

## A matrix for the evaluation of COVID-19 contact risk in healthcare workers: Technical note

*Sağlık çalışanlarında COVID-19 temas riskinin değerlendirilmesi için bir matris:  
Teknik not*

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### ABSTRACT

The aim of this technical note is to propose a reliable, fast-adaptable and easy-to-use matrix that accurately classifies risk for contact tracing of healthcare workers with COVID-19 patients. The researchers have created a matrix with the support of the literature and their experience within the university hospital surveillance team. This matrix enables a detailed High / Medium / Low Risk classification of contacts of healthcare workers with COVID-19 cases, covering many different contact situations encountered in a university hospital. Three main headings have come to the fore in health worker contact risk classification: Differences caused by the ventilation of the environment: Indoors, well ventilated indoors, outdoors; direct contact or material sharing; aerosol generating procedure. The matrix is quickly adapted by surveillance team members and is easy to use.

**Keywords:** Healthcare workers; COVID-19; contact tracing; contact assessment; matrix.

### Öz

*Bu teknik notun amacı, sağlık çalışanlarında COVID-19 temas riskini doğru bir şekilde sınıflandıran güvenilir, hızlı uyarlanabilir ve kullanımı kolay bir matris önermektir. Araştırmacılar, üniversite hastanesi sürveyans ekibinin deneyimlerinden ve literatürlerden yararlanarak bir matris oluşturmuşlardır. Bu matris, bir üniversite hastanesinde sağlık çalışanlarının COVID-19 vakaları birçok farklı temas durumunu Yüksek / Orta / Düşük Risk olarak sınıflandırmasına olanak tanır. Sağlık çalışanı temas riski sınıflandırmasında üç ana başlık öne çıkmıştır: Ortamın havalandırılmasından kaynaklanan farklılıklar: İç mekân, iyi havalandırılan iç mekân, dış mekân; doğrudan temas veya ortak malzeme kullanımı; aerosol oluşturma prosedürü. Matris, sürveyans ekibi üyeleri tarafından hızla adapte olunmuş ve kullanımı kolaydır.*

**Anahtar Sözcükler:** Sağlık çalışanları, COVID-19, temaslı takibi, temaslı değerlendirmesi, matris.

### INTRODUCTION

The Occupational Health and Safety Unit (OHSU) conducts COVID-19 contact-tracing among the healthcare workers of Ege University Medical Faculty (EUMF) Hospital. The variety of the environment in terms of risky contacts in the workplace (open / well ventilated closed / closed / the environments where the aerosol-generating process is performed), the use of mask in the case and the healthcare worker, and the type of

mask, together with the exposure time and distance (variety of distance), a need for a guide has arisen. In addition, it was necessary to evaluate the use of PPE and contact distance of the health worker together. When questioning direct contact with the cases or the use of common materials like computer keyboards, the need to question hand hygiene after contact was also required.

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The aim of this technical note is to propose a reliable, fast-adaptable and easy-to-use matrix that accurately classifies the risk of contacts of healthcare workers with COVID-19 patients.

### Development of the matrix

A matrix based on the guidelines of the Ministry of Health was developed by the researchers with the support of the literature and started to be used as of August 17 (Figure-1). The High / Medium / Low Risk classification has been updated (1-4). The first draft of the matrix, which was submitted for the approval of seven nurses, two occupational safety specialists and two medical doctors involved in contact determination studies, was updated in line with the recommendations and started to be implemented on August 24. At the end of the first month, the matrix was evaluated by the surveillance team and 7 experts (2 public health, 2 microbiology, 2 infectious diseases experts, 1 epidemiologist), and its application was continued following its approval.

### DISCUSSION

Three main headings came to the fore in health care workers contact risk classification.

#### 1. Differences caused by the ventilation of the environment: Indoors, well ventilated indoors, outdoors (Matrix 1)

Indoors are more risky areas where it is difficult to keep the distance between people wide (5). Another possible situation that increases the risk is the longer stay together indoors (6). Well ventilation, essential for a healthy indoor climate, helps limit the spread of the SARS-CoV-2 virus (7). However, according to available data, the contamination potential is much lower outdoors than indoor environments, due to the turbulence levels found outdoors (6). In evaluating the contact of HCWs with COVID-19 cases, it was necessary to categorize the contact environment as closed / well ventilated indoor / outdoor. However, in situations where the same environment is shared, the risk is associated with many factors including ventilation of the environment, use of masks, distance and exposure time (8).

SARS-CoV-2 spreads between people who are in close contact with each other. A distance of at least 1 meter is recommended for COVID-19 patients to reduce the risk of infection when talking or coughing (9). However, there are also sources that suggest staying at least 2 meters away from other people even in open environments (5). In contact risk assessment, it is important to take into account that a physical distance of at least 1 meter reduces the risk of SARS-CoV-2 transmission, but 2 meters may be more effective, and the greater the distance, the more likely to be protected (10).

The risk of SARS-CoV-2 spread is determined by how closely the interaction with the COVID-19 case takes places and how long this interaction lasts. For healthcare workers, high-risk exposures are directly related to face-to-face contact lasting 15 minutes or longer (1, 8). Using the 15-minute contact time limit on the basis of evidence provides practicality in classification of contact risk (4). It should also be taken into account that the cumulative exposure time in repeated contacts affects the risk of transmission (11).

