

A Pilot Evaluation of Distance Education Modalities for Health Workers in the U.S.-Affiliated Pacific Islands

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Abstract

Background: Healthcare workers in many parts of the U.S.-Affiliated Pacific Islands (USAPI) have limited access to continuing education. Barriers to traditional on-site continuing education programs include the diversity of educational needs, limited health staffing, the distances between islands and associated high travel costs. A pilot evaluation of distance education modalities was conducted among USAPI healthcare workers. *Methods:* Three distance education modalities (live videoconference, live audioconference and a recorded computer-based format) were evaluated in comparison to live lecture during two separate half-day educational programs in Pohnpei, Federated States of Micronesia, in June 2004. Participants from the USAPI included 59 nurses, doctors, dentists and other healthcare workers who were assigned to different educational modalities for two training modules (diabetes/oral health and metabolic syndrome). We conducted pre-and post-tests and obtained participant feedback. *Results:* Comparison of pre-test and post-test scores showed statistically significant score increases among the live lecture and videoconference group for the diabetes/oral health module and among all three distance education modalities for the metabolic syndrome module. Participants expressed a high degree of interest in each of the distance education modalities. Computer-based training was well-accepted even by health workers with little prior computer experience. *Conclusions:* This pilot study validates the ongoing development and evaluation of distance education resources as part of a comprehensive approach to improving continuing education in the USAPI. The results have been used to guide continuing education efforts in the region.

Key words: Pacific Islands; Distance Education; Workforce Development. (PHD 2007 Vol 14 No 1 pp 22-30)

Introduction

The U.S.-Affiliated Pacific Islands (USAPI) are comprised of three freely associated states (the Federated States of Micronesia [FSM], the Republic of Palau and the Republic of the Marshall Islands [RMI]), two U.S. territories (American Samoa and Guam) and the Commonwealth of the Northern Mariana Islands (CNMI). These islands are diverse in language, culture, economy, resources and infrastructure, and are separated by vast expanses of the Pacific Ocean.

The need for continuing education for health workers in the USAPI has been highlighted by health leaders in the region as well as the U.S. Institute of Medicine.^{1,2} The

Pacific Islands Continuing Clinical Education Program, funded by the U.S. Health Resources and Services Administration (HRSA) and developed by the University of Washington provided continuing education support through a live on-site training model between 1999 and 2003.³ The Palau Area Health Education Center (AHEC) program, in collaboration with the Fiji School of Medicine, has provided distance and on-site training to enable health workers to attain university certificates and diplomas.⁴ Despite the benefits of these programs, there remains great need in many parts of the USAPI for sustainable continuing education for a broad range of health workers. Multiple factors, including the diversity of needs, limited health staffing, the great distances between islands, travel costs and budgetary constraints have limited the ability to provide continuing education through live lectures by content experts. Limited resources have also hampered sustained local continuing education efforts in many parts of the USAPI. These challenges are detailed and discussed in depth elsewhere in this issue.

Given the challenges to providing appropriate on-site continuing education throughout the region, there has been sustained interest in distance education methods. Various USAPI distance education efforts have utilized communications technology available through the region.⁵ Satellite transmissions of live video and audio through the University of Hawai'i Pan-Pacific Education and Communication Experiments by Satellite (PEACESAT) program have enabled low-cost international communications for some USAPI jurisdictions.⁶ Distance education through telephone conferences also have been used² but have been limited by high costs of commercial telephone service throughout the region. The increased availability of computer resources for health workers throughout the USAPI, notably since 2004 under the World Health Organization's (WHO) Pacific Open Learning Health Network project,⁷ offers the potential for increased use of computer-based training formats.

Moreover, many USAPI health workers have experience with the successful telehealth application of telephone and internet communications for clinical consultations and referrals. Many providers in the region, especially physicians, have used these resources effectively with the support of the Pacific Island Healthcare Program at the Tripler Army Medical Center in Honolulu, Hawai'i.⁸⁻¹²

In light of technological changes and the continuing need for evolving education efforts in the region, the Pacific Association for Clinical Training (PACT) was established in 2003. PACT aims to support the development of comprehensive continuing education programs for health workers in the USAPI jurisdictions, and is funded through a four-year cooperative agreement between HRSA and the Department of Family Medicine and Community Health at the University of Hawai'i's, John A. Burns School of Medicine.

