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# Report from the RSNA COVID-19 Task Force: COVID-19 Impact on Academic Radiology Research—A Survey of Vice Chairs of Research

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## Abstract

**Objective:** Survey vice chairs of research from academic radiology departments on the impact of coronavirus disease 2019 (COVID-19) on research activities.

**Methods:** The survey asked respondents to quantify changes in research performed during the shutdown and ramp-up, relative to pre-COVID-19 levels. Respondents estimated research activity changes by overall research type (wet, instrumentation, or core facilities; prospective non-COVID-19 clinical research and computational laboratories) and then by the research activity type (data analysis, grant or manuscript writing, clinician involvement, summer student participation, and international research fellow appointments). The  $\chi^2$  test was used for comparison between shutdown and ramp-up, with Yates correction when necessary.

**Results:** Of 105 vice chairs contacted, 46 (43.8%) responded. For 95.5%, wet, instrumentation, or core facilities research decreased to  $\leq 50\%$  during shutdown and for 83.3% during ramp-up ( $P < .0001$ ). In addition, 89.2% and 46.5% indicated reduction to  $\leq 25\%$  of non-COVID-19 clinical research during shutdown and ramp-up, respectively ( $P < .0001$ ). Only computational research increased to 120% during shutdown (39.5%) or ramp-up (50%) ( $P = .8984$ ). For data analysis from closed laboratories, 75% and 86% showed decreased activity during shutdown and ramp-up, respectively ( $P = .28$ ). Increased grant writing during shutdown and ramp-up was reported by 45.5% and 23.3% ( $P = .093$ ). For 52.3% and 23.3%, manuscript writing and submission increased during shutdown and ramp-up, respectively ( $P < .02$ ). Clinician research involvement trended toward relative decreases during shutdown (84.1% versus 60.5%,  $P = .05$ ). There was similar drop in summer student participation (shutdown: 86.4%, ramp-up: 83.7%,  $P = .95$ ) and international researcher appointment (shutdown: 85.7%, ramp-up: 86.1%;  $P = .96$ ).

**Conclusion:** Many radiology research activities diminished during the COVID-19 shutdown and to a lesser extent during the ramp-up. Activities that could be done remotely, such as computational analysis and grant and manuscript writing and submission, increased.

**Key Words:** COVID-19, research impact, survey

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## INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has significantly impacted hospital and health care systems in many ways, with significant impact on clinical radiology

departments [1,2], including impacts on finances [3] and operational efficiencies [4]. Academic radiology departments, similar to other clinical departments, were also forced to suspend many research activities [5]. Researchers

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and their staff were forced to stay home because hospitals and universities only allowed essential health care workers on premises to limit potential COVID-19 spread. Prospective non-COVID-19 clinical research was generally suspended, including patient recruitment, scanning on clinical or research imaging modalities, and on-site data analysis. In addition, many clinical scientists were diverted to focus on clinical work within the radiology department or to care for patients on the front lines. There were slowdowns in institutional review board reviews and approvals, as well as marked delays in journal manuscript reviews [6]. At many institutions, intramural funding opportunities were suspended to divert funds to clinical care [6]. There was also an impact on National Institutes of Health–funded studies, because many laboratories continued to pay salaries for laboratory staff, without the ability to continue prospective non-COVID-19 clinical research activities [6].

These challenges resulted in a greater than 20% decline in research time for researchers in clinical sciences and a 24% decline in research time across all disciplines [7]. Some areas of research, however, were not as greatly affected including computational sciences [7]. In fact, research in radiology artificial intelligence laboratories often experienced increases in productivity. Approaches to lessen the impact on research varied between institutions and academic radiology departments. The current study is a survey of academic radiology vice chairs of research to determine the impact of COVID-19 on research activities within radiology departments.

## METHODS

The RSNA COVID-19 Task Force developed an anonymous survey in Qualtrics (Qualtrics, Provo, Utah). An initial draft was prepared and then iteratively refined by group consensus. A link to the survey was e-mailed to the RSNA listserv of 105 radiology department vice chairs of research on July 15, 2020. One reminder e-mail was subsequently sent to the group. The survey was closed on August 3, 2020.

