



# Chest X-Ray for Follow-Up of Hospitalized COVID-19 Patients in Settings with Limited Access to Computed Tomography

Victor Velásquez-Rimachi<sup>1, 2</sup>,  
Sandra S. Chavez-Malpartida<sup>3, 4</sup>,  
Randy Velasquez-Fernandez<sup>3, 4</sup>,  
Luis Campos-Ramirez<sup>5</sup>

<sup>1</sup>Red de Eficacia Clínica y Sanitaria, REDECS, Lima, Peru; <sup>2</sup>Neuroscience Research Group, Clinical Effectiveness, and Public Health, Universidad Científica del Sur, Lima, Peru; <sup>3</sup>Facultad de Medicina Humana, Universidad Nacional Mayor de San Marcos, Lima, Peru; <sup>4</sup>Sociedad Científica de San Fernando, Lima, Peru; <sup>5</sup>Department of Radiology, Aurelio Diaz Ufano Hospital, Lima, Peru

Dear Editor,

We have read with great interest, the recent article published in Korean Journal of Radiology titled “Characteristics of COVID-19 patients who progress to pneumonia on follow-up chest radiograph: 236 patients from a single isolated cohort in Daegu” [1]. The authors observed that 35% (59/167) of their patients hospitalized with COVID-19 and initially classified as negative for pneumonia on chest X-ray (CXR) showed a positive conversion at follow-up [1]. Additionally, they identified that age  $\geq 45$  years (odds ratio [OR]: 3.93, 95% confidence interval [CI]: 1.76–8.75,  $p = 0.001$ ), absolute lymphocyte count  $< 1500$  cells/ $\mu\text{L}$  (OR: 2.25, 95% CI: 1.03–4.89,  $p = 0.041$ ), and C-reactive protein  $> 0.5$  mg/dL (OR: 3.91, 95% CI: 1.54–9.91,  $p = 0.004$ ) were

**Received:** December 3, 2020 **Revised:** December 3, 2020

**Accepted:** December 9, 2020

**Corresponding author:** Victor Velásquez Rimachi, MD, Red de Eficacia Clínica y Sanitaria, REDECS, Libra, Los Olivos 15301, Lima, Peru.

• E-mail: [victor.velasquez1@unmsm.edu.pe](mailto:victor.velasquez1@unmsm.edu.pe)

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

independent factors related to this conversion [1].

We are aware of various imaging studies used to monitor response treatment because it can reveal the evolution of lung involvement and, therefore, evaluate therapeutic interventions' efficacy [2]. Consequently, in June 2020, WHO published a quick guide for the use of chest imaging in COVID-19, where it recommended its use to indicate therapeutic management in hospitalized patients with suspected or confirmed COVID-19 [3].

However, not all countries have the availability of sophisticated studies, such as in South Korea, where alternative imaging modalities may be chosen. For example, in Peru, 90% of reference hospitals had CXR, and only 42% had computed tomography (CT) [4]. Given this scarcity, we must know the benefits and limitations of each study, mainly due to its applicability in limited CT access contexts.

CXR is a suitable alternative because it has essential advantages such as lower cost and radiation, requires fewer human resources, and minimizes the mobilization of hospitalized patients [5]. Likewise, its portable version shows a particular application by reducing the risk of transmission and the need for constant disinfection of procedure rooms, significantly allowing sequential evaluation [6].

In conclusion, although there is still uncertainty about the usefulness of CXR, it could be used for the individualized follow-up of hospitalized patients with COVID-19 in settings with limited access to CT because it identifies a significant proportion of positive conversions to COVID-19 pneumonia [1].

## Acknowledgments

The authors thank the midwife Elkie Johanna Henrica Renders for her support in verifying the English language.

## Author Contributions

Conceptualization: all authors. Methodology: Víctor Velásquez-Rimachi. Project administration: Sandra S. Chavez-Malpartida. Resources: Luis Campos-Ramirez. Supervision: Luis Campos-Ramirez. Writing—original draft: Sandra S. Chavez-Malpartida, Randy Velasquez-Fernandez. Writing—review & editing: Victor Velásquez-Rimachi, Luis Campos-Ramirez.

