A Virtual Curriculum to Increase Exposure to Oncologic Subspecialties for Undergraduate Medical Students

Maria Claudia Moncaliano1 · Anita Mahadevan1 · Jessica C. Liu1 · Ilora Naik1 · Irina Pateva1,2

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Abstract

Medical student exposure to oncology is imperative given the prevalence of cancer, growing need for survivorship care, and ever-evolving therapies. Our institution offers a Cancer Care Elective for undergraduate medical students focused on clinical shadowing, but the COVID-19 pandemic necessitated completely redesigning a virtual alternative. In this study, we utilize a post-elective survey to 1) assess whether the novel virtual elective effectively promoted student learning and 2) identify which components were most impactful. We created an entirely virtual, semester-long course with structured mentorship, subspecialty panels, physician-led didactics, and patient exposure. Students attended multidisciplinary tumor boards and presented on oncologic topics. A post-elective survey assessed the course’s impact on students’ knowledge and the perceived value of each elective component. Of the 29 enrolled students, 12 responded to our survey (41%). Most students reported that the elective highly enhanced their understanding of medical (67%), surgical (75%), and pediatric (66%) oncology. The highest rated didactic involved patients discussing their cancer journeys, with 80% of students reporting that this session enhanced their understanding of patient–physician collaboration. Students reported that physician mentorship helped them better understand oncology (90%) and promoted interest in pursuing an oncologic career (100%). This study demonstrates that our virtual Cancer Care Elective was effective at increasing student understanding of oncology in practice. The results also suggest that patient exposure and physician mentorship are particularly educational and encouraging.

Keywords Cancer Education · Virtual Learning · Virtual Mentorship · Medical Student Mentorship · Undergraduate Medical Elective · Medical Education · Medical Students

Introduction

A meeting hosted by the International Union Against Cancer and WHO in 1992 recommended that cancer education be a mandatory part of medical training, covering topics related to epidemiology, prevention, screening, diagnosis, treatment, and palliation [1]. The Oncology Education Committee of Australia has recommended that medical students observe components of multidisciplinary cancer care and shared decision making as well as engage with people who are living with cancer—placing emphasis on honing knowledge, skills, and perspectives that are best able to meet the needs of the communities doctors work with [2]. Given the increasing incidence of cancer and growing need for survivorship care, it is important that medical students at all levels are exposed to cancer care through curriculum. It is becoming increasingly clear that primary care physicians play a significant role in oncologic outcomes, which further demonstrates
the importance of effective oncologic exposure in medical students regardless of the specialty they decide to enter [3].

While medical schools may incorporate oncology topics in their curriculum, many students are unaware of the variety of subspecialties and therapeutic strategies involved in cancer management and treatment as well as the interdisciplinary team members involved in cancer care. A characterization of oncology education in US medical schools demonstrated that the education was highly variable across institutions. Students reported less confidence in their knowledge of cancer treatment compared with other topics, citing difficulties with engaging in shadowing and rotations with oncologic focus. They also reported an underemphasis on cancer in their curricula compared to other common diseases [3]. Another study found that most medical students will never do a clinical rotation in oncology and will have disproportionately fewer didactics relating to oncology in their preclinical and clinical years [4]. This is a problem that is not unique to the USA. Several studies from the UK, Australia, Canada, and Greece report similar dissatisfaction with medical school curricula in providing students with adequate exposure to and education regarding caring for patients with cancer [5–7]. The study in Greece highlighted the lack of emphasis on psychosocial and ethical aspects of cancer care [8]. Medical students value being able to effectively work with patients with cancer, and patients serve to benefit from increased exposure. A study done related to patient perspectives about cancer care found that patients valued providers who were able to bridge gaps in education, share sources of trustworthy education, and prioritize individuality in cancer care [9]. Ultimately, both medical students and patients serve to benefit from increased exposure to cancer care in medical education.

Several barriers exist to effective oncologic curriculum, including the lack of oncologic subspecialists involved in medical education and the multidisciplinary nature of cancer care that makes it difficult to effectively organize curricula [3]. To help students get introduced to the breadth of career possibilities with regard to caring for patients with cancer, many institutions have developed electives that give overviews to various aspects. A study by Wisiniewski et al. sought to bridge these barriers through designing curricula in surgical oncology that included formal didactics, a rotation in a clinical service that matched student interest, student-led presentations, and case-based learning. Didactics addressed topics related to cancer epidemiology and multidisciplinary cancer care. They also implemented the apprentice model through matching each student to individual faculty members that matched their area of interest. The study had promising results, showing that early incorporation of cancer-specific education into the surgery core clerkship was both educational and well-received by third-year students [10]. Another study tracked changes in the oncology curriculum at a Canadian medical school. Additions addressed public health, cancer biology, diagnosis, therapy, and principles of care over several sessions [11].