The survey asked respondents to quantify changes in research performed during the height of the pandemic shutdown and then during the subsequent ramp-up period, relative to pre-COVID-19 levels. The survey did not explicitly define the shutdown or ramp-up periods for respondents because each institution may have had a different duration and period for the shutdown. Specifically, respondents estimated the change in research activities by overall type of research being performed and then by the specific type of research activities performed. Categories for overall type of research included wet or instrumentation laboratory and core facilities research and prospective non-COVID-19 clinical research and computation laboratories (image analysis, artificial intelligence, etc). Categories for specific type of research activities performed included data analysis, grant writing activity,

manuscript writing and submissions, clinical involvement in research, summer student participation in research, and appointment of international research fellows.

For each data element, respondents were asked to indicate the level of research activity relative to pre-COVID-19 baseline, using a 6-point scale (complete stoppage, 25%, 50%, 75%, no change, 120%). The complete survey is available in e-only [Supplemental Table 1](#). Data were analyzed using  $\chi^2$  tests with Yates corrections when necessary.

## RESULTS

Of the 105 radiology vice chairs of research included on the RSNA list serve, 46 responded (43.8%).

### Overall Type of Research Being Performed

[Figure 1](#) shows overall changes in volume of type of research performed during shutdown and ramp-up periods relative to the prepandemic baseline.

Regarding wet or instrumentation laboratory and core facilities research, 95.5% of respondents indicated a reduction to 50% or less in activity from pre-COVID-19 levels during shutdown and 83.3% during ramp-up. The levels of wet or instrumentation laboratory and core facilities research activities were significantly increased during the ramp-up compared with shutdown (+12.5%,  $\chi^2 = 27.42$ ,  $P < .0001$ ). In addition, 65.9% of wet or instrumentation laboratory and core facilities research activity was completely stopped during shutdown and 9.5% during the ramp-up.

Regarding prospective non-COVID-19 clinical research activity, 89.2% of respondents indicated a reduction to 25% or less of pre-COVID-19 levels during shutdown and 46.5% during ramp-up. The level of prospective non-COVID-19 clinical research activity was significantly increased during ramp-up compared with shutdown (+42.7%,  $\chi^2 = 22.03$ ,  $P < .0001$ ), and 52.2% of prospective non-COVID-19 clinical research activity was completely stopped during shutdown and 9.3% during ramp-up.

The only overall type of research that any respondents indicated had increased to 120% during shutdown or ramp-up periods occurred in computational laboratories. During shutdown, 30.2% of computational laboratories experienced no change, and 9.3% experienced an increase to 120% of baseline. During ramp-up, 42.9% experienced no change from baseline, and 7.1% experienced an increase to 120%. The differences between shutdown and ramp-up were not statistically significant ( $\chi^2 = 1.62$ ,  $P = .8984$ ).

### Specific Type of Research Activities Performed

[Figure 2](#) shows the specific type of research activities performed during shutdown and the subsequent ramp-up period. There was no significant difference in data analysis

