PRIMARY PRE-HOSPITAL TRIAGE OF PATIENTS WITH COVID-19

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The COVID-19 pandemic affected every sector of society, radically altering the work of health systems throughout the world. In the situation of the mass influx of patients seeking medical care that was hard to control, the issue of the widespread adoption of the medical sorting (triage) principles became urgent within weeks. The review provides analysis of 49 publications dealing with various aspects of arranging pre-hospital triage. The dynamic changes in approaches to triage, its objectives and technologies, as well as in the contribution of various X-ray imaging methods depending on the evolving experience of working with the novel infection, are of great interest. The search for literature in Russian and English published before March 10, 2022 was performed in a number of databases (Embase, Medline/PubMed, Researchgate, medrxiv.org, RISC). The search was performed using the following keywords: COVID-19, coronavirus, *коронавирус*, SARS-COV-2, 2019nCOV, lung ultrasound, computed tomography, computerized tomography, *компьютерная томография*, CT, triage, *сортировка*. The strategy of establishing pre-hospital triage centers or stations in case of pandemic makes it possible to reduce both the burden on the emergency departments and the occupancy rate for inpatient services. Quick access to various imaging methods (X-ray imaging, lung ultrasound or computed tomography) greatly facilitates taking clinical decisions, and could be considered beneficial in the current extraordinary situation.

Keywords: novel coronavirus infection, COVID-19, triage, computed tomography

Author contribution: Cherkashin MA — article planning, literature collecting and analysis, manuscript writing, editing; Berezina NA — literature collecting and analysis, manuscript writing; Berezin NS — article planning, manuscript writing, editing; Nikolaev AA, Kuplevatskaya DI, Kuplevatsky VI, Rakova TM, Shcheparev IS — literature collecting and analysis, manuscript writing.

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Received: 14.04.2022 **Accepted:** 29.04.2022 **Published online:** 25.05.2022

DOI: 10.47183/mes.2022.015

ПЕРВИЧНАЯ МЕДИЦИНСКАЯ СОРТИРОВКА ПАЦИЕНТОВ С COVID-19 НА ДОГОСПИТАЛЬНОМ ЭТАПЕ

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Пандемия COVID-19 затронула все сферы жизни и кардинально изменила работу систем здравоохранения во всех странах. В условиях массового, трудно контролируемого обращения пациентов за медицинской помощью, с первых недель остро встал вопрос широкого внедрения в рутинную практику принципов медицинской сортировки (триажа). В обзоре дан анализ 49 публикаций, посвященных разным аспектам организации догоспитальной медицинской сортировки. Значительный интерес представляет динамика изменений подходов к триажу, его целей и технологий, а также роли разных методов лучевой диагностики, в зависимости от того, как накапливался опыт работы с новой инфекцией. Поиск литературы на русском и английском языках проведен за период до 10 марта 2022 г. с использованием различных баз данных и репозиториев (Embase, Medline/PubMed, Researchgate, medrxiv.org, РИНЦ). Поиск осуществляли по ключевым словам «COVID-19», «coronavirus», «коронавирус», «SARS-COV-2», «2019nCOV», «lung ultrasound», «computed tomography», «computerized tomography», «компьютерная томография», «CT», «triage», «сортировка». Стратегия создания центров или пунктов догоспитальной сортировки в случае пандемии позволяет снизить нагрузку на приемные отделения больниц и загруженность стационаров. Быстрый доступ к различным методам медицинской визуализации (рентгенография, ультразвуковое исследование легких или компьютерная томография) значительно облегчает принятие клинического решения и в сложившихся нестандартных условиях может быть признан полезным.

Ключевые слова: новая коронавирусная инфекция, COVID-19, медицинская сортировка, компьютерная томография

Вклад авторов: М. А. Черкашин — планирование статьи, сбор и анализ литературы, подготовка рукописи, редактирование; Н. С. Березин — сбор и анализ литературы, подготовка рукописи; Н. А. Березина — планирование статьи, подготовка рукописи, редактирование; А. А. Николаев, Д. И. Куплевацкая, В. И. Куплевацкий, Т. М. Ракова, И. С. Щепарев — сбор и анализ литературы, подготовка рукописи.