While there are a few studies and programs that strive to make changes in oncology curricula, there still exist gaps in the literature. Most of the studies that either track curricula changes or assess the effectiveness of oncology electives are done outside of the USA [12]. Additionally, many of these electives are focused on radiation oncology rather than cancer care generally [13, 14]. The literature shows that there are many different ways to teach oncology in medical school including standardized patients, elective summer programs, skills training, and participation in cancer screening and prevention programs [15]. Virtual mentorship has also recently emerged as a way to effectively engage students in oncology careers and network with healthcare professionals [16].

At our institution, there previously existed an in-person elective for students interested in oncology. The main component of this elective involved students shadowing oncologists in various subspecialties, and there were no didactic sessions or formal mentorship meetings required. Because of the COVID-19 pandemic, undergraduate medical students were not permitted to participate in shadowing experiences at our local hospitals, impacting the ability for students to be exposed to cancer subspecialties and meet potential mentors in the field. Thus, this virtual elective was developed to address decreased clinical exposure and mentorship access in oncology during the first and second years of medical school.

We report here results of this virtual elective developed for the purpose of educating, engaging, and mentoring undergraduate first- and second-year medical students on the spectrum of oncology care. The elective served to introduce medical students to different careers, clinical and non-clinical aspects, research, and health disparities in cancer care. This elective pulled in elements from various curricular interventions in previous studies, such as one-on-one mentorship and didactics that address both public health and basic science elements of cancer care.

**Methods**

We developed a virtual oncology elective course for first- and second-year undergraduate medical students with the aim of introducing students to different oncology subspecialties, broad topics in cancer care, connecting them with mentors in oncology, and giving them opportunities to appreciate the multidisciplinary and holistic aspects of cancer care. The course design addressed four needs during virtual learning:

1) Broad education on oncology specialties,
2) Access to physician mentorship,
3) Access to cancer patients,
4) Opportunities for collaborative learning.

**Course Design**

The course was designed to span over one academic semester and was conducted two times. Each session included five virtual didactic sessions. These sessions were led by local medical, surgical, radiation, and pediatric oncologists. The topics included a virtual panel of oncology specialists, an overview of health disparities in cancer care, cancer care from the patient’s perspective, cancer research, and comprehensive cancer care. Due to schedule constraints, not all sessions were held both semesters. An overview of each session and when it was held is included in Table 1. There was also a session in which teams of 2–4 students gave 5–10-min presentations in self-selected oncology topics.

**Virtual Mentorship**

Each student was paired with a mentor to meet with virtually over at least two sessions and was asked to attend a tumor board multidisciplinary meeting. Mentors were identified by emailing a list of oncology faculty at our affiliate hospital who have historically been involved with the Oncology Interest Group and Cancer Care Elective at our institution to provide students with shadowing opportunities. The email specified that mentors would be expected to meet with their assigned student twice over the course of a semester. The topics of conversation were entirely up to the student and mentor team. Mentors were also asked to invite students to one session of their department’s tumor board meeting. Faculty were asked to inform us via email of any particular areas of academic interest, particularly in research, community service, advocacy, or leadership.

Upon registering for the elective, students were asked to inform us of their specialty of interest and other interests including research, advocacy, biostatistics, and community service. We also received some responses from both faculty and students about personal interests and hobbies.

We used the following information to match students and faculty members: faculty specialty, type of research, and research topic of interest. For most of the faculty, we did not receive responses regarding their areas of academic interest, so we used information available on the hospital website regarding their work and research to match them.

**Table 1** Didactic Sessions. Titles and descriptions of didactic sessions held during each of the two semesters of the elective

