Computed Tomography Database for Radiation Risk Assessment (“CT Register”)

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Introduction
Mayak PA – Russian first nuclear cycle factory for Plutonium production
Mayak Worker Cohort (MWC)- workers are exposed to external gamma- and incorporated plutonium (Pu-239)
Ozyorsk Population – people living in the surrounding area
Computed Tomography – a new source of man-made radiation exposure for both Ozyorsk population and Mayak workers since 1990-s

Methods
Retrospective cohort study started in 1993 when first CT-scanners appeared in the Southern Ural
Data collected from 5 hospitals located in the Southern Urals including Ozyorsk clinical hospital No.71
Cohort: Ozyorsk residents who were born between 1916-2015 yrs. and exposed to diagnostic CT have been analyzed
Follow-up period through the end of 2018
Medical and dosimetric information collected from archives of CT departments
Data from MWC have been linked to the analysis
Cancer incidence used for the analyses since exposure to ionizing radiation is a factor of cancerogenic risk. The data from local Cancer Register has been linked to the study.
Predisposed cases accounted (e.g., pre-cancer conditions found before the 1st CT examination)

Vital status has been updated for 65.3% of cohort (as of December 31, 2018)
Cause of death established for 86.1% of cohort members
Person-time (T) calculated from 1st CT to the date of exit: cancer diagnosis, death, end of 2018 or lost to follow-up
Regression model for cancer incidence in terms of age, sex, cancer diagnosis, death, end of 2018 or lost to follow-up
Cohort: Ozyorsk residents who were born between 1916-2015 yrs. and exposed to diagnostic CT have been analyzed
Follow-up period through the end of 2018
Cohort distribution by area exposed to CT

Results
Cohort of 16,653 exposed to CT (26,626 observations)
Proportion of Mayak workers is 25 % (29.8% of those worked with Pu-239 and have individual doses)
Mean Effective Dose for single CT 3.8 mSv (min 0.1-max 50.2); for Mayak workers 4.0 mSv (min 0.2-max 50.2)
Total Cancer cases to the end of follow-up 2,333 (14.0%)
Cancer cases among workers exposed to CT: 33.6%
Cancer diagnosed on or before CT (67.6%) as well as pre-cancer cases (24.7%) have been excluded from the analysis
% Deaths 30.2% (cancer deaths 40.4%) % Alive 50.5%
% Lost 19.4% Mean survival time: T = 1527 days (9-9866)

Discussion
Limitations: Organ absorbed dose not calculated (ED estimate as referral).
Different scanner types used in hospitals (both single and multispiral).
CT outside SU not accounted. Short follow-up period for severely ill persons
Advantages: Detailed information on vital status, cancer incidence and cause of death of Ozyorsk population.
Single CT dose and cumulative dose data available. Long-term follow-up.

Conclusions
A “CT Register” database (CTDB) is a unique source of information for the prospective epidemiological study of low dose health effects.
The information from “CT Register” database can be used for the radiation risk analysis to improve the radiation safety standards for nuclear workers and population exposed to low dose of diagnostic radiation.