Head and neck cancer treatment-related dysphagia (HNCTD) is one of the most important complications among HNC patients, which has been the focus of recent therapeutic efforts to evaluate the oncologic safety of various treatment de-intensification strategies.

Three cohorts of irradiated head and neck cancer (HNC) patients were identified using an unsupervised cluster analysis of the total scores for Sydney Swallow Questionnaire (SSQ) and the MD Anderson Dysphagia Inventory (MDADI) [1], in a pilot study using 89 patients.

In a subsequent validation study, alcohol intake was significant different across three groups, measured by Functional Assessment of Cancer Therapy-Head and Neck (FACT-HN) scale, before radiation therapy (RT) among 269 HNC patients (Table 1).

We hypothesized that baseline alcohol intake has causal relationship with swallowing function among HNC patients after RT. Moderate drinking may improve swallowing function.

Materials/Methods (Cont'd)

- For each particular individual, one can generally observe only one, but not both, of the two potential outcomes. The unobserved outcome is called the “counterfactual” outcome.
- Assume that the people in the treatment group on average are identical to the people in the control group with respect to their potential outcomes.
- Average causal effect (ACE) as the population average of the individual level causal effects
- Assume no unmeasured confounders.
  - Causal assumption visualization: Causal Directed acyclic graphs (DAG): visual representations of causal assumptions for baseline alcohol intake, baseline confounders and swallowing function outcomes.
  - Estimate ACE:
    - Parametric g-formula;
    - Inverse Probability Weight (IPW);
    - Augmented Inverse Probability Weight (AIPW);
    - 95% CI of the ACE estimation was extracted by a bootstrap process from their empirical distributions.

Results

- Study population: HNC patients treated in 12/2015 – 01/2017 with definitive radiation therapy.
- Cluster identification: Unsupervised cluster analysis (k-mean) using the elbow criterion and CLUSPLOT analysis was performed to identify unique patient cohorts in this validation study.
- Characteristics comparison: baseline patients characteristics were compared across three clusters using ANOVA test (continuous variable) or Chi2 test (categorical variable).
- Causal inference analysis:
  - Potential outcomes and Average Causal Effect (ACE):