

## Perceived Impact of COVID-19 on Pediatric Radiology Departments Around the World: WFPI COVID-19 Task Force Survey Results from 6 Continents

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# **Perceived Impact of COVID-19 on Pediatric Radiology Departments Around the World: WFPI COVID-19 Task Force Survey Results from 6 Continents**

## **ABSTRACT**

### **Purpose**

To investigate how COVID-19 has impacted pediatric radiology practice around the world at the present time.

### **Materials and Methods**

This study was based on a survey conducted by the World Federation of Pediatric Imaging (WFPI) COVID-19 task force. Pediatric radiology representatives from countries around the world were identified and asked to complete an electronic survey consisting of 17 questions related to the impact of, concerns surrounding, and education related to COVID-19 on pediatric radiology. For each outcome variable, a pair of 2-way frequency tables was constructed: one against COVID-19 prevalence, and another against region. Tests of independence of the tables' row and column factors were performed based on Fisher's exact test and odds ratios (OR) were estimated via logistic regression models corresponding to these 2-way tables.

### **Results**

The survey (response rate 87%, 72/83) comprised representatives from 71 countries and Hong Kong across 6 continents. 66/72 respondents (92%) indicated that COVID-19 has resulted in moderate (21/72, 29%), significant (36/72, 50%), or complete (9/72, 13%) change in radiology departments/practices in their countries. The two most frequent concerns over the next four months were personal/family health (54/72, 75%) and exposure (48/72, 67%). 79% (57/72) of respondents indicated some level of discomfort in identifying pediatric COVID-19 imaging

manifestations. Changes in resident education were reported by 68/72 (94%) respondents, and 22/72 (31%) were concerned that the likelihood of current trainees pursuing a career in pediatric radiology will be impacted.

### **Conclusion**

COVID-19 has had a substantial negative impact on pediatric radiology practice around the world.

## INTRODUCTION

Since the first cases were reported in Wuhan, China in December 2019, the coronavirus disease 2019 (COVID-19) has quickly evolved into a global pandemic with millions of cases reported worldwide.<sup>1</sup> Due to the strong infectivity, long incubation period, variable clinical presentation (including asymptomatic carriers), and limitations in availability and accuracy of PCR testing, the virus has been difficult to contain.<sup>2</sup> Pediatric patients in particular, who have a higher nasopharyngeal SARS-CoV-2 viral load than adults in the early phase of infection and are more likely to be asymptomatic or demonstrate mild clinical symptoms, likely play an important role in disease transmission as asymptomatic carriers.<sup>3,4</sup> This pandemic has resulted in unprecedented changes worldwide, with nations going into various degrees of lockdown, with the goal of slowing disease spread enough to prevent overwhelming health care systems.<sup>5</sup>

These unprecedented changes have had a substantial impact on radiology practice patterns at all levels from countries, to hospitals, to radiology departments, and individual radiologists. At the hospital level, many institutions have undergone dramatic changes in workflow, infection control measures, and in some cases allocation of resources. Practice patterns in individual radiology departments are also rapidly evolving in response to shared experiences and evolving guidelines focused on infection control and limiting exposure.<sup>2,6-12</sup> Additionally, as many non-emergent radiologic exams initially deferred at the pandemic onset are being rescheduled, many departments are dealing with the new challenge of handling a surge in study volume while maintaining a safe environment. At the individual level, many radiologists have been directly impacted through changing work environments as well as salary cuts and in some cases furloughs.<sup>13,14</sup>

Currently, there is some information published regarding how COVID-19 has impacted radiology practice.<sup>14-17</sup> However, there is very limited information regarding the impact of COVID-19 on pediatric radiology practice (departments/divisions in children's hospitals, university practices, and community practices).<sup>18</sup> As pediatric radiology departments handle a different patient population with unique needs (parental support and involvement, child life specialists, greater potential for lack of cooperation or understanding in infants and developmentally delayed patients) from adult departments, a focused evaluation on the impact of COVID-19 on pediatric radiology departments that are coping with changes to these needs is important. We hypothesized that significant changes related to COVID-19 are occurring in pediatric radiology departments/practices (i.e., changes in daily departmental function and required clinical duties, declining volume of radiologic examinations, decline in direct patient contact) and radiology trainee exposure to pediatric imaging has been negatively impacted by the pandemic. Therefore, the purpose of this study is to investigate how COVID-19 has impacted pediatric radiology departments around the world at the present time.

## **MATERIALS AND METHODS**

### ***Institutional Review Board***

The institutional review board granted exemption for this study because it did not include any individual patient data, did not include vulnerable populations, was voluntary and low risk to participants, and all survey participants were informed of the purpose of the study prior to completing the survey.

## *Survey Methods*

A COVID-19 task force for the World Federation of Pediatric Imaging (WFPI), comprising 10 members from around the world, was formed. These 10 members were from 7 different countries (Brazil, Spain, Slovenia, South Africa, United States of America, and United Arab Emirates) and Hong Kong representing five different continents (Africa, Asia, Europe, North America, and South America).

