



## 1 **1. Introduction**

2 COVID-19 is a disease caused by a virus from the Coronaviridae family of viruses first  
3 described in the Wuhan region of Hubei State in China in December 2019<sup>1</sup>. The disease  
4 is characterized by acute respiratory symptoms, similar to those seen in the MERS and  
5 SARS outbreaks, and features human-to-human transmission. Although initially thought  
6 to be a zoonotic disease, in which the SARS-Cov-2 virus was transmitted from bats to  
7 humans, human-to-human transmission is currently the primary way the disease is  
8 transmitted. [1]

9 As of February 15, 2021, the number of COVID-19 cases around the World had exceeded  
10 171 million cases, with more than 3.5 million casualties<sup>2</sup>. Although some countries have  
11 seemingly begun to recover from the peak incidence, a second wave linked to the  
12 loosening of public health regulations remains a significant risk. [2] The first case of  
13 COVID-19 in Turkey was identified on March 11, 2020, and the first death due to the  
14 disease occurred on March 16<sup>3</sup>.

15 The Turkish Ministry of Health (MoH) commenced preparations for dealing with an  
16 epidemic in January 2020, immediately following reports of an emerging epidemic in  
17 Wuhan. Simultaneously, the case definitions for probable and confirmed COVID-19  
18 were set down, and testing and treatment algorithms were developed<sup>4</sup>.

19 Contact tracing has proven essential in mitigating and suppressing the epidemic. Contact  
20 tracing allows an index case to be identified and permits the discovery of those at risk of

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<sup>1</sup> World Health Organization (2020). Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations [online]. Website: <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations> [accessed 15 aug 2020]

<sup>2</sup> Wordometer (2021). Coronavirus Live Update [online]. Website: <https://www.worldometers.info/coronavirus/> [accessed 31 May 2021]

<sup>3</sup> Ministry of Health (2020). COVID-19 Bilgilendirme Platformu (in Turkish) [online]. Website: <https://covid19.saglik.gov.tr/TR-68443/covid-19-durum-raporu.html> [accessed 23 October 2020]

<sup>4</sup> Ministry of Health (2020). Algoritmalar (in Turkish) [online]. Website: <https://covid19bilgi.saglik.gov.tr/tr/algoritmalar> [accessed 18 September 2020]

1 infection so that they may be isolated. It is one of the cornerstones of mitigation and  
2 suppression efforts in public health responses to an epidemic. Previous studies concerned  
3 with the first cases in particular cities and the associated contact tracing efforts have  
4 revealed that person-to-person transmissibility is high for COVID-19, but further research  
5 into understanding the attack rates of local outbreaks is called for. [3]

6 With a registered population of 15,462,452, İstanbul is the most populous city in Turkey,  
7 accounting for almost 19% of the total population<sup>5</sup>. In addition to its central role in the  
8 commercial and economic life of the country, İstanbul is home to one of the busiest  
9 airports in the World, accommodating 200,000 passengers daily<sup>6</sup>. İstanbul has become  
10 evolved into a hotspot of the pandemic.

11 This study describes the first COVID-19 case and contacts tracing around the index case  
12 in İstanbul, Turkey.

## 13 **2. Materials and Methods**

14 In this article, we describe the first polymerase chain reaction positive (PCR (+)) COVID-  
15 19 case (index case), together with both suspected and confirmed cases discovered by  
16 tracing their contacts. We outline the clinical characteristics of the index case and examine  
17 disease progression in the suspected or confirmed cases of COVID-19 amongst the  
18 contacts of the index and source case.

19 The relevant laboratory test results, symptoms, follow-up, and treatment protocols were  
20 obtained from the Ministry of Health's national COVID-19 Surveillance system database.

