# Improving efficacy and efficiency in an Emergency Unit by using the Radiology Department as the entry door of COVID-19 from the Primary Care Network

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RSNA® 2020
HUMAN INSIGHT/VISIONARY MEDICINE
November 29 to December 5

Morales Meseguer
Hospital General Universitario

# INTRODUCTION

First COVID-19 wave in the **Region of Murcia (Spain)** → Patients with **mild respiratory symptoms** were kept **at home**

High volumen of home-confined patients
Clinical needs for chest X-ray

→ urged our health area to set up a **High-Resolution Radiology Supply (HRRS)**

Area Vega Media del Segura

The Radiology Department (RD) was the entry-door. It aimed to:

- Provide **objective respiratory clinical information**
- Immediately **transfer patients with pneumonia to the Emergency Department (ED)**
- **Avoid overwhelming arrivals of respiratory patients to the ED**
- Refer back to **home confinement and telephone follow-up** those patients **without pneumonia**
- **Pilot and export the idea** to the other health areas

**OBJECTIVES**

1. To analyze **changes in the ED workload**
2. To analyze **differences in waiting-times** between HRRS and ED patients
3. To evaluate **how the HRRS discriminated the need for admission**

# METHODS

## 1. BACKGROUND

- **Before the COVID-19 pandemic started,** in our ED:
  - Number of patients usually treated: 1657 per week (e.g. 20-26 February).
  - Ratio of respiratory/non-respiratory patients : 1 (e.g. 206/218 20-26 March).
- **Expected respiratory patients per day during** the epidemic wave: 118 [(1657/2)/7]
- Through the usual ED way**, the infection risk for non-respiratory patients would have presumably been increased**.

## 2. INTERVENTION

### 2.1. HRRS CHARACTERISTICS

Main tools

X- RAY + OXIMETRY

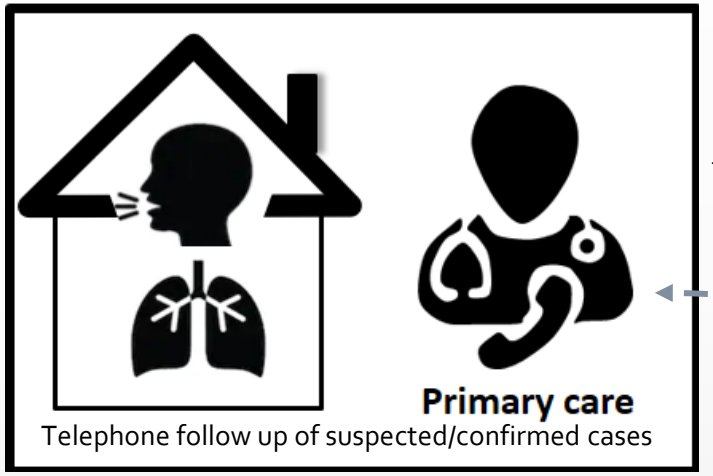
It aimed to be

1. **Relevant:** conclusive X-rays
2. **Accesible**: in less than 24h and without waiting time
3. **Swift:** less than 15 min workflow
4. **Safe:** reducing risk of patients and staff infections, and of failing communication between RD and ED.

# METHODS

## 2.1. HRRS MAIN COMPONENTS

### A. General Practitioners




- More than 6-7 days fever
- Persistent respiratory symptoms
- Worsening of general condition

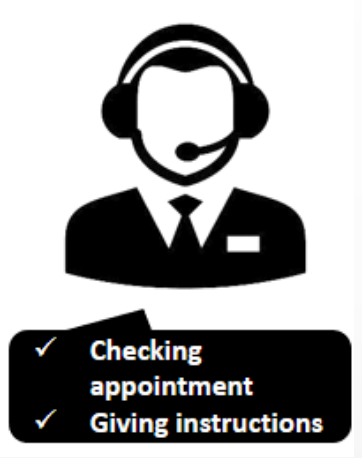
Normal chest X-ray

### B. Specific electronic agenda

| Name | Phone number | Time | Reason |
|---|---|---|---|
| | | 9:00 | COVID-19 suspiction |
| | | 9:15 | COVID-19 suspiction |
| | | 9:30 | COVID-19 suspiction |