In order to glean an overall picture of the impact of COVID-19 on pediatric radiology practice around the world up to June 1, 2020, survey responses from an individual representative for each country were collected. Through careful and thoughtful discussion among members of the WFPI COVID-19 task force, representatives for each country were selected primarily based on past work experience with members of the WFPI COVID-19 task force and their activities on pediatric radiology practice in their own countries. To prevent variation in results related to differences in response rates from various countries, representatives were limited to one per country.

Using GoogleForms, an electronic survey was created which consisted of 17 questions related to demographics of respondents, disease prevalence, concerns related to COVID-19, and the impact of COVID-19 on radiology departments and education as well as the differences between pediatric and adult radiology departments (Appendix 1). The survey was then sent electronically to representative radiologists from 83 countries around the world. All survey responses were completed online and electronically returned by June 1, 2020. In order to enhance the response rate, a follow-up email was sent to outstanding representatives during the interval of data collection. Country specific COVID-19 prevalence data from the World Health

Organization Situation Report on June 1, 2020, available for 67/72 countries (93%), was also collected for comparison with our survey data.<sup>19</sup>

### ***Statistical Analysis***

For each outcome variable (a table column factor, such as the impact of COVID-19), a pair of 2-way frequency tables was constructed: one with COVID-19 prevalence as a 2-level row factor, and another with region as a 7-level row factor. Tests of independence between the row and column factors were based on Fisher's exact test using the FREQ procedure in SAS/STAT® 14.1 (2015).<sup>20,21</sup> These tests were computed directly for 2 x 2 tables, and by Monte Carlo methods (10,000 samples) for larger tables. For the purposes of interpretation via odds ratios (OR), logistic regression models corresponding to the 2-way tables were estimated using the LOGISTIC procedure in SAS/STAT®. In this context, the table column factor corresponds to a binary outcome, while the row factor corresponds to a predictor (prevalence or region). Given the sparseness of these tables, logistic models were estimated using penalized likelihood methods rather than likelihood methods.<sup>22,23</sup> Tests of independence and equality of odds were at the 5% level unless otherwise indicated.

## **Results**

### ***Survey Responses***

A total of 72 complete responses (87%) were received in response to the 83 electronic surveys sent to individual representatives from around the world (Figure 1). The numbers of respondents for each geographic region were as follows: Europe (28/72, 39%), Asia (13/72,

18%), Middle East (11/72, 15%), South America (10/72, 14%), Africa (5/72, 7%), North America (3/72, 4%), and Australasia (2/72, 3%). The 11 countries in whom survey responses were not received included 6/11 (55%) from Europe, 2/11 (18%) from Asia, 2/11 (18%) from Africa, and 1/11 (9%) from the Middle East.

### ***Demographics of Survey Respondents***

Respondents' ages ranged from younger than 35 years to older than 65 years (median = 46-55 years) and years of experience ranged from less than 5 years to greater than 16 years (median = greater than 16 years). 31/72 (43%) respondents were male and 41/72 (57%) respondents were female. In terms of practice settings for the 72 respondents, 41/72 (57%) worked in a primarily academic setting, 27/72 (38%) worked in a hybrid private practice and academic setting, and 4/72 (6%) work primarily in a private practice setting. In terms of the primary practice population, 42/72 (58%) respondents reported a primarily pediatric practice, while 30/72 (42%) respondents reported a mixed pediatric and adult practice.

### ***Prevalence of COVID-19 in Respondents' Countries***

COVID-19 disease prevalence, as indicated by the responses to survey question 7, was defined as high prevalence (endemic area with known community spread of COVID-19), low-prevalence (small number of cases related to travel or to spread that can be traced to a person with known COVID-19 infection), or no reported cases. COVID-19 disease prevalence was reported as high by 40/72 respondents (56%) and low by 32/72 respondents (44%). Regions in which the majority of respondents indicated a high disease prevalence were North America (3/3,



100%), Europe (18/28, 64%), South America (6/10, 60%), and the Middle East (6/11, 55%), while regions where the majority of respondents reported a low disease prevalence were Australia (2/2, 100%), Africa (4/5, 80%), and Asia (7/13, 54%).

The majority of disease prevalence reported in the survey responses, 44/67 (66%), were concordant with the World Health Organization (WHO) prevalence data. Of the 23/67 (34%) discordant responses, 13/23 (57%) were lower than WHO prevalence, while 10/23 (43%) were higher. The discordant responses were observed in 8/23 (35%) countries from Europe, 6/23 (26%) from Asia, 3/23 (13%) from South America, 3/23 (13%) from Africa, and 3/23 (13%) from the Middle East.

### ***Impact of COVID-19 on Radiology Departments / Practices***

92% of respondents (66/72) indicated that the COVID-19 pandemic resulted in moderate (21/72, 29%), significant (36/72, 50%), or complete change (9/72, 13%) in radiology departments / practices in their countries, while 6 respondents (8%) indicated that the pandemic has only slightly changed (5/72, 7%) or not changed (1/72, 1%) radiology departments / practices in their countries. The likelihood of reporting at least a moderate change in radiology departments / practices was dependent on COVID-19 disease prevalence ( $p= 0.006$ ), being higher in high disease prevalence areas compared to low disease prevalence areas (OR 14.5) (Figure 2).

