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Initial Impact of COVID-19 on Radiology Practices: An ACR/RBMA Survey

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Abstract

Purpose: The coronavirus disease 2019 (COVID-19) pandemic affected radiology practices in many ways. The aim of this survey was to estimate declines in imaging volumes and financial impact across different practice settings during April 2020.

Methods: The survey, comprising 48 questions, was conducted among members of the ACR and the Radiology Business Management Association during May 2020. Survey questions focused on practice demographics, volumes, financials, personnel and staff adjustments, and anticipation of recovery.

Results: During April 2020, nearly all radiology practices reported substantial (56.4%-63.7%) declines in imaging volumes, with outpatient imaging volumes most severely affected. Mean gross charges declined by 50.1% to 54.8% and collections declined by 46.4% to 53.9%. Percentage reductions did not correlate with practice size. The majority of respondents believed that volumes would recover but not entirely (62%-88%) and anticipated a short-term recovery, with a surge likely in the short term due to postponement of elective imaging (52%-64%). About 16% of respondents reported that radiologists in their practices tested positive for COVID-19. More than half (52.3%) reported that availability of personal protective equipment had become an issue or was inadequate. A majority (62.3%) reported that their practices had existing remote reading or teleradiology capabilities in place before the pandemic, and 22.3% developed such capabilities in response to the pandemic.

Conclusions: Radiology practices across different settings experienced substantial declines in imaging volumes and collections during the initial wave of the COVID-19 pandemic in April 2020. Most are actively engaged in both short- and long-term operational adjustments.

Key Words: COVID-19, radiology practice, impact, survey, imaging volume

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INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has had a devastating impact on population health. Both government policy responses imposing stay-at-home orders and limited elective medical care, as well as individual behavior in response to social distancing recommendations and voluntary avoidance of medical care to slow the transmission of COVID-19, have adversely affected the demand for imaging [1,2]. Radiology practices have had to quickly adapt by reducing and eliminating the availability of nonurgent and routine imaging, while ensuring acute care capacity in response to the crisis [1,3]. The availability of personal protective equipment (PPE) and other measures to limit the transmission potential of the infection have created challenges for all aspects of health care. The COVID-19 pandemic has also created an economic crisis alongside a health care crisis, the magnitude of which is not yet fully understood [4]. The Coronavirus Aid, Relief, and Economic Security Act and the Paycheck Protection Program and Health Care Enhancement Act together provide $175 billion in emergency funding for hospitals and other health care organizations [5,6]. However, it remains uncertain whether this level of funding will be adequate or if additional congressional action will be necessary to stabilize health care markets [7]. It is unclear how and to what extent the pandemic has affected different radiology practices and how administrators and practice leaders are responding to the disruptions caused by the pandemic.

We undertook this survey to assess the impact of the COVID-19 pandemic on radiology practices in different settings and to assess their anticipation of recovery. The purposes of this study were to assess changes in radiology practices during the initial wave of the COVID-19 pandemic as of April 30, 2020, and to provide information that could assist in both short-term and long-term recovery plans.

METHODS

Institutional review board oversight was not required for this study, because it involved no private identifying information and did not constitute human subjects research.

The survey was conducted through the ACR. The survey was performed using SurveyMonkey software (SurveyMonkey, San Mateo, California). The survey was distributed to members of the Radiology Business Management Association (RBMA) thorough email correspondence. The RBMA has approximately 2,000 members representing 788 practices in the United States. The survey was sent to all RBMA members who had not previously opted out of receiving surveys, resulting in 1,823 survey invitations. On the RBMA business side, imaging centers represent CMS place of service (POS) 11 or POS 19 billing codes, which are the stand-alone office type designations. Hospital outpatient departments (hospital based) represent CMS POS 22 billing codes. Many imaging centers are joint ventures with hospitals, and the imaging centers perform MRI for inpatient and emergency department (ED) cases. We decided to combine imaging centers with outpatient hospitals in this survey because there may be crossover for some respondents, and those patient types should closely mirror each other with regard to the impact of COVID-19.

