

Integrating Distance Strategies to Meet the 2020 Summer Research Internship Competencies and Objectives

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ABSTRACT: Knowledge of research skills such as information literacy, critical thinking, ability to ask questions, and evidence-based decisions are necessary for all medical students. They will use these skills for clinical decisions, translate research findings to clinical practice, and educate their patients. Research also plays an essential role in the selection process for many residency programs, and it has only become more critical over time. Therefore, research activities are a central component of medical schools' curriculum throughout the 4 years. One of the research opportunities offered to medical students is their participation in a research summer internship. Nevertheless, due to the COVID-19 pandemic, summer 2020 was impacted by the rapid shut down of academic and research activities to minimize infection. In this article, the authors describe the methodology changes to maintain the summer research internship offering amongst the coronavirus pandemic compared to the previous 6 years (2014-2019). Students answered a survey to assess their insight regarding general aspects of the summer research internship, structure, mentorship, faculty, and research skills development. Overall, students had a positive perception of all the survey areas, especially in mentor performance and research skills development. In conclusion, the authors found 2 critical attitudes toward facing unexpected challenges, such as the impact of COVID-19. These are essential to open new opportunities for the future of medical education research: (1) assuming a fast, encouraging, and constant response from the academic leaders, and (2) facilitating the stakeholders' interest, resilience, and commitment to help and support.

KEYWORDS: Medical education, summer research, research skills, medical students, COVID-19

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Introduction

The offering of medical students' opportunities to engage in research experiences during their medical training is essential to respond to the increasing need for physician-scientists in the healthcare workforce.¹⁻³ Academic medicine associations recommend research as one of the medical curriculum components to help translate discoveries to a better quality of life for all.⁴ These research experiences, mentored by good role models and knowledge of the research process and publications in peer-review journals, help medical students see the practice of medicine as a venue for discovery and innovation in health and health care to serve their patients better.^{5,6} Moreover, according to the MATCH (National Resident Matching Program), research and scholarly productivity are significant determinants to compete successfully in obtaining residencies and fellowships after their graduation.⁷

San Juan Bautista School of Medicine (SJBSM) is a private academic institution in Puerto Rico. Research activities are a central component of its curriculum, including an Introduction

to Research course, a Research Summer Internship, and a Clinical and Translational Research Design course during the first 2 years. The school also has a Research Clerkship and research electives in the 4th year. For the 2020 Summer Research Internship, most medical students who applied to research programs had their expectations fulfilled to attend competitive research rotations at SJBSM or other national programs. Regularly, the students look for opportunities in their residency interest areas. However, the scenario changed by the beginning of March 2020, when the COVID-19 pandemic starts affecting the academic and research activities.⁸⁻¹² The immediate suspension of research activities created numerous challenges aggravated because of our situation of geographical isolation. This fast change in the environment limited their research experience in their area of interest for residency.

This study describes the translational experience of offering the 2020 Summer Research Internship at a distance compared to the previous 6 years (2014-2019). We describe the methodological changes implemented to respond to the



academic's fast transformation due to the coronavirus pandemic. We include a brief discussion of the expected outcomes, challenges, limitations, and potential impact on the medical students' residency applications.

The SJBSM Summer Research Internship 2014 to 2019

Since the inception of the required summer research experience, the SJBSM medical students apply and compete for SJBSM or other prestigious research summer programs across Puerto Rico, the USA, and other countries. During these years, most Internships focused on hands-on summer research experiences allowing students to develop, conduct, and manage a research study. The Internship also aims to introduce students to basic science or clinical science settings to enhance their scientific research process competencies. The primary objectives for the Summer Research Internship are to:

1. Develop medical students' interest in biomedical, clinical, and epidemiologic research.
2. Introduce students to the multiple steps of the research process and how the steps interlink.
3. Develop students' skills in the management of research methods and analytical tools.
4. Promote ethical and professional behavior while conducting research.
5. Improve students' skills in searching and conducting a critical appraisal of the literature.
6. Familiarize students with the data gathering process, analysis/interpretation of scientific data.
7. Strengthen students' skills in teamwork and collaborative work.
8. Allow students to attend and participate in journal clubs, research meetings, and seminars.
9. Strengthen students' skills in oral and written presentations of research methods and findings.