As one aspect of these efforts, a pilot study was conducted to assess the effectiveness of various distance education modalities for health workers in the USAPI. The evaluation was performed during continuing education programs featuring multiple modalities that were offered as supplemental sessions of the 2004 American Pacific Nursing Leaders Council (APNLC) and the Pacific Basin Medical Association (PBMA) annual

conferences. These were held in Pohnpei, FSM. The goal of the evaluation was to assist with the planning, design and implementation of distance education components as part of comprehensive continuing education programs for health workers in the region.

Materials and Methods

Two continuing education modules were prepared for delivery through four different modalities: live lecture, simultaneous videocast of the live lecture, simultaneous audiocast of the live lecture, and a pre-recorded computer-based format. Modules topics selected for relevance to a range of health workers in the USAPI, were *Diabetes and Oral Health* and *Metabolic Syndrome*. The

oral health module was prepared by Dr. Beatrice Gandara of the University of Washington School of Dentistry and one of the physician authors (Dr. Lee E. Buenconsejo-Lum), and the metabolic syndrome module was also prepared by Dr. Buenconsejo-Lum.

Each module consisted of a pre-test, followed by a 45-minute educational presentation. The participants in the live lecture, videoconference and audioconference groups were able to ask questions of the presenter following the presentation. Participants in the computer-based training groups were able to review and return to previous slides at their own pace during this period, but did not have

the ability to ask questions. A post-test identical to the pre-test was then administered. After completion of the post-test, participants were able to give verbal feedback to their group based on their experience with each modality. Comments were recorded and transcribed by the facilitators for each session. As is common to continuing education programs, participants also completed a written evaluation and questionnaire, which included questions regarding demographic and identifying information. The questionnaire asked about previous continuing education experiences and offered participants the opportunity to provide additional comments.

The project was conducted in conference rooms and the computer laboratory in the main library of the College of Micronesia FSM National Campus located in Palikir, Pohnpei. One conference room was configured for a live lecture with a videoconference broadcast unit. This unit provided a simultaneous audio-visual feed to a videoconferencing unit connected to a television in an

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adjoining room, simulating the videoconference facilities available through much of the USAPI. A third room, configured to receive simultaneous audio from the live lecture through a speakerphone, had a computer and liquid crystal display projector to show the same slide presentation provided in the live session. Ten computer workstations in the library computer lab were used for the computer-based training modality consisting of a slide presentation identical to that presented in the live sessions with recorded audio narration by the same speaker (Dr. Buenconsejo-Lum). Participants in the computer-based module each had their own computer and headphones to view this recorded slideshow and were able to play, pause, and replay slides at their own pace. A facilitator was stationed in each room to advance slides or to provide computer assistance if needed. Technical setup and assistance was provided by PEACESAT affiliated staff from the University of Hawai'i, the University of Guam, and the College of Micronesia.

The evaluation was performed during similar sessions on two separate days to accommodate the schedules of the APNLC and PBMA conferences. Leaders from these two associations assisted in recruiting participants and facilitating transportation to the seminar site. As an incentive, each day participants were entered into a random drawing for a video cassette recorder, which was awarded at the conclusion of each day's session.

Scheduled Day 1 participants were predominantly nurses participating in the APNLC conference, while Day 2 participants were mostly physicians attending the PBMA conference. However, trainings were also attended by dentists, health assistants, and other health personnel working in the region. The modules were identical on Days 1 and 2 with the exception that a live lecture was not offered on Day 2 in order to provide greater numbers for evaluating the distance education modalities. On each day the intent was to assign participants randomly to the two different modalities. Evaluation packets with alternating assignments to two different modalities were given to participants in sequential order of their registration. After completing their first module, participants then proceeded to a different modality for their second module based on their packet assignment.