The survey comprised 48 questions (included in the Online Supplement) with multiple-choice and free-text responses and took approximately 10 min to complete. Survey questions were categorized as practice demographic information, imaging case volumes, practice financials, practice changes, personnel and staff adjustments, and anticipation of recovery. Survey respondents were instructed to focus their responses on the time period of the COVID-19 pandemic as of April 30, 2020. Participation was voluntary, and no compensation was offered to participants. Anonymity was maintained for all participants and individual responses. Because practices may have multiple RBMA members, we included instructions in both the emailed survey introduction and the first survey question for invitees to coordinate with other practice members to send a single response per practice. Moreover, the survey software records the Internet protocol addresses of respondents, limiting specific respondents to single response. The survey was open for 20 days (May 7, 2020, to May 26, 2020).

Statistical Analysis

All survey results were compiled and graphed using Microsoft Excel (Microsoft, Redmond, Washington). The numeric estimates for reduction in volume, reduction in receipts, and reduction in gross charges were plotted against the reported full-time equivalents (FTEs). Data points with FTEs greater than 100 (from six respondents) were removed from the plot only to improve visualization because of the scaled effects. Responses from other facilities and from breast centers were not plotted because of the limited number of FTEs reported. A best-fit linear regression line with 95% confidence interval was added to each graph to show the overall trend. For family-wise correlation, a statistically significant α value was defined as 0.00278 after Bonferroni correction.

RESULTS

There was a total of 248 responses, with 13 ZIP codes identified with more than one response and assessed for similarities in the number of reported FTEs and other

responses. Among these respondents, 6 were considered duplicates not eligible for inclusion. Among the remaining 242 responses, 26 were from imaging centers, 80 from hospital-based organizations, 64 from mixed practices, 1 from a breast center, and 3 from other facilities; 68 were missing data. Details of respondents' characteristics are available in the Online Supplement. Responses from respondents with unsure, limited, or no input management decisions were excluded, leaving a total of 228 responses for analysis (a response rate of 28.9%).

Imaging Volumes

Overall, a decline in imaging volumes in April 2020 was reported by 97.4% of practices (222 of 228): 100% of imaging centers (24 of 24), 98.7% of hospital-based organizations (74 of 75), 100% of mixed practices (62 of 62), and 92.5% of other practice types (62 of 67). The remaining 2.6% of responses (6 of 228) were either no difference (n = 1), unsure (n = 2), or unanswered (n = 3). The overall decline in imaging volumes is depicted in Figure 1 in relation to the number of FTEs. Details about the reported overall reduction in imaging volumes and stratified by patient service location (ED, outpatient, and inpatient settings) in different practice settings are provided in Table 1.

Radiologic Procedures

There was a drop of nearly 90% in elective procedures across practices, with a decrease in urgent procedures reported by 62.7% of hospital-based practices and 67.2% of mixed practices. Details on the number of responses that reported declines in elective, nonurgent procedures and the change in urgent, invasive procedures across different practice settings are provided in the Online Supplement.

For interventional radiology and other invasive procedures, many practices made changes to scheduling. About one-fifth (19.3% [44 of 228]) reported that their interventional radiology practices were assigning alternating weekly or biweekly schedules; 3.5% (8 of 228) reported redeployments from clinical service to academic/research or administrative services, 2.6% reported redeployment to other hospital COVID 19-related services (i.e., screening services, emergency or inpatient care), but 43% (98 of 228) reported regular scheduling in place. Respondents who provided other measures taken by their practices are detailed in the Online Supplement.

In terms of PPE, among 170 respondents, 35.3% (60 of 170) reported their practices had an adequate supply, 22.9% (39 of 170) reported that availability had become an issue, and 29.4% (50 of 170) reported that PPE availability was inadequate and they had begun to ration. Thirteen respondents (7.6%) indicated that PPE was provided only for high-risk procedures because of inadequate availability, 0.6% (1 of 170) reported that PPE was not available, and 4% (7 of 170) responded "unsure."