During the last 6 years (2014-2019), approximately 60% of the SJBSM medical students did their summer research internship in research programs outside of Puerto Rico. Most of the activities were primary research, including applied basic research, clinical research (clinical trials and observational), and epidemiological research (experimental and observational).¹³

The SJBSM 2020 Summer Research Distance Internship

By late March 2020, students began to receive cancellation letters due to COVID 19 until all in-person research rotations both locally and in the USA were canceled by the end of April. Therefore, the decision was to postpone the Summer Internship or design strategies to offer a distance research experience that met the expected academic objectives and competencies. SJBSM's curriculum committee decided to

continue with the Internship offering by revising the activities consonant to distance research experiences. The internship research objectives and competencies remained without any alteration. We modified only the learning strategies or activities to introduce the students to the research process in distance learning modality. Table 1 summarizes the virtual activities used to address the 2020 Internship research competencies and objectives. We also incorporated a new Translational Research Seminar Series with topics addressing each Internship's objectives.

For the 2020 Summer Research Internship, the SJBSM Research Center Director joined the Summer Research Internship course coordinator to help identify and invite mentors who could work with the medical students at a distance to offer a virtual research experience. A new description of the Internship was prepared and discussed with each of the mentors to work on secondary research activities related to their area of expertise, such as developing a research proposal, writing a case report, review, or hypothesis. The medical students received the mentors' names and their area of expertise to pair them as best possible with their area of interest. Once all 57 students had mentors, the 2020 Summer Research Internship officially started in June, with 26 mentors. Some mentors had more than 1 medical student, and the Course Coordinator or the Research Center Director maintained weekly contact with the mentors and students. We presented the 1-hour seminar weekly using distance software/platforms to all students and mentors to reinforce the research skills competencies and maintain communication among the networks. We believe that the personal contact with mentors and students and the weekly meetings during the Seminars helped facilitate the mentors and students' interest, resilience, and commitment to help and support achieving the goals during a challenging time.

Figure 1 presents the radical change from the almost 60% of the SJBSM medical students doing their summer research internship in an institution outside of Puerto Rico during 2014 to 2019 to only 9% (n=5) in 2020. Each mentor chose the research project, topic (s), and the Internship's starting date to comply with the minimum requirement of 100 hours in no less than four (4) weeks and no more than eight (8) weeks. The students participated in the seminar series, journal clubs, mentor meetings, and literature review to develop research skills on information literacy, critical thinking, and evidence-based decisions. They worked with mentors on writing research proposals, scientific articles, case studies, or reviews to facilitate scientific writing skills. To develop their presentation and oral skills, medical students present their research projects and expected outcomes in an oral presentation to SJBSM faculty and students during November.

The Internship's requisites for completion remained the same: an oral presentation about their research project mid-year and a portfolio before the end of the year describing their experience. Nevertheless, the students had the choice to continue working with each respective mentor to produce a

Table 1. Virtual activities to address the Internship competencies and objectives.

COMPETENCIES	OBJECTIVES	TRANSLATIONAL RESEARCH SEMINAR TOPICS	MENTORED ACTIVITIES
Medical knowledge	Develop medical students' interest in biomedical, clinical, and epidemiologic research. Allow students to attend and participate in journal clubs, research meetings, and seminars.	"Develop medical students' interest in biomedical, clinical, and epidemiologic research."	Discussion of topic and literature findings with the mentor Weekly Research Seminars, mentor's meetings
Critical thinking	Introduce students to the multiple steps of the research process and how the steps interlink. Improve students' skills in searching and conducting a critical appraisal of the literature.	"The multiple steps of the research process and how the steps interlink." "Introduction to Literature Search."	Critical Evaluation of published work in peer-reviewed journals Literature review, identifying gaps in knowledge, defining a research question
Organizational skills	Develop students' skills in the management of research methods and analytical tools.	"Case Reports as clinical research tools for an integrative medicine experience: The Metabolic Correction Model."	Allowing students to continue working during the academic year with their mentor
Professionalism	Promote ethical and professional behavior while conducting research.	"Beyond a culture of professionalism and ethics in research and medicine."	Responsibility in delivering assignments on time with the opportunity to discuss issues with a mentor
Data acquisition	Familiarize students with the data gathering process, analysis, and interpretation of scientific data.	"How to write the best-Case Report."	Retrospective data analysis and interpretation, evaluation of methodology and design
Teamwork	Strengthen students' skills in teamwork and collaborative work.	"Transdisciplinary teamwork: a Health Justice experience."	Working with the mentor and other supporting staff
Communication skills	Strengthen students' skills in oral and written presentations of research methods and findings.	"Writing a Review: Skills in research and conducting a critical appraisal of the literature."	Oral presentation of the research project; writing drafts