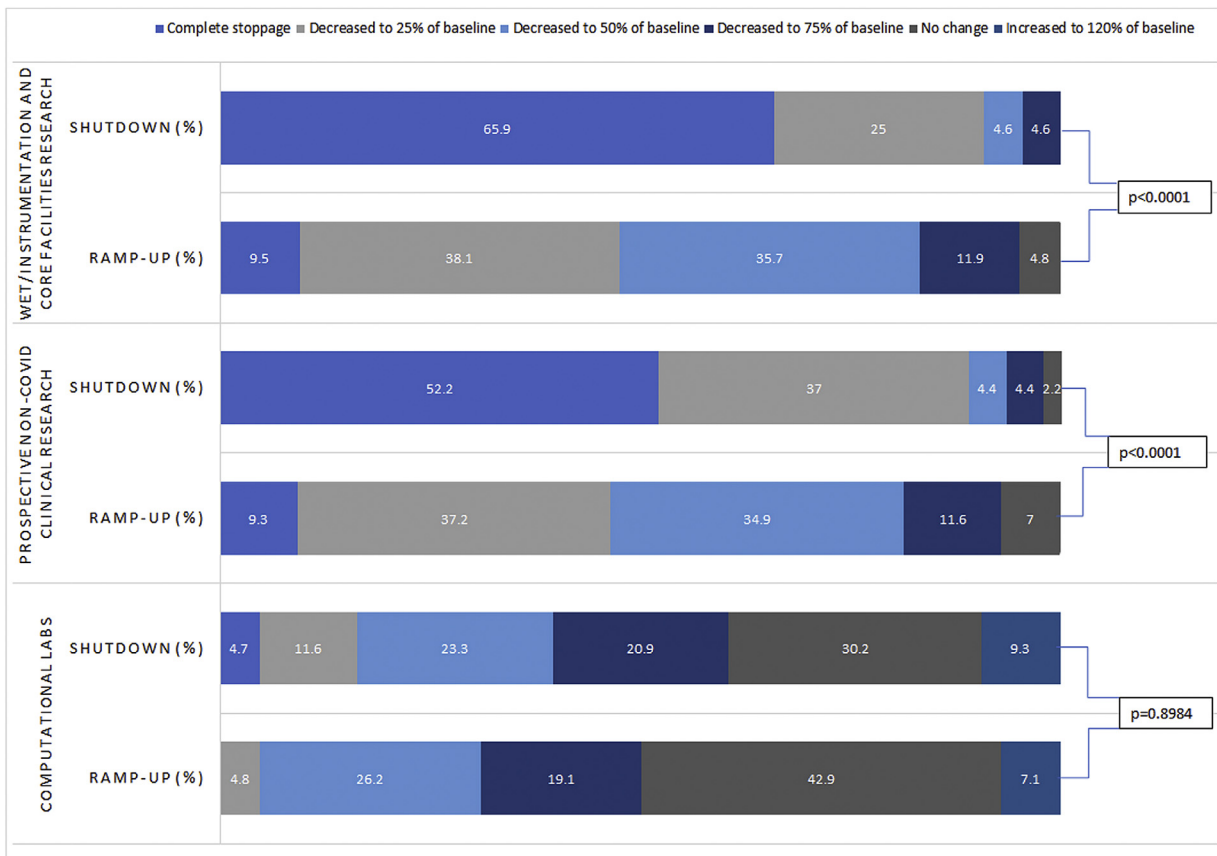


Fig. 1. Level of overall type of research being performed during the recent coronavirus disease 2019 (COVID-19) shutdown and ramp-up period.

from closed laboratories, with 75% and 86% showing baseline or decreased activity during shutdown and ramp-up, respectively ( $\chi^2 = 2.58, P = .28$ ). Grant writing activity showed a trend toward increasing, with 45.5% of respondents indicating increased grant writing activity during shutdown (45.5%) compared with 23.3% indicating an increase during the ramp-up, although this difference was not significant ( $\chi^2 = 4.74, P = .093$ ). Manuscript writing and submission increased during shutdown according to 52.3% of respondents, compared with only 23.3% indicating an increase in writing or submission during the ramp-up ( $\chi^2 = 7.9, P < .02$ ). There was a trend toward decreased clinical involvement in research during shutdown (84.1% indicated a decrease) compared with during the ramp-up (60.5% indicated a decrease) ( $\chi^2 = 5.85, P = .05$ ). During both periods, there was a near equivalent drop in summer student participation in research (shutdown: 86.4%, ramp-up: 83.7%;  $\chi^2 = 0.108, P = .95$ ) and appointment of new international research fellows (shutdown: 85.7%, ramp-up: 86.1%;  $\chi^2 = 0.002, P = .96$ ).

## DISCUSSION

During the COVID-19 pandemic, research activities were markedly impacted at academic institutions, in line with

reduction of elective radiological imaging and procedures upon which many studies depend. During stay-at-home periods, many institutions shut down prospective non-COVID-19 clinical research and research that would not directly impact patient care and outcomes. There has since been a ramp-up period, mirroring clinical ramp-ups [8] in some respects, that is still ongoing. According to vice chairs of research across radiology departments, wet or instrumentation laboratory and core facilities research and prospective non-COVID-19 clinical research were most dramatically affected, with a significant increase in activity during the ramp-up. Computational laboratory research was not dramatically affected during the shutdown or ramp-up.