Financial Data

A total of 100% of respondents (24 of 24) from imaging centers, 96% (72 of 75) from hospital-based organizations, 100% (62 of 62) from mixed practices, and 94% (16 of 17) from other facilities and breast centers reported losses in revenue. The mean reductions in receipts and gross charges reported for imaging centers were 53.9 ± 19.8% and 54.8 ± 23.2%, respectively. The mean reductions in receipts and gross charges reported for hospital-based organizations were 47.3 ± 17.2% and 52.6 ± 13.2%, respectively. Respondents from mixed practices reported mean reductions of 51.2 ± 15.6% and 54.1 ± 11.3%, and mean reductions

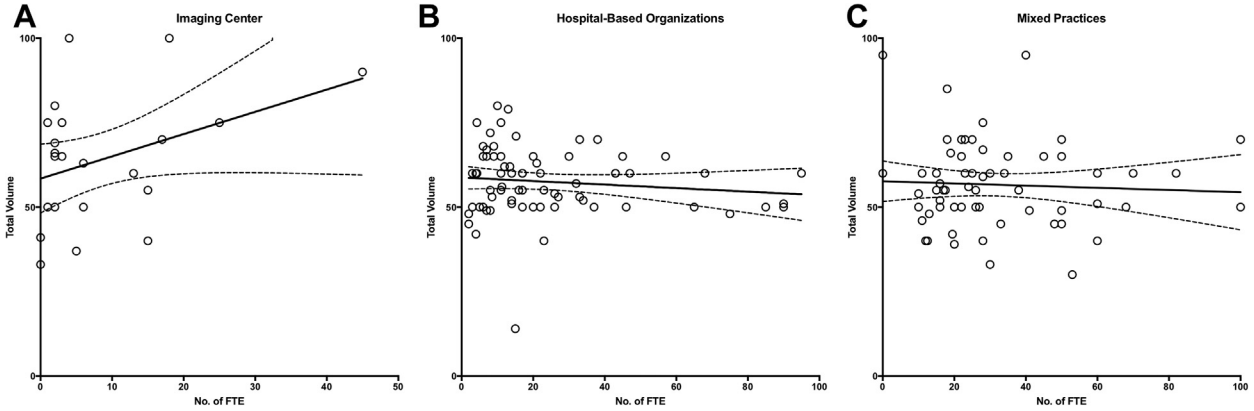

Fig 1. Plots of reported percentages of reduction in total imaging volume against the number of estimated full-time equivalents (FTEs). The best-fit linear regression line is the solid black line, with the 95% confidence interval depicted by dotted lines.

Table 1. Percentage declines reported from baseline in overall imaging volumes stratified by ED, outpatient, and inpatient settings for different practice settings

	Overall	ED	Outpatient	Inpatient
Imaging centers	63.7% ± 18.0%	31.3% ± 33.8%	57.9% ± 22.7%	24.3% ± 29.8%
Hospital based	57.8% ± 10.3%	42.3% ± 18.4%	55.6% ± 26.3%	39.8% ± 17.0%
Mixed practices	56.7% ± 12.7%	45.1% ± 12.8%	60.1% ± 19.2%	45.1% ± 15.9%
Breast centers/other facilities	56.4% ± 14.6%	42.4% ± 18.2%	56.6% ± 20.7%	40.2% ± 19.7%

Note: Data are expressed as mean ± SD. ED = emergency department.

reported by other facilities and breast centers were 46.4 ± 19.3% and 50.1 ± 19.1%, respectively. The individual reported reduction percentages in receipts and gross charges plotted by number of FTEs are shown in Figures 2 and 3, respectively. After Bonferroni correction, there was no statistically significant correlation between the percentage reduction in receipts or gross charges and the number of FTEs.

