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NEWS

Radiology Weather Forecast: Prediction of Average Versus Above Average Polytrauma-CT Occurrence Based on Weather Data

PURPOSE

To investigate the association between fluctuations in Polytrauma-CT frequency and weather changes to forecast the Polytrauma-CT occurrence. Due to the unpredictability of polytrauma examinations, any approach for estimation would improve resource planning in the emergency room and radiology.

METHODS AND MATERIALS

We retrieved all Polytrauma-CTs between 1.1.2011 and 31.12.2020 (n=4613) from the radiological information system. Daily local weather data was downloaded from meteoblue.com. The maximum number of Polytrauma-CTs per day increased from 4 in 2011 to 11 in 2020. All data were normalized to account for the increase of the maximum number of Polytrauma-CTs per day (2011: 4 to 2020: 11) and meteorological weather changes. Normalization was performed by subtraction of mean and division by the difference between maximum and mean of the corresponding year. Data was smoothened using the moving average of the preceding 15 days. Above normal number of daily Polytrauma-CTs was defined as above median. A logistic regression analysis was employed as prediction model.

RESULTS

Significant more Polytrauma-CTs were acquired in winter compared to summer months, emphasizing a seasonal change in Polytrauma-CTs (normalized median 0.003; -IQR 0.16-0.14 vs. normalized median 0.03; IQR -0.11-0.20; $p< 0.0001$). There were significantly less Polytrauma-CTs in the lower temperature quartile compared to the upper temperature quartile (normalized median -0.03; IQR -0.16-0.10 vs. normalized median 0.05; IQR - 0.11-0.2; $p< 0.0001$). The median temperature in case of a Polytrauma-CT was above 14.6 °C (IQR: 7.4 to 20.3 °C) ($p = 0.04$) the median temperature from 2011 to 2021 was 13.0 °C (IQR: 6.6 to 19.1 °C). Temperature ($r=0.39$), sunshine duration ($r=0.34$) and ultra-violet amount ($r=0.35$) correlated positively, wind velocity ($r=-0.39$) and clouds ($r=-0.22$) negatively with Polytrauma-CT occurrence (correlations were significant $p<0.001$). The prediction model for identification of days with above normal number of Polytrauma-CTs achieved a diagnostic performance of 0.74 area under the curve ($p < 0.0001$) with a specificity of 71% and a sensitivity of 68%.

CONCLUSIONS

It is possible to partially forecast normal or above normal daily number of Polytrauma-CTs on the basis of weather data. This may improve resource planning.

CLINICAL RELEVANCE/APPLICATIONS

Resource planning is major topic in radiology departments. Emergency examinations are a highly variable but important factors regarding the workload. Employing our forecast model identification of seasons with higher workload regarding Polytrauma-CTs is feasible.