**ORCID iDs**

Victor Velásquez-Rimachi

<https://orcid.org/0000-0002-9350-7171>

Sandra S. Chavez-Malpartida

<https://orcid.org/0000-0003-3519-5189>

Randy Velasquez-Fernandez

<https://orcid.org/0000-0001-7548-7085>

Luis Campos-Ramirez

<https://orcid.org/0000-0001-7422-7038>

**REFERENCES**

1. Jung HK, Kim JY, Lee MS, Lee JY, Park JS, Hyun M, et al. Characteristics of COVID-19 patients who progress to pneumonia on follow-up chest radiograph: 236 patients from a single isolated cohort in Daegu, South Korea. *Korean J Radiol* 2020;21:1265-1272
2. Larici AR, Cicchetti G, Marano R, Merlino B, Elia L, Calandriello L, et al. Multimodality imaging of COVID-19 pneumonia: from diagnosis to follow-up. A comprehensive review. *Eur J Radiol* 2020;131:109217
3. Akl EA, Blažič I, Yaacoub S, Frija G, Chou R, Appiah JA, et al. Use of chest imaging in the diagnosis and management of COVID-19: a WHO rapid advice guide. *Radiology* 2021;298:E63-E69
4. del Pueblo D. *El derecho a la salud: los servicios de emergencia en los establecimientos de salud públicos y el acceso a medicamentos esenciales*. Lima, Perú 2016
5. Rubin GD, Ryerson CJ, Haramati LB, Sverzellati N, Kanne JP, Raoof S, et al. The role of chest imaging in patient management during the COVID-19 pandemic: a multinational consensus statement from the Fleischner Society. *Radiology* 2020;296:172-180
6. Zanardo M, Schiaffino S, Sardanelli F. Bringing radiology to patient's home using mobile equipment: a weapon to fight COVID-19 pandemic. *Clin Imaging* 2020;68:99-101

## Response

Ha Kyung Jung, Jin Young Kim

All authors: Department of Radiology, Dongsan Hospital, Keimyung University College of Medicine, Daegu, Korea

To the Editor,

Firstly, we would like to thank you for your thoughtful comments on our article titled “Characteristics of COVID-19 patients who progress to pneumonia on follow-up chest radiograph: 236 patients from a single isolated cohort in Daegu” published in the Korean Journal of Radiology [1]. We investigated the prevalence of COVID-19 pneumonia using chest radiographs and concluded that elderly patients ( $\geq 45$  years old) with abnormal laboratory findings (elevated C-reactive protein and low absolute lymphocyte counts) developed pneumonia on follow-up chest radiographs.

Even though it has already been confirmed in many published studies that computed tomography (CT) is more sensitive for pneumonia detection than chest radiograph, as you described, chest radiograph is the mainstay of imaging modality in resource-constrained environment [2-4]. Compared with CT, several advantages including portable usage, lower cost, and faster application advocate the use of chest radiograph [2]. In particular, the rapid spread of COVID-19 is emphasizing the importance of timely determination of the therapeutic plan and hospitalization through adequate use of chest imaging [5]. In further data collection conducted at our hospital, there were 60 patients whose chest radiographs were normal, but pneumonia was detected on chest CT. However, none of them had progressed to severe disease requiring oxygen treatment or intensive unit care. We assume that only CT visible pneumonia may not lead to clinical deterioration and monitoring the extent of pneumonia using chest radiograph may be sufficient

when CT is unavailable. Although chest radiograph may underestimate pneumonia compared to CT, we agree that it can be an alternative imaging tool for investigating and monitoring pneumonia in COVID-19 patients, especially in a medical resource-constrained environment. We believe that your comments have enriched our study and we sincerely appreciate your interest.

## ORCID iDs

Ha Kyung Jung

<https://orcid.org/0000-0003-4571-2688>

Jin Young Kim

<https://orcid.org/0000-0001-6714-8358>

## REFERENCES

1. Jung HK, Kim JY, Lee MS, Lee JY, Park JS, Hyun M, et al. Characteristics of COVID-19 patients who progress to pneumonia on follow-up chest radiograph: 236 patients from a single isolated cohort in Daegu, South Korea. *Korean J Radiol* 2020;21:1265-1272
2. Rubin GD, Ryerson CJ, Haramati LB, Sverzellati N, Kanne JP, Raouf S, et al. The role of chest imaging in patient management during the COVID-19 pandemic: a multinational consensus statement from the Fleischner Society. *Chest* 2020;158:106-116
3. Yoon SH, Lee KH, Kim JY, Lee YK, Ko H, Kim KH, et al. Chest radiographic and CT findings of the 2019 novel coronavirus disease (COVID-19): analysis of nine patients treated in Korea. *Korean J Radiol* 2020;21:494-500
4. Minardi J, Marsh C, Sengupta P. Risk-stratifying COVID-19 patients the right way. *JACC Cardiovasc Imaging* 2020;13:2300-2303
5. Akl EA, Blažič I, Yaacoub S, Frijia G, Chou R, Appiah JA, et al. Use of chest imaging in the diagnosis and management of COVID-19: a WHO rapid advice guide. *Radiology* 2021;298:E63-E69

---

**Corresponding author:** Jin Young Kim, MD, Department of Radiology, Dongsan Hospital, Keimyung University College of Medicine, 1035 Dalgubeol-daero, Dalseo-gu, Daegu 42601, Korea.  
 • E-mail: [jjinkim0411@naver.com](mailto:jjinkim0411@naver.com)