A total of 164 respondents indicated that they had applied for financial relief programs, including the Small Business Association Paycheck Protection Program, Economic Injury Disaster Loan emergency advances, accelerated payments, and CARES Act Provider Relief Fund. Among the 23 imaging centers that applied, only 9% (2 of 23) applied for one program, and 91% (21 of 23) applied for two or more programs. Among the 69 hospital-based organizations that applied, only 6% (4 of 69) applied for one program, and 94% (65 of 69) applied for two or more programs. All 62 mixed practices indicated that they had applied for financial relief programs, with 5% (3 of 62) applying for only one program and 95% (59 of 62) applying for two or more programs. Ten of the eleven recorded responses (91%) from other facilities and breast centers indicated that they had applied, with 10% (1 of 10) applying for one program and 90% (9 of 10) for two or more programs.

Among the 167 respondents, 87% (145 of 167) indicated that they had experienced reductions in salary and/or headcount, with the proportion being the highest among mixed practices (56 of 62 [90.3%]). Approximately 18% (30 of 167), 25% (41 of 167), and 8% (14 of 167) of practices reduced, postponed, and eliminated incentive payments, respectively. In addition, 50.3% of practices (84 of 167) had to reduce salary, 44.3% (74 of 167) postponed bonuses, 32.9% (55 of 167) reduced bonuses, and 16.7% (28 of 167) eliminated bonuses. Furthermore, 22% respondents (37 of 167) reported attrition, furlough, or loss of radiology staff members, and 35.3% (59 of 167) reported loss of nonradiology staff members. Some respondents described additional changes their practices made during the COVID-19 pandemic, which are detailed in the Online Supplement.

Radiology Staffing

Regarding the impact of COVID-19 on radiology staffing, 47% of practices (86 of 183) reported that radiologists were in-house, with higher proportions among hospital-based organizations (46.7% [35 of 75]) and mixed practices (64.5% [40 of 62]). Approximately 38.3% of respondents (70 of 183) indicated that there was limited radiologist staffing in the hospital, with higher proportions among hospital-based organizations (48% [88 of 183]) and mixed practices (41.9% [77 of 183]). In the outpatient setting, 36.6% of respondents (67 of 183) reported having practicing radiologists staff the outpatient clinics. A total of 67.7% of respondents (124 of 183) indicated that radiologists were staffed in remote locations, with 76.0% (139 of 183) and 75.8% (138 of 183) reported by hospital-based organizations and mixed practices, respectively. Relatively few reported having radiologists be reassigned from clinical time to academic, research, or administrative time (11.5% [21 of 183]) or other services (3.3% [6 of 183]). Assignment of radiologists to paid time off (PTO) was reported by 31.1% of respondents (57 of 183). Mixed practices tended to assign more radiologists to PTO (50.0% [31 of 62]). Many practices chose to reduce working hours and compensation (62.8% [115 of 183]), with the highest proportion among mixed practices (71% [44 of 62]). Furloughs occurred at 23.5% of surveyed practices (43 of 183), highest among mixed practices (29.0% [18 of 62]). Only 8 practices reported no changes in normal radiology staffing, with 5 being hospital-based organizations.

Regarding employees physically working on site in the hospital, practices reported granting exemptions for the following reasons: 28.1% (47 of 167) for people older than 65 years, 46.7% (78 of 167) for people with high-risk underlying conditions regardless of age, 22.1% (37 of 167) for pregnancy, and 17.4% (29 of 167) for people with elder care needs; 16.2% (27 of 167) responded "unsure," and 24.5%