A total of 59 participants attended the sessions on two separate days. On Day 1, 36 participants were randomly assigned to two of the four different modalities. There were 23 participants on Day 2; 16 participants

were each assigned using the same technique as for Day 1; an additional six participants arrived late and participated in the second module only. One participant from Day 1 chose to return on Day 2 to experience the two distance modalities he had not previously attended.

Statistical Analysis

Test scores and questionnaire response data were entered into SPSS 10 (Statistical Package for Social Services v.10) for analysis. No personal identifying data was entered into the database. Results were pooled for Day 1 and Day 2 participants. The pre-test and post-test scores for each modality and module were compared using paired-sample t-tests.

Results

Demographic characteristics of the participants are presented in Table 1. There were more female than male participants, and nurses comprised the single largest group of participants, followed by doctors. The most represented jurisdictions were Majuro (RMI), Pohnpei (FSM) and Chuuk (FSM). The only USAPI jurisdictions not represented were American Samoa and the CNMI, both of which had limited representation at the 2004 APNLC and PBMA conferences.

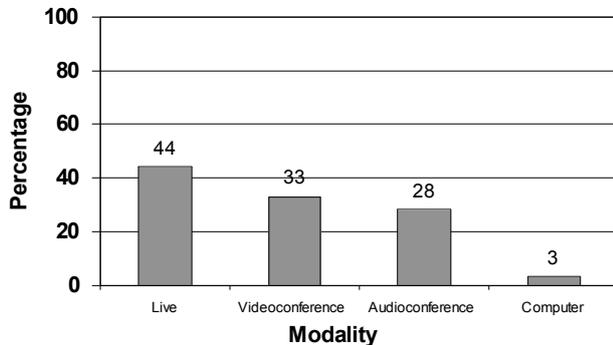
Table 1. Pilot Evaluation Participant Demographic Characteristics

Total Participants	59
Mean Age (years)	44.3 (Range 24 - 61)
	N %
Male	20 (33.9)
Female	38 (64.4)
Missing	1 (1.7)
Professional Role	N %
Nurse	28 (47.5)
Hospital nurses	13 (22.0)
Public health nurses	11 (18.6)
Nurse midwives	2 (3.4)
Nurse practitioners	2 (3.4)
Doctor	15 (25.4)
Other Dental	3 (5.1)
Health Assistant	3 (5.1)
Teacher	3 (5.1)
Dentist	2 (3.4)
Other	4 (6.7)
Missing	1 (1.7)
Jurisdiction	N %
Chuuk, FSM	11 (18.6)
Ebeye, RMI	2 (3.4)
Guam	1 (1.7)
Kosrae, FSM	2 (3.4)
Majuro, RMI	20 (33.9)
Palau	2 (3.4)
Pohnpei, FSM	18 (30.5)
Yap, FSM	2 (3.4)
Missing	1 (1.7)

Figure 1 shows the prior experience participants in each modality had with that specific continuing education

modality. Only a minority of participants indicated prior access to continuing education through each of the modalities, with fewer having used the various distance

Figure 1. Percentage of participants in each modality who reported prior experience with a similar continuing education method.



education formats compared to the live lecture format. The smallest proportion of participants reported ever having used a computer-based training modality for continuing education.

Pre-test and post-test results for each module, stratified by modality and pooled for both days, are presented in Figures 2a, 2b and Tables 2a, 2b. There are some differences in pre-test knowledge among the participants for each modality, with the diabetes/oral health module live format group exhibiting the lowest pre-test scores. Statistically significant mean score gains were noted for the following groups: live lecture and videoconference in the diabetes/oral health module and all three of the distance education modalities in the metabolic syndrome group. While all other groups also trended towards a mean score gain, these mean gains were not statistically significant for those groups.