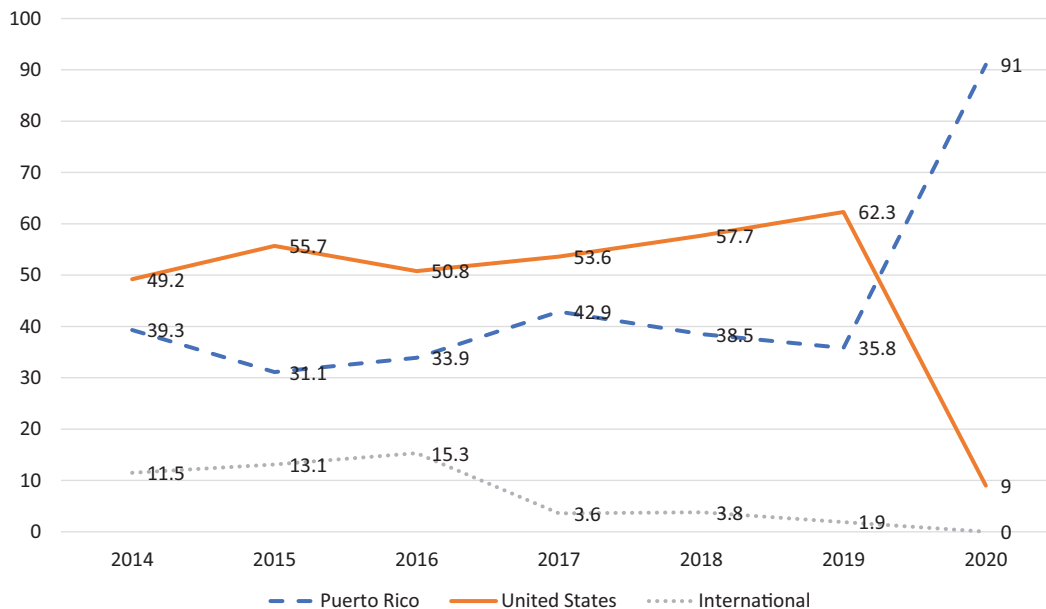


Figure 1. Distribution of medical students by the location of the Summer Research Internship Program, 2014–2020.

scholarly outcome by the end of the academic year, such as an abstract for an oral or poster presentation, submitting a manuscript, or developing a research proposal. Therefore, in contrast

to other years, where most of the activities were primary research, all the 2020 Internship activities resulted from secondary research (Figure 2).

Assessment of the 2020 Summer Research Distance Internship

The Learning Assessment Office developed a survey to evaluate this new methodology. Following the summer experience, the students voluntarily answered this survey (77% response) about their perception of the 2020 Summer Research Distance Internship, mentor and faculty performance, internship structure, and research skills. The survey had a 5-point Likert scale (1 = disagree strongly, 2 = disagree slightly, 3 = neutral, 4 = agree slightly, 5 = agree strongly). We created a 3-point scale integrating 1 and 2 responses into 1 category and 4 and 5 into another, yielding a scale of 1 = disagree, 2 = neutral, and 3 = agree.

Overall, between 80% and 91% of students agreed that the Internship met their expectations, had a high educational impact, was useful in progress toward their degree, and highly recommended the Internship. The mentors' performance was the survey component, where most students positively agreed (between 93% and 98%). In terms of faculty performance, over 90% of students agreed that the faculty participating in the seminars was well prepared, organized, communicated clearly, and were easy to understand. The faculty use of time during the Translational Research Seminars and the encouragement for students to participate were the areas that the students least agreed. Over 90% of students agreed the internship workload and requirements were appropriate, and the environment felt like a welcoming place to express their ideas. Another component measured in the survey was the students' perception of research skills development.

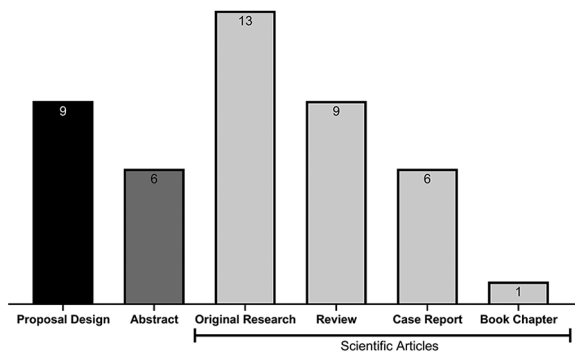


Figure 2. Distribution of secondary research activities during the 2020 Summer Research Internship.