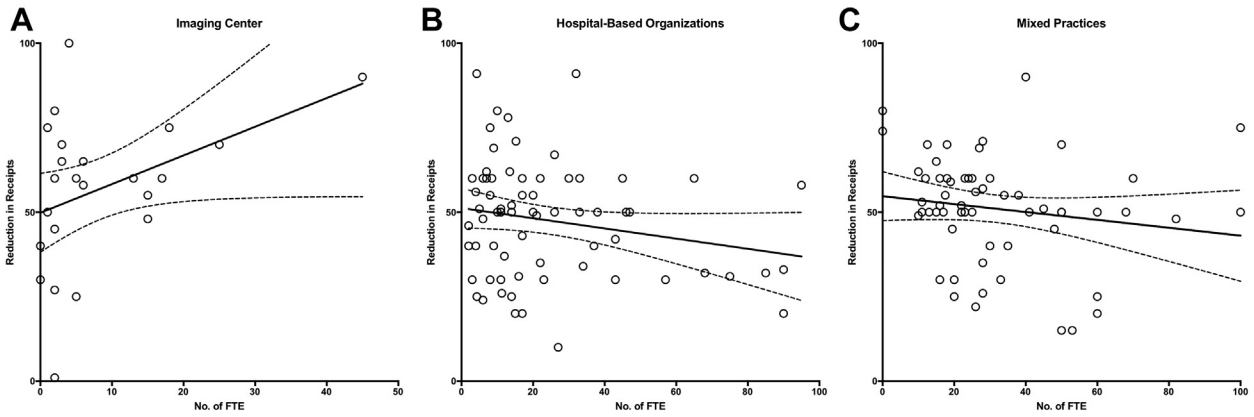

Fig 2. Plots of reported percentages of reduction in receipts against the number of estimated full-time equivalents (FTEs). The best-fit linear regression line is the solid black line, with the 95% confidence interval depicted by dotted lines.

(41 of 167) indicated that no exemptions were granted. Eleven respondents provided other answers, which are detailed in the Online Supplement.

A majority of the responders (62.3% [111 of 170]) reported that their practices had existing remote reading or teleradiology capabilities in place before the COVID-19 pandemic, and 22.3% (38 of 170) developed such remote reading or teleradiology capabilities as a response to the pandemic. A total of 148 respondents answered questions regarding preparedness for teleradiology. These respondents generally felt well prepared for this change (77.0% [114 of 148]). When asked if remote reading and teleradiology would likely be a standard operating procedure in the future, 77.0% (114 of 148) respondents agreed; 50.7% (75 of 148) thought that on-site reading would be used only to maintain visibility and availability. When asked to estimate the percentage of radiology staff members who were able to work remotely, respondents from imaging centers, hospital-based organizations, mixed practices, and other facilities and breast centers reported averages of 58.9 ± 41.4%, 69.2 ± 31.1%, 54.0 ± 29.8%, and 84.7 ± 15.3%, respectively.

Regarding staff reassignment, 118 responses were recorded, with only 25 (21%) responding affirmatively. Radiologists were reassigned to other clinical services, research, and telehealth. Technologists and administrative staff members were also reassigned.

The impact of COVID-19 on training programs is detailed in the Online Supplement.

A total of 147 responses were recorded regarding COVID-19 testing among radiologists. About 16% (23 of 147) reported that radiologists in their practices tested positive, with a total of 41 radiologists being positive and 37 symptomatic. Among the 165 responses regarding non-radiology staff members, 16% (27 of 165) responded that they had staff members who tested positive, summing up to 52 or 53 staff members testing positive (one reported that 1 or 2 staff members tested positive) and 48 demonstrating symptoms suggestive of COVID-19.