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Статья получена: 14.04.2022 **Статья принята к печати:** 29.04.2022 **Опубликована онлайн:** 25.05.2022

DOI: 10.47183/mes.2022.015

At the end of 2019, the spread of the novel coronavirus infection began in China with an epicenter in the city of Wuhan, Hubei province [1, 2]. The virus was soon identified, and was given the name SARS-CoV-2 by the Coronaviridae Study Group (CSG) of the International Committee on Taxonomy of Viruses [3]. Acute infection caused by SARS-CoV-2 was named COVID-19 (Coronavirus disease 2019) [1]. In early 2020, the active global spread of COVID-19 began [4]. In March 2020, the epidemic also affected the Russian Federation. On March 11, 2020, the World Health Organization (WHO) classified COVID-19 as a pandemic due to the growing number of new cases.

As the experience of foreign countries had proved, the mass influx of patients revealed a severe mismatch between the needs and capabilities of inpatient services. Accumulation of patients potentially not in need of admission in emergency departments resulted in the shortage of beds and increased mortality among seriously ill patients [5, 6]. Within weeks of the novel coronavirus infection outbreak, there was an urgent need in the methods for identification of individuals with COVID-19 and their distribution based on the prognosis.

The obvious solution was the widespread application of medical sorting (triage) principles normally implemented

in case of a major catastrophe or natural disaster. The main principle of triage is as follows: when resources are insufficient, one has to segregate between patients who are in need of immediate inpatient care, and patients who can be referred to the outpatient clinic or treated less urgently.

The paper provides an analytical review of the data on the pre-hospital triage arrangement for patients with suspected COVID-19 and the role of various medical imaging methods in clinical decision-making published over the past two years. The approaches to X-ray diagnostics vary from country to country, and the attitude towards these diagnostic techniques has changed during the pandemic. The authors have focused on using chest computed tomography (CT), since this method remains most widely available in our country.

The search for literature in Russian and English published before March 10, 2022 was performed in a number of databases (Embase, Medline/PubMed, Researchgate, medrxiv.org, RISC). The following keywords were used for search: COVID-19, coronavirus, коронавирус, SARS-COV-2, 2019nCOV, computed tomography, computerized tomography, компьютерная томография, CT, triage, сортировка. Given the lack of knowledge and the great importance of the issue, available preprints, in-press articles and abstracts for scientific conferences were also included in analysis. At least two authors rated each of the 156 reports that were found from a scale of 1 to 5 (methods, the use of at least X-ray diagnostic method, results, clinical significance). In case of disagreement, the author team took a decision by vote. Finally, 49 reports were included.

Triage and its implementation

Pre-hospital triage of patients with suspected novel coronavirus infection in the environment of emergency department is a key to further strategy of the patient management and routing [7]. In the context of the ongoing pandemic, outpatient triage is a complex of diagnostic procedures aimed at assessing the patient's condition severity and making a decision as objective as possible on urgency and need for the patient's admission to the specialized hospital. Medical institutions can move on to triage in exceptional cases, generally in case of multiple simultaneous admissions. The main purpose of triage is to provide optimum care to the maximum number of victims or patients [7].

Low availability of PCR-based laboratory tests for primary diagnosis of patients with suspected COVID-19 was a common pressure faced by all countries during the first months of the pandemic [8–10]. The average delay after swabbing in the emergency department was 573 ± 327 min (189–2,812 min) [10].

It is necessary to promptly filter out the conventionally “zero-infection” patients, who should be provided care in outpatient clinics, and to deduce a group af patients with coronavirus infection to be referred to the conventionally “red zone” hospitals. Furthermore, in is important to perform primary pre-hospital differential diagnosis of the causes of respiratory failure, since this may result from the noncommunicable somatic disorder [10–12].

Initially, triage involved the patients' separation into COVID+ and COVID–; the majority of reports published in 2020 described exactly that strategy [10, 13]. However, this goal was soon supplemented with sorting based on the disease severity, since the hospitals were overloaded, and the need to establish clear criteria for admission in the context of acute shortage of beds became apparent.

