

A review of COVID-19's impact on radiology residents' academics and wellness in North America

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Introduction

- Radiology residents faced unique challenges during the COVID-19 pandemic.
- The pandemic disrupted traditional learning models and resulted in a significant decline in case volume/diversity.
- Research activities were also affected, with many in-person research facilities being suspended.
- The pandemic had a negative impact on resident wellness, with social isolation and increased workload contributing to burnout.
- However, the pandemic also presented opportunities for innovation and the adoption of new, flexible learning models.

Objectives

- Highlight the impact of COVID-19 on radiology residency education, research, and wellness.
- Discuss the strategies used by residency programs to adapt to the challenges posed by the pandemic.
- Explore the potential benefits and drawbacks of virtual learning and research models.
- Examine the impact of the pandemic on resident well-being and identify wellness initiatives that can be implemented to address these challenges.

Materials and Methods

- The study selection process is summarized in **Fig. 1** below.
- 24 research papers were reviewed.
- Included studies were conducted in North America and published between 2020 and 2022.
- Study designs included qualitative, quantitative, and mixed-methods approaches.
- Studies addressed several domains of interest including residency curriculum (14), Research (4), and resident well-being (6).

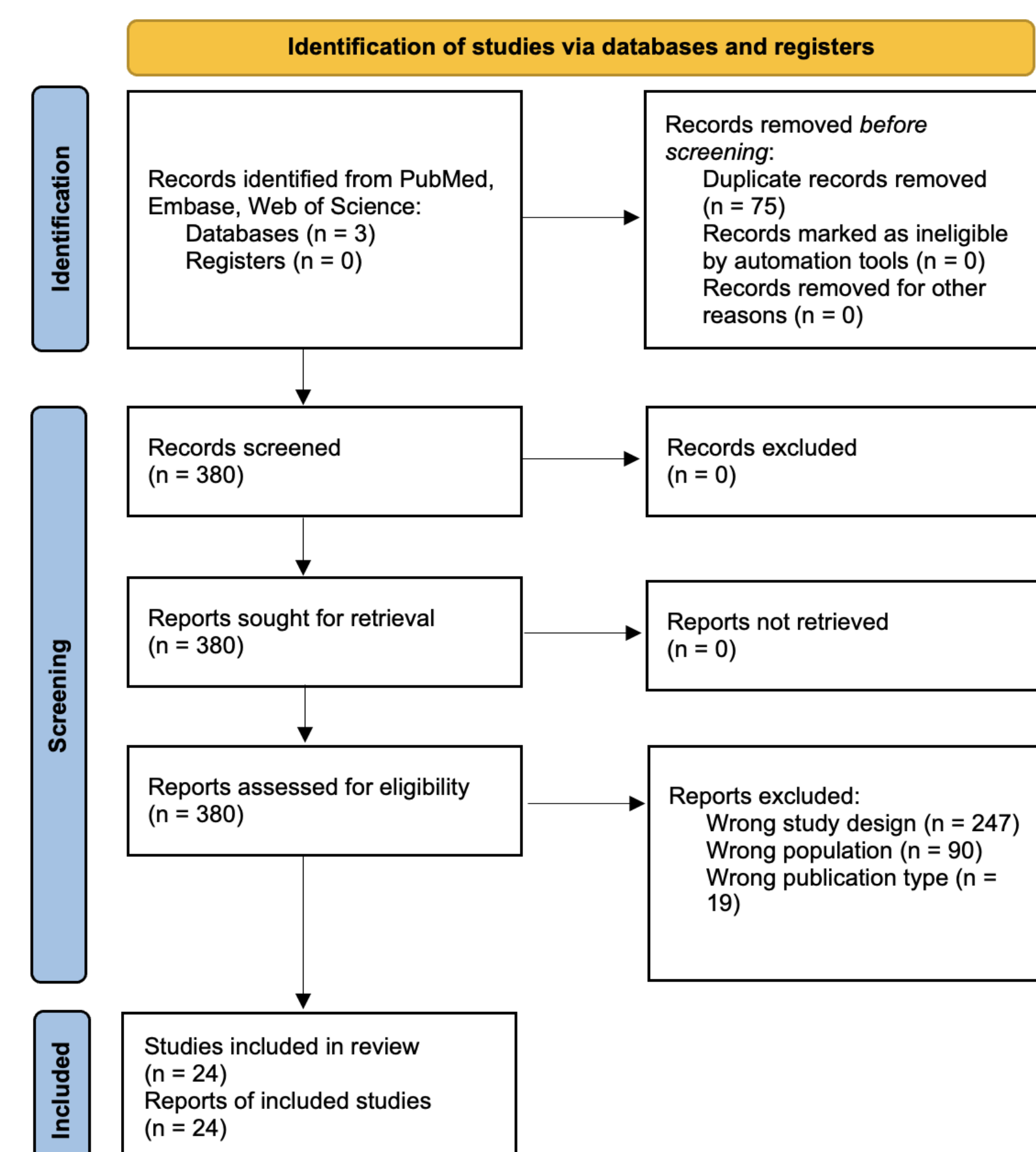


Fig. 1: Flow chart of the study selection process

Results

Category	Changes	Impact	Strategies to Mitigate
Decline in Case Volume and Diversity of Cases	<ul style="list-style-type: none"> • Directives from local health and legislative authorities to defer or delay elective radiology imaging [4]. • Increased fears of contagion from visiting hospitals or imaging centers [5]. • Radiology residents deployed to non-radiology clinical areas [5]. • Increased need for COVID-related imaging [6]. • Large decline in certain examinations such as mammography, magnetic resonance imaging (MRI), and non-positron tomography/computed tomography nuclear medicine [7]. 	<ul style="list-style-type: none"> • Radiology residents saw a great decline in case number, with R1 and R2 residents particularly impacted [7]. • Decline in residents' perceived competency with interpretation of imaging [8]. • Impeded residents' ability of fulfill graduation requirements due to case volume requirements [9]. • Decline in case diversity negatively impacted the completeness of resident's education [10]. 	<ul style="list-style-type: none"> • Simulated cases curated by faculty for each resident cohort [10]. • Explosion of online resources with large repositories of cases which can be accessed virtually [11]. • Loosening of case requirements for graduation, especially in case-heavy fields such as interventional radiology [12].