Figure 2a. Pre- and Post-Test Scores: Diabetes/Oral Health Module

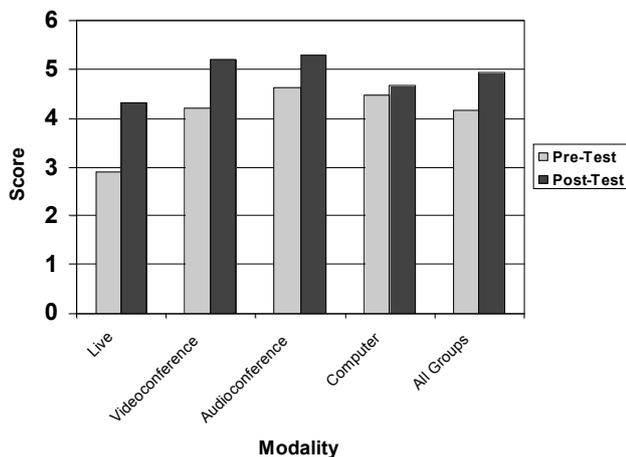
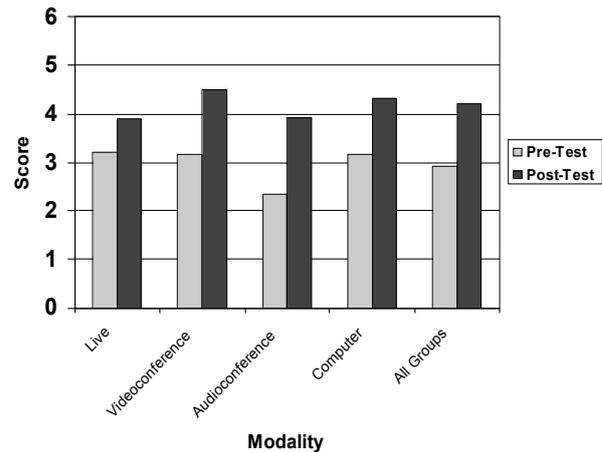


Figure 2b. Pre- and Post-Test Scores: Metabolic Syndrome Module



An evaluation form for each module assessed participants' level of interest in using the particular modality that they had just completed. The general level

Table 2a. Pre- and Post-Test Scores: Diabetes/Oral Health

DM and Oral Health Module	Number of Participants	Pre-test	Post-test	Mean Score Gain (95% CI)	p-value (2-tailed)
Live	9	2.89	4.33	1.44 (0.0007 - 2.88)	0.050
Video	15	4.20	5.20	1.00 (0.018 - 1.98)	0.046
Audio	14	4.64	5.29	0.64 (-0.09 - 1.38)	0.082
Computer	15	4.47	4.67	0.20 (-0.32 - 0.72)	0.424

Table 2b. Pre- and Post-Test Scores: Metabolic Syndrome

Metabolic Syndrome Module	Number of Participants	Pre-test	Post-test	Mean Score Gain (95% CI)	p-value (2-tailed)
Live	9	3.22	3.89	0.67 (-0.35 - 1.68)	0.169
Video	14	3.07	4.50	1.43 (0.80 - 2.06)	0.000
Audio	15	2.33	3.93	1.60 (0.88 - 2.32)	0.000
Computer	18	3.17	4.33	1.17 (0.45 - 1.88)	0.003

of interest was high for all educational formats, reflecting the enthusiasm for continuing education activities through any of these modalities. Despite limited prior experience with computer-based methods, interest was very high for this format (Figure 3). There was no statistically significant difference between the levels of interest in each modality.

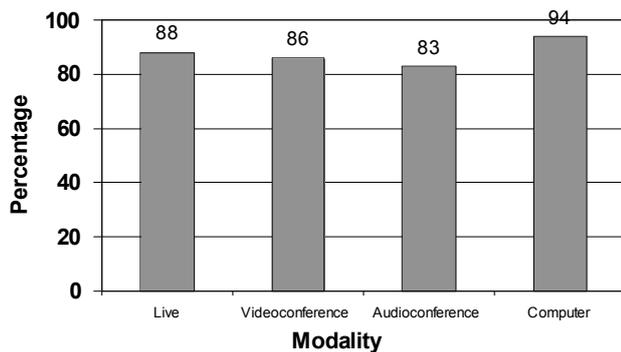
Participant Comments

Some comments provided by participants at the conclusion of each training module are listed below. When available, participant job roles are identified.