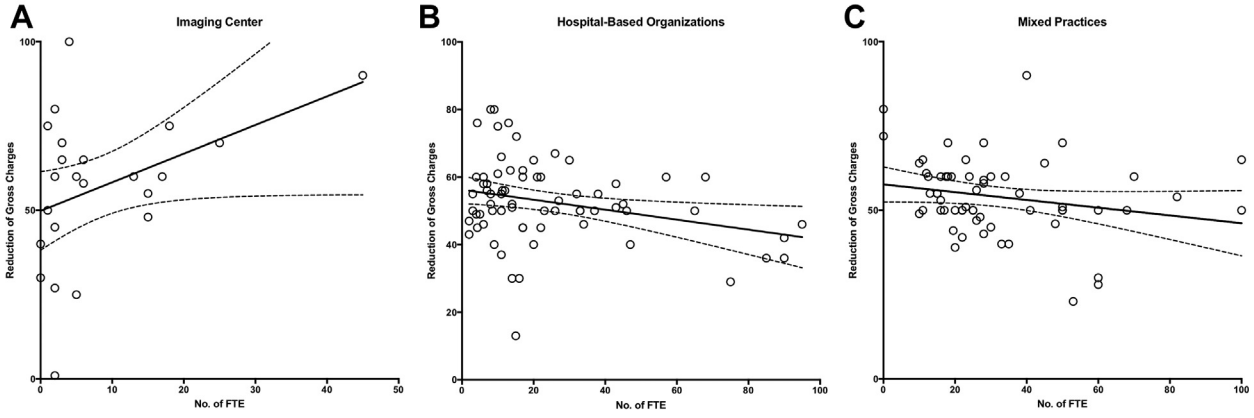

Fig 3. Plots of reported percentages of reduction in gross charges against the number of estimated full-time equivalents (FTEs). The best-fit linear regression line is the solid black line, with the 95% confidence interval depicted by dotted lines.

Table 2. Number of responses regarding the expected speed and extent of recovery in imaging volumes, potential short-term surge, and perceived adverse impact on practices according to size of practice

	Quick Recovery		Likely Extent of Recovery		Short-Term Surge		Adverse Impact on Practice	
	Likely	Unlikely	Recover but Not Entirely	Unlikely	Likely	Unlikely	Small	Large
Imaging centers (n = 24)	37.5 (9)	41.7 (10)	62.5 (15)	16.7 (4)	58.3 (14)	25.0 (6)	66.7 (16)	29.2 (7)
Hospital based (n = 75)	28.0 (21)	54.1 (40)	88.0 (66)	5.3 (4)	56.0 (42)	26.7 (20)	52.0 (39)	25.3 (19)
Mixed practice (n = 62)	17.7 (11)	72.6 (45)	74.2 (46)	12.9 (8)	51.6 (32)	29.0 (18)	50.0 (31)	29.0 (18)
Other facilities/breast centers (n = 22)	45.5 (10)	40.9 (9)	72.7 (16)	13.6 (3)	63.7 (14)	18.2 (4)	68.2 (15)	18.2 (4)

Note: Data are expressed as percentage (number).

Beliefs for Recovery Phase

Table 2 summarizes responses regarding the expected speed and extent of recovery in imaging volumes, a possible short-term surge due to postponed elective imaging, and adverse impact on practices. Among imaging centers, 62.5% believed that imaging volume would recover but not entirely. The corresponding proportions were 88% for hospital-based organizations and 74.2% for mixed practices. Respondents expecting a short-term surge due to postponed elective imaging were 58.3% for imaging centers, 56.0% for hospital-based organizations, 51.6% for mixed practices, and 63.7% for other facilities and breast centers. Details on the degree of likelihood (somewhat likely versus very likely) and exact response counts are provided in the Online Supplement.

DISCUSSION

The survey results quantify the extent of impact of the COVID-19 pandemic on radiology practices across the spectrum of settings. There were initial anecdotal reports of substantial (50%-70%) declines in nationwide imaging volumes [8]. Recently, COVID-19-associated declines in imaging volumes were described for a single large health system in New York, the area hit hardest by the initial wave of COVID-19 cases, as well as a large university hospital in northern California [1,2]. The survey showed similar results, with the estimated percentage decline from baseline in imaging volumes being greatest for imaging centers (63.7%), with smaller declines among hospital-based, mixed, and other practices (56%-58%). The decrease in imaging volumes included a 40% to 45% drop in cases from EDs as well as for inpatients from hospital-based and mixed practices. As expected, the drop in imaging volumes in the outpatient setting was greater at 55% to 60%. There was no statistically significant correlation between the percentage reduction in imaging volume and practice size (number of FTEs). These declines in volume are a reflection of most practices' avoiding all nonurgent imaging. Substantial COVID-19-related imaging work volume decreases have been recently reported, similar across community practices [9].

