Introduction:
Severe trauma should be treated immediately. Whole-body CT (WBCT) is widely accepted to improve the accuracy of detecting injuries. However, it remains the problem of time-consuming. Therefore, we focused on the scout image taken in advance of WBCT. Detecting major traumatic injuries from a single scout image would reduce the time to start treatment. A previous study suggested that even specialists could not easily find chest and pelvic injuries using WBCT scout image alone. In this study, we aimed to develop and validate deep neural network (DNN) models detecting pneumo/hemothorax and pelvic fracture from WBCT scouts.

Methods:
We retrospectively collected 2088 anonymous WBCT scouts together with their clinical reports at the Osaka General Medical Center between January 1, 2013, and December 31, 2017. We excluded incomplete, younger than 7 years old, postoperative, and poorly depicted images. The part of this dataset from January 1, 2017, until December 31, 2017, was used for validation and the rest for training DNN models. Pneumo/hemothorax detection model and pelvic fracture detection model were trained respectively. Accuracy, and Areas under the receiver operating characteristic curves (AUCs) were used to assess the models.

Results:
The training dataset for pneumo/hemothorax contained 984 images (mean age 48 years; 30% female patients), and for pelvic fracture consisted of 783 images (48 years; 28%). The validation dataset for the former contained 258 images (54 years; 30%), and for the latter consisted of 186 images (55 years; 24%). The models achieved 59% accuracy and an AUC of 0.57 for detecting pneumo/hemothorax, 72% and 0.62 for pelvic fracture.

Conclusion:
Our results show that DNN models can potentially identify pneumo/hemothorax and pelvic fracture from WBCT scouts. Increasing the number of samples, DNN model could accurately detect severe trauma injuries using WBCT scout image.