Covid-19 appointment

### C. Administrative staff




### D. Reception

Provide surgical mask and explain how to reach the radiology room

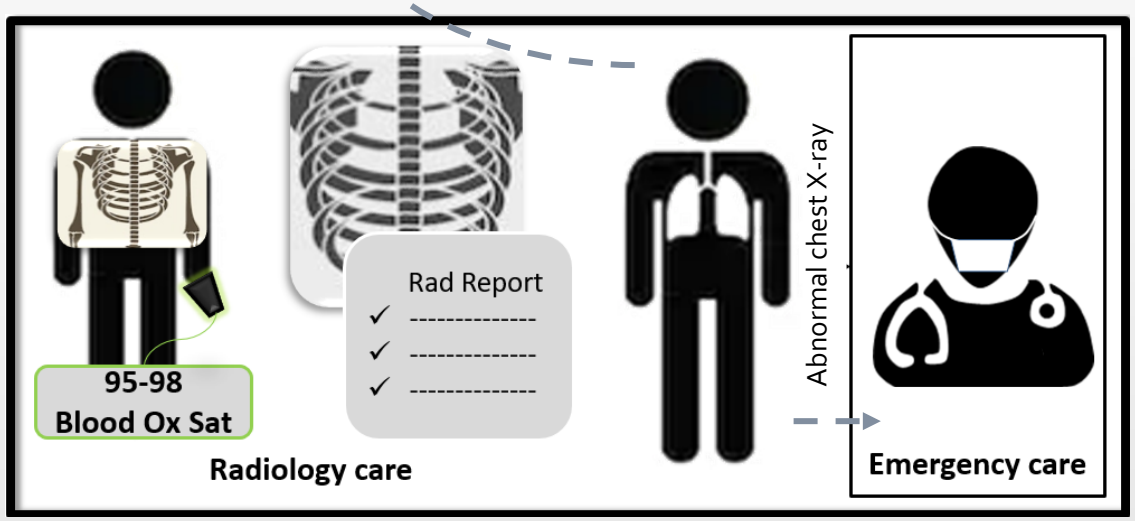
### E. Radiology Department technicians and nurses

Chest X-Ray and/or chest tomosynthesis, oximetry, cleaning, informing the patient and/or accompanying to ED