| Semester 1 | Session Title | Description |
|------------|---------------|-------------|
|            | Introduction to Oncology | • Students are oriented to the goals of the elective  
• Presentation by a representative of a local cancer wellness center providing comprehensive resources for patients |
|            | Oncological Subspecialties Panel | • Specialists in clinical, radiation, surgical, and pediatric oncology are invited to discuss their specialty and answer student questions |
|            | Health Disparities in Cancer Care | • Oncologists present on cancer disparities in their field |
|            | Advancements in Cancer Research | • Oncologists present their latest research in their specialty |
|            | Clinical Correlation with Cancer Patients | • Students meet a cancer patient and hear their story  
• A faculty member identified a patient who would be willing to speak with medical students. The patient was asked to share their cancer diagnosis and treatment story  
• Question and Answer Session between students and the patient |
|            | Student Presentations | • Student teams select a cancer-related topic and give a 5–10-min presentation |
| Semester 2 | Session Title | Description |
|            | Introduction to the Elective | • Students are oriented to the goals of the elective  
• Presentation by a representative of a local cancer wellness center providing comprehensive resources for patients |
|            | Oncological Subspecialties Panel | • Specialists in clinical, radiation, surgical, and pediatric oncology are invited to discuss their specialty and answer student questions |
|            | Health Disparities in Cancer Care | • Oncologists present on cancer disparities in their field |
|            | Integrative Cancer Care | • Representatives from a local cancer wellness center lead a series of activities for students to get acquainted with their services and the impact on patient wellness |
|            | Clinical Correlation with Cancer Patients | • Students meet a cancer patient and hear their story  
• Question and Answer Session between students and the patient |
|            | Student Presentations | • Student teams select a cancer-related topic and give a 5–10-min presentation  
• For this semester, the session was split into two separate sessions for time. All students attended both sessions, but only half presented during each session |
with students. Every effort was made to match students with faculty in their specialty of interest.

**Data Collection**

After completion of the elective, enrolled students were asked to respond to a voluntary survey aimed at assessing the efficacy of the elective. An IRB approved protocol was utilized for implementing a post-survey of the participating students in the elective over the 2020–2021 academic year. The goal of the survey was to assess the course’s impact on the medical students’ interest and knowledge of oncology specialties, cancer research, health disparities, and comprehensive cancer care. We also assessed the perceived value of virtual lectures, mentorship, and networking.

**Results**

A total of 29 students participated in the elective over the 2020–2021 academic year of which 12 students responded to the survey (41% response rate). We received responses from five first-year (41.7%) and seven second-year (58.3%) medical students.

Seventy-five percent of respondents had at least one previous oncology-related experience prior to participating in the elective and 7/9 of the respondents participated in more than one of the following categories: coursework, volunteer work, research, or a healthcare role in oncology.

After taking this elective, 100% of respondents somewhat or strongly agreed that the elective was useful to assess their level of interest in pursuing a career in oncology and while 58.33% of respondents reported interest in the field after the elective concluded, 41.67% were unsure. Ninety-one percent of respondents stated that the elective was helpful in understanding health disparities in cancer care outcomes. Students reported increased interest in learning more about or pursuing research in healthcare disparities (75%) as well as increased interest in comprehensive cancer care (91.66%).

Our goal was to introduce students to multiple oncology subspecialties and the majority of students reported that the elective enhanced their understanding of medical (66.67%), surgical (75%), and pediatric (66%) oncology to a high degree. Only 49% of students felt similarly about the elective’s effectiveness in educating them about radiation oncology, potentially because of the limited time in the curriculum afforded to this subspecialty.

Students were asked to rate on a 1–10 scale their overall impression of each of the virtual didactic sessions. The mean score for each of the six sessions was above 7/10 with the most popular session (8.10/10) being a clinical correlation session in which a patient discussed their cancer care story alongside their physician over zoom (Table 2). Most students agreed that this session helped students better understand how patients and physicians work together to address a cancer diagnosis (80%). Overall, students reported that the virtual lecture series was very useful (70%) and engaging despite the limitations of a virtual format (80%).

The student presentations at the end of each semester were rated at 7.20/10 (Table 2). Students prepared PowerPoint presentations on a variety of topics including novel cancer therapies, tumor board impact, nutrition during cancer treatment, cancer wellness centers, interventions for hair loss during chemotherapy, racial disparities in breast cancer, cancer vaccines, and racial disparities in breast cancer, among others.

Students reported that the elective gave them professional contacts to connect with to get involved in oncology research (80%) and clinical shadowing (90%). In terms of mentorship, students rated their mentors as accessible (100%) and available (70%). Most students planned to continue their mentorship relationship after the elective concluded (80%). Having a personal physician mentor helped students better understand oncology (90%) and made them more interested in pursuing a career in oncology (100%).