General

“The speaking delivery could have been slower, since those who don't speak English well would have had trouble following it.”

Figure 3. Percentage of participants in each modality who would choose to use a similar method for future continuing education.



“With all continuing medical education, it is a question of how much time people are willing spend doing this. And you get interrupted, when you’re needed in your clinic.”

Nurse: “This is my first time sitting in this kind of conference, because all I do is work in the clinic.”

Live Lecture

“Technological deliveries appeal more to those under 30. Older people still prefer face-to-face presentations.”

Videoconference

“Before coming to the video, I was in the web [computer]-part and I really liked that, after the presentation you can go through the lecture in your own time, but with a video conference you have to be there at the set time and you can’t go back.”

Nurse: “We need to have good technical support, and we need to have both a tech person and a medical person familiar with the content to answer questions present for any such presentations.”

Nurse: “Many would still prefer face-to-face [presentations].”

Doctor: “We just do the audio with the slides, but this one is better because you can actually see the presenter and you can really interact. This is perfect.”

Doctor: “Before, we used to have video conferences but it is not operational any more. Seeing the presenter does help me to stay up and concentrate.”

Nurse: “Presentations like this are very cost effective and would be good for the Pacific. We need more of them.”

Audioconference

Nurse: “I like seeing the same presentation as other

jurisdictions. I don’t like that there is no written material and we cannot interrupt speaker for questions. We need to wait to ask questions and sometimes forget. I have tried audio before through PEACESAT.”

Nurse: “Liked audio lecture since I can ask questions. Also liked computer training, but could not ask questions.”

Dentist: “First time using this format. This is more accessible to staff and cost-effective. Not really interactive. My mind wandered off at one point.”

“With audio you need more of the microphones, so that you can interrupt and ask questions when the time is right.”

Computer

Nurse: “Have not used in Chuuk. Don’t have power all the time. I think it makes me scared but I want to learn how to use the computer. We have a computer lab but I haven’t learned how to use it. But I would like to learn.”

“With the web [computer]-based, you can go over it at your own pace, except that I won’t be able to be asking questions.”

Doctor: “It would be good to have this to go back to on my own because sometimes when we have presentations on-island I missed them because I have to see patients.”

Dentist: “Other session was the audio lecture; in comparison the web format didn’t allow time to ask questions, the audio allowed us to ask questions to the presenter.”

Doctor: “First time exposed to this kind of training. It was very informative. I liked using the computer. I liked everything about it except that I would like to have more interaction.”

Discussion

The results suggest that the distance education modalities evaluated in this pilot study can be effective in promoting knowledge gain among health workers in this resource-limited region. For both training modules, participants demonstrated increases in mean knowledge gain through each modality, although the sample size was too small to demonstrate statistically significant differences in all cases. Participants were generally satisfied with all methods and noted a willingness to use them again. They expressed appreciation for the continuing education content. This pilot study validates the ongoing development and evaluation of distance

education resources as part of a comprehensive approach to improving continuing education in the region.

The number of participants who indicated having previous experience with distance education formats was lowest for the computer-based training group. The slightly higher numbers who had used live video and audio conferencing likely reflects the combined efforts of technology providers (including PEACESAT) and content providers, notably the Palau AHEC in conjunction with the Fiji School of Medicine. The response that less than half had ever participated in a live continuing education presentation was unexpected and may reflect the relative lack of continuing education resources available to public and allied health staff in the region. This percentage is likely skewed lower due to the absence of physicians in the live lecture group, which was not offered on Day 2.

Computer-based training using recorded presentations can be an effective learning tool for health workers in the USAPI. Participants appreciated the ability to review material at their own pace using this modality. They cited the inability to see the speaker and to ask questions as a disadvantage of this format. Even those participants lacking experience with computers showed an ability to navigate the sessions with very limited instruction. Moreover, these same participants generally showed enthusiasm for the computer-based modality, citing interest in learning more about technology. This recorded format also allows health workers to access training at convenient times and offers access to a greater number of health staff.