### G. COVID radiology room

Robotized remote-control x-ray digital 3D and oximetry

### H. Radiologists *(next slide)*




### I. Emergency Department

Patients with radiological signs of pneumonia directly go

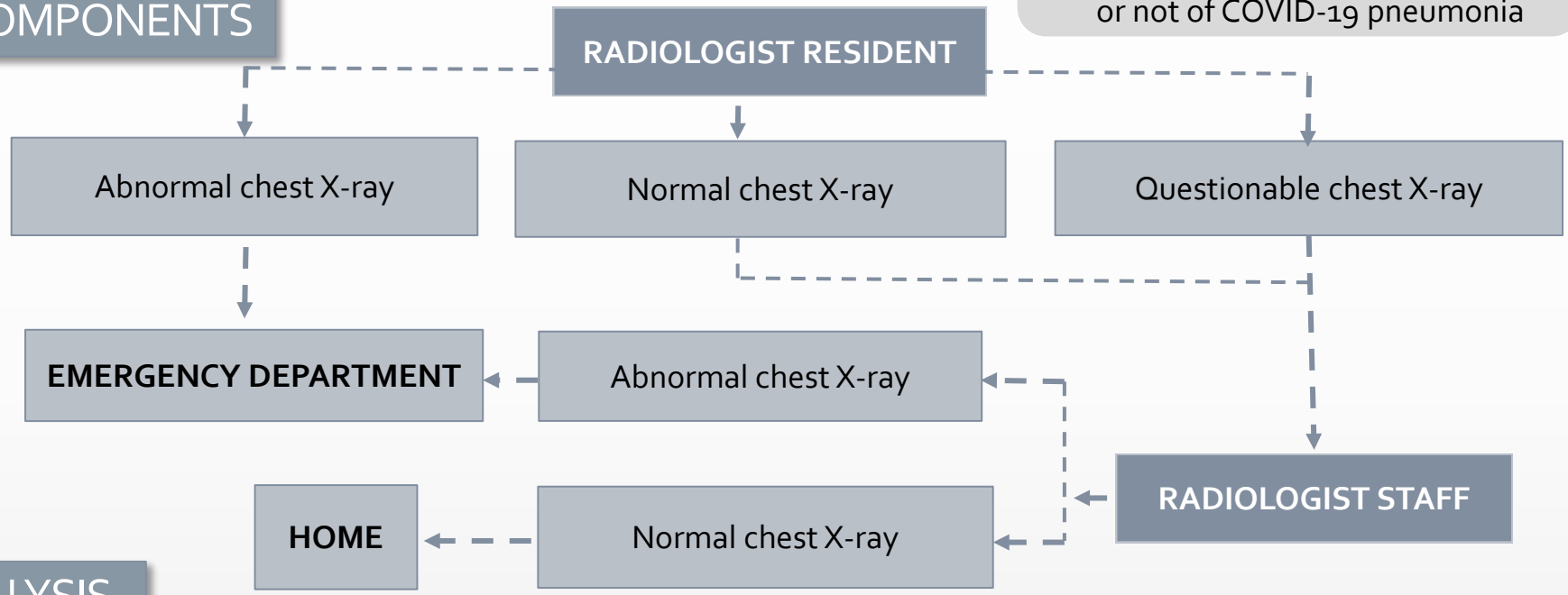
### J. Crisis committee every day

# METHODS

**RAD REPORT**
- ✓ **Oxygen saturation**
- ✓ **Radiology findings** suggestive or not of COVID-19 pneumonia

## 2.1. HRRS MAIN COMPONENTS

**H. Radiologists**




## STATISTICAL ANALYSIS

Group 1 (G1): **HRRS. Normal X-ray - Returning home**. *Process length:* appointment time – report validation.

Group 2 (G2): **HRRS. Abnormal X-ray** (ground glass / consolidation / reticular patern)- **ED**. *Process length:* arrival time to the ED – clinical report signature.

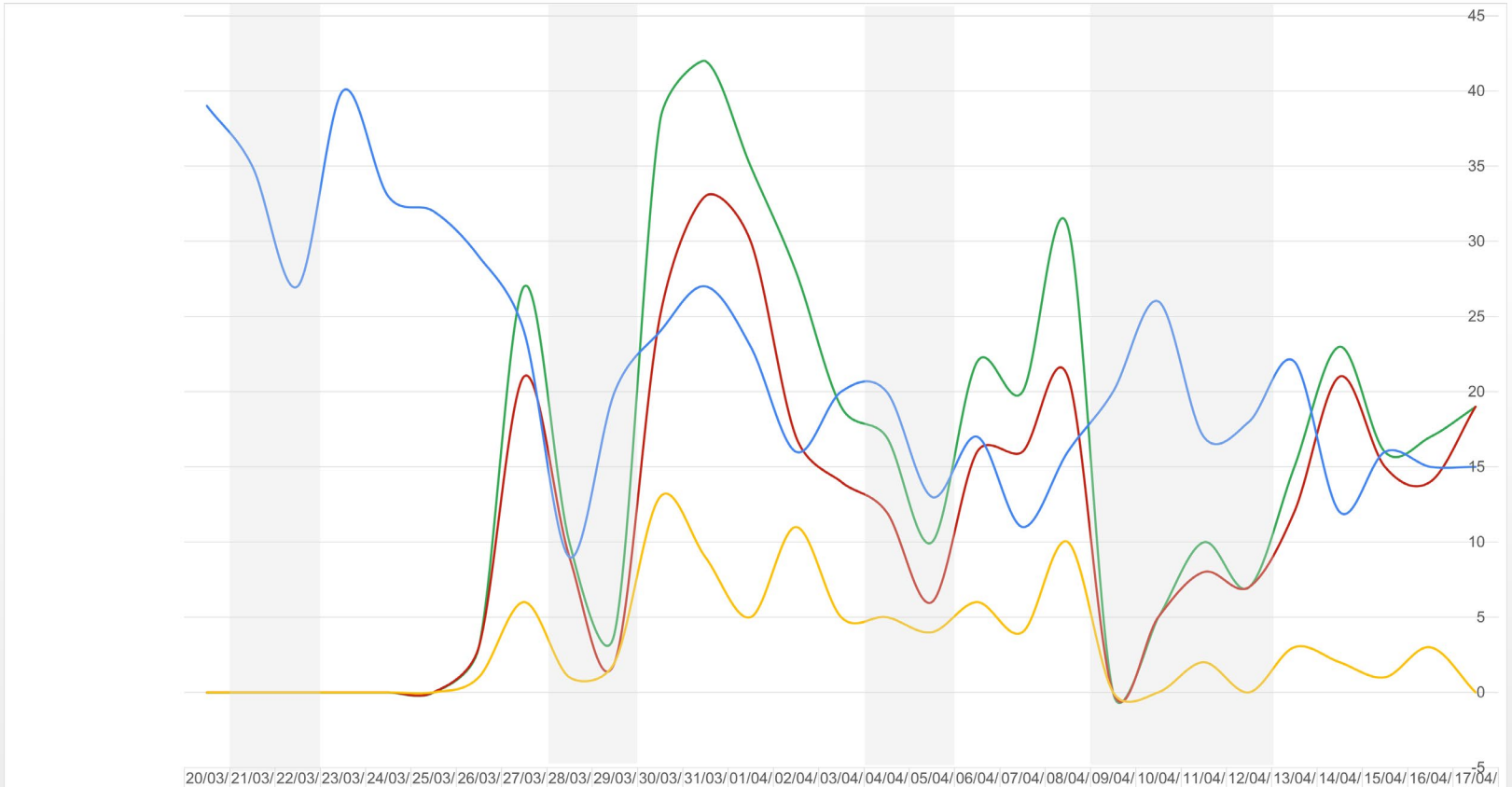
Group 3 (G3): **Respiratory ED patients.** *Process length:* arrival time to the ED – clinical report signature.