21 At the same time, contact tracing reports were acquired from the İstanbul Public Health  
22 Directorate. Tracing reports were re-evaluated by a public health official, and a field

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<sup>5</sup> Turkish Statistical Institute (2020). Adrese Dayali Nufus Kayit Sistemi Sonuclari (in Turkish) [online].  
Website: <https://data.tuik.gov.tr/Bulten/Index?p=Adrese-Dayali-Nufus-Kayit-Sistemi-Sonuclari-2020-37210> [accessed 15 May 2021]

<sup>6</sup> İstanbul Airport (2020). Facts and Figures [online]. Website: <https://www.istairport.com/en> [accessed 18 August 2020]

1 contact tracer was allocated to the specific case. No additional data collection was  
2 undertaken for the purposes of this study. The İstanbul Medeniyet University Göztepe  
3 Research and Training Hospital Internal Review Board granted ethical approval via  
4 decree number: 2020/0208 for the study.

## 5 **2.1 Diagnosis and treatment of COVID-19 cases in Turkey**

6 Turkey employs the WHO's case definition, which is regularly updated. Any person  
7 presenting with symptoms that may suggest a COVID-19 infection (cough, fever,  
8 shortness of breath) is advised to apply to a hospital for COVID-19 testing. A PCR test is  
9 used to confirm cases of COVID-19. If COVID-19 is confirmed, the patient is admitted  
10 to the hospital or recommended to self-isolate at home. In the latter situation, follow-up  
11 is by daily phone calls.

12 All PCR(+) cases, plus those diagnosed clinically but without a PCR(+) result, start  
13 treatment according to the most recent version of the treatment protocol designed by the  
14 Turkish Ministry of Health's COVID-19 Scientific Committee, a committee of clinicians  
15 and public health officials appointed to advise on and prepare the strategies for diagnosis  
16 and treatment of COVID-19 plus any public health interventions required. All diagnoses  
17 and treatments related to COVID-19 are provided free of charge to all citizens, even in  
18 private hospitals.

## 19 **2.2 Contact tracing**

20 When a PCR(+) case is identified, notification is sent to the local Public Health  
21 Directorate and the patient's registered general practitioner to facilitate contact tracing.  
22 Field teams call and visit all possible contacts for symptom surveillance and PCR test  
23 sampling. Cases are followed up via phone every day until the point where symptoms  
24 have not been present for 14 days, and are advised to self-isolate during this period. In  
25 the contacts of a case that develops symptoms, the usual COVID-19 case diagnosis and

1 treatment protocols are used.

## 2 **2.3 Index case**

3 An index case is defined as the first patient identified with PCR-confirmed COVID-19.

4 The source case is then the individual who brought and transmitted the disease from an  
5 international source. Primary cases are described as confirmed cases of COVID-19 who  
6 are in close contact with the source or index case, and for whom no other confirmed or  
7 suspected case of COVID-19 is possible as a source of the illness. [4] Secondary cases  
8 are confirmed cases of COVID-19 cases that are believed to have been infected by the  
9 primary cases identified by the contact tracing investigation. [4]

10 In this study, the index case is coded as Patient B, and the source case as Patient A. Contact  
11 tracing for both cases was undertaken simultaneously since after the international trip of  
12 Patient A, they spent time together and had contact with the same people. Contacts of the  
13 index case or source (primary contacts) and their contacts (secondary contacts) are  
14 categorized into 'family,' 'work place' and 'hospital' with 'F,' 'W' and 'H' as the respective  
15 designations. The contacts of the index and source cases are coded with uppercase letters,  
16 while the secondary contacts are coded lowercase. The codes are also numbered in order  
17 of being traced. Contact mapping is presented in a separate Figure (Figure 1).

18 The age, comorbidity, duration of symptoms, and hospital stay are indicated for all  
19 hospitalized patients and all patients with a PCR (+) test.

## 20 **3. Results**

21 Eight days post-return from overseas travel, Patient A presented in hospital with fatigue,  
22 fever, and cough. A PCR test was performed, which was evaluated as a negative result.  
23 Patient B developed symptoms one day after Patient A. Patient B is the sibling of Patient  
24 A. They had been traveling together for business. Patient B, however, was found to be  
25 PCR (+) for COVID-19. Thus, Patient B is the index case in İstanbul. Contact tracing was

1 performed simultaneously for both cases, as the contacts for both individuals were the  
2 same after Patient A returned from overseas.

3 The index case was admitted to the hospital, where he remained for 21 days in total, 16  
4 of which were in the ICU (intensive care unit). He was intubated for ten days. See Figure  
5 2. He was admitted on the third day of symptoms, i.e., on day 12.