Virtual Delivery of Education	<ul style="list-style-type: none"> • Synchronous and asynchronous classes via platforms such as Zoom, Microsoft Teams, Skype, or Google Meet [13]. • Synchronous sessions consisted of virtual didactic lectures, team-based case reviews, and grand rounds [2]. • Asynchronous sessions consisted of watching previously recorded lectures/online modules, answering practice questions, completing cases online, and reading relevant articles/book chapters [2]. 	<ul style="list-style-type: none"> • Radiology residents still felt that most learning objectives were being met despite the virtual curriculum [14]. • Stronger emphasis on self-directed learning [13]. • Well received by residents, citing advantages such as ease of access and greater autonomy [4]. • Decreased anxiety towards public speaking with more opportunities to ask questions and clarify concepts [4]. • Virtual learning activities sometimes led to decreased engagement and increased distractibility [4]. 	<ul style="list-style-type: none"> • Virtual folders called "Resident Manuals" created containing various virtual radiology resources [2]. • Digital polling software such as "Kahoot" and "Poll Everywhere" to promote audience engagement [2]. • Directing questions specifically to named students [14]. • Using the "chat" feature of virtual meetings to ask questions [4].
Research	<ul style="list-style-type: none"> • Research facilities were suspended [9]. • In-person meeting conferences for research showcasing were cancelled or postponed [15]. 	<ul style="list-style-type: none"> • Majority of radiology residents perceived a moderate or high level of disruption in their research activity [16]. 	<ul style="list-style-type: none"> • Increase in remote research projects, with an emphasis on quality improvement and COVID-19 related studies [17]. • Change to a hybrid medical conferencing format [16].
Less Face-to-Face Opportunities	<ul style="list-style-type: none"> • Fewer face-to-face opportunities for radiology residents to interact with attendings and colleagues [18]. • Exclusive teams of attendings, nurses, and residents to minimize contamination with other healthcare workers, minimizing interactions even when in-person [9]. 	<ul style="list-style-type: none"> • Difficulties making connections and networking [18]. • Less mentorship opportunities [8]. • Negative impact on professional development [18]. • Diminished a sense of community between healthcare teams [19]. 	<ul style="list-style-type: none"> • Encouraging webcam usage during virtual events [4]. • Structured mentorship programs that assigned residents to faculty mentors [20]. • Virtual "huddles" or "town hall meetings" to encourage more interaction [14].
Wellness	<ul style="list-style-type: none"> • Decline in case volume and suspension of many in-person educational programs [17]. • Uncertainty such as disruptions to scheduling and possibilities of redeployment to non-radiology clinical services [21]. • Postponement of certification exams such as the American Board of Radiology exams [22]. • Anxiety and stress related to work-related exposure [6]. 	<ul style="list-style-type: none"> • Widespread anxiety and burnout [6]. • Decline in morale amongst residents [6]. • Resident's perceived competence negatively impacted [21]. • Increased worry about the uncertainties brought about by COVID-19 [21]. • Difficulty building strong personal connections [11]. • Increased feelings of isolation and remoteness [23]. 	<ul style="list-style-type: none"> • Virtual town halls and huddles helped break feelings of remoteness [11]. • Virtual meditation or mindfulness sessions built into curriculum [11]. • Virtual team building activities such as virtual workout challenges, happy hours, and game nights [24]. • Virtual list of online wellness resources [25]. • Staying involved with resident fellow sections of radiological societies [26]. • Protecting time-off for residents [8]. • Social media platforms such as Twitter can help build a sense of community and connectedness [27].

