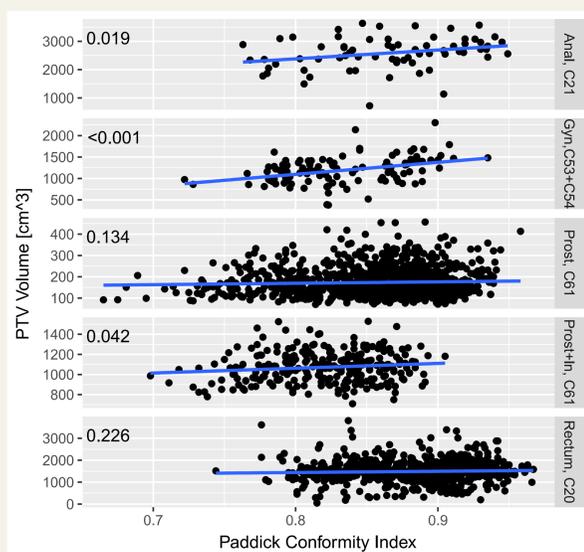
ICD code toggles used in the database analysis were C20, C21, C53/C54 and C61 corresponding to malignant neoplasm of rectum, anal canal, cervix/corpus uteri and prostate, respectively. Prostate plans was separated into prostate only or prostate + lymph nodes. Prostate only and rectum plans were considered simple and other plans were considered complex as lymph nodes are included in their target volume.

Using an in-house developed script (Eclipse scripting API, v13.6, Varian Medical Systems) approved treatment plans and dose distributions were retrieved and the Paddick Conformity Index (PCI) was calculated according to:

## Results

In total 2235 VMAT treatment plans were analyzed. The global mean PCI was 0.86 for all plans for the years analyzed. Looking on all diagnoses the average PCI per year were 0.87, 0.82, 0.83, 0.85, 0.87 and 0.89 for 2012 to 2017, indicating a yearly PCI increase of 0.02 (Fig. 1). With exception from the first year due to mostly simple circular target volumes (22/28 plans). Separating out treatment plans to simple spherical/circular targets (prostate only plus rectal vs others) over the last two years we found mean PCI = 0.89 for prostate only and rectal treatments. For other more complex treatment the mean PCI was 0.86. Looking at the correlation between PCI and target volume a significant ( $p < 0.05$ ) increase for the slope was found for the complex plans but not the simple plans (Fig. 2).

**Figure 2.** Paddick conformity index for all treatment plans, separated on diagnosis. Values indicate p-values for the slope from a linear model. Blue line indicates the linear fit. Note the different y-scales for the different diagnoses.



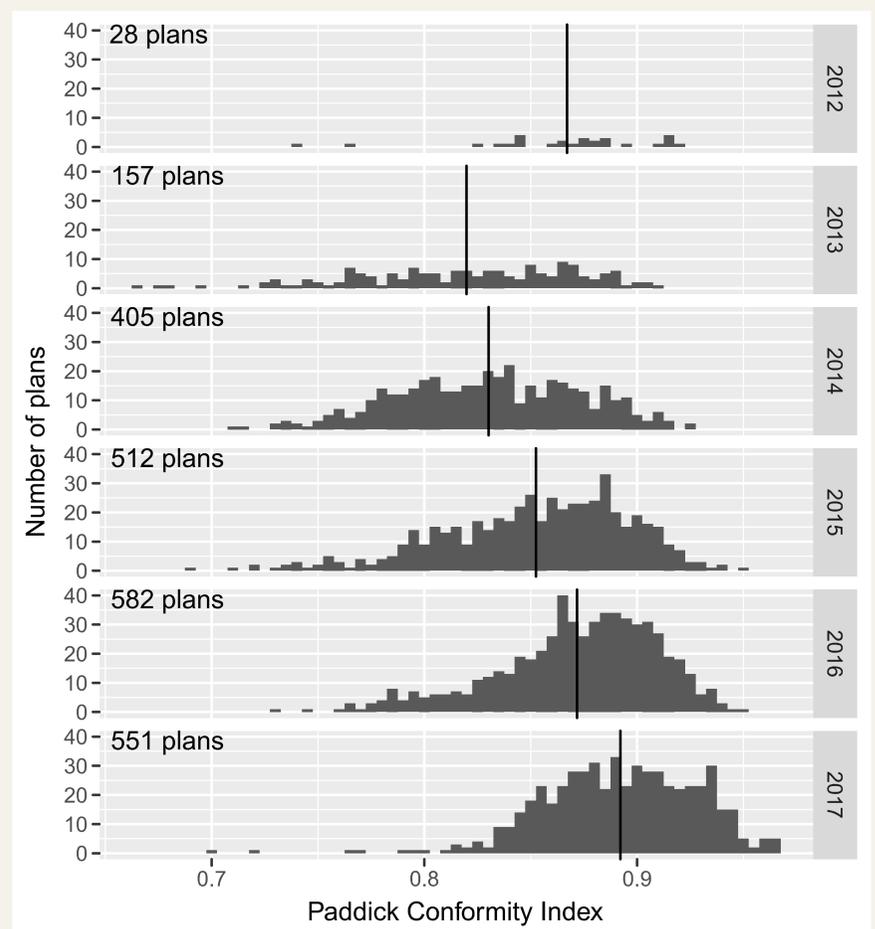
## Conclusions

Evaluating the clinical specific PCI, we decided on a guiding value of 0.92 for rectum and prostate only patients and 0.90 for other, more complex pelvic treatments.

A simple script has been implemented in our clinical workflow for guidance during the treatment planning process. The treatment planner can quickly evaluate the conformity of their treatment plan and compare it to the set guiding value of PCI.

$$PCI = \frac{TV_{PIV}^2}{TV \cdot PIV}$$

where  $TV_{PIV}$  was the target volume covered by the prescription isodose,  $TV$  the target volume and  $PIV$  the prescription isodose volume. In cases of treatments with different dose levels, the lowest level was analyzed with its corresponding target volume. The PCI was evaluated for each year. We established clinical guiding values for use in the daily clinical workflow at our clinic for simple/complex target. Additionally we evaluated if there was a significant correlation ( $p < 0.05$ ) between PCI and the target volume using a linear model.



**Figure 1.** Paddick Conformity Index for all evaluated treatment plans, separated on year. Solid lines indicates mean PCI for the corresponding year.