Overall, students identified the understanding of basic, clinical, and translational as the research skills that they most developed during the summer internship (98%). They answered the ability to identify, formulate and solve problems as the skill that they least developed (86%).

The questionnaire also had a section with 3 open questions. We received 42 comments on the question, "What are the strengths of this Internship?." Several of the responses included multiple areas of strength. After an evaluation, we categorized the strengths comments by research skills development, mentors, research experience, time management and flexibility, teamwork, and learning environment. Twenty-three (23) comments were regarding the question, "Do you have any recommendations for improving this internship?." The answers did not show any pattern. Most students did not provide recommendations as they understand no change is needed (65%, n = 15). Table 2 presents the "students" comments on improvement. Twenty-eight (28) comments were received for the question, "Describe your experience as a student in the internship." The "students" responses related to their experience were varied and all positive. Table 3 presents examples of free-text comments.

Conclusion

The 2020 Summer Research Internship's distance methodology focused on secondary research. It represented a significant translation from previous years' experiences to adapt to the pandemic restrictions applied to students' participation in bench and bedside research. The offering of distance learning strategies to meet the research competencies and objectives has merits that will be defined in the long term by scientific writing outcomes, new research proposals, research productivity, students and mentors' surveys, and residency acceptance rates. We expect that medical students' scientific productivity, including poster and oral presentations and peer-reviewed publications, will be the same or better than in previous years. Research plays an essential role in the selection process for many residency programs. Therefore, we expect this summer research internship to positively impact our medical students in their residency admission.

In conclusion, we found 2 critical attitudes toward facing unexpected challenges, such as the impact of COVID-19.

Table 2. Free-text comments related to student recommendations for improving the internship.

"More organization in the course objectives and tasks each student has to complete."
"Focus on presentations that are more clinically related."
"More communication between mentors and their students."
"The alternative of distance internship should be included as a permanent option for future students."
"Due to the circumstances, the experience surpassed my expectations. However, it would have been great to do bench work in the lab. Or included it later in the semester."
"Explain the different types of scientific research and papers before starting our projects. That way, we would be better educated on how to carry out our research and papers."
"The internship may improve with better coordination between the school and the mentors."

Table 3. Examples of free-text comments related to student experience during the internship.

"I enjoyed the experience because I was able to focus on a topic that is related to my desired branch as a doctor. I learned a lot, and it allowed me to get a taste of what is yet to come in that branch of medicine that I like."
"I enjoyed it. It was at a distance because of COVID-19, but I feel as though we made the most out of the experience."
"It was very hands-on, and we were in constant communication from our mentor. He gave us feedback constantly, and it was nice to work together toward a project."
"Overall, it was an excellent opportunity to work on a potentially publishable article. Reading tons of papers helped me understand more about research methods (eg, double-blind clinical trials). Also, working on my writing is something that certainly developed a more skilled scientific on me."
"The feedback received was constructive and enriching, and under the unforeseen circumstances, the internship helped me grow as a future physician."
"I developed critical thinking and discipline. Also strengthening my teamwork mindset and communication skills."
"My experience in the internship was well-rounded. I got to explore some of my interests together with residents and develop ongoing research."
"Overall. It was a nice experience. As mentioned before, we were able to do the tasks at our own pace, which, in my case, made it easier to get them done."
"It was also a great learning experience in both the topic of the research and how a research is conducted."
"I had the experience on how to do a publication which is so necessary for residency. I'm very pleased to be part of this opportunity."

These are essential to open new opportunities for the future of medical education research: (1) assuming a fast, encouraging, and constant response from the academic leaders, and (2) facilitating the stakeholders' interest, resilience, and commitment to help and support. Therefore, we recommend that a successful translation of an established academic requirement, such as moving from a traditional in-person experience to a completely virtual one in a short timeframe, requires that all the participants be aware of the changes, believe in them, and are willing and committed to participate.

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Author Contributions

EE initiated the call for conceptualizing the manuscript. EE, AC, and YI conceived and designed the original drafts. FG analyzed and helped in the interpretation of the evaluation data. IM provided substantial suggestions to improve the manuscript. All authors read and approved the final manuscript.

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