17 of 72 respondents (24%) indicated that pediatric radiologists had been asked to perform duties beyond the scope of usual practice in their countries including: 1) interpreting adult examinations (15/72, 21%); 2) being re-deployed to clinical practice in the emergency department (3/72, 4%); 3) being re-deployed to clinical practice on inpatient units (2/72, 3%); 4)

being asked to perform disease screening (2/72, 3%); and 5) being moved to practice in different hospitals (1/72, 1%). The likelihood of being asked to perform additional duties was borderline dependent upon COVID-19 prevalence ( $p= 0.056$ ) with high prevalence areas more likely to report additional duties than low prevalence areas (OR 3.0).

Survey respondents indicated that radiology practices in their countries previously reading primarily pediatric examinations reported a percentage shift to interpreting adult examinations of: 0% (43/72, 60%), 1-25% (9/72, 13%), 26-50% (9/72, 13%), 51-75% (9/72, 13%), >75% (2/72, 3%). The likelihood of reporting a shift to interpreting adult examinations was not dependent on COVID-19 prevalence ( $p = 0.173$ ) or region ( $p = 0.133$ ).

### ***Concerns of Pediatric Radiologists Due to COVID-19***

Survey respondents were asked to select 3 responses indicating the greatest concerns for pediatric radiologists in their countries over the next 4 months. The reported concerns, from most frequent to least frequent, were: 1) personal / family health (54/72, 75%); 2) exposure (48/72, 67%); 3) professional development (19/72, 26%); 4) job security (17/72, 24%); 5) work relationships (17/72, 24%); 6) personal finance (16/72, 22%); 7) non-work obligations (16/72, 22%); 8) research (11/72, 15%); 9) job satisfaction (5/72, 7%); and 10) redeployment (4/72, 6%) (Table 1).

The likelihood of reporting job-related concerns was dependent on COVID-19 prevalence ( $p= 0.029$ ), being higher in high prevalence areas (OR 3.13). Concern for exposure was dependent on region ( $p= 0.029$ ), being significantly higher in Asia (OR 6.06,  $p= 0.028$ ) and South America (OR 8.36,  $p= 0.034$ ) and borderline significantly higher in the Middle East (OR

5.0,  $p = 0.054$ ) when compared with Europe. Concern for exposure was not significantly different between North America and Europe (OR 2.24,  $p = 0.522$ ).

### ***Education Related to COVID-19 for Practicing Radiologists and Radiology Trainees***

#### Education Related to COVID-19 for Practicing Radiologists

Reported radiologist comfort in identifying imaging manifestations of COVID-19 in pediatric patients was identified as not comfortable by 13/72 (18%) respondents, somewhat comfortable by 44/72 (61%) respondents, and very comfortable by 15/72 (21%) respondents (Figure 3). The 3 forms of media indicated as most useful for sharing imaging manifestations of pediatric COVID-19 were: 1) webinars (live or on-demand) (56/72, 78%); 2) journal articles / case reports (55/72, 76%); and 3) professional society websites (39/72, 54%). Other forms of media types reported as useful included shared case log (21, 29%), social media (21, 29%), email (17, 24%), and podcasts (3, 4%).

#### Education Related to COVID-19 for Radiology Trainees

Changes in radiology resident education due to COVID-19 were reported in 68 countries (94%) including: 1) decreased volume of pediatric imaging studies available for trainees to interpret (55/72, 76%); 2) cancellation of teaching conferences (42/72, 58%); and 3) cancelled / delayed clinical rotations (36/72, 50%) (Figure 4). The likelihood of reporting one or more changes in education was not dependent on COVID-19 prevalence ( $p = 0.317$ ) or region ( $p = 0.618$ ). Additionally, 22/72 (31%) participants indicated that they believe changes related to COVID-19 will impact the likelihood of current radiology trainees pursuing a career in pediatric radiology in their countries (Figure 5).

### ***Perceived Differences between Pediatric and Adult Radiology Departments***

The perceived differences between pediatric and adult radiology departments during the COVID-19 pandemic were as follows: 1) pediatric radiology departments are seeing a greater decline in volume of routine radiology examinations (38/72, 53%); 2) pediatric radiologists are impacted more than adult radiologists by the loss of direct patient interaction (32/72, 44%); 3) pediatric radiologists are experiencing a greater change in how radiologic exams are performed (29/72, 40%); 4) pediatric radiology departments are more prepared for the COVID-19 pandemic (14/72, 19%); 5) pediatric radiologists are being asked to interpret more examinations outside of their field of expertise (14/72, 19%); (Table 2). The likelihood of reporting a greater decline in volume of routine pediatric radiology examinations was dependent on COVID-19 prevalence ( $p=0.032$ ), being a greater decline in volume of routine pediatric radiology examinations in high prevalence COVID-19 areas compared to low prevalence areas (OR 3.0).

### **DISCUSSION**

This international survey is the first study to provide an early glimpse into how COVID-19 is impacting pediatric radiology practice worldwide with data gathered based on 71 countries and Hong Kong from 6 continents. The demographic data from this study is reflective of pediatric radiologists around the world with a more even distribution of gender, and a preponderance of academic or hybrid academic / private practice, over exclusively private practice work settings compared to other subspecialties in radiology.<sup>24,25</sup> The median age of

respondents was 46-55, which is in line with the most recent American College of Radiology (ACR) workforce survey.<sup>26</sup> Disease prevalence was relatively well-balanced between the high-prevalence and low-prevalence groups and was concordant with disease prevalence reported by the World Health Organization in the majority of cases.