There was no significant difference in the level of data analysis performed during the shutdown versus during the ramp-up, with pre-COVID-19 levels as a reference, with a slight skew toward reduced research efforts during both periods. Similarly, there was no significant difference in grant writing activities, which were increased for both groups relative to pre-COVID-19 baseline. There was marked reduction in international research fellow and summer student research activity during both periods that

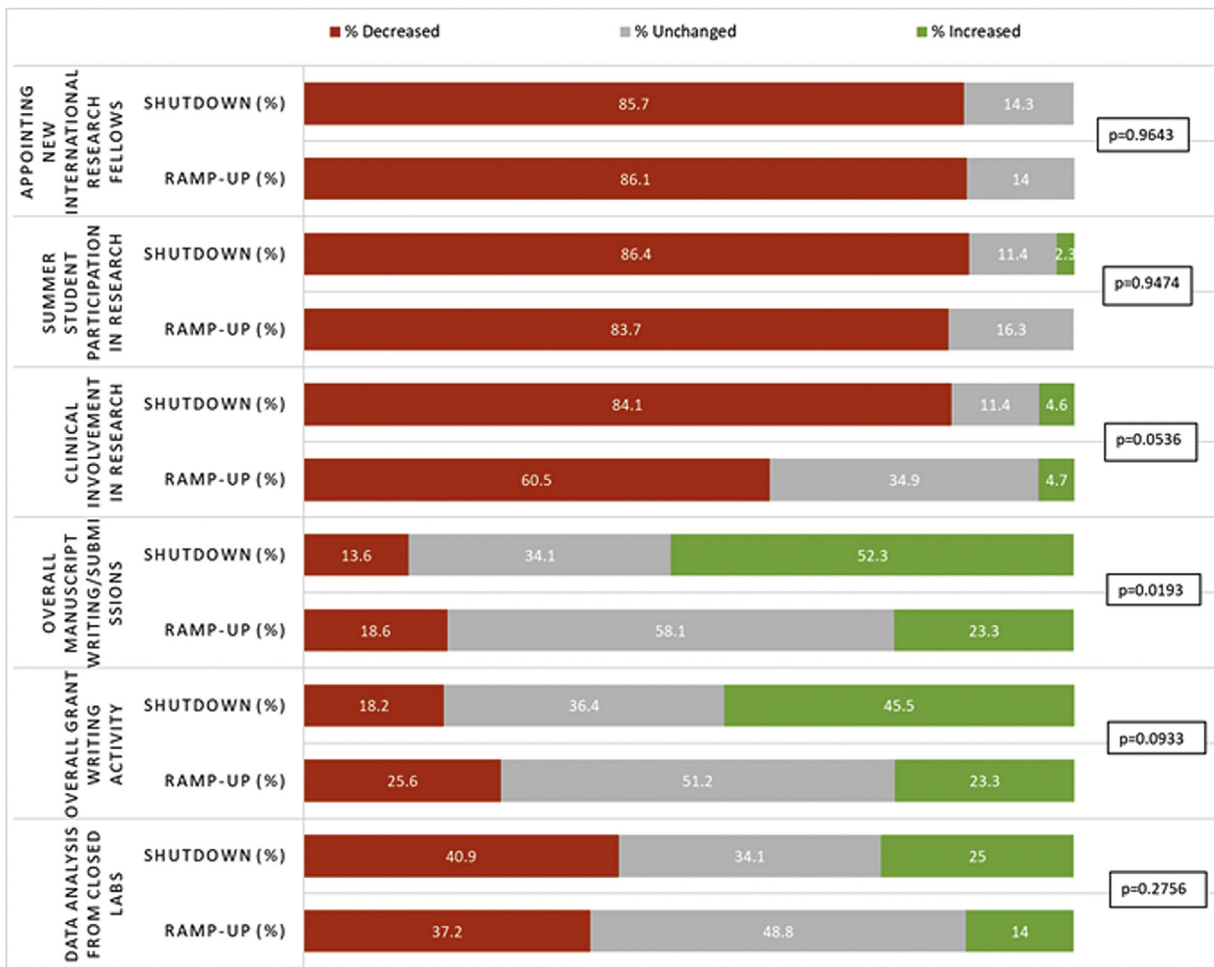


Fig. 2. Level of overall type of research being performed during the recent coronavirus disease 2019 shutdown and ramp-up period.

was not significantly different. There was an increase in manuscript writing during the shutdown, which was significantly different from the ramp-up period, and there was a shutdown-related reduction in clinical involvement in research, which was significantly different from the ramp-up.