6 Patient A was re-tested 15 days after his initial (negative) PCR test. This time the test was  
7 positive. Despite COVID-19 being diagnosed by PCR earlier in Patient B than in patient  
8 A, Patient A is considered the source case since he had a history of overseas travel  
9 compatible with becoming infected, unlike Patient B. Patient A remained in hospital for  
10 32 days but was neither admitted to ICU nor required intubation. The ages and  
11 comorbidities of all contact-traced persons are presented in table 1. Neither Patient A nor  
12 Patient B had any comorbidities or other known risk factors, such as older age.

13 There were 12 PCR (+) cases amongst the contacts of the source case. These are the  
14 primary cases. Four primary cases were family contacts (F), 4 were workplace contacts  
15 (W), and 4 were hospital contacts (H) (see table 2). Three family contacts were admitted  
16 to ICU and intubated. Three workplace contacts were also admitted to ICU and intubated.  
17 Amongst the H contacts, only one individual was admitted to ICU and intubated. (See  
18 tables 1 and 2).

19 Three patients, one from each category of contact, suffered a fatal outcome. The hospital  
20 contact who died was a 32-year-old woman with immunosuppression. The F contact who  
21 died was the 66-year-old father of the source case, while the W contact was 76 years old.  
22 All these individuals were admitted to ICU and intubated after being admitted to the  
23 hospital. Contact tracing identified 73 contacts of the primary cases (i.e., secondary cases)  
24 who were then tested for COVID-19 by PCR, with positive results in 18% of these (n=13).  
25 The mortality among secondary cases was 0% (Figure 1). One of the secondary cases was

1 an F contact. This individual is the mother of the index case (F5f1). However, despite a  
2 9-day admission to the hospital, repeated PCR tests were negative.

3 While the spouse of the source case tested PCR (+), their children, aged 6 and 8, were  
4 negative on PCR testing (Figure 1).

5 One patient (H3) tested PRC (+), (-), (+), (-), and (-) consecutively . The positive result  
6 on the third test was deemed a false positive. (see Figure 2).

7 The contact tracing investigation of the index case in İstanbul uncovered 12 primary cases  
8 confirmed by PCR plus an additional 11 secondary cases confirmed by PCR (n=23). One  
9 further case amongst the secondary contacts was diagnosed with clinical signs without  
10 being PCR (+). Three fatalities were observed amongst the primary cases, while there  
11 were none in the secondary cases. (see Figure 2).

12 Only 14 out of 73 individuals traced from both index and source cases had symptoms on  
13 or before the day of investigation. The most common symptom was fever, followed by  
14 cough and malaise. Seven out of 23 people were asymptomatic. (see Figure 1).

15 The median length of hospital stay was 15 days (IQR:6-21 days)(See Figure 2). For  
16 primary contacts of the index or source case, the median length was 17, and for secondary  
17 contacts, it was six days. The median age of all PCR (+) patients was 39 (IQR: 32-58 and  
18 mean 44). The median age of hospitalized patients was 43 years (IQR: 36-66 and mean  
19 50). The fatalities (n:3) were aged 32, 66, and 76 years. Four patients admitted some form  
20 of comorbidity. Three were hypertensive, with one also declaring diabetes mellitus.  
21 Another individual was suffering from an immunosuppressive disorder. Two of the  
22 deceased patients had comorbidities (See table 1).