The mask worn by the person acts as a simple barrier to help prevent respiratory droplets from getting into the air and other people. The use of masks is particularly important in environments

ENVIRONMENT		PATIENT				DISTANCE	
		MASK USE		NO MASK			
MATRIX 1	INDOORS	NO	Medium	High	High	High	<1 m
			Low	Medium	Medium	High	1-2 m
			No Risk	Low	Low	Medium	≥2 m
		YES	Low	Medium	Medium	High	<1 m
			No Risk	Low	Low	Medium	1-2 m
			No Risk	No Risk	No Risk	Low	≥2 m
	WELL VENTILATED INDOOR	NO	Low	Medium	Medium	High	<1 m
			No Risk	Low	Low	Medium	1-2 m
			No Risk	Low	Low	Medium	≥2 m
		YES	Low	Low	Low	Medium	<1 m
			No Risk	Low	Low	Low	1-2 m
			No Risk	No Risk	No Risk	Low	≥2 m
OUTDOORS	NO	Low	Low	Low	Medium	<1 m	
		No Risk	Low	Low	Medium	1-2 m	
		No Risk	No Risk	No Risk	No Risk	≥2 m	
	YES	Low	Low	Low	Medium	<1 m	
		No Risk	Low	Low	Low	1-2 m	
		No Risk	No Risk	No Risk	No Risk	≥2 m	
		DURATION					
		<15 Min		≥15 Min		<15 min.	≥15 min.
MATRIX 2		GLOVES USE					
		YES		NO			
HANDWASHING	NO	Medium		High			
	YES	Low		Medium			
MATRIX 3		PATIENT					
		MASK USE		NO MASK			
AEROSOL GENERATING ENVIRONMENT	HEALTH CARE WORKERS	NO MASK	Medium	High	High	High	<1 m
			Low	Medium	High	High	1-2 m
			Low	Low	Medium	High	≥2 m
		MASK USE	Low	Medium	Medium	High	<1 m
			No Risk	Low	Low	Medium	1-2 m
			No Risk	Low	Low	Medium	≥2 m
	N95 USE	NO	No Risk	Low	Low	Medium	<1 m
			No Risk	Low	Low	Medium	1-2 m
			No Risk	No Risk	No Risk	Low	≥2 m
		YES	No Risk	Low	Low	Medium	<1 m
			No Risk	Low	Low	Medium	1-2 m
			No Risk	No Risk	No Risk	Low	≥2 m
		FACE SHIELD					
		YES		NO			

Figure-1. Matrix for the evaluation of Covid-19 contact risk in healthcare workers.

where people are close to each other or where social distance is difficult to maintain (10). Mask use details of both the HCW and the patient are important in determining the risk of COVID-19 exposure (12).

## **2. Direct contact or material sharing (Matrix 2)**

A high-risk contact occurs when healthcare workers care for COVID-19 patients without or with inappropriate PPE. If hand hygiene has not been achieved after direct contact with the patient, with the patient's body fluids, or with the patient's contaminated environment, it is also within the scope of high-risk contact (1). This feature becomes more important when the case in contact is a colleague, so many different items like pens and keyboards could be shared with the case in the two days before the symptoms or diagnosis.

## **3. Aerosol generating procedures (AGP) (Matrix 3)**

Coughing, sneezing, or laughing produce high-velocity gas clouds that contain respiratory droplets. This propels droplets farther than background airflow streams, transported over 2 meters in a short period of time. (8). Coughing, sneezing, or laughing are more likely to produce greater amounts of contagious respiratory aerosols than most procedures performed on patients (13). Performing aerosol generation procedures in healthcare settings or potentially elsewhere in closed, crowded, poorly ventilated environments increase the risk of infection (14). High risk contact can be considered when a healthcare worker is applying the procedure or is present in the environment without PPE or with inappropriate PPE during an AGP (1). The Ministry of Health's Assessment of the Contact Status of the Health Care Worker with the COVID-19 patient recommends the use of N95 masks and face shields or eyeglasses together in aerosol-generating procedures, considering the use of a medical mask instead of N95 or not using a face shield/eyeglasses as medium risk (2).

## **SONUÇ**

However, there are difficulties in determining whether the reported transfers during AGPs are due to aerosols or other exposures (13). Another issue is that currently there is insufficient evidence to support the effectiveness of face shields for resource control. Therefore, face shields are not currently recommended to replace masks (13).

## **Limitation**

Despite all this evidence, there are still situations where the matrix may be limited in its use. It should be noted that as the contact time increases in a poorly ventilated indoor, the importance of the distance and the protection of the mask decrease. Even if the contact time is short, how long the patient has been in the environment might be important and whether the patient is not wearing a mask as well. The total time of repeated exposure, whether it exceeds 15 minutes might be evaluated in detail by an experienced surveillance team. In addition, if there is more than one contact type, all of them should be evaluated separately and the HCWs followed-up according to the one with higher risk. It should not be forgotten that the evaluations rely on the self-reports of the person coming into contact with a COVID-19 case.

## **Abbreviations**

AGP: Aerosol generating procedure

COVID-19: Coronavirus disease 2019

OHSU: Occupational Health and Safety Unit

EUMF: Ege University Medical Faculty

HCW: Healthcare worker

PCR: Polymerase chain reaction

PPE: Personal protective equipment

SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2

WHO: World Health Organization

## **Declarations**

### **Conflict of interest**

The authors declare that they have no conflict of interest.

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### **Authors' contributions**

SD and RD were involved in the development of the matrix and led the manuscript writing.

The manuscript was reviewed and authorized by the authors.

### **Consent to participate**

The surveillance team and the experts consented to participate in the evaluation of the contact risk classification matrices.

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