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

Juana M. Plasencia Martínez, Marina Lozano Ros, Pablo Fabuel Ortega, María C. Sánchez Ayala, Gloria Pérez Hernández, José María García Santos.

Hospital Universitario Morales Meseguer, Murcia (Spain)
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 → High-Resolution Radiology Supply (HRRS)

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 \(\frac{1657}{2}/7\)

- Through the usual ED way, the infection risk for non-respiratory patients would have presumably been increased.

2. INTERVENTION

2.1. HRRS CHARACTERISTICS

1. Relevant: conclusive X-rays
2. Accessible: 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.

X-RAY + OXIMETRY

It aimed to be
2.1. HRRS MAIN COMPONENTS

A. General Practitioners

- Telephone follow up of suspected/confirmed cases

B. Specific electronic agenda

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone number</th>
<th>Time</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>9:00</td>
<td>COVID-19 suspicion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9:15</td>
<td>COVID-19 suspicion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9:30</td>
<td>COVID-19 suspicion</td>
</tr>
</tbody>
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C. Administrative staff

- Checking appointment
- Giving instructions

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

F. COVID radiology room

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

G. Radiologists (next slide)

- Normal chest X-ray

H. Radiology care

- Rad Report
  - ✔️
  - ✔️
  - ✔️

I. Emergency Department

- Patients with radiological signs of pneumonia directly go to ED every day

J. Crisis committee

- Every day
METHODS

2.1. HRRS MAIN COMPONENTS

Abnormal chest X-ray → Normal chest X-ray → Questionable chest X-ray

H. Radiologists

Abnormal chest X-ray → Normal chest X-ray → Questionable chest X-ray

EMERGENCY DEPARTMENT

HOME

RADIOLOGIST RESIDENT

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

RADIOLOGIST STAFF

STATISTICAL ANALYSIS


Group 2 (G2): HRRS. Abnormal X-ray (ground glass / consolidation / reticular pattern) - ED. 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.
- 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.
- **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).

### B. WAITING TIMES

<table>
<thead>
<tr>
<th>GROUP 1</th>
<th>GROUP 2</th>
<th>GROUP 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0:41</td>
<td>5:25</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1:05</td>
<td>3:08</td>
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<tr>
<td>Median</td>
<td>0:28</td>
<td>4:40</td>
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<tr>
<td>Interquartile Range</td>
<td>0:36</td>
<td>2:53</td>
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<tr>
<td>Range</td>
<td>13:08</td>
<td>16:27</td>
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</table>
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.
- 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.
REFERENCES