## 23 **4. Discussion**

### 24 **4.1 Main Findings of the study**

25 This case report describes the first known cases of COVID-19 in İstanbul, the clinical

1 course of the disease, and the primary and secondary cases arising among their contacts.  
2 With a history of international travel, the source case is assumed to have brought COVID-  
3 19 into this group, even though he had serial PCR (-) results but turned PCR(+) later and  
4 a relatively mild clinical course, without the need for ICU admission. His brother, who  
5 had an earlier clinical course and a PCR (+) result in his first test, eventually leading to  
6 ICU admission, is designated as the index case of the country.  
7 The distribution of PCR (+) cases seems to be between family, work, and hospital  
8 contacts. Deaths also show a similar distribution. Two of the patients who died had some  
9 form of comorbidity. While the risk of transmission is believed to be higher with closer  
10 and extended contact<sup>7</sup>, in this cluster, mortality and PCR positivity were similar in all  
11 groups (work, family, and hospital), meaning that shorter and less distant contact could  
12 also lead to a similar risk of transmission.  
13 This case study describes importing the first COVID-19 case and cluster into İstanbul and  
14 Turkey and transmission from the source and index case. While the start of symptoms to  
15 hospitalization for both cases was almost a week, the string of transmission lead to 23  
16 confirmed cases in this time frame, underlining the high infectivity of the virus and the  
17 need for rapid and comprehensive contact tracing when a COVID-19 case is confirmed.  
18 There are several limitations to this study. Contact tracing around this case is thought to  
19 be near-complete, with all contacts identified. Still, self-declaration by the cases may have  
20 led to some of the cases being missed due to fears of stigmatization or marginalization.  
21 Besides, since this was a rapidly evolving pandemic, the treatment algorithm in use was  
22 being revised almost every week, leading to difficulties in comparing prognoses between  
23 cases.

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<sup>7</sup> World Health Organization (2020). Novel Coronavirus – China [online]. Website: <https://www.who.int/csr/don/12-january-2020-novel-coronavirus-china/en/> [accessed 18 October 2020]



1 Contact tracing and the closure of borders happened relatively early in Turkey. Closures  
2 started with countries with high traffic and many cases, leading to rapid identification and  
3 mitigation of local outbreaks. In addition, contact tracing has been one of the cornerstones  
4 of the COVID-19 response in Turkey. In this first cluster, tracers were able to test all the  
5 contacts of both index and source cases in a relatively short time to identify the last case  
6 of the cluster in a week of investigation. This study described cases of the first COVID-  
7 19 cluster in İstanbul with contact tracing.

#### 8 **Acknowledgement and disclaimers**

9 None of the authors disclose any conflict of interest. There was no funding available for  
10 this study.

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2 **Tables and Figures**

3 **Table 1**

4

Cases	Age	Comorbidity	Hospitalisation Duration	ICU Duration	Intubation Duration	Prognosis
Patient A (source)	39	-	32	None	None	recovered
<b><u>Primary Cases</u></b>		-				
F1	30	-	None	None	None	asymptomatic
Patient B (index)	34	-	21	16	10	recovered
F5	66	HTN, DM	22	21	21	deceased
F6	60	-	23	20	2	recovered
W1	43	-	29	5	1	recovered
W2	46	-	17	None	None	recovered
W3	7	-	20	19	19	deceased

	6					
W4	3 8	-	15	9	None	recovered
H1	3 2	Immuns up.	14	14	3	deceased
H2	3 6	-	5	Non e	None	recovered
H3	3 9	-	5	Non e	None	recovered
H4	2 9	-	15	Non e	None	recovered
<b><u>Seconda ry Cases</u></b>						
F4f1	3 3	-	None	Non e	None	recovered
F4f2	2	-	None	Non e	None	recovered
F5f1 <sup>8</sup>	6 0	HTN	9	Non e	None	recovered
F5f2	8 1	HTN	5	Non e	None	recovered
F5f3	7 6	-	6	Non e	None	recovered

<sup>8</sup> Although F5f1 has never turned PCR(+), he showed similar symptoms to COVID-19 and was hospitalised.

H1f1	5 5	-	None	Non e	None	asymptoma tic
H1f2	5 5	-	None	Non e	None	asymptoma tic
H1w11	2 9	-	None	Non e	None	asymptoma tic
H1w20	5 0	-	None	Non e	None	asymptoma tic
H1w24	3 2	-	None	Non e	None	recovered
H1w28	3 6	-	None	Non e	None	asymptoma tic
F4f4	2 9	-	None	Non e	None	asymptoma tic

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2 Table 1. Prognosis of COVID-19 PCR Positive Cases

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2 **Table 2**

Day	1	2	3	4	5	6	7	8	9	10	11	12	...	Day 21
Outpatient			Inpatient						ICU & intubation			Between 13 to 21, remission in all symptoms and laboratory tests was observed.	Discharge	
Fever	+	+	+	+	+	+	+							
Malaise	+		+	+										
Cough			+	+										
Chest Radiography							+	+	++	+	+	+		Normal
Lab results indicative of COVID-19 <sup>9</sup>					Leukopenia									
CRP <sup>10</sup>	↑	↑	↑	↑	↑↑	↑	↑	↑	↑	↑	↓	↓		Normal

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<sup>9</sup> Laboratory results, excluding CRP levels were evaluated as a whole. Results outside the normal range of laboratory values are presented in the table.

