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Virtual Remote Pathology Education in Support of Virtual Remote Gynecologic-Oncology Training

The Open Pathology Education Network Pilot Proof of Concept Experience

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• Context.—The subspecialty workforce in pathology globally is inadequate for the demands of many modern therapies. The Open Pathology Education Network (OPEN) was formed to augment the global pathology workforce. The International Gynecologic Cancer Society (IGCS) virtual gynecologic-oncology (gyn-onc) fellowship training identified needs for higher-level pathology support.

Objective.—To report on an OPEN-IGCS pilot project to support gyn-onc and pathology education efforts in a developing country.

Design.—Curriculum with learning objectives and content from open sources was assembled. Mentoring sessions included bidirectional case sharing. Trainees received sequential curricula assignments and had options for communication outside mentoring sessions. Pretest and posttest sequential curricula assignments and had options for communication outside mentoring sessions. Pretest and posttest digital slide assessments were included. Mentors attended the gynecology tumor board, allowing for the assessment of quality and accuracy of pathology diagnosis for cases discussed.

Results.—Learners completing the pretest and posttest showed substantial improvement, with 2 practicing pathologists improving their diagnostic scores from 60% to an average of 95%. A third trainee-level participant also improved, but to a lesser degree. Qualitative assessments included increased confidence in presentation and an increased ability to anticipate questions, raise issues of expanded differential diagnoses, and articulate appropriate workup. Observations of clinicians who participated also noted increased confidence in participating pathologists. Secondary value included establishing an expanded network of support in other subspecialties for participants. Pathologic issues at the tumor board decreased, from more than 50% in the first 3 months of study to 0% in the last 3 months of study. The curriculum was embedded into a self-paced learning portal at courses.open-pathology.org.

Conclusions.—The OPEN-IGCS collaboration model shows the potential to provide subspecialty pathology training remotely.


Pathology is a foundational science in medicine, and the practice of pathology, as observed by Sir William Osler more than a century ago, is a gauge for the broader practice of medicine. As such, the absence or insufficiency of quality pathology practice in many areas of the world is an indicator of inferior medical services. Nowhere is this truism more evident than in support of advanced oncology services. Countries with low and medium human development indices show a significant disparity of outcomes relative to high development index countries, with an excess (70%) of cancer deaths.

In 2017, the International Gynecologic Cancer Society (IGCS) launched the Global Fellowship in Gynecologic Oncology to provide training in gynecologic oncology (gyn-onc) in low-middle income countries where no such training for physicians was available. The objective was to improve access to cancer care for women living in these countries. The IGCS Global Fellowship program is built on a model of frequent academic engagement through online mentorship, regular mentor on-site visits, and short-term observerships for Fellows at sponsoring institutions. One of the first and more successful of these training sites is the Da Nang Oncology Hospital (DOH) in Da Nang, Vietnam, which graduated its first gyn-onc fellow successfully in 2019, a second in 2022, and continues to train physicians to provide cancer care in a resource-restricted care environment where no formal training in gyn-onc is available.
A key interface for international mentors and trainees in the IGCS fellowships is the regular gyn-onc tumor boards, conducted on the Extension for Community Healthcare Outcomes platform and model pioneered at the University of New Mexico. These tumor boards bring together trainees and senior physicians at the training site, international gynecologic mentors in the fields of radiation oncology, surgical gyn-onc, gynecologic pathologists, and others. Only occasionally do local pathologists participate in the tumor board, and not infrequently the pathologic diagnosis provided locally requires revision or further evaluation in order to properly inform the treatment planning.

The Open Pathology Education Network (OPEN) began with a consortium and alliance of a diverse array of pathologists and organizations in the fall of 2021. Their aim was to impact both the quantity and quality of practicing pathologists in the developing world. Acknowledging the economic limitations of such individuals, OPEN sought to provide educational training materials without cost. Taking account of the distances separating willing trainees and training sites, OPEN proposed to present materials virtually, available anywhere internet access, even at low speeds, could be obtained. Recognizing the need to develop skills with the support of mentors and teachers, OPEN included periodic live interactions and mentoring to build confidence and expand the team of colleagues with whom a participant could hone their skills.

Recognizing the synergy of their aims, in early 2022, IGCS and OPEN determined to see if OPEN could help raise the quality and reliability of pathology practice at the Da Nang site simultaneously with IGCS efforts to enhance the expertise of their trainees and graduates practicing at DOH.

**MATERIALS AND METHODS**

OPEN proposed a curriculum composed of open-source educational materials that had been curated by experienced gynecologic pathologists. These included video lectures and case presentations, often accompanied by digital slide sets, web pages, open-source articles, and slide decks (Figures 1 and 2). Initially these were presented in an anatomic site/organ system fashion, beginning with the ovary and fallopian tube and proceeding distally towards the vagina and vulva. Unknown digital slide sets were presented as both pretest assessments and as midcourse and final examinations.

Additionally, a group communication channel was established to handle questions, announcements, and scheduling, and to convey assignments of new materials. This was also convenient to remind members of upcoming events, such as the gyn-onc tumor board and the mentoring sessions.

Group mentoring sessions were held monthly and lasted at least an hour. As an indication of dedication to the process, the group members at the training site selected 0600 hours as the start time. Attendance was generally robust among the 3 pathologist-mentors and gyn-onc fellows at the training site, as well as some participants from nearby hospitals who learned of the sessions. These sessions began in May 2022 and continued through April 2023. Initially a single international mentor (L.A.H.) was present, but this was soon expanded to include 2 additional gynecologic pathologists (A.P.W., V.P.), precluding any need to cancel the session in a given month because of travel or other scheduling issues. The format of the sessions allowed about half of the time for the training site participants to present 1 or 2 cases, with proposed questions for discussion. The second half of the time was devoted to mentors sharing cases or fielding questions pertinent to the prior month’s assigned study materials. Recordings of the sessions occurred somewhat sporadically, and the recordings were posted to the messenger group for review, but they rarely recorded any views. Live transcript features were also used because several of the participants felt their language listening skills were not equal to the challenge.

Several of the international mentors also participated in the monthly virtual gyn-onc tumor board at DOH. These featured discussions of 2 recent cases presented by the gyn-onc fellow, with presentation of clinical, radiographic, and pathologic findings as well as questions for discussion. The cases illustrated the challenges of subspecialty care in a developing country, with both advanced-stage common tumors and uncommon entities or diagnostic challenges. Discussion was solicited from a wide array of international practitioners in medical, surgical, and radiation oncology as well as pathologists to answer the questions presented by the fellow around any needed additional steps to validate the diagnosis.
therapeutic options, and their rationale, and concluded with a summary decision about what options were most suited to the local setting. A key metric for the evaluation of pilot project success was deemed to be the number of cases with pathology which required revision or consideration of additional testing before definite treatment planning could proceed, in other words when pathologic evaluation was incomplete or potentially incorrect. Allowance was made for cases where outside case materials were either not available for review or were insufficient for further testing. Minor discrepancies (differences of grading by one grade, margin status, etc) with minimal impact on management were not included in this tally.

RESULTS

At the conclusion of the 12 months of the pilot project, an evaluation session was held that was attended by the trainees, the director of DOH, IGCS leaders—including the director of international training sites—the primary site mentor for IGCS, and the OPEN mentors.

Five pathologists, including 1 first-year trainee, who were recruited from the DOH and Da Nang General Hospital (Da Nang, Vietnam), participated in the course. One dropped from participation after 5 months because of maternity leave, whereas another dropped after relocating to another hospital. All these pathologists were trained in Vietnam, which offers several routes to anatomic pathology practice. Most commonly these are 2 years in duration. All the participants had been in practice less than 6 years. None had any subspecialty training because it is yet unavailable in Vietnam.

Ultimately 2 of the practicing pathologists completed both the pretests and posttests, raising their scores from a mean of 60% on the pretest assessment to higher than 94% on the final exam. Perhaps more significantly, all the mentors noted a much greater sense of confidence and wisdom in evaluating gynecologic lesions. Both of the pathologists who completed the course practiced general pathology, one at DOH and another at Da Nang General Hospital, where gynecologic disorders were much less common than at DOH. For background, both of these pathologists had completed 1 to 2 years of "master's level" training in pathology at either the Ho Chi Minh University of Medicine and Pharmacy or the Ho Chi Minh City Oncology Hospital (Ho Chi Minh City, Vietnam), and been in practice less than 5 years prior to participating in the OPEN course. Both of the successful participants felt very pleased with their progress. Additionally, they now felt quite at home discussing these cases with peers in gynecologic pathology, and they were eager to continue the networking as it might be needed for other types of cases.

Trainees noted that they generally spent between 1 and 4 hours per week studying the materials provided by the project, in addition to their routine duties in pathology.

Figure 2. Curricular material included links to digital slide materials for self-study, as well as for evaluations. “Target diagnoses” guided learners to high-yield digital slide examples of core diagnostic content.
The presentation language in English was not a problem for them, and the amount of material was suited to their available time.

Though the case numbers discussed in the gynecologic tumor boards were quite small (usually 2 per tumor board), there was a trend toward fewer cases needing to be revised or undergo further testing before treatment planning could be accomplished among those cases presented at the tumor board. During the 2 months preceding and the first 6-month period of the program, revised diagnoses occurred in 9 of 16 presented cases (56%), whereas in the subsequent 7 months, the revision rate dropped to 4 of 14 (28.6%, Figure 3). These revisions were all major revisions significantly altering management. During the final 3 months of study, no cases required revision, persisting beyond the completion of the pilot project. Additionally, the pathologist at DOH who completed the pilot project now attends regularly at the tumor board. Diagnostic revision or issues identified ranged widely, including misidentifying secondary tumor as a new tumor, misinterpretation of reactive changes as neoplastic or preneoplastic, and misclassification due to incomplete or improper interpretation of stains. The availability of and cost constraints on obtaining stains or advanced molecular testing was a frequently identified issue.

The international mentors observed a much greater sense of confidence and competence among the trainees. They were able to ask meaningful questions and interact much more like peers than when beginning the program.

Hospital leadership was pleased with the outcome of the program, and these leaders expressed desire for continued mentorship of their young pathologists, akin to that being given to the gyn-onc fellows.

DISCUSSION

Subspecialty pathology practice has become the norm in developed areas of the world. With the advent of more personalized therapies, and the related testing requirements, this deeper knowledge needs to be applied at the time of diagnosis for patients to receive the benefits of advanced personalized therapies like checkpoint inhibitors, poly-ADP ribose polymerase inhibitors, vaccine therapies, and such. Only recently have some centers in Vietnam begun to develop subspecialists to cope with these demands. (Lewis Hassell, MD, personal observations from K Hospital, Ha Noi, Vietnam, and University of Medicine and Pharmacy of Ho Chi Minh City, Vietnam)

This pilot project with IGCS represents an attempt to transfer some level of subspecialty expertise to general pathologists providing support for gyn-onc programs at a hospital in a developing world setting.

The use of virtual methods to offer training in pathology was enforced across the world by the advent of the COVID-19 pandemic and allowed more people experience with remote teaching as well as remote learning. Crossing this “digital divide” has now opened the potential to take that training from within the bounds of a single institution and share it much more broadly. The success of this pilot project underscores the feasibility of this shift in paradigms. Given the lifetime direct impact of a single diagnostic pathologist may be upward of 50 000 patients and when considered in conjunction with indirect impacts via colleagues or trainees they may influence potentially multiplying that several times, such virtual mentoring early in a pathologist’s career could be a considerable game-changer for diagnostic quality in a region.

The applicability of these course materials to a more general pathology training effort in gynecologic pathology was questioned by some observers, who noted that the content and emphasis were organized neither by level of graduated responsibility, such as the “entrustable professional activities” used widely in graduate medical education, nor by the frequency of disease. Hence a similar amount of time was devoted to uncommon ovarian tumors, such as Sertoli-Leydig tumors, as to the grading and classification of endometrial cancers. With those criticisms in mind, when transposed to the OPEN learning management site (courses.open-pathology.org) the curricular materials were revised toward a more graduated responsibility and progressive complexity-based approach. The entire curriculum presented manually in the pilot project at DOH, plus added enhancements, is now available for self-paced learning online.

Of course, there are limitations in what has been demonstrated. First, all interactions were in English, and indeed, some early participants may have dropped out in part because of insecurity regarding their English skills. However, that this project succeeded in a non-English-speaking country despite that stipulation emphasizes that English for most has become the language of instruction and communication of medical science. Secondly, the case and participant numbers are very small. Crossing the “10 000 hour” threshold of expertise popularized by Malcolm Gladwell will take more time than can be offered in a 1-year pilot project, but the infrastructure for further mentoring has been constructed that should allow a smoother course toward that level of expertise. Continued “chatter” on the pilot project communication channel, although at low frequency, attests to ongoing interest in maintaining the network of support. Additionally, on-site visits by the pathology mentors have begun to occur, just as clinical gyn-onc mentor visits have occurred. The program depended on the volunteer efforts of the mentors, along with academic support from their institutions. The desires for further contact with the trainees, and the mentors’ willingness to continue in future expansion of the effort, would indicate that the reward of their involvement was sufficient compensation.

Access to technology is a key potential limitation for future efforts of this nature. Although the digital slides used in our program typically do not require high bandwidth, they do require access to devices and a network with internet access, as well as some level of technology savvy to access and maintain them. Most all of the materials used were available on

Figure 3. Percentage of gynecology-oncology tumor board cases at Da Nang Oncology Hospital (Da Nang, Vietnam) between April 2022 and July 2023 with major diagnostic problems at time of presentation; only 2 cases, and rarely 3 cases, were presented each month.
open-access platforms, without any intervening paywalls. Selected references did require subscription or library access, usually only available to the mentors via their academic affiliations, so these were only shared within the constraints of copyright laws and permissions. OPEN sees its mission as one to lower the barriers to access to quality pathology education. Most of these barriers are highlighted in the Table.

It cannot be emphasized enough that the project succeeded because of the strong support of hospital leadership and the departmental leaders. They saw a pathway to enhanced practice for their trainees, as noted in the Table. Young and engaged learners were also key to success, made more so in part by prior in-country experience with one of the mentors. Interested and quality instructors, with a level of cultural understanding from prior exposure, may also be a key to promoting such efforts elsewhere.

### CONCLUSIONS

Subspecialty pathology education can be accomplished remotely, and it appears to be a need as subspecialty care advances in other fields of medical care. Successful realization of this is facilitated by institutional support for trainees and collaboration with other training programs. In any setting, programs that are driven by local demands for improvement, as well as by quality virtual materials and mentors, will have the best chance for enduring impact.

### References