**Discussion**

The results of this study demonstrate how a preclinical cancer care elective can increase medical student interest and engagement with oncology as a specialty. Students perceived one-to-one mentorship with a physician and direct patient exposure as important learning experiences. An opportunity to learn about healthcare disparities and comprehensive cancer care was also highly rated by students. Lastly, survey results indicate that in addition to a diverse lecture series, students giving presentations to one another was an engaging and meaningful way to learn.

| Table 2 Student Impressions of Lectures. Students rated on a 1–10 scale their impressions of each lecture they attended during the Cancer Care Elective. In the scale, 1 = not useful/valuable and 10 = very useful/valuable. The mean scores and standard deviations are reported here |
|---|---|---|
| Oncology Panel of Specialists (n = 10) | 7.80 | 1.66 |
| Health Disparities in Cancer Care (n = 10) | 7.60 | 1.50 |
| Clinical Correlation with a Patient (n = 10) | 8.10 | 2.51 |
| Sampling of Services from a local patient and family support organization (n = 4) | 7.25 | 2.38 |
| Student Presentations (n = 4) | 7.20 | 1.78 |
| Research in Cancer Care (n = 4) | 8.00 | 1.53 |
Physician mentorship in oncology is important to the learning and engagement of medical students. Previous studies on cancer education focus on didactic lectures and small group discussions within the curriculum as a means of increasing student exposure to oncology [17]. However, here we demonstrate the added benefit and increased student satisfaction of connecting students to physicians early on through an extracurricular elective. Opportunities for clinical shadowing and oncologic research allow for a greater understanding of oncology as a field and career choice. Thus, it is not surprising that early and accessible physician mentorship has been found to increase student interest in oncology [18]. Furthermore, a study by Barrett et al. shows the added benefit that students with oncology mentors are 5.76 times more likely to match in oncology than other students [19]. In this era of the COVID-19 pandemic and virtual learning, our study provides additional insight that virtual mentorship is still a valuable experience for students. While future studies would be beneficial to compare virtual and in-person mentorship efficacy, our study centering on this virtual elective showed that virtual mentorship is a viable option with a positive impact on students.

Direct patient encounters in cancer care can also enhance the preclinical medical student experience. Although first- and second-year students often develop a strong knowledge base for clerkships, students report lacking confidence in addressing more emotional or sensitive topics with patients such as cancer. While standardized patients and simulations offer effective and meaningful learning experiences, a study by Baer et al. demonstrates high satisfaction and increased confidence in breaking bad news in students interacting with cancer survivors [20]. Having firsthand experience could potentially prepare students for interactions with critically ill patients and end-of-life care. While students in this elective developed a greater understanding of how physicians address cancer diagnoses, future studies could examine whether student confidence and comfort improves from a preclinical elective.

A key component of this preclinical elective was exposure to health disparities research in cancer care. While a growing number of medical schools now address health inequities in their curricula, extracurricular electives such as this one could help raise awareness in specific fields of research, such as oncology. A previous study demonstrates that cancer disparity education can not only improve student knowledge, but also increase confidence in working with cancer patients [21]. This study adds that educational sessions on health disparities research can increase student interest in learning more about or pursuing research in healthcare disparities. In addition, our results may reflect an underlying enthusiasm among our students for health disparities knowledge. This course was held in 2020–2021, a time when our medical school had profound interest in incorporating Diversity, Equity, and Inclusion in the curriculum, likely as a result of the COVID-19 pandemic highlighting health inequities. Ultimately, in an effort to combat health inequities, it will be crucial to look for opportunities both in and out of the classroom to educate the next generation of medical professionals.

Another goal for students in this elective was to learn about the social, emotional, and mental health resources available to cancer patients. Cancer can be physically and emotionally draining for patients, families, and caregivers alike. However, we now know that the health, well-being, and survival of cancer patients is improved by social support and social networks [22]. Thus, it is increasingly important for physicians to be aware of these local resources to support cancer patients and families. This elective featured a speaker and cancer survivor from a local community organization offering services including peer support groups, professional mental health services, financial and legal assistance, exercise classes, and art and music therapy. Our students developed a greater interest in learning about comprehensive cancer care from this session, and we believe further research in the role of these sessions in medical education is warranted.

This study is limited by its retrospective nature, a small sample size, and evaluation of student perceptions only after the elective. As a retrospective survey, this study was unable to control for all possible confounding factors. The survey was optional, inherently introducing self-selection bias. Responses were also based on a given student’s honesty and memory, and a potential desire to give socially and culturally acceptable responses to questions addressing sensitive topics may have impacted results. Surveys given at the end of the elective were unable to measure change in student interest or learning during the elective. Future studies could attempt to measure a change in attitudes by opting for a pre- and post-elective survey.

Declarations

Conflict of Interest The authors declare that they have no conflict of interest.

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