The results of this study demonstrate that the COVID-19 pandemic is having a major impact on pediatric radiology departments around the world at this present time with greater than 90% of survey respondents indicating that radiology departments / practices in their countries have undergone moderate, significant, or complete change as a result of COVID-19. Furthermore, the degree of change was greater in high-prevalence countries than low-prevalence countries. This finding is reflective of changes in departmental workflow, restriction of departmental access, and infection control measures described in the literature.<sup>6,14,18</sup> Importantly, our study found that nearly a quarter of pediatric radiologists (17/72) are now being asked to perform clinical duties beyond the scope of usual practice in their countries. The most frequently reported additional duty was being asked to interpret adult examinations with some degree of shift from pediatric to adult imaging reported by 40% of respondents (29/72). As the pathology, imaging techniques, and treatments are often quite different between pediatric and adult patients, this added duty may represent a significant source of stress for pediatric radiologists; especially those who are more advanced in their careers and have not interpreted adult examinations for many years. In addition, even for same disease, manifestations can be different for pediatric and adult populations, COVID-19 infection being a notable example. Previously published data showed that imaging findings of COVID-19 in children are different from those in adult patients.<sup>27-30</sup> Furthermore, we are now recognizing multisystem inflammatory syndrome in children (MIS-C) that occurs only in the pediatric population.<sup>31,32</sup>

The most frequently reported concerns over the next four months due to COVID-19 in our study were concern for exposure to the virus and concern for personal and / or family health. Similar concerns may translate to other radiology subspecialties not evaluated in this study as they have been reported by physicians in other fields of medicine in both the current and prior pandemics.<sup>33-35</sup> Interestingly, the concern for exposure was dependent on region, being higher in Asia and the Middle East compared with Europe; regions that have prior first-hand experience with the Severe Acute Respiratory Syndrome (SARS) and Middle Eastern Respiratory Syndrome (MERS) outbreaks respectively. Both SARS and MERS have been shown to be associated with acute stress at the time of crisis as well as post-traumatic stress in health care workers, which may explain increased concerns surrounding personal exposure in these regions.<sup>36,37</sup> The etiology for relatively increased frequency of exposure concern in South America is less clear, although it could be related to the rapidly rising COVID-19 case numbers in Brazil and other South American countries at the time of data collection.<sup>38</sup> Given that the primary concerns for pediatric radiologists are related to exposure and health, continued efforts to develop and disseminate guidelines focused on infection control and reducing risk of exposure are imperative. Utilization of dedicated spaces and equipment (portable when possible to reduce transport) for patients with suspected COVID-19, controlled access to radiology department, decentralization of work areas, available personal protective equipment (PPE), among others, have been recognized as important steps for infection control and prevention.<sup>6,8</sup>

Nearly 80% of respondents (57/72) in this study indicated that pediatric radiologists in their countries have some level of discomfort with identifying the imaging manifestations of pediatric COVID-19. This discomfort may relate to a combination of the sometimes non-specific imaging appearance of pediatric COVID-19 pneumonia as well as a limited amount of

educational resources available for improving understanding of this entity. Although there are currently a few articles discussing the imaging manifestations of pediatric COVID-19 pneumonia available, understanding of the disease manifestations continues to grow and necessitates continued international collaboration and sharing of information.<sup>27-30,39-41</sup> The results of our study suggests that webinars, journal articles/case reports, and professional society websites are the three most preferred forms for sharing imaging findings around the world. Therefore, we believe that future educational efforts regarding pediatric COVID-19 should be focused on utilizing these forms of media.

Changes in radiology resident exposure to pediatric imaging were reported by 94% of survey respondents and included decreased volume of pediatric imaging studies available for trainee interpretation, cancellation of educational conferences, and / or cancellation or delayed clinical rotations. This result is in line with a recent survey of members of the Association of Program Directors in Radiology which found that 70% of respondents (75/107) felt that the educational mission in their radiology department was at least moderately negatively impacted by COVID-19 related changes.<sup>42</sup> Importantly, 31% of survey respondents (22/72) in our study indicated concern that COVID-19 related changes in resident education would impact the likelihood of current radiology trainees pursuing a career in pediatric radiology in their countries. This concern is likely justified as radiology resident surveys of factors influencing fellowship choices found that “the degree of patient contact”, “the degree of personal interaction with other doctors” and “enjoyable rotations during residency” were among the top factors in fellowship selection by the pediatric radiology subgroup.<sup>43,44</sup> These findings are of particular interest given the concern for declining interest in pediatric radiology in recent years.<sup>45</sup>