Limitations

Limitations of this pilot study included a lack of power in determining differences between modalities, due to the relatively small numbers in each group. The small number of test questions and the number of participants who showed high pre-test knowledge limited the ability of the test tool in measuring differences in knowledge gain between the groups. Utilizing lengthier and more rigorous pre- and post-tests, and including more participants or fewer modalities would address these quantitative limitations. The small numbers of participating allied health workers limits the ability to generalize these findings to allied health workers in the region. This was partially the result of recruitment from attendees of doctors' and nurses' conferences, but also

reflects the relatively lower numbers of allied health staff throughout the region.

The lack of a statistically significant score increase among participants in the metabolic syndrome live lecture group can likely also be attributed to the decision not to assign Day 2 participants to this format in order to collect more information on the three distance education modalities. The smaller numbers in this group lacked the power to demonstrate a significant knowledge gain. The results from the live lecture format are also not representative of the entire range of health workers, since physicians were effectively excluded from this format. This may explain some of the differences seen in this

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group, which had the lowest diabetes/oral health pre-score and also the smallest increase in metabolic syndrome scores. This methodological difference limits the validity of direct comparisons of live lecture to the other modalities in a pooled analysis of results from both days. A sub-analysis of Day 1 results lacked adequate power to demonstrate statistically significant changes for any modality. The pooling of results, however, does facilitate comparisons between the three distance education modalities and also reflects the reality that continuing education offerings are often shared among doctors, nurses and allied health workers in this region.

An additional consequence of the analysis of pooled data is the inability to assess optimal formats for profession-specific needs. Since the presentations were prepared by a dentist and a physician, the lack of professional specificity might have limited the relevance and effectiveness for nurses and other health workers. Further ongoing evaluation of continuing education programs should also attempt to focus on profession-specific materials developed by experts from clinical nursing, public health, and allied health specialties.

The use of a post-test tool immediately after completion of the continuing education program to assess knowledge gain may not reflect long-term knowledge gain and cannot address changes in practice as a result of continuing education. These limitations are inherent to much of the current practice of evaluating continuing education. The group comment session in the presence of the facilitator might have limited some participants from providing possibly negative feedback on their experiences. For some individuals, this effect may have been accentuated by cultural norms among

many Micronesians that discourage open expressions of criticism. Providing participants with an opportunity to provide anonymous feedback might be helpful in eliciting a wider range of opinions.

The lack of representation from several jurisdictions in the USAPI limits the ability to generalize these findings throughout the region. In reality there is a great diversity of health systems, practitioners and health education needs throughout the USAPI region, as is documented elsewhere in this issue. Focusing this study on practitioners from the Freely Associated States, particularly the FSM and RMI, does provide useful insights for developing continuing education approaches for practitioners in these relatively resource-limited jurisdictions. Future efforts should also be directed at developing jurisdiction-specific distance education approaches given the evolving, yet diverse availability of technology and technical support in the region.

Application of Findings

The results of this study are being applied to the implementation and further evaluation of distance education resources as a component of a comprehensive approach to developing continuing education infrastructure in the USAPI region.

This evaluation highlights the potential effectiveness of computer-based training modules and the high degree of interest in this format among health workers, despite limited experience. Such store-and-forward computer-based training options may be a valuable additional training tool in a continuing education program. This format can offer self-paced learning in a setting where multiple time zones, heavy patient-care responsibilities and limited training budgets often challenge the ability to use live educational modalities. Although video and audioconferencing formats continue to serve a role in specific jurisdictions, notably American Samoa, Guam, Majuro, RMI, and parts of the FSM, PACT is also supporting further development and evaluation of the use of recorded computer-based content in order to broaden access to continuing education materials.

Since this 2004 pilot study, PACT has facilitated the recording and dissemination of numerous continuing education presentations by health workers in the region in a computer-based format. Recorded programs include presentations from the August 2005 PBMA Conference in Chuuk, FSM, the 1st FSM Health Symposium in January 2006 in Pohnpei, and the June 2006 APNLC

Conference in Majuro, RMI. Additional content has been developed and recorded by local, regional and international experts for the benefit of USAPI health workers. PACT has collaborated with the U.S. Centers for Disease Control and Prevention in producing recordings of a tuberculosis clinical training seminar for Pacific health workers, and with the Pacific Island Health Officers Association in recording training modules for laboratory workers. These presentations are available on CD and DVD and can be played on Macintosh and Windows-compatible computer systems without additional commercial software. PACT has distributed content discs through local continuing professional development coordinators in each jurisdiction, to be offered at no cost to health workers. Participants can return evaluation forms through their local coordinators for regional continuing education credit offered through PACT.