In such circumstances, the search for diagnostic methods capable of affecting clinical decision-making on a short-term basis began. Since damage to the respiratory system prevailed, some authors proposed the use of various X-ray imaging modalities for additional quick assessment of the patient's condition, such as chest computed tomography, ultrasound investigation, conventional X-ray imaging [11, 14–17].

As a result, by February 2020 there was a consensus opinion that the triage protocol had to include clinical, laboratory, and radiological data (usually the chest CT results) [18–20].

X-ray imaging

Conventional diagnostic X-ray imaging methods, being the most accessible and widely used, were adopted in patients with COVID-19 since the first days of the pandemic. However, it was found that CT was more sensitive [17, 21]. Nevertheless, X-ray imaging provides some advantages over CT: lower radiation burden, faster data acquisition, possible use in the intensive care units, portability. The method is still meaningful and useful for follow-up and quick diagnosis of possible complications in patients already admitted to hospital [20, 22]. The data of the retrospective comparative study aimed to assess the efficiency of CT and chest X-ray for the hospital admission triage were published [17]. A total of 113 patients with suspected COVID-19-associated pneumonia admitted to the university clinic in Izmir (Turkey) from March 15 to September 1, 2020 were enrolled. The inclusion criteria were as possible: positive PCR test result, availability of chest X-ray images with the preliminary diagnosis of pneumonia, availability of chest CT images in addition to X-ray images. The Brixia scoring system modified by the authors was used to assess lung injury: each lung was divided into 6 zones, each lung field was evaluated based on the presence and the grade of the ground glass opacities, reticular densities, and areas of consolidation. The scoring system details are provided in Table 1.

The authors noted that at an earlier stage of the disease, when the ground glass opacities prevailed, X-ray imaging was characterized by low sensitivity, that is why CT was more effective in this situation. However, at the progressive stages, the methods showed comparable sensitivity, thus allowing to suggest the use of X-ray imaging not for triage, but for assessing the dynamic changes in the condition of patients admitted to the intensive care unit [17].

Diagnostic ultrasound

Lung ultrasound (LU) is widely used for rapid assessment of patients with respiratory failure within the framework of the BLUE protocol [23]. The potential of using LU for differential diagnosis of viral and bacterial pneumonia was described during the pandemic of the H1N1 influenza (2009) [24]. To date, portable ultrasound units are widely used, that is why LU is applied at all stages of care provision, from outpatient clinics to intensive care units, in the context of the ongoing pandemic [14, 25, 26]. In contrast to X-ray imaging and CT, ultrasound imaging enables rapid assessment (the BLUE protocol duration is less than 3 min), there is no radiation burden, assessment can be repeated many times at any moment, there is no need to transport the patient [14–16]. LU makes it possible to promptly assess pulmonary lesion and the presence of pneumothorax or pleural effusion in severe patients with severe hypoxemia, when the patient's transfer to the CT unit is associated with organizational difficulties [14, 27].

The first recorded case of using LU to assess the pulmonary lesion grade in patient with COVID-19 was published in 2020 by the group of Italian physicians. The authors concluded that the

Table 1. Scoring system for assessment of radiographic findings and CT results (Brixia scoring system modified by Çinkooğlu)

Radiographic feature	CT feature	Grade (X-ray)	Score (CT)
No	No	0	0
Hazy density	Ground glass opacity	1	1
Reticular density	Crazy paving, reticular density	2	2
Consolidation	Consolidation	3	3

method could be used for primary screening in the emergency department since it allowed to divide patients into low-risk (no pathological findings; the patients can wait for the next-level X-ray imaging if necessary) and high-risk (pathological findings; the patients need further investigation and the decision whether to start therapy) group [25]. It was also mentioned that ultrasound imaging simplicity and availability of portable devices made it possible to use ultrasound for pre-triage screening in outpatient clinics.