<sup>10</sup> CRP level over 3 mg/dL is marked as ↑, CRP level over 10 mg/dL is marked as ↑↑, any meaningful decrease is marked as ↓.

1 Table 2: Clinical presentation and course of hospitalization of Index Case



Figure 1

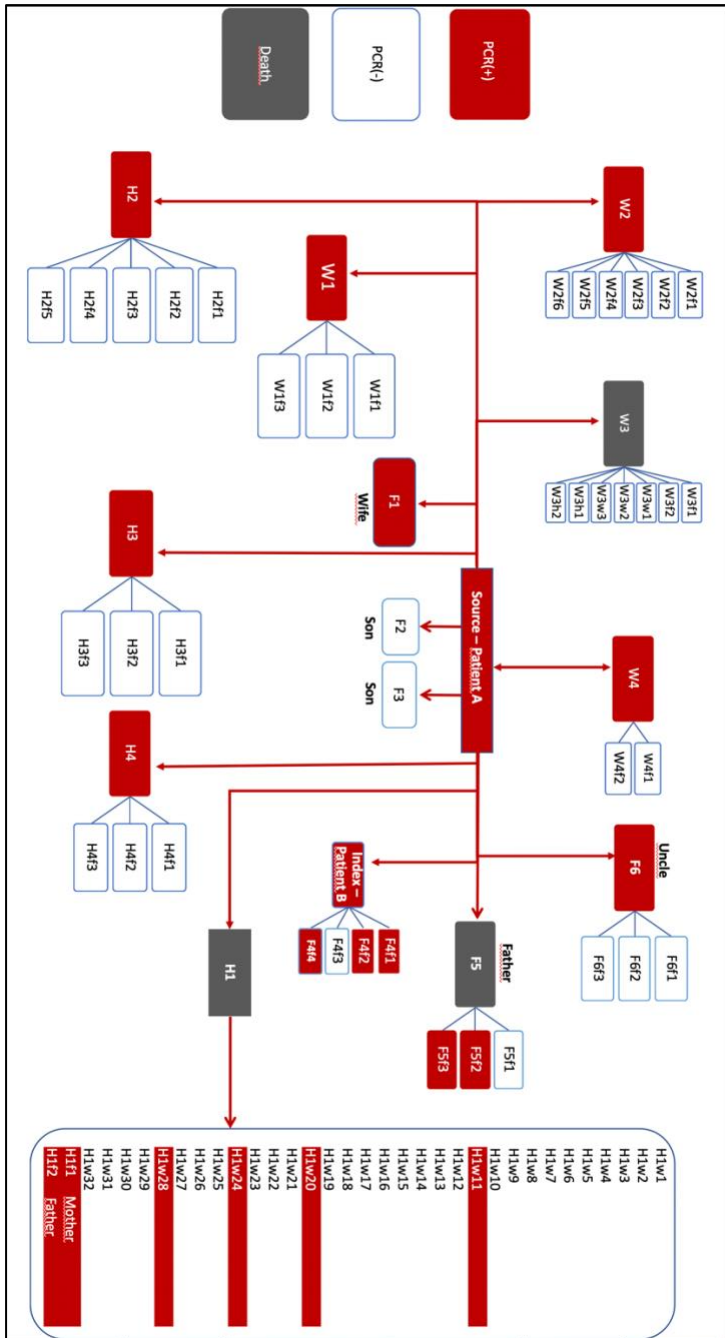


Figure 1: Contact Tracing Map of Index and Source Cases



Figure 2<sup>11</sup>

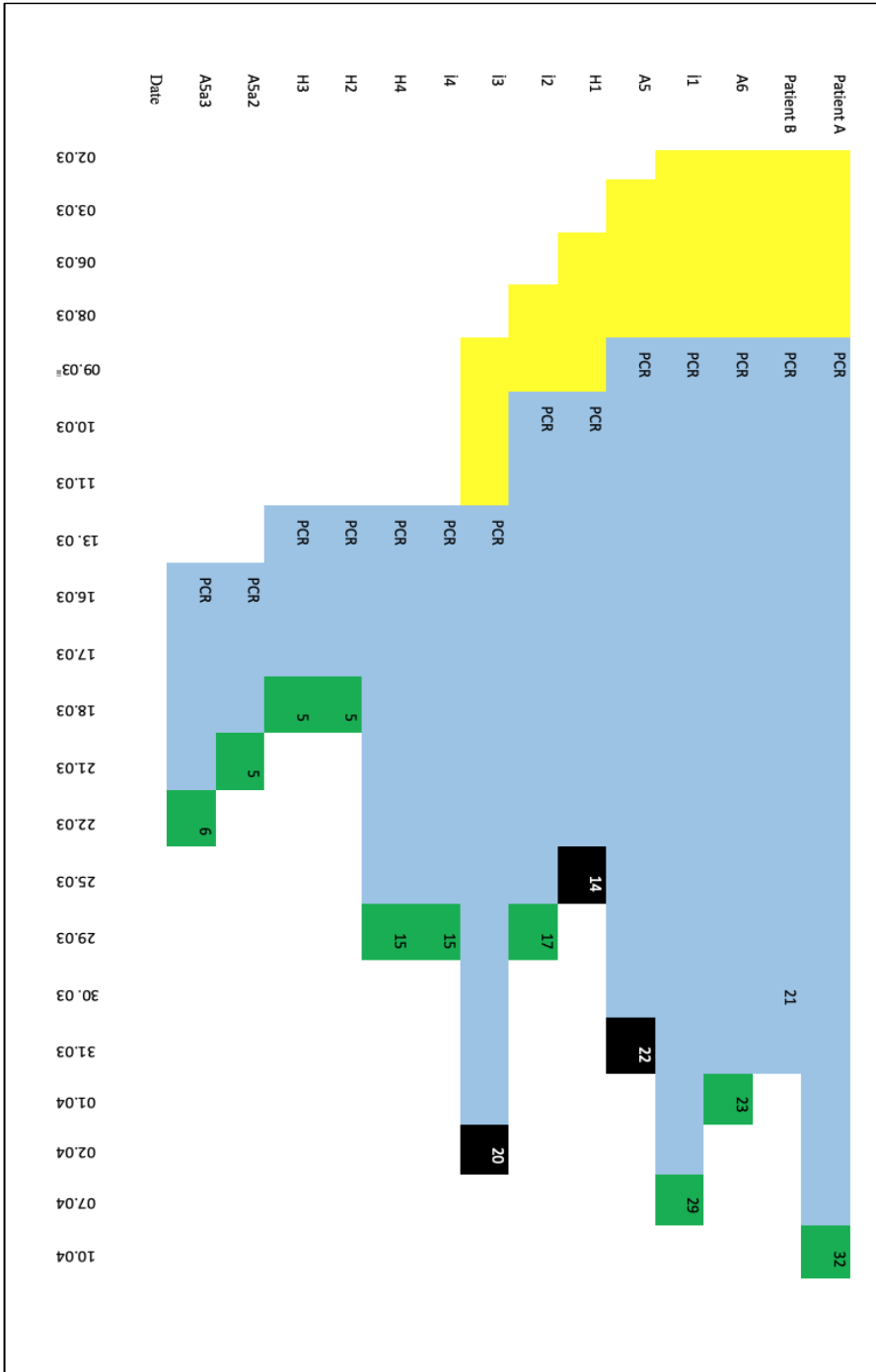


Figure 2: Length of symptoms and hospital admission of hospitalized patients.

<sup>11</sup> The days patient experienced symptoms before hospitalization are coded yellow. Blue is used for days spent in the hospital. If the patient had died, the day of death is coded black, and else, the day of discharge is coded green. Numbers represent the length of hospital stay in days. "PCR" represents the day of PCR test sample was taken.