The application of distance education modalities in the USAPI has also increased opportunities for local capacity development in providing professional education. By offering technologies that can enable recording and transmission of content rapidly and inexpensively throughout the region, local expertise can be readily highlighted and disseminated. In this way regional distance education can benefit and complement ongoing live, on-site continuing education efforts such as those currently provided in the region by the Palau AHEC and Fiji School of Medicine collaborative.⁴

This study also highlights the limited experience of many USAPI health workers, especially non-physicians, with computer technology. A technological transformation through local, regional and international efforts has dramatically improved health worker access to computer resources in the USAPI since 2003. Additional funding for internet access and technical support has been provided by local governments. To attain the full potential from these important information technology developments, health workers in the region still require training in the optimal use of computer-based resources. Some support for health worker training has been provided through the dedicated efforts of the University of Guam, Robert F. Kennedy Memorial Library staff,¹³ but additional efforts to develop local capacity in order to provide widespread and ongoing training are needed. Moreover, while some important content resources have been made freely available in the region by agencies such as WHO through POLHN (Pacific Open Learning Health Net), Pacific

This study also highlights two additional critical requirements for operating and sustaining effective continuing distance education programs in this region: available technical support and strong local facilitation.

Resources for Education and Learning (PREL, EBSCO database), and the Ocean Medicine Foundation (The Medical Letter Online, and selected other resources), most practitioners still lack access to specific high quality health materials such as full-text journals through The Health Inter Network Access to Research Initiative (HINARI)¹⁴ or similar health databases. Additional external funding for content materials and informatics training will be necessary to unlock the full potential for improving health worker training and practice in this resource-limited region.

This study also highlights two additional critical requirements for operating and sustaining effective continuing distance education programs in this region: available technical support and strong local facilitation. PEACESAT staff who provided the technical support for this evaluation project have also been involved in training local support staff throughout the region. Additional support is still necessary for developing local capacity to provide technical skills training through local educational institutions. This evaluation did not attempt to assess technical limitations and needs to operate each modality reliably and effectively in specific jurisdictions. In reality, these considerations are very important, as indicated by the participants who commented on limited electricity and non-functioning equipment. Other reports in this issue serve to document in detail some of the technical and practical considerations of various distance education formats in specific USAPI jurisdictions.

Efforts to support, develop and strengthen ongoing local facilitation and coordination of health worker training have been an integral part of successful continuing education programs in the region, notably in American Samoa, Majuro, and Palau. Since its inception, the PACT has worked to support and broaden local coordination for health worker education in the USAPI through technical assistance, targeted resource support, content recording and delivery, special projects and an active mini-grant process to strengthen the role of local continuing professional development facilitators and coordinators. Additional efforts are ongoing and will likely be necessary into the future to continue fostering local and regional continuing education programs to the point where these programs can ultimately be self-sustainable.

In summary, this pilot evaluation highlights the potential for applying distance education modalities to meet a

critical need of health workers in the USAPI. Follow-up distance education activities based on the results of this study have provided additional experience to support computer-based training as a valuable component of a comprehensive continuing education program for Pacific health workers. A successful program for continuing professional development with distance education methods must include strong local coordination and facilitation. Capacity development of local expertise in applying newly available information technology resources should remain a priority given the limited experience of most USAPI health workers. Provision for adequate local technical support through training and hiring is essential to the sustainability of continuing education programs with a distance education component. Many of these conclusions may be applicable to health workers in other resource-poor settings who have limited access to ongoing training opportunities.

In summary, this pilot evaluation highlights the potential for applying distance education modalities to meet a critical need of health workers in the USAPI.

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