Other authors proposed an ultrasound classification system based on the clinical trial data for assessing the lung injury severity, the need of patient's admission to ICU, and the need for mechanical ventilation [16]. Classification was based on the scoring system: damage to 12 areas (two anterior, two posterior and two lateral for each lung) was visually assessed (0–4 points). Classification was named LUZ (lung ultrasound Zaragoza score) by the authors. The LUZ score of 22 points or more was a predictor of the patient's need for mechanical ventilation [16].

Other authors suggest a pre-hospital triage algorithm based on the respiratory distress (RD) assessment, saturation mesurement and ulrtasound findings [26]. The patients should be divided into 4 groups:

— self-quarantine at home (no symptoms of RD, $SpO_2 \geq 93\%$, no pathological ultrasound findings);

— self-quarantine at home with subsequent follow-up (no symptoms of RD, $SpO_2 \geq 93\%$, pathological ultrasound findings);

— oxygen therapy at home with straight follow-up, or hospital admission for patients at risk (symptoms of RD, $SpO_2 < 93\%$, no pathological ultrasound findings);

— hospital admission (symptoms of RD, $SpO_2 < 93\%$, pathological ultrasound findings) [26].

A number of comparative clinical trials revealed that LU and CT showed similar sensitivity and specificity when used for primary diagnosis of the COVID-19-associated pneumonia [19].

In general, ultrasound imaging can be used both at the pre-hospital stage and in emergency departments for primary triage of patients, as well as for assessment of the disease severity and course in pulmonology departments and ICUs [14].

Computed tomography

Chest CT in patients with COVID-19 is used for the instrumental clinical decision support when performing triage, as well as for primary X-ray diagnostics and assessment of the disease pattern (in outpatient and hospital settings, including intensive care units) [28]. Initially, the data on the CT sensitivity and specificity in the diagnosis of the COVID-19-associated viral pneumonia were quite controversial, however, situation had improved significantly after standardization and establishing clear criteria [29].

As early as April 2020, a number of clinical guidelines were issued by various medical associations (Fleischner Society, Society of Thoracic Radiology, American College of Radiology, Radiological Society of North America), which discussed the use of CT for the diagnosis of coronavirus pneumonia [30, 31].

Initially, great hope was placed on CT in terms of the COVID-19 diagnosis. The study is quite illustrative, during which a series of telephone interviews with seven emergency department clinical leads from across England were taken in April 2020 [32]. Triage of patients during the pandemic was one of the themes. All the surveyed leads reported that they often faced situations when asymptomatic patients in the emergency department with such presentations as trauma were unexpectedly demonstrating incidental viral pneumonia on CT. That is why undertaking chest radiography and significantly increasing the use of chest CT even in asymptomatic patients were started in order to promptly exclude lung injury [32]. French researchers reported the experience of three university hospitals of Lyon, France, gained from March to April 2020 [10]. Chest CT was performed in all patients regardless of the cause of the visit for triage and further transfer of patients to the COVID+ or COVID- hospital unit [10].

However, it quickly became apparent that radiograpic features of all types of interstitial pneumonia caused by respiratory viruses were quite the same; in actual practice, it was almost impossible to distinguish between the COVID-associated lesion and, for example, influenza. It was only possible to evaluate the lung injury severity [33]. As a consequence, the agreement was reached to avoid using both X-ray imaging and CT for screening of asymptomatic patients, since the changes revealed had low specificity [28]. Thus, currently there is only one recommendation: to use X-ray methods in moderate to severe patients showing symptoms of respiratory distress with clinical suspicion of COVID-19, even in case of negative PCR test results. The interim guidelines issued by the Ministry of Health also suggest that pre-hospital X-ray diagnostics in patients with acute respiratory infections for the

Table 2. CO-RADS classification [7, 38]

CO-RADS	Suspicion for COVID-19	CT imaging results
CO-RADS 1	No	Normal or non-infectious disease
CO-RADS 2	Low	Pathological features typical for other infections but not COVID-19
CO-RADS 3	Medium	Equivocal findings for COVID-19
CO-RADS 4	High	Suspicious for COVID-19
CO-RADS 5	Very high	Typical COVID-19
CO-RADS 6	PCR+	COVID-19