In this study, the most frequently reported difference between pediatric and adult radiology departments was that pediatric radiology departments are experiencing a greater decline in routine radiology examinations, a finding that was more frequently reported in countries with high COVID-19 prevalence. Although no comparative numerical data is available, the volume decline is supported by a recent report from a tertiary children's hospital describing deferment of all outpatient elective, non-urgent, and non-emergent pediatric radiology examinations.<sup>18</sup> Greater impact from loss of direct patient interaction and a greater degree of change in how radiology examinations are performed in pediatric radiology departments were also frequently reported in this study. These findings likely, at least partially, reflect intrinsic differences between pediatric and adult radiology. For example, a previous study of factors influencing radiology resident fellowship choices found that residents pursuing pediatric radiology ranked physician-patient contact higher than respondents choosing other subspecialties.<sup>44</sup> Efforts to limit exposure to patients suspected of having COVID-19 have also likely impacted how pediatric radiology examinations are performed. For example, at some institutions of our WFPI COVID-19 Task Force, pediatric radiologists previously frequently performed targeted sonographic examinations after the sonographers, but are now discouraged from doing so (except where clinically essential), in most instances to limit exposure. Additionally, previous members of the radiology treatment team such as child life specialists, an individual trained to help children and their families cope with the anxiety of undergoing difficult radiological examinations (e.g., fluoroscopic examinations and MRI), may be less frequently utilized to limit the number of individuals present for a given exam / procedure.<sup>46</sup>

We acknowledge that our study has several potential limitations. First, although we were able to acquire information from a large number of countries around the world, there are still



many countries not represented in this survey study and direct generalizability of our results to these countries is therefore inapplicable. However, in many smaller countries with less well established / developed pediatric radiology practices, pediatric imaging studies are currently interpreted by adult radiologists; thus, specific pediatric radiology representatives were difficult to identify in those countries. Second, the selection method of survey respondents may have introduced an element of bias as they were chosen through work experience with members of the WFPI COVID-19 task force and their activities in pediatric radiology practice in their countries. To achieve the goal of obtaining a global perspective on the impact of COVID-19 on pediatric radiology departments, it was necessary to identify individuals able to be contacted through the WFPI with experience appropriate to evaluate the COVID-19 impact. Additionally, to prevent differences in response rates from various countries (i.e., receiving 10 responses from one country and only 1 from another), the decision was made to limit representatives to one per country. Ultimately, the goal of the study to obtain a picture of overall practice patterns globally was achieved; however, future randomized studies will be needed to further assess how pediatric radiologists' perspectives may change at local, regional, and country levels. Third, although survey respondents were asked to answer questions as a representative of their country as a whole, countries with diverse populations of pediatric radiologists may have differing views from the representative. Additionally, survey responses may have been influenced by the personal experience and knowledge of each respondent. Nevertheless, the goal of our study was to obtain a snapshot of overall practice patterns in each country from one respondent. Future studies will be needed to ascertain a more complete picture of overall practice patterns for individual countries by surveying individual pediatric radiologists in each country. Fourth, the results of our study regarding COVID-19 disease prevalence may differ from prevalence defined

by the World Health Organization's situation report. However, our survey study focuses on the responses from radiologists currently physically living in different countries around the world rather than based on statistics used by the World Health Organization's situation report. Future study focusing on the differences between the respondents who are physically living in different countries versus the World Health Organization's situation report regarding disease prevalence would be helpful to assess the perceived differences in disease prevalence in each country. Fifth, the majority of our survey respondents worked in an academic or hybrid academic-private practice setting with only a few respondents identifying private practice as their primary practice setting. For this reason, the impact of COVID-19 on exclusively private practice setting is not well assessed by our study. However, this also reflects the current practice pattern of pediatric radiology of respondents' own countries. Future study, focusing on the impact of COVID-19 on pediatric radiology practice in the primarily private practice setting, will shed light on potentially unique COVID-19 related changes of pediatric radiology practice in primarily private practice setting. Sixth, this study only evaluated concerns and changes related to COVID-19 as experienced by pediatric radiologists. Future studies comparing responses between pediatric and adult radiologists will be needed to investigate which concerns/changes are more specific to pediatric versus adult radiologists. Finally, this study only evaluated changes in trainee exposure to pediatric imaging as a result of COVID-19. Future studies will be needed to assess whether the change in pediatric trainee exposure differs from other radiology sub-specialties.

In conclusion, the COVID-19 pandemic has had a substantial impact on pediatric radiology departments worldwide at this present time. The most pressing concerns for pediatric radiologists in the upcoming months are exposure to COVID-19 and personal / family health. Therefore, continued development and dissemination of infection control / prevention measures

will be important. Because the majority of respondents indicate some level of discomfort with identifying the imaging manifestations of pediatric COVID-19, there is a need for education which could be through webinars, journal articles / case reports, and professional society websites, all of which were recognized as the three most helpful forms of media by respondents in our study. Lastly but also importantly, the majority of respondents indicated changes in radiology trainees exposure to pediatric imaging as a result of COVID-19 and a substantial portion of respondents were concerned that this would impact the likelihood of current radiology trainees pursuing a career in pediatric radiology. Therefore, concerted effort to create innovative and practical solutions is currently needed to overcome these unexpected challenges and difficulties created by COVID-19 pandemics in pediatric radiology practice around the world.

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## Appendix 1

### WFPI COVID-19 Task Force: Survey on Pediatric COVID-19

The following survey has been developed to assess the experience and concerns regarding COVID-19 among practicing pediatric radiologists around the world. You are selected as a representative for your country and we will appreciate it greatly if you can complete this survey based on your knowledge regarding the current status of pediatric COVID-19 infection in your country.

All information collected for this survey will be confidential and only used for statistical analysis.

#### Survey Questions:

1. What is your age range?
  - Under 35
  - 35-45
  - 46-55
  - 56-65
  - > 65
  
2. What is your gender?
  - Male
  - Female
  
3. How many years have you been in practicing pediatric radiology after the completion of your training?
  - 5 years or less
  - 6-10 years
  - 11-15 years
  - 16 or more years
  
4. Primary practice setting?
  - Academic
  - Private Practice
  - Both
  
5. How would you describe your primary practice population?
  - Adults
  - Children
  - Both



6. What institution or private group do you work for?
- Name: \_\_\_\_\_
  - Location: \_\_\_\_\_
  - Country: \_\_\_\_\_
7. What is the prevalence of COVID-19 infection in the country of your radiology practice?
- No reported cases
  - Low-prevalence (small number of cases related to travel or to spread that can be traced to person with known COVID-19 infection)
  - High-prevalence (endemic area with known community spread of COVID-19)
8. What are pediatric radiologists most concerned about related to COVID-19 over the next four months in your country? Please choose up to 3.
- Job security
  - Loss of job satisfaction
  - Personal finances
  - Non-work obligations (i.e. lack of childcare)
  - Fear of personal exposure to COVID-19
  - Concern for personal/family health
  - Being re-deployed
  - Loss of interdepartmental relationships with other providers
  - Negative impact on professional development
  - Negative impact on research projects/grant requirements
  - Other ( \_\_\_\_\_ )
9. How would you rate the impact COVID-19 has had of radiology departments/practices in your country?
- Not at all
  - Slightly
  - Moderately
  - Significantly
  - Completely Changed
10. How comfortable do you think that radiologists feel about identifying imaging manifestations of COVID-19 in pediatric patients in your country?
- Not at all comfortable
  - Somewhat comfortable
  - Very comfortable
11. What form of media would be most helpful to share imaging findings in pediatric COVID-19 in your country? Please choose up to 3.
- Journal articles/case reports
  - Webinars (Live or On-Demand)

- Podcasts
- Shared imaging case log
- Social media
- Professional society website
- Email
- Other (\_\_\_\_\_)

12. Have pediatric radiologists been asked to perform clinical duties beyond the scope of usual practice in your country due to COVID-19 infection?

- Yes
- No (if you selected this answer skip to question #14)

13. What additional duties / roles have pediatric radiologists been asked / played since the start of the COVID-19 pandemic in your country?

- Interpreting adult examinations
- Being re-deployed to ED
- Being re-deployed to inpatient units
- Other (\_\_\_\_\_)

14. If previously reading primarily pediatric exams, what percentage of workload, do you think, has shifted to adult examinations in your country?

- Not applicable, still reading almost exclusively pediatric exams
- 1-25%
- 26-50%
- 51-75%
- >75%

15. What are the greatest differences between adult and pediatric radiology departments during the COVID-19 pandemic in your country? Please select all that apply.

- Pediatric radiology departments are more prepared than adult radiology departments are to handle the pandemic
- Pediatric radiology departments are less prepared than adult radiology departments are to handle the pandemic
- Pediatric radiologists are being asked to interpret more examinations outside of their area of expertise compared with adult radiologists
- Pediatric radiology departments are seeing a greater decline in volume of routine radiology examinations performed than adult radiology departments
- Pediatric radiology departments are seeing less of a decline in volume of routine radiology examinations performed than adult radiology departments
- Pediatric radiologists are more impacted by loss of direct patient interaction compared with adult radiologists

- Pediatric radiologists experience greater change in how radiologic exams are performed compared to adults (i.e. restrictions on parents being present, loss of child life specialist during examinations)
- Other ( \_\_\_\_\_ )

16. How has exposure to/education in pediatric radiology for current radiology residents been impacted by COVID-19 at institutions/practices in your country? Please select all that apply.

- Radiology resident exposure to pediatric radiology has not changed
- Pediatric radiology rotations have been canceled or delayed
- Decreased volume of pediatric imaging studies available for trainees to interpret
- Cancellation of previously scheduled pediatric radiology teaching conferences
- Other ( \_\_\_\_\_ )

17. Do you think COVID-19 related changes will impact the likelihood of current radiology trainees to pursue a career in pediatric radiology in your country?

- Yes
- No

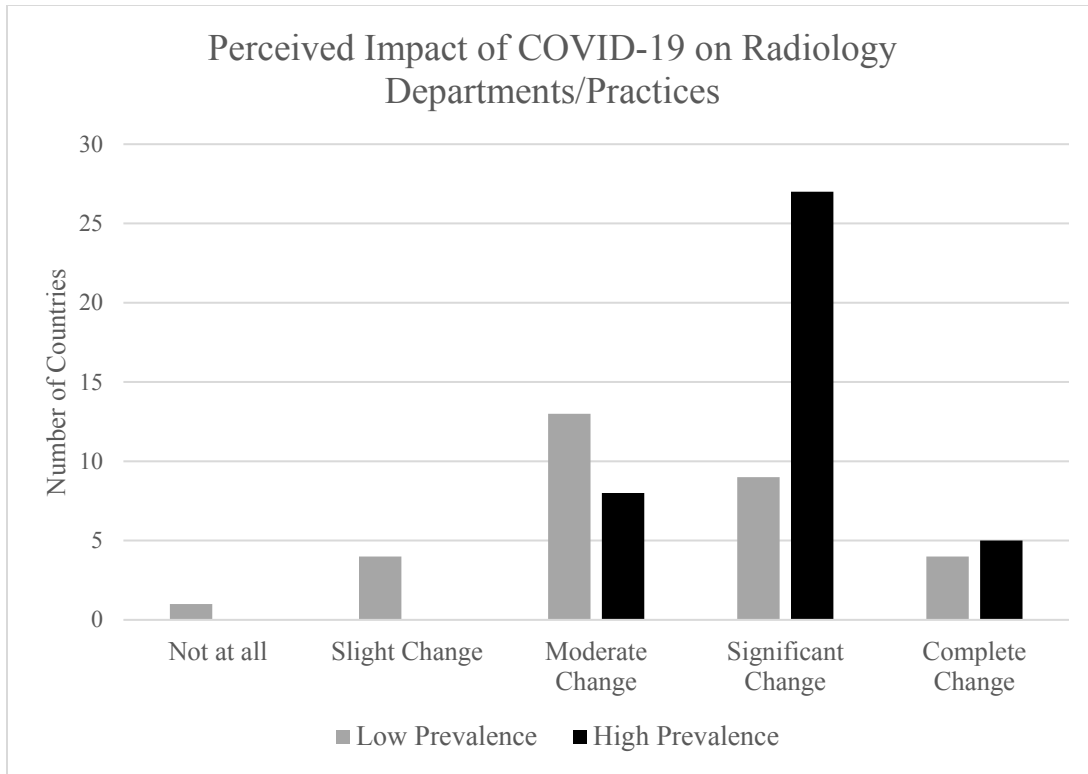
**Table 1: Top 3 Concerns Over Next 4 Months**

<b>Top 3 Concerns Over Next 4 Months</b>	
<b>Concern</b>	<b>Number of Countries (%)</b>
Personal / Family Health	54/72 (75%)
Exposure	48/72 (67%)
Professional Development	19/72 (26%)
Job Security	17/72 (24%)
Work Relationships	17/72 (24%)
Personal Finance	16/72 (22%)
Non-Work Obligations	16/72 (22%)
Research	11/72 (15%)
Job Satisfaction	5/72 (7%)
Redeployment	4/72 (6%)

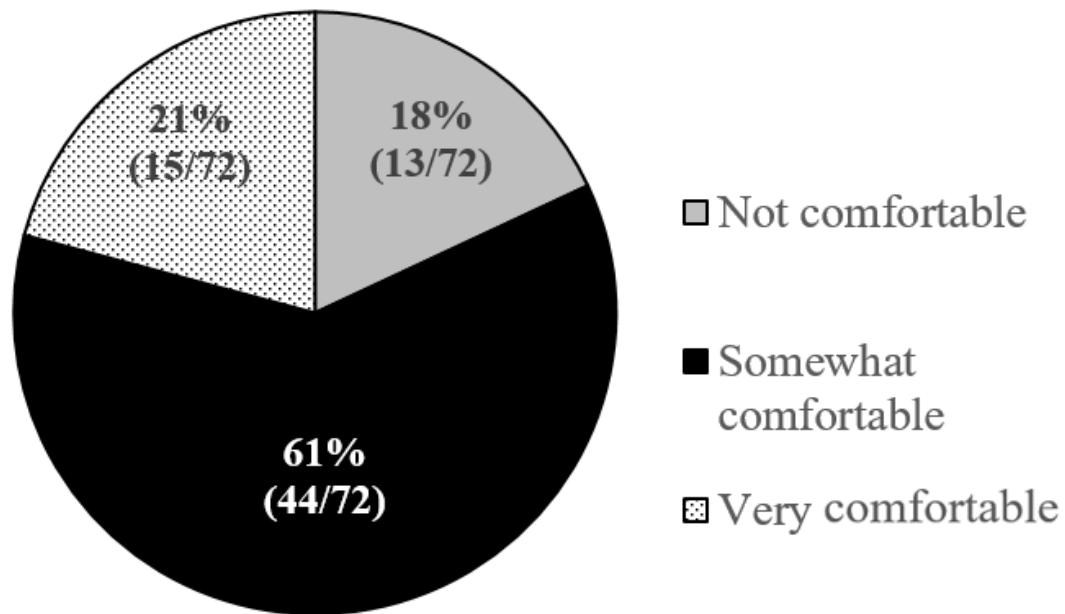
**Table 2: Perceived Differences Between Pediatric and Adult Radiology Departments**

<b>Perceived Differences between Pediatric and Adult Radiology Departments</b>	
<b>Difference</b>	<b>Number of Countries (%)</b>
Pediatric radiology departments are seeing a greater decline in volume of routine radiology examinations	38/72 (53%)
Pediatric radiologists are more impacted by loss of direct patient interaction	32/72 (44%)
Pediatric radiologists experience greater change in how radiologic exams are performed	29/72 (40%)
Pediatric radiology departments are more prepared for the COVID-19 pandemic	14/72 (19%)
Pediatric radiologists are being asked to interpret more examinations outside of their field of expertise	14/72 (19%)

