

Representation of High-Level Radiation Oncology Treatment Events from CPT Codes

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Background

To address the challenge characterized in the OHDSI Oncology CDM Extension proposal as “Oncology treatments often create a clinical event welter that thwarts many analytic use cases”¹, there is an ongoing development in aggregation of the lower-level clinical patient events such as conditions, procedures, and drug treatments into higher-level events called episodes. In the OMOP CDM, these higher-level events are stored in the EPISODE table. As an example, for a Radiation Oncology treatment that is comprised of 72 lower-level clinical patient events/entries in the PROCEDURE_OCCURRENCE table across 11 CPT codes, aggregation to a higher-level event will result in one record of Beam IMRT in the EPISODE table covering a duration of 27 days. Additional critical attributes of this treatment episode, such as organ (e.g. left breast), radiation fractions (e.g. 15 Fractions), and radiation dose (e.g. 267 cGy Dose) can be represented in the MEASUREMENT table and explicitly connected to the record in the EPISODE table as episode modifiers.

These higher-level events address several major use cases such as, aggregating the data to a level that's most intuitive to an oncology professional, more amenable to analytics, and predicting variables of interest (e.g disease progression, disease free, overall survival). The extended EPISODE table is intended to hold aggregated disease and treatment episodes. One of the cancer treatment sub-domains that will be aggregated to a higher-level relationship is Radiation Oncology treatment.

This report covers the assessment of aggregating Radiation Oncology treatment data from the lower-level Radiation Oncology treatment CPT billing codes to higher-level concepts that represent a Radiation Oncology treatment event in the EPISODE table. The focus was on CPT codes because that may be the only structured source available in the data.

Methods

The approach taken to do the assessment of aggregating lower-level Radiation Oncology treatment CPT billing codes to a higher-level relationship to represent a Radiation Oncology treatment in the EPISODES table is as follows:

- 1) To curate the value set comprised of CPT billing codes designated for Radiation Oncology treatment, we queried the OMOP Vocabulary CONCEPT table limited to CPT codes 77261 through 77799 and additional CPT codes that were part of the artifacts we obtained in step 2 below.
- 2) We then compiled any past work that was shared with OHDSI done on modalities and techniques annotations of higher-level treatment classifications to the lower-level CPT codes. For example, CPT codes 77520 – 77525 for proton beam radiation treatment delivery were annotated with Proton external beam radiotherapy. The following sources were used: 1) Cancer Research Network's (CRN)², 2) The American Society for Radiation Oncology (ASTRO)³, and 3) Observational Research in Oncology Toolbox (OROT)⁴ from Surveillance, epidemiology, and end results program (SEER).
- 3) Next, we identified an approach to use in assessing the coverage of higher-level treatment events in a recent consensus paper published by ASTRO on the minimum standard data elements for

entering a Radiation Oncology treatment⁵.

- 4) Finally, we assessed the CPT code procedure descriptions along with the assignments of higher-level treatment classifications we compiled in step 2 against the modality and technique defined by ASTRO in step 3 to determine the extent of coverage from the CPT codes of the modality and/or technique for recording an episode of Radiation Oncology treatment.

Results

Based on the annotations to the CPT billing codes that were used to assess CPT's coverage of the recommended level of data capture of the modalities and techniques by ASTRO⁵, there were 3 major paradigms described below. Refer to figure 1 for specific examples of each. 1) There was one or more CPT codes that corresponded to a recommended modality and/or technique, 2) The level of granularity of the CPT codes did not correspond to a recommended modality and/or technique, or 3) No corresponding CPT code to a recommended modality and/or technique.

There was incomplete coverage but the impact of not having better completeness is inconclusive. Overall, the results show that CPT Radiation Oncology treatment can be used for a subset of modalities and techniques defined in ASTRO in a high-level Radiation oncology treatment event.

When there is a different level of granularity or no CPT code with the recommended level of detail for the modalities and/or techniques, we will need to have less detailed representation of the high-level event. For example, when there is CPT code annotated as external beam radiotherapy, the high-level event will capture only the highest-level modality.

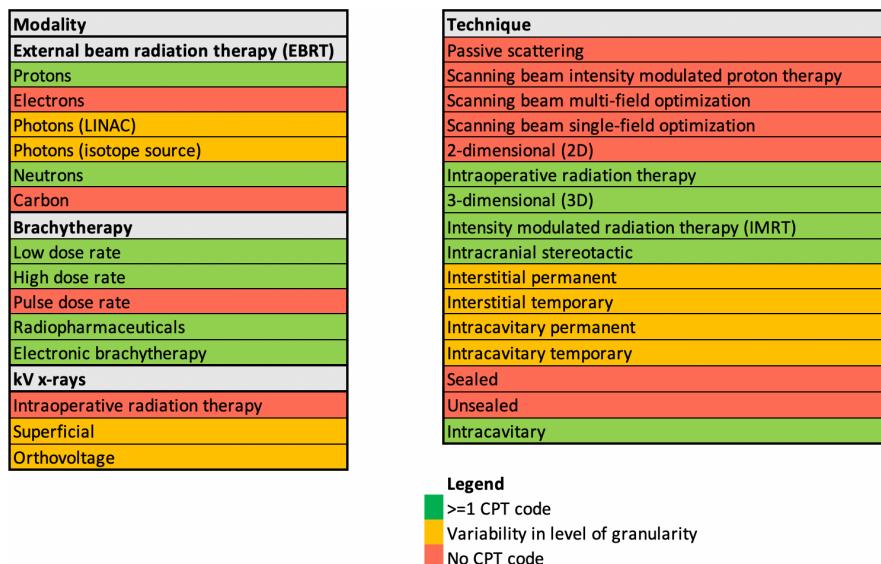


Figure 1. CPT's coverage of the recommended level of data capture of the modalities and techniques by ASTRO. In green, >=1 CPT code correspond. For example, code 77525, Proton treatment delivery; complex is annotated as modality – Proton treatment delivery and corresponds with one of the modalities in the figure. In orange are the modalities and/or techniques that did not correspond to the level of granularity. For example, code 77401, Radiation treatment delivery, superficial and/or ortho voltage, per day is annotated as modality - Radiation treatment delivery, superficial and/or orthovoltage and would not correspond to the level of granularity in the ASTRO

artifact. In red, no CPT code is annotated that corresponds. For example, no CPT code indicated radiation treatment delivery using Carbon modality.

Conclusion

The work depicted in this report is still in progress. Additional areas include determining an approach to handling the paradigms where there is a variability in granularity or missingness of codes that can inform the modality and/or technique. A second area of the assessment would include use of source data to determine true coverage based on multiple CPT billing codes of one or more modalities and techniques being processed during a specific timeframe for a treatment and how use of the codes together can inform the complete picture of a higher-level episode. And third, there will need to be a script/algorithm that will aggregate the lower-level codes to generate a higher-level episode.

References/Citations

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