Table 3. Classification of the CT scan results based on the changes revealed

Score	Radiological findings	Changes
CT-0 (zero)	Nomal or no CT signs of viral pneumonia in patient with typical clinical manifestations and relevant exposure history	
CT-1 (mild)	Ground glass opacities with no other signs	Lung parenchymal involvement below 25%
CT-2 (moderate)	Ground glass opacities with no other signs	Lung parenchymal involvement 25–50%
CT-3 (severe)	Ground glass opacities and areas of consolidation	Lung parenchymal involvement 50–75% or lesion increase by 50% within 24–48 h in patient with respiratory distress
CT-4 (critical)	Diffuse ground glass opacification and areas of consolidation in combination with reticular pattern. Hydrothorax	Lung parenchymal involvement over 75%

purpose of triage is indicated only for moderate, severe and critical cases [1].

Features of CT performed in patients with suspected COVID-19

In most cases, low-dose CT scan is the best option, which allows to reduce radiation exposure without compromising the quality of assessment [34, 35]. The procedure is performed without intravenous contrast; the contrast could be additionally used in case of suspected pulmonary embolism or necrotizing pneumonia [1, 34–37].

Classifications have been developed by various radiological associations, that are currently widely used all over the world.

The CO-RADS classification system for assessment of the viral pneumonia likelyhood, developed by the Dutch Radiological Society in March 2020, was the first effort for standardization of the criteria [7, 38].

Based on the number of radiological symptoms, according to this classification, the likelyhood of having COVID-19 varies between very low (CO-RADS-1) and very high (CO-RADS-5), and the maximum score of CO-RADS-6 provides laboratory confirmation (Table 2).

At the stage of the CO-RADS clinical implementation, it turned out that this classification made it impossible to confirm reliably the diagnosis of COVID-19, despite of the high hopes.

Meanwhile, in early spring of 2020, the colleagues from China and USA proposed a number of variants for classification of lung involvement severity in patients with viral pneumonia [39].

Four groups are distinguished based on the percentage of pulmonary parenchymal involvement: nomal lung (0%), less than 25%, 25–50%, more than 50% involved [39].

The modified version of this scoring system was included in the consensus of the Russian Society of Roentgenologists and Radiologists and approved in our country (Table 3) [37, 40].

The proposed scale greatly simplified characterization of findings and became a tool for preliminary assessment of the patient's condition severity by clinicists. In the context of the lack of hospital beds, this pneumonia severity scoring system provided the basis of the outpatient and emergency department triage. To date, hospitalization of patients assigned CT-3 and CT-4 scores has become a routine approach. The patients with pneumonia scores of CT-0-2 and no risk factors (age over 60, diabetes mellitus, pregnancy, etc.) are returned to the outpatient clinics [7, 40].

Organization of a pre-hospital triage center

During the initial phase of the pandemic, the burden of working with the majority of first admitted symptomatic patients fell on emergency departments making them considerably overburdened [32, 41–45].

The growing number of patients, difficulties in ensuring infection control, insufficient preparedness of hospitals for the large number of daily admissions, limited resources, difficulties in rapid obtaining the PCR test results resulted in implementation of strategies of both expanding the capacity of existing emergency departments and performing pre-hospital triage.

Thus, in April 2020, a group of authors from Milano published an article describing preperation of their hospital for patient admissions [44]. Primary assessment (pre-triage) was performed in the ambulance car or in a shelter unit created at the entrance of the emergency department, where body temperature, SpO_2, and respiratory system were assessed. The patients with suspected COVID-19 and SpO_2< 94% were referred to CT and swabing in the “red zone” of the emergency department; symptomatic patients with SpO_2> 94% were referred to swabbing only. After obtaining the results, each patient was re-examined by the physician who decided whether he/she required admission. In case a severe patient arrived in need of immediate critical care, an isolated area with the necessary equipment was prepared in the emergency department. The patients of this category were admitted to the dedicated intensive care unit after CT and received respiratory support pending laboratory confirmation of COVID-19. The patients with positive swab test results were transferred to the COVID-19+ department, and the patients with negative results were transferred to the specialized COVID-19– department [44].

A group of authors from the universities of Milano and Parma proposed a diagnostic algorithm based on the experience in working with the first 702 patients in 2020. The algorithm included primary patient assessment in the shelter unit created at the entrance of the emergency department followed by CT referral to address the issue of admission [46].

In September 2020, a survey of heads of 283 Spanish emergency departments was published [43]. In the majority of emergency departments, triage was launched, observation beds were provided, and patient flow separation was introduced. The nursing staff was increased by 83%, and the number of physicians increased by 59% [43].

The following measures were proposed to increase the emergency department efficiency [32]:

1. Splitting patients into five cohorts based on clinical observations and investigations:
   – suitable for outpatient discharge;
   – suitable for outpatient discharge after in-depth assessment;
   – admit to medical ward;
   – admit to critical care;
   – commence end of life care.
2. Early escalation of care decisions in the emergency department.
3. Deployment of mobile emergency rapid intubation teams enabling early airway care in high-risk patients [32].

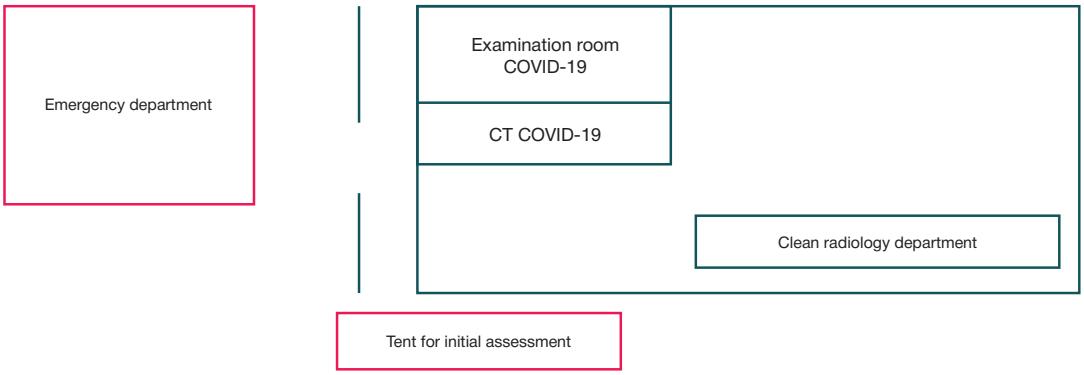

Fig. 1. Layout of the Sichuan university clinic triage station (adapted from [49])

In addition, the decision to establish pre-hospital pre-triage and triage centers was taken by a number of hospitals. Thus, on April 14, 2020, the first experience of creating such center in the indoor ambulance bay of the Massachusetts General Hospital, Boston, USA was reported [12]. The following areas were allocated and equipped:

– waiting area;
– desk;
– triage desk;
– swabbing area.

After assessment the patient was referred for home treatment under the supervision of general practitioner or admitted to hospital [12]. It was found that patients arrived via two main pathways: 75% of patients were referred from primary care offices, the other 25% were walk-ins. Over the first three weeks of operation, the center saw a total of 2667 patients (160 people daily on average), of them only 1% were transferred to the emergency department [12].

The strategy of using outpatient centers (OCTCs) for screening, routing, and follow-up of patients with suspected COVID-19 was implemented in Moscow in late March — early April [40]. A total of 47 centers equipped with CT scanners were deployed in city outpatient clinics. All the scanners were merged into unified digital space, thus enabling remote image assessment by radiologists and thus reducing the risk of infection in medical personnel. In addition, OCTCs were segregated into “red,” “buffer,” and “green” zones. The “red” zone contained CT scanners. All medical personnel assigned to this zone were provided with grade 3 personal protective gear. “Buffer” zone was used to put on personal protective gear. In the “green” zone there were consulting rooms and staff rooms. The outpatient centers saw over 268,000 patients by October 2020 [40].

The experience of the outpatient triage centers deployment in St. Petersburg was reported [7, 47]. During the first 6 months of operation, the centers saw only those patients admitted by ambulance, about 400 cases daily. Then the routing of patients changed, resulting in 80% of patients referred from outpatient clinics. The major goal was to provide preliminary assessment of the patient's condition severity and decide on hospitalization.

