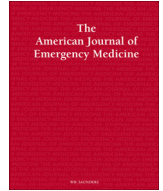




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## Higher frequency of new chest tumor diagnoses in emergency department due to the COVID-19 pandemic

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### 1. Introduction

The COVID-19 pandemic has been a severe burden to the healthcare system worldwide, with described complications in the diagnostics of oncological diseases. Due to lockdowns, telemedicine services, and devoting a significant proportion of medical staff to fight COVID-19, access to oncological services is limited with consequent delays in diagnosis [1]. We have observed that changes made to the emergency department (ED) routine diagnostic work-up due to the pandemic has resulted in increased efficacy of the ED in the diagnosis of chest tumors. The process of assessment of patients suspected of being infected with COVID-19 increases the usage of high-resolution computerized tomography (CT HR) scans. Using the COVID-19 Reporting and Data System (CO-RADS) score, we rapidly can assess changes in patients' lungs before obtaining the reverse transcription polymerase chain reaction (RT-PCR) test results. Pulmonary manifestations of COVID-19 on CT (CO-RADS  $\geq 3$ ) were reported to be seen in 67% of the patients with a symptom duration of less than 48 h and in 95% of the patients with a symptom duration of more than 48 h [2]. Before the COVID-19 pandemic, patients with respiratory tract symptoms were routinely diagnosed using chest X-rays, with high-resolution CT (HR CT) scans of the chest being the next diagnostic step performed in cases of diagnostic uncertainty. During the pandemic such patients underwent HR CT (with no contrast enhancement) of the chest first, to exclude or confirm radiological features of SARS-COV-2 pneumonia. Indications for performing HR CT during pandemic were presence of cough and/or dyspnea.

The aim of our research was to determine whether increased amount of CT HR performed during the pandemic at our ED contributed to more frequent detection of chest tumors. We followed the history of the patients to verify whether an ED diagnosis of a pulmonary tumor was effective in terms of further diagnostic and therapeutic work-up.

The study was performed in an ED of a tertiary university hospital, with 1100 beds, 120,000 hospitalizations per year and approximately 30,000 ED visits annually. The ED is one of four localized in an urban

area inhabited by 1,000,000 citizens. The hospital was not a center dedicated specifically for COVID-19 patients.

We have compared periods from March 15, 2020 (the date when COVID-19-related procedures were established at the hospital) to November 30, 2020, and from March 15, 2019, to November 30, 2019. We have used hospital informatic system (Clininet®, CompuGroup Medical, Lublin, Poland) to calculate number of chest CTs performed at ED during the analyzed periods. Then, using contextual-searching software (MedStreamDesigner®, Transition Technologies-Science, Warsaw, Poland) we have reviewed patients' ED charts to find cases with presence of following phrases: "chest tumor", "lung tumor", "lung cancer". Medical records of found cases were carefully reviewed and all patients with chest tumor diagnosed prior to ED visits were excluded and in remaining cases it was ascertained that the diagnosis of the tumor was made in ED. The tumors were diagnosed upon radiological description. All de novo diagnosed patients were directed to oncological out-patient department that allowed follow-up of the patients.

The continuous variables were compared using *t*-tests, while discrete data were compared using chi-square tests. The protocol of the study was accepted by local Bioethical Committee of the Medical University of Gdansk.

In total, 29,140 and 24,323 patients were admitted to the ED in the analyzed periods of 2019 and 2020, respectively. HR CT scans of the chest were performed 2447 cases (10.1% of ED patients) in 2020 versus 780 cases (2.7% of ED patients) in 2019 ( $p < 0.0001$ ). We have found 217 patients with chest tumors hospitalized in Ed in 2019 and 181 in 2020. There were 17 (0.06% of ED patients) and 27 (0.11% of ED patients) cases of chest tumors diagnosed de novo in 2019 and 2020, respectively ( $p = 0.049$ ). Chest tumors were found in 2.2% and 1.1% of patients undergoing chest CT in 2019 and 2020, respectively ( $p = 0.03$ ). Prevalence of patients in advanced (disseminated) stages of the disease was insignificantly higher in 2020 (11.8% vs. 29.6%,  $p > 0.05$ ), though.

without statistical significance. The percentage of subjects among whom any oncological therapy initiated within three months from ED diagnosis was insignificantly lower in 2020 (40.7% vs. 47%,  $p > 0.05$ ). This observation corresponds to data from other publications [3].

Performing chest CTs among approximately 1 in 10 ED patients contributed to finding previously undiagnosed chest tumors in 1 per 1000 ED patients, while, in the pre-pandemic period, chest tumors were found in 6 per 10,000 ED patients. This suggests the existence of a

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population of patients with undiagnosed tumors who potentially could have been diagnosed in the ED.

The previously described rate of all oncological diagnoses de novo made at EDs ranged from 17% to 52% of all confirmed cancer cases [4]. A Japanese study reported that 13% of the 771 patients with confirmed pulmonary cancer was diagnosed at EDs [5]. Data on the frequency of de novo diagnosis of chest tumors among the ED patient population is lacking. A cohort study of screening, using low-dose CT, conducted in West China Hospital between 2006 and 2017 showed that 2.1% of patients were diagnosed with lung cancer [6]. These findings are comparable with the results achieved in the ED in our study. The difference observed between 2019 and 2020 (2.2% vs. 1.1%) is understandable as only patients with some suspicion (based upon earlier results) underwent CT scans in 2019. The ED routine in 2020 was closer to a “screening” study.

While EDs are certainly not dedicated for oncological diagnostic work-ups, our data suggest that replacing routine chest X-rays with HR CT scans may result in the earlier detection of neoplasm in some patients, which may allow faster further diagnostic work-ups and initiation of therapy.

The limitation of our study is its retrospective nature. Our results make an assumption for performing prospective analysis of the usefulness of ED diagnostic work-ups of patients with chest symptoms in diagnosing tumors of the chest.

In summary, our data shows that the pandemic-provoked more frequent usage of HR CT has its positive side-effect: an earlier oncological diagnosis. Therefore, chest HR CT should be more frequently used in ED patients with pulmonary signs and symptoms.

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#### CRediT authorship contribution statement

**Klaudia Krzyzaniak:** Writing – original draft, Investigation, Data curation. **Mariusz Sieminski:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Formal analysis, Data curation, Conceptualization.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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