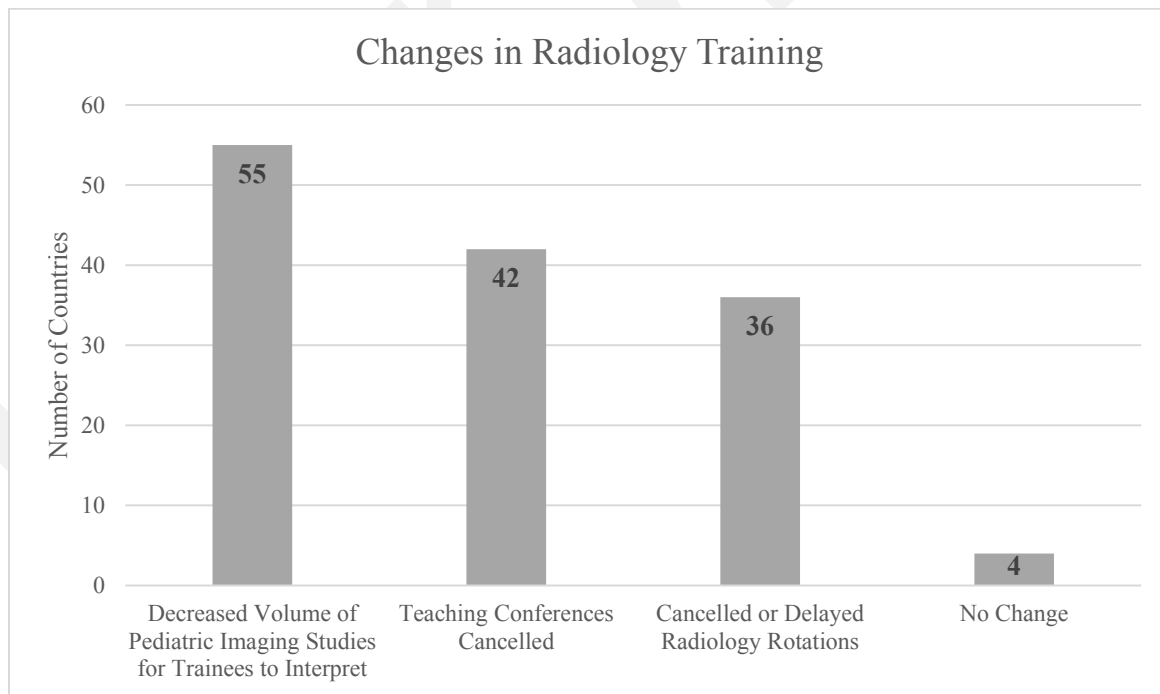




**Figure 2-** A graphical representation of the reported perceived impact of COVID-19 on radiology departments / practices in representatives' countries.

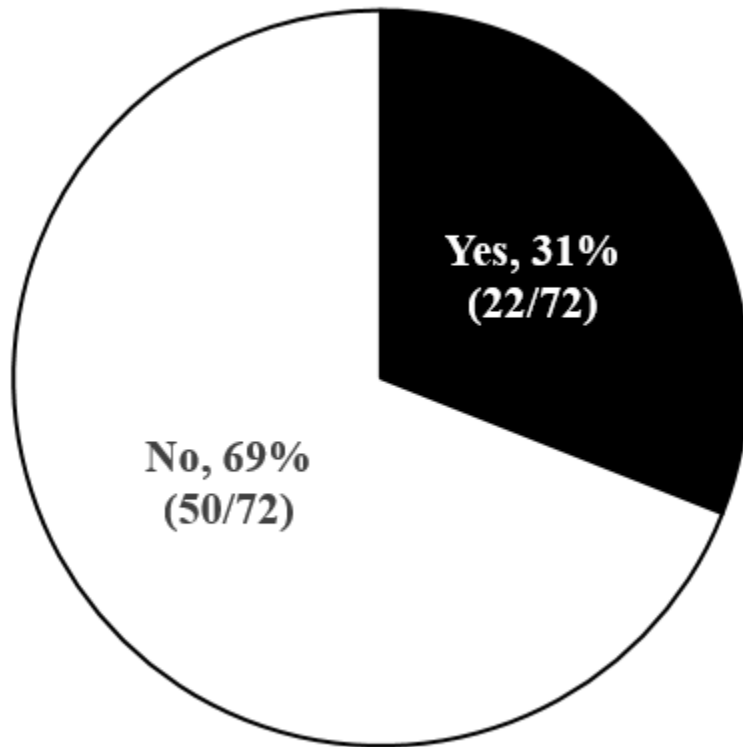


**Figure 3-** Reported comfort with interpreting the imaging manifestations of pediatric COVID-19 in representatives' countries.



**Figure 4-** Reported changes in radiology resident education in representatives' countries.





**Figure 5-** Perceived likelihood that changes related to COVID-19 will impact the decision of current radiology trainees to pursue a career in pediatric radiology.