- Daily absolute and relative frequencies, total accumulated frequency for all groups and daily ratio of hospitalised patients por G2 and G3 were calculated.

- The analysis was performed with the IBM Statistics SPSS 20 software. The ANOVA and Bonferroni correction, Student T, Kruskal-Wallis, and Chi2 tests were applied. Statistically significant differences were assumed when $P < 0.05$.

# RESULTS

## A. WORKLOAD




| | 20/03/2020 | 21/03/2020 | 22/03/2020 | 23/03/2020 | 24/03/2020 | 25/03/2020 | 26/03/2020 | 27/03/2020 | 28/03/2020 | 29/03/2020 | 30/03/2020 | 31/03/2020 | 01/04/2020 | 02/04/2020 | 03/04/2020 | 04/04/2020 | 05/04/2020 | 06/04/2020 | 07/04/2020 | 08/04/2020 | 09/04/2020 | 10/04/2020 | 11/04/2020 | 12/04/2020 | 13/04/2020 | 14/04/2020 | 15/04/2020 | 16/04/2020 | 17/04/2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of patients assisted in the HRRS | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 27 | 10 | 4 | 38 | 42 | 35 | 28 | 19 | 17 | 10 | 22 | 20 | 31 | 0 | 5 | 10 | 7 | 15 | 23 | 16 | 17 | 19 |
| Group 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 21 | 9 | 2 | 25 | 33 | 30 | 17 | 14 | 12 | 6 | 16 | 16 | 21 | 0 | 5 | 8 | 7 | 12 | 21 | 15 | 14 | 19 |
| Group 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 1 | 2 | 13 | 9 | 5 | 11 | 5 | 5 | 4 | 6 | 4 | 10 | 0 | 0 | 2 | 0 | 3 | 2 | 1 | 3 | 0 |
| Group 3 | 39 | 35 | 27 | 40 | 33 | 32 | 29 | 24 | 9 | 20 | 24 | 27 | 23 | 16 | 20 | 20 | 13 | 17 | 11 | 16 | 20 | 26 | 17 | 18 | 22 | 12 | 16 | 15 | 15 |

- The HRRS started on **March 26th,** with 135 confirmed and 1169 possible cases 2020, being considered **the peak of the epidemic wave**.
- From **March 26th to April 17th** 2020:

  418 **HRRS patients** (9,89% of active/possible home-confined cases):

  - **G1**: 325 (77.75%)
  - **G2**: 93 (22.24%). 1 patient asked for voluntary discharge.

  431 **ED respiratory patients (G3)**

  - 224 (52%): home
  - 203 (47.10%): admitted
  - 4 (0.93%): refused admission

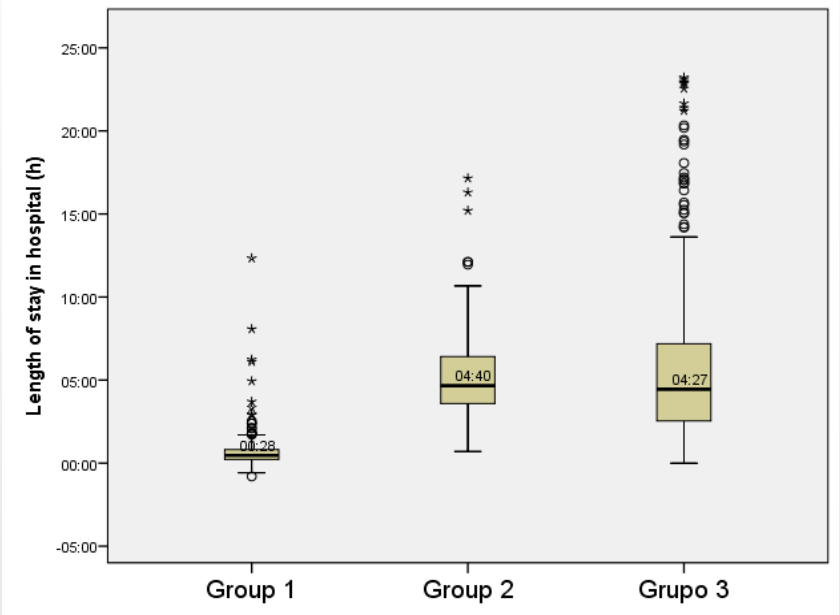
- **65%** [(326+228)/849] **of patients returned back to home confinement.**
- **Descent peaks of the HRRS flow**- grey bands - were justified by **weekends or holidays,** when less GPs were available to refer patients.

# RESULTS

## B. WAITING TIMES

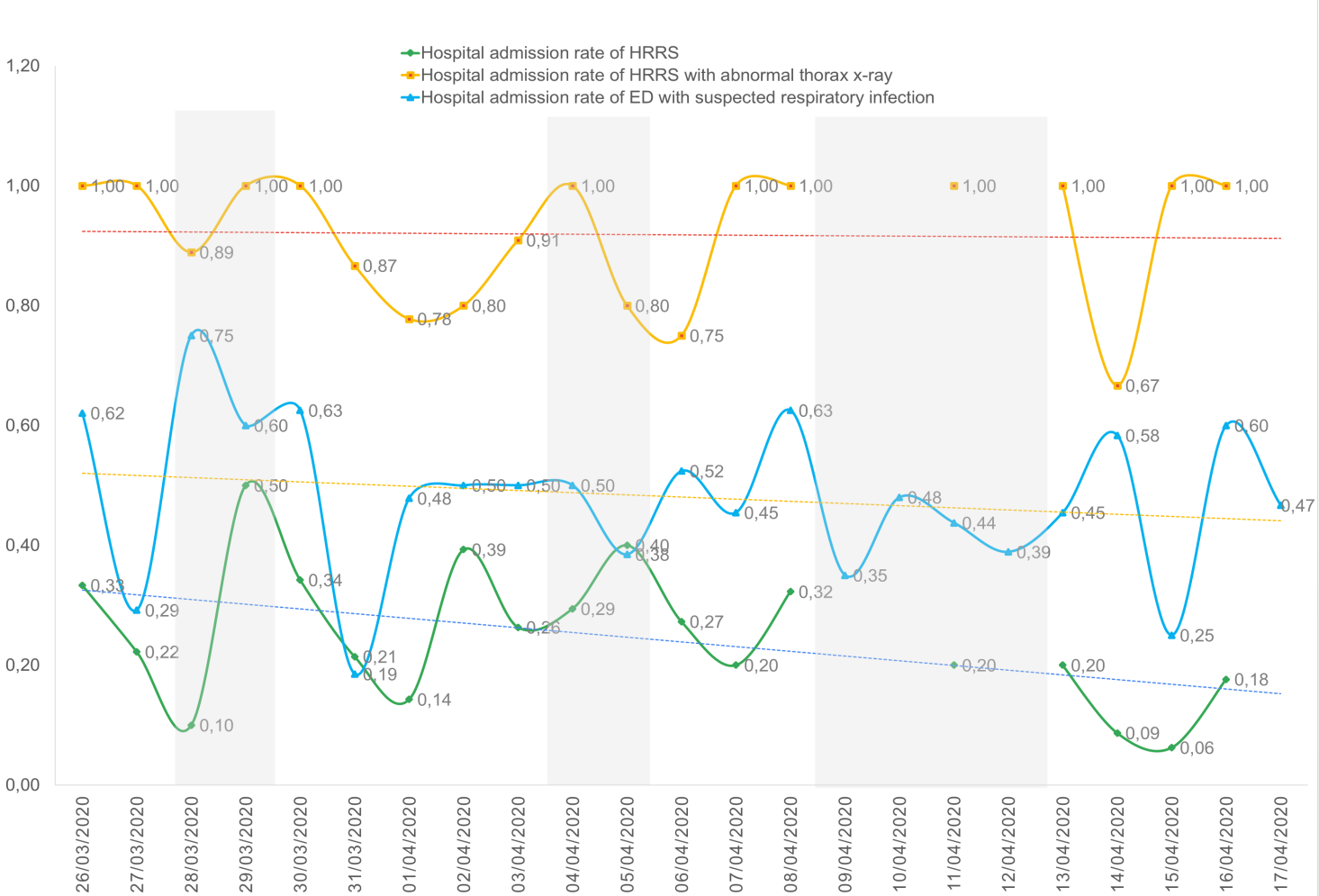
- **G1 patients** (0:41 ± 1:05h) **stayed in hospital significantly less time than G2 and G3 subjects** (5:25 ± 3:08h and 5:36 ± 4:36h, respectively; *P* <0.001), even when G2 and G3 patients returned home (3:36 ± 2:58h and 3:50 ± 3:16h, respectively (*P* <0.001).
- **The time span in the ED did not differ between G2 and G3 when they returned home** (3:36 ± 2:58h vs. 3:50 ± 3:16h; *P* = 0.841), **but was shorter for G2** (5:27 ± 3:08h vs. 7:42 ± 5:02h) **when patients were admitted** (*P* < 0.001).
- **Even considering the G2 HRRS and ED lengths together, they waited less time than G3 patients,** except for the 9/93 (9.6%) G2 patients returning home (4:44 vs 3:50 h).

| | GROUP 1 | GROUP 2 | GROUP 3 |
|---|---|---|---|
| **Mean** | 0:41 | 5:25 | 5:36 |
| **Standard Deviation** | 1:05 | 3:08 | 4:36 |
| **Median** | 0:28 | 4:40 | 4:27 |
| **Interquartile Range** | 0:36 | 2:53 | 4:41 |
| **Range** | 13:08 | 16:27 | 23:13 |



# RESULTS

## C. ADMISSION




- **G2 patients were more frequently admitted** (84/93, 90.3%) **than in G3** (203/431, 47.1%; *P* <0.001).
- **Rate per day was always higher for G2** (mean rates: 0.92, range 0.67-1 vs. 0.48, range 0.18-0.75), **regardless the epidemics time point**.
- It suggests **a HRRS high yield for fast admission decisions**.
- All eight G2 patients with normal chest X-rays (8/93, 8.6%) who shook ED advice were discharged by the emergency physicians.

# CONCLUSIONS

- A straightforward and sustainable **outpatient HRRS could triaged and substantially decreased respiratory patients at the ED** during the COVID-19 pandemic.
- It could also **reduce waiting times and hospital length,** and yield **fast admission decisions**.
- Consequently, the **RD as an entry-door** for the triage of selected common pathologies **might be spread to many other clinical situations.**

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