The Role of Telehealth in Pacific Island Human Resource for Health (HRH) Development: An Environmental Scan of Past Experiences and Potential Developments

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Abstract—Adequate human resources for health (HRH) are an essential requirement to meet the Millennium Development Goals (MDGs). However, there are many barriers to meet this requirement as evidenced by the current worldwide shortage of health professionals. In the Pacific Islands region, the long-standing need for HRH has yet to be met. “Telehealth” technologies may help to meet the requirement for HRH and there have been some creative and innovative uses of telehealth in the region. However, to take full advantage of telehealth will require overcoming other barriers including the telecommunications policy and regulatory frameworks and the lack of strong interlinkages among institutions, programs, and donors in the region. This paper describes some of the innovative telehealth programs and collaborative efforts among diverse stakeholders, regional telecommunication issues, and the potential for future development of information and communication technology or “ICT” for telehealth and HRH development in the Pacific Islands region.

Index Terms—Pacific Islands, Telehealth, Human Resources for Health (HRH) Development.

I. INTRODUCTION

THE Pacific Islands Region consists of 22 island economies that are scattered across a vast ocean which occupies almost a third of the earth’s surface. The islands are diverse in geography, economic structure, political organization, language, and culture. The 25,000+ Pacific islands are home to an estimated 8.6 million individuals, and are politically organized as nations and territories. Table 1 shows the political affiliations of the Pacific Island countries in the region.

The island populations are culturally and ethnically diverse, and country populations range from two thousand to over five and one-half million; densities reach as high as 90,000 individuals per square mile on a tiny atoll. Many of these diverse Pacific nations and territories are comprised of only one island. Others, however, are comprised of over 100 islands spread across wide ocean expanses. Geologically, the islands include low island atolls to high islands formed by volcanoes.

The differences, diversity, and small and dispersed populations contribute to diseconomies of scale, and presents unique health system and human resource development challenges. The diseconomies also contribute to the information and communication technology (ICT) challenges or “digital divide” within the region, and between the region and “developed” countries. As a consequence, while “telehealth” and ICT play important roles in health care in many countries, the benefits of telehealth in the Pacific Islands region, especially in addressing the challenge of human resource for development in health systems, have yet to be realized, despite very innovative ways the island economies have used telehealth and ICT so far.

Table 1 - Pacific Island Economies and Political Affiliation

<table>
<thead>
<tr>
<th>Political Affiliation</th>
<th>Pacific Island Economy</th>
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<tbody>
<tr>
<td>Independent Countries:</td>
<td>Papua New Guinea, Fiji, Vanuatu, Solomon Islands, Samoa, Tonga, Tuvalu, Nauru, Kiribati</td>
</tr>
<tr>
<td>US free association:</td>
<td>Republic of the Marshall Islands, Federated States of Micronesia, Republic of Palau</td>
</tr>
<tr>
<td>NZ free association:</td>
<td>Cook Islands, Niue, Tokelau</td>
</tr>
<tr>
<td>US territory:</td>
<td>Commonwealth of the Northern Mariana Islands (CNMI), Guam, American Samoa</td>
</tr>
<tr>
<td>French Territory:</td>
<td>French Polynesia, New Caledonia, Wallis &amp; Futuna</td>
</tr>
<tr>
<td>British Territory:</td>
<td>Pitcairn Island</td>
</tr>
</tbody>
</table>

The objective of this paper is to briefly review the Pacific Island health indicators and issues related to training and retention of health workers; define “telehealth;” and explore the current state of telecommunication infrastructure and regulatory frameworks in the Pacific, since it is a significant factor in the general use of ICT in all sectors. The paper describes some of the efforts and reports of key policy
organizations that have advocated for improved telecommunication infrastructure and policy and for the use of telehealth to address health and health worker education. The paper then provides a broad environmental scan of how telehealth is currently being used in the Pacific island region for health worker education and training; and, concurrently examines the state of ICT for both technical staff and for health workers. The paper discusses some of the key lessons learned and although it draws primarily from the experiences in the Western Pacific in describing current telehealth activities, the lessons are common across the Pacific Islands region.

II. HEALTH, HUMAN RESOURCE FOR HEALTH (HRH) DEVELOPMENT IN THE PACIFIC ISLANDS, AND TELEHEALTH

The health indices of the Pacific Islands are as varied as the islands themselves. However, many Pacific jurisdictions are challenged by the double burden of diseases and health outcomes of developing nations (e.g., tuberculosis, Hansen’s disease, and high infant mortality), as well as the “lifestyle” non-communicable diseases of more affluent nations (e.g., diabetes, cardio-vascular disease, and cancer). Moreover, Pacific jurisdictions are contending with rises in communicable diseases and increasing alcohol and drug use [1].

The ability to address these health problems rests in part on having adequate numbers of health workers. Yet many of the fragile health care systems of the Pacific Island jurisdictions function without adequate human resources for health. Moreover, many health workers haven’t had the opportunity for formal training in their field, but rather have been trained on the job, often by individuals who themselves were trained on the job [2]. In the Pacific, many nations also depend on expatriate physicians, nurses and other health professionals. For example, in the Marshall Islands, 80-90% of the medical staff are expatriates, as is many of the nursing and midwifery health care professionals.

The health care worker shortage is not only a regional problem, but reflects a global shortage and mal-distribution of health workers. In recognition of this problem, the World Health Organization (WHO) declared 2006-2015 as the decade of “Human Resource for Health” (HRH) development”. HRH refers to all persons who provide health services, from community health workers to nurses, physicians, allied health workers, and health administrators. The 2006 World Health Day was dedicated to highlighting the critical importance of health workers and to urging new policies to improve their education and training, compensation, incentives, management, and working conditions [3]. In the Pacific region, the Western Pacific Regional Office (WPRO) of the WHO, in 2007, released the WPRO Regional Strategy on Human Resources for Health – 2006-2015 [4].

Achieving an adequate number and distribution of health workers in the Pacific region will require access to affordable, quality education and training opportunities and programs. Such programs must be culturally relevant, overcome often inadequate secondary schooling, and prepare health workers for delivering care in the health systems of remote, island jurisdictions. However, in small island nations, such educational opportunities and programs may not be available; or if available, difficult to sustain, given limited funding, and small numbers of students and faculty. The 2006 World Health Report entitled Working Together for Health proposes the use of telehealth as a means to achieve greater access to cost-effective HRH education [3].

Telehealth is the use of ICT to support long-distance clinical health care, health worker and patient health-related education, public health, and health administration. A range of technologies are used for telehealth applications, including computers, video teleconferencing technologies, electronic access to health information and databases, multimedia applications, and the like [5]. Increasingly, the term, “eHealth” is used in discussing health applications of ICT. eHealth and telehealth are interchangeable concepts and today also include electronic health records.

III. PACIFIC ISLAND TELECOMMUNICATIONS – MONOPOLIES, ICT POLICY REFORM, TELECOMMUNICATION NETWORKS, AND UNIVERSAL SERVICE

An essential element in being able to effectively use telehealth is access to affordable and reliable telecommunication services. Currently, in the Pacific, the ability to use telehealