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## Increased radiation dose and radiation related lifetime - Cancer risk in obese populations due to Projection Radiography

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**Purpose:** Primarily to evaluate the radiation dose delivered to patients with obesity in projection radiography and its relationship to the patient's size. A secondary purpose is to estimate the subsequent projected radiation-related lifetime cancer risk to patients with obesity compared to normal-weight patients.

**Method and material:** Data from 1964 patients from a bariatric clinic in the United Kingdom were reviewed with the relevant permission. 630 patients were identified to have a projection radiography history and were included in the study. Patients' dose area product (DAP) data were collected for all projection radiography. Multiple exams in one day including a single DAP reading and exams with no records of DAP and exposure factors were excluded. Correlations were calculated and data analysed to yield the third quartile for each examination using STATA 14. Absorbed doses were generated from PCXMC simulation, utilising DAP data from this study and the United Kingdom national diagnostic reference level (NDRL), to calculate the effective risk for patients with obesity compared to patients

with normal-weight.

**Results:** Patients with obesity received higher DAPs for all examinations included in this study compared to NDRL. Abdominal and lumbar spine radiographs DAPs were the highest (17.6 and 30.31 Gy cm<sup>2</sup>) compared to the NDRL (2.5 and 4 Gy cm<sup>2</sup>). Only moderate to low correlations were found between patient's size and DAPs in the abdomen and chest radiographs. The projected radiation-related lifetime cancer risk for patients with obesity is up to 153% higher than for adult patients with normal weight.

**Conclusion:** Patients with obesity receive higher DAPs than normal-weight adults which may be in excess of that expected due to their size. Therefore, radiation-related lifetime cancer risk is increased in patients with obesity as a result of medical radiation exposures. This indicates more dose optimisation research is needed in this group of patients to reduce dose rate and variation.

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