A majority of respondents (62%-88%) felt that imaging volume would recover but not entirely, with the lowest proportion among imaging centers. More than half (52%-64% of respondents) felt that there may be a surge in the short term because of postponement of elective imaging, with the highest proportion among breast centers and other facilities. Radiology practice volumes were reported to be increasing recently [2]. However, at the time of writing, there is a rapid increase in the number of reported cases, especially in some geographic areas [10]. The areas affected most adversely by the initial wave in April are starting to show declining trends. However, the overall impact of the increasing number of positive cases and reported deaths on radiology practice remains unknown and would require further study. Approximately 50% to 68% respondents felt that smaller practices might be more adversely affected, with the higher proportions reported by imaging centers and breast centers and other facilities. This could make access to radiology services in rural areas even more challenging [9].

Hospital-based organizations and mixed practices reported radiologists' providing interpretations from remote locations in approximately 75% of cases. Only about 10% were reassigned to academic, research, or administrative time. PTO was reported by 30% to 50%, and working hours and compensation were reduced at approximately 60%, with furloughs reported by 23.5%. Roughly half the practices gave exemptions from physically working on site in the hospital for individuals at high risk, but approximately one-fourth of respondents gave no exemptions. Significant

changes to practice had to be made for invasive and interventional procedures, and nearly half the respondents reported that the availability of PPE had become an issue or was inadequate.

A majority of practices felt well prepared for remote reading and teleradiology and felt that it would become standard operating procedure in the future. Roughly half of all respondents thought that on-site reading would be used only to maintain visibility and availability. Increasing teleradiology services has significant implications for faster turnaround times and opportunities for greater access to subspecialized radiologists [11]. More than 40% of respondents in our survey reported an adverse impact on their radiology training programs.

Reductions in receipts and gross charges were nearly 50% across the spectrum of practice settings, and almost all practices have applied for financial relief through one or more programs. As a result, 87% reported reductions in salary and/or headcount, with nearly half reducing, postponing, or eliminating incentive payments. Disproportionate declines have recently been reported in some subspecialty areas (eg, breast imaging) [9]. The short- and long-term impact on radiology practices remains to be seen.

A main limitation inherent in survey studies is that systematic bias could have been introduced by a possible higher response rate from practices in geographic regions more severely affected by the pandemic. To minimize this response bias, we instructed practices to submit only a single response to our survey and removed multiple responses from the same practice in the statistical analysis. Another important limitation in this study is that the percentage declines from baseline in imaging volumes, as well as receipts and gross charges, for the month of April 2020 are reported estimates, not actual numbers that can be audited. However, these reported estimates in imaging volume decline are compared with the current literature to evaluate the difference with real-world data.

In conclusion, the survey shows the dramatic impact of the COVID-19 pandemic on radiology practices and the response measures taken during the crisis. The continued spread in parts of the United States and the possibility of further increases in areas previously affected adversely make prediction of the short- to medium-term impact unclear. We aim to conduct a follow-up survey to further study some of these issues. These survey results will hopefully help radiology leadership gauge the initial impact and make appropriate changes in response to the pandemic.

TAKE-HOME POINTS

- Survey results revealed a reported 56.4% to 63.7% decline in overall imaging volumes across the spectrum of practice settings for the month of April 2020.
- The reported decline in imaging volumes was greatest in the outpatient setting, but an almost 40% decline was reported in the ED and inpatient settings during the initial wave.
- Significant declines in receipts and gross charges were reported by almost all practices, and nearly 70% of responding practices indicated that they had applied for financial relief programs.

ADDITIONAL RESOURCES

Additional resources can be found online at: https://doi.org/10.1016/j.jacr.2020.07.028.

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