The survey results indicating increased computational research activities in radiology departments have some similarities to a survey study that Myers et al [7] conducted of principal investigators across many disciplines, which found computer science had the smallest decline in research activity across all disciplines. Similar to our results, Myers et al [7] showed that laboratory-based research activities were most impacted, with 30% to 40% reductions. Computational radiology research during the shutdown showed increased activity, in contradistinction to wet or instrumentation laboratory and core facilities research, likely because of data and computational access from home. And, although clinician involvement in research during the pandemic shutdown decreased, this likely

differed between specialties. Anecdotally, for some institutions, radiologist involvement increased because of reduced imaging interpretation responsibilities during the elective imaging shutdown.

Vagal et al [5] summarized steps taken by six academic radiology departments in research during the pandemic. The common theme was cessation of on-site in-person research and recruitment, with a few exceptions: (1) COVID-19 research and (2) research that if paused would result in significant detriment to patient health. Some institutions also permitted continuation of long-standing research projects in which a pause would result in significant detriment to the project. Researchers worked from home, and some institutions had researchers focus on other research activities, including grant and manuscript writing and data analysis. Student and trainee activities were also halted or significantly diminished. This is similar to what the current survey found, in which the respondents indicated most non-COVID-19 research activities and wet or instrumentation laboratory and core facilities research activities were paused

during the shutdown, but grant and manuscript submissions and computational analysis work increased. In our survey, however, data analysis from closed laboratories did not increase, which may be a result of researchers unable to access data remotely or reduced access to students or postdoctoral research fellows. Many of the respondents to our survey also indicated cessation of summer student and international fellow research activity that could impact research in a variety of ways.

This study depicts the research experiences of academic institutions across the country during the COVID-19 shutdowns and subsequent ramp-ups and can help inform radiology department leadership teams of research activities that can be maintained with limited intervention, those areas that will require more support to ramp back up after a shutdown, and potentially areas of research that were impacted during the shutdown that could have been maintained with limited risk during future pandemics or related crises. These data can also help radiology leadership better understand the discontinuity of faculty and laboratory research productivity that could inform promotion considerations. The current survey indicated a reduction in data analysis from closed laboratories and limited research activities from students and international research fellows. In future research shutdowns, potential activities can be promoted by radiology departments, encouraging and facilitating remote research activities through increased virtual research infrastructure. In addition, with the capabilities of performing computational analysis from home, an increased focus from departments to support artificial intelligence research could help maintain research activities during future shutdowns. Creation of virtual research educational materials and interactive workshops on grant writing, research methodology, and manuscript writing can help radiologists conduct virtual research activities with appropriate guidance through periods of reduced clinical responsibilities and remote work. These resources could also help introduce trainees and students to research, facilitating their research activities with virtual education and mentorship.

There are a few limitations to the current survey study. First, the study was performed during the initial ramp-up period of a dynamic pandemic, with most institutions only considering full return for fall 2021. Institutional research activities have likely evolved over time and continue to do so as institutional, state, and federal restrictions ease. Second, the scope of the survey was narrow, addressing only certain research activities. For example, we did not address the impact of the shutdown and ramp-up on COVID-19–focused research. This approach was chosen to increase engagement and response rates. Maintaining animal and equipment facilities, addressing equity in research, and researcher wellness were not addressed. Although we would

have preferred to receive responses from every respondent, we feel the results are likely generalizable given the 44% response rate. The RSNA vice chairs for research is a diverse group representing institutions that are diverse with respect to geography, size (both clinical and research), research funding levels, research support and infrastructure, and faculty. Although the survey was anonymous, we believe the respondents represented the overall diversity of academic radiology research. Third, a number of areas of research addressed in this study have multifactorial influences, affected by state and national laws and immigration agency policy changes, and are not strictly under the control of the academic institutions. These details, however, are beyond the scope of this article.

### TAKE-HOME POINTS

- During the COVID-19 shutdown, many research activities were diminished, and this persisted for many activities during the ramp-up.
- Activities that could be conducted from home such as computational analysis, as well as grant and manuscript writing and submission, however, remained the same or increased.
- Having knowledge of the types of activities particularly impacted by an event such as the COVID-19 pandemic can help us prepare for future events should they occur, as well as help leaders such as vice chairs for research innovate around new ways to conduct research in the future.

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### ADDITIONAL RESOURCES

Additional resources can be found online at: <https://doi.org/10.1016/j.jacr.2021.10.017>.

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