The standard algorithm of assessment was as follows:

– history taking;
– contactless temperature measurement;
– assessment of patient complaints;
– respiratory rate assessment and pulse oximetry;
– obtaining information on comorbidities and additional risks;
– in addition, taking the history of vaccination against COVID-19 was started from June 2021 [48]. The authors noted that auscultation was impossible when wearing protective equipment, and such components of physical examination as palpation and percussion were severely limited. However, the data obtained were usually enough for primary assessment of the disease severity. The patient's physical examination was followed by CT. Then re-examination was performed using the image assessment results, and the decision of admission was made. Respiratory support and monitoring of vital functions were provided when necessary [7].

The time spent on triage is a key issue. The long patient's stay in the emergency department or triage center adversely affects his psychological state. However, in case of severe disease, the necessary care provision is delayed. Thus, analysis of 1,945 emergency department visits showed that the mean delay between CT appointment, CT scanning, and CT report was 187 ± 148 min [10]. However, taking into account the fact that the delay for PCR test results was several times longer at a

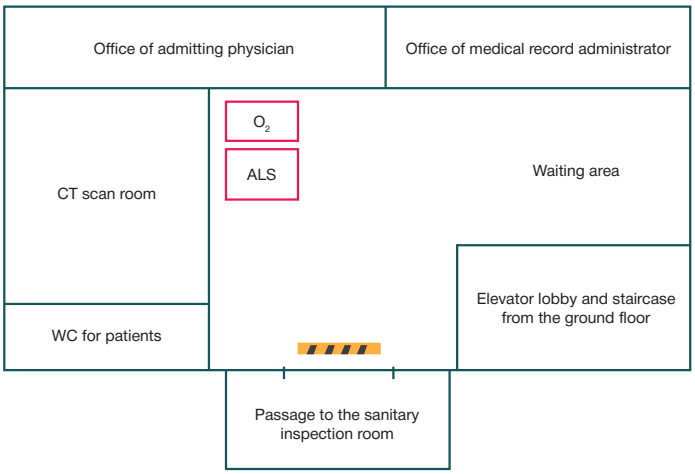

Fig. 2. Layout of the floor with CT scanner. O_2 — oxygen source, ALS — emergency trolley [7]

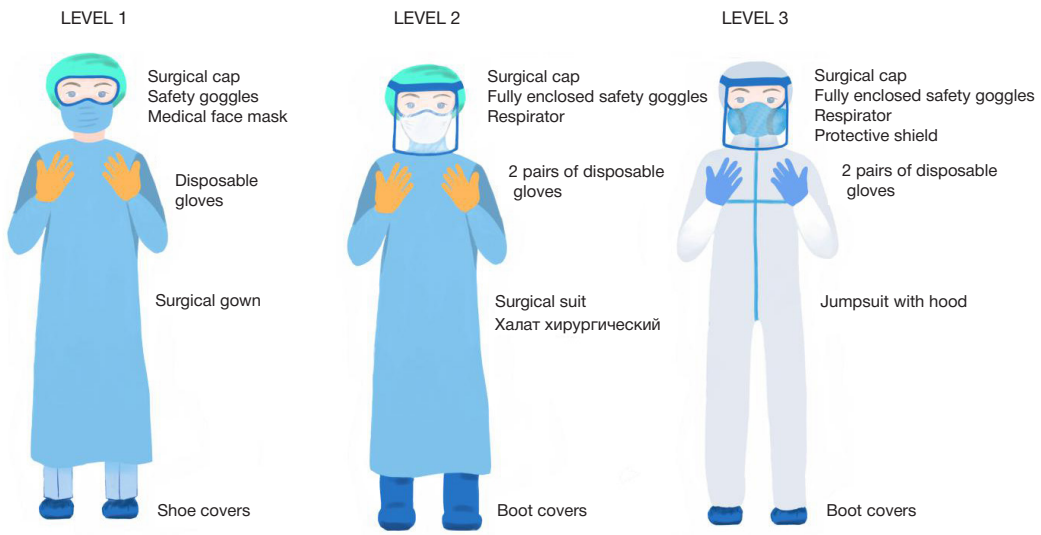

Fig. 3. Levels of protection dependig on working conditions [7]

moment, the authors concluded that CT was a fast and simple method facilitating patient triage [10].