Conclusion

- In summary, changes to radiology residency programs after the COVID-19 pandemic include: a decline in case volume, decreased diversity of cases, virtual delivery of education, refocusing of research, less face-to-face interaction opportunities, and a decline in resident wellbeing.
- The pandemic necessitated a shift to virtual learning for radiology residents.
- Virtual learning posed challenges such as limited opportunities for hands-on experience, decreased interaction with colleagues and faculty, and difficulty with engaging in real-time discussions.
- However, virtual learning also had some benefits, including increased accessibility to educational resources, flexible scheduling, and the ability to attend conferences and meetings remotely.
- Simulated cases and online repositories of cases were utilized to address the decline in case volume and diversity.
- Audience engagement during virtual learning sessions was encouraged through the use of digital polling software and directed questions.
- The use of virtual folders containing virtual radiology resources organized by resident level of training was helpful in developing the virtual curriculum.

Literature Cited

- [1] J S, N M, BE D, AK D, PM S, C B, et al. Quantifying Impact of Disruption to Radiology Education During the COVID-19 Pandemic and Implications for Future Training. *Curr Probl Diagn Radiol* 2021;50:815-9.
- [2] J S, N M, BE D, AK D, PM S, SA M, et al. Beyond business as usual: Radiology residency educational response to the COVID-2019 pandemic. *Clin Imaging* 2021;69:349-53.
- [3] Accreditation Council for Graduate Medical Education. Radiology Documents and Resources. *Radiol Doc Resour* n.d. <https://www.acgme.org/specialties/radiology/documents-and-resources/> (accessed April 17, 2023).
- [4] Zamora E, Moadel RM, Song N, Zuckier LS. Remote Reading and Teaching of Nuclear Medicine in the Era of COVID-19. *Semin Nucl Med* 2022;52:71-8.
- [5] Alvin MD, George E, Deng F, Warhadpande S, Lee SI. The Impact of COVID-19 on Radiology Trainees. *Radiology* 2020;296:246-8. <https://doi.org/10.1148/radiol.202021222>.
- [6] JB R, E E, MD P, CM D, DS S, DE H, et al. COVID-19 Impact on Well-Being and Education in Radiology Residencies: A Survey of the Association of Program Directors in Radiology. *Acad Radiol* 2020;27:1162-72.
- [7] Poyiadji N, Klochko C, LaForce J, Brown M, Griffith B, Poyiadji N, et al. COVID-19 and Radiology Resident Imaging Volumes-Differential Impact by Resident Training Year and Imaging Modality. *Acad Radiol* 2021;28:106-11.
- [8] N L, A S-B, A B, R E, YM C, P M. Resident Experiences With Virtual Radiology Learning During the COVID-19 Pandemic. *Acad Radiol* 2021;28:704-10.
- [9] Gabr AM, Li N, Schenning RC, Elbarbary A, Anderson JC, Kaufman JA, et al. Diagnostic and Interventional Radiology Case Volume and Education in the Age of Pandemics: Impact Analysis and Potential Future Directions. *Acad Radiol* 2020;27:1481-8.
- [10] MP R, NR F, ME B, B D, J F, JC H, et al. Preserving Radiology Resident Education During the COVID-19 Pandemic: The Simulated Daily Readout. *Acad Radiol* 2020;27:1154-61.
- [11] Chong A, Kagetsu NJ, Yen A, Cooke EA. Radiology Residency Preparedness and Response to the COVID-19 Pandemic. *Acad Radiol* 2020;27:856-61.
