

# Using Radiomics to Study Statin Use and Omega-3 Use in Prostate Cancer Patients



D Zheng1\*, Y Shi2, E Wahle1, L Krajewski1, X Liang3, Q Du2, C Zhang2, S Zhou1, M Baine1

- 1 University of Nebraska Medical Center, Omaha, NE
- 2 University of Nebraska Lincoln, Lincoln, NE
- 3 University of Florida, Jacksonville, FL

## **INTRODUCTION**

Prostate cancer is the second most common cancer among males. It was estimated in the United States that 1 in 7 men will be diagnosed with prostate cancer at some point in their lifetimes<sup>1</sup>. There have been known links between prostate cancer and the use of statins (a common heart medication) and omega-3 fatty acids (fish oil supplements)<sup>2</sup>. The observed associations are complex and controversial, drawing active research for further elucidation. We therefore explore the novel application of using radiomics, a new field of medicine that involves extracting large amounts of quantitative data from medical images such as CT scans or MRIs.

## **AIM**

To analyze the association of radiomics pattern and statin and omega-3 use in prostate cancer patients.

# **METHOD**

A panel of 944 radiomics features were analyzed on 95 male patients with prostate cancer.

#### **Clinical Information**

 Patient diagnosis details and use of statins or omega-3 supplements were collected

#### **Imaging and Contouring**

- High resolution T2-weighted MRI scan was used for radiomics analysis
- The prostate gland and the peripheral region of the prostate were contoured (Example contours shown for two patients in Figure 1)

### **Radiomic Feature extraction**

- All images were normalized to be compatible for analysis
- A total of 944 radiomic features were extracted for each contour using 3D-Slicer

#### **Data Analysis**

- Heatmaps were generated to display correlations of omega-3 use and statin use with the radiomic features
- Machine learning models were developed using a sequential floating forward method (SFF) for feature selection with 1000 round resampling and a gradient boost machine (GBM) for optimization
- The machine learning model was trained and then tested for its ability to predict the use of statins or omega-3s using 3-fold cross-validation with 500 round resampling
- Final results of the models' predictability were measured as average ROC-AUC and average precision-recall AUC for the prostate gland and peripheral region for both statin use and omega-3 use

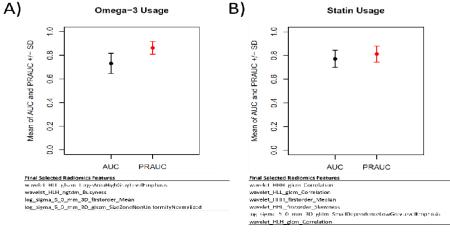
## **CONCLUSIONS**

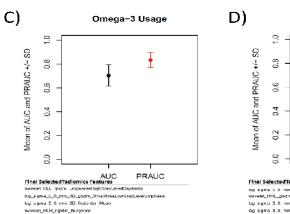
As the first study to analyze the radiomic feature pattern in relation to statin and omega-3 drug uses in prostate cancer patients, our study illustrated the potential usefulness of the radiomics tool for further exploring these drugs' effects and mechanisms in prostate cancer.

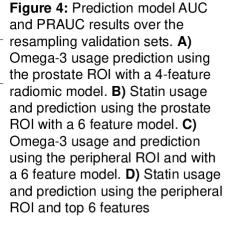
## **RESULTS**

- Heatmaps were generated to show the association between the use of statins or Omega-3s and the radiomic feature pattern, based on the prostate ROI (Figure 2) and the peripheral ROI (Figure 3).
   This offers a holistic and visual representation of the correlations within our dataset.
- For Omega-3 use prediction, a 6-feature radiomics model based on the prostate ROI achieved an average AUC of 0.772 (SD: 0.073) and a 6-feature radiomics model based on the peripheral ROI achieved an average AUC of 0.554 (SD: 0.091). (Figure 4 A & C)
- For statin use prediction, a 4-feature radiomics model based on the prostate ROI achieved an average AUC of 0.731 (SD: 0.085) and a 4-feature radiomics model based on the peripheral ROI achieved an average AUC of 0.704 (SD: 0.090). (Figure 4 B & D)

Statin Usage







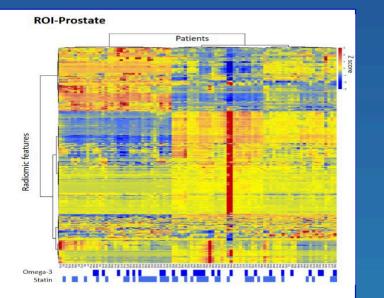
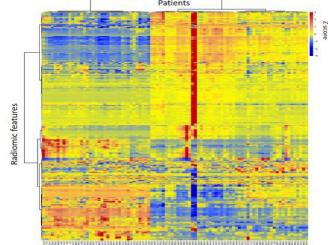


Figure 2: Heatmap that displays radiomic feature correlations between stain and omega-3 use of the prostate gland region of interest

ROI-Peripheral Zone



**Figure 3:** Heatmap that displays radiomic feature correlations between stain and omega-3 use of the peripheral region of interest

## **METHODS**





Figure 1: Example contours on two patients from our dataset. Prostate ROI in blue and peripheral ROI in red.

## **REFERENCES**

- 1 Siegel et al. "Cancer statistics, 2020", CA, 2020
   2 Rompay et al. "Prostate cancer incidence and mortality among men using statins and non-statin lipid-lowering medications", European Journal of Cancer, 2018
- 3 Gevariya et al. "Omega-3 fatty acids decrease prostate cancer progression associated with an anti-tumor immune response in eugonadal and castrated mice", the Prostate, 2018

## **CONTACT INFORMATION**

Dandan Zheng: dandan.zheng@unmc.edu