In general, implementation of pre-hospital triage was effective. According to the data from St. Petersburg obtained from April to November 2020, triage centers saw a total of 37,537: pneumonia was found in 21,986 cases, 5,532 patients needed hospitalization due to severe disease and severe lung injury, 32,005 patients were referred to outpatient clinics [47].

Providing infection control

To ensure adequate infection control, in practice it is necessary not only to modify the procedures, but also to perform some engineering and oganizational operations, reconfigure units and facilities [32, 44].

In June 2020, the authors from the West China Hospital (Sichuan, China) reported the experience of the radiology department reconfiguration for primary triage [49]. There were 4,300 beds in the Sichuan university clinic. The clinic was reconfigured to handle cases of COVID-19 on January 21, 2020. Tents, in which the patients with suspected COVID-19 were assessed, were set up in front of the emergency department. After assessment the patients were sent to the emergency department for CT. To ensure infection control, the department was divided into four areas: contaminated, semicontaminated, buffer, and clean areas (Fig. 1) [49].

The authors of another article described another zoning variant: CT scan room, examination room, emergency cases and oxygen sources are in the contaminated area (Fig. 2) [7].

The patients are admitted to the center by ambulance, medical records are processed in the waiting area. Then physical examination, CT scan, and re-examination based on the CT results are performed. After that physician desides on evacuation to the specialized hospital or referral to the outpatient clinic [7].

Rearrangement of the routine diagnostic procedures is required to reduce the risk of infection in the staff. Thus, elective procedures (screening, etc.) must be delayed, the number of the first-line personnel must be reduced; it is recommended to perform radiography with a portable device at the bedside to avoid the movement of patients. Only a radiographer should be in the CT room, while radiologists should assess the images in the clean area [20].

High risk of the personnel contamination with viral aerosol, the need for regular treatment and desinfection of the rooms, the use of personal protective equipment, and other factors make CT scan much more difficult and require thorough planning [34, 49]. The rational use of personal protective equipment seems to be a serious matter. In the beginning of the pandemic, information was extremely controversial, the majority of healthcare professionals were not trained to use PPE, that is why special training was required. For example, a three-step training scheme was implemented in one large regional hospital in Italy: lectures with live demonstration of the PPE donning and doffing, in-situ similation of the PPE donning, use, and doffing, surprise individual assessment after the beginning of work [44]. Currently, all domestic and foreign regulatory agencies (Rospotrebnadzor, Ministry of Health, CDC, NHS и т. д.) distinguish the following levels of PPE protection [1, 7]:

— level 1: possibility of contact with the patient with suspected infection (emergency department staff; ambulance units; hospital ward staff; outpatient clinics personnel; diagnostic department personnel, etc.);

— level 2: prolonged contact with the patient in the unit of the infectious disease/reconfigured hospital;

— level 3: prolonged contact with the patients with suspected infection or infection confirmed by laboratory tests in the intensive care unit, invasive respiratory interventions in patients of this category.

Possible sets for various levels of PPE are provided in Fig. 3.

Thus, to date, the use of level 1 PPE is enough when working in the pre-hospital triage stations [1, 7].

CONCLUSION

The concept of establishing pre-hospital triage centers or stations in case of pandemic makes it possible to reduce both the burden on the emergency departments and the occupancy rate for inpatient services as a whole. Quick access to various imaging methods (X-ray imaging, lung ultrasound or CT) greatly facilitates taking clinical decisions, and could be considered beneficial in the current extraordinary situation. However, it is necessary to strictly follow the clinical practice guidelines in order to avoid the excessive use of chest CT without medical reasons. Organization of the activities of such centers requires careful preparation in terms of infection control, creation of safe routes, and patient flow separation.

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