- [12] Accreditation Council for Graduate Medical Education. Special communication to diagnostic radiology residents, interventional radiology residents, subspecialty radiology fellows, and program directors [Internet] 2020. www.acgme.org/COVID-19.
- [13] J H, K R, A C, T S, H M, G C, et al. The Radiology Resident Experience at a Large Tertiary Care Hospital During the COVID-19 Pandemic. *J Med Educ Curric Dev* 2020;7:2382120520963036.
- [14] Warnica W, Moody A, Probyn L, Bartlett E, Singh N, Pakkal M. Lessons Learned From the Effects of COVID-19 on the Training and Education Workflow of Radiology Residents-A Time for Reflection: Perspectives of Residency Program Directors and Residents in Canada. *Can Assoc Radiol J J Assoc Can Radiol* 2021;72:637-44. <https://doi.org/10.1177/0846537120963649>.
- [15] Virakar M, Jensen C, Javadi S, Saleh M, Bhosale PR. Radiology Education Amid COVID-19 Pandemic and Possible Solutions. *J Comput Assist Tomogr* 2020;44:472-8.
- [16] Odedra D, Chahal BS, Patil MN. Impact of COVID-19 on Canadian Radiology Residency Training Programs. *Can Assoc Radiol J* 2020;71:482-9. <https://doi.org/10.1177/0846537120933215>.
- [17] Chalfant J, Pittman S, Kothari P, Chong A, Grimm L, Sohlich R, et al. Impact of the COVID-19 Pandemic on Breast Imaging Education. *J BREAST IMAGING* 2021;3.
- [18] Ostapenko A, McPeck S, Liechty S, Kleiner D, Ostapenko A, McPeck S, et al. Has COVID-19 Hurt Resident Education? A Network-Wide Resident Survey on Education and Experience During the Pandemic. *J Med Educ Curric Dev* 2020;7.
- [19] Jorge Ruiz, Michael J Mintzer, Rosanne M Leipzig. The Impact of E-Learning in Medical Education. *Acad Med* 2006;81(3):207-12.
- [20] Lou S, Goss C, Evanoff B, Duncan J, Kannampalli T, Lou SS, et al. Risk factors associated with physician trainee concern over missed educational opportunities during the COVID-19 pandemic. *BMC Med Educ* 2021;21.
- [21] Slanetz PJ, Parikh U, Chapman T, Motuzas CL. Coronavirus Disease 2019 (COVID-19) and Radiology Education-Strategies for Survival. *J Am Coll Radiol JACR* 2020;17:743-5. <https://doi.org/10.1016/j.jacr.2020.03.034>.
- [22] Hoegger MJ, Shetty AS, Denner DR, Gould JE, Wahl RL, Raptis CA, et al. A Snapshot of Radiology Training During the Early COVID-19 Pandemic. *Curr Probl Diagn Radiol* 2021;50:807-13. <https://doi.org/10.1067/j.cpradiol.2020.06.012>.
- [23] Pietrabissa G, Simpson SG. Psychological Consequences of Social Isolation During COVID-19 Outbreak. *Front Psychol* 2020;11:2201. <https://doi.org/10.3389/fpsyg.2020.02201>.
- [24] England E, Kanfi A, Flink C, Vagal A, Sarkany D, Patel MD, et al. Radiology Residency Program Management in the COVID Era - Strategy and Reality. *Acad Radiol* 2020;27:1140-6. <https://doi.org/10.1016/j.acra.2020.05.001>.
- [25] Roytman M, Shah S. Lessons learned during the COVID-19 pandemic: a single institution radiology chief resident experience. *Clin Imaging* 2020;68:90-3. <https://doi.org/10.1016/j.clinimag.2020.06.030>.
- [26] Derbew HM, Hailu T, Salah FO, Otero HJ. Education Over the Net: Global Education in Times of a Pandemic. *Pediatr Radiol* 2022;52:S104-5.
- [27] Heitkamp DE, Cooke EA, Deitte LA, Hunt KN, Milburn JM, Patel AK, et al. Radiology Program Directors Should Have an Active Presence on Twitter. *J Am Coll Radiol* 2020;17:293-5. <https://doi.org/10.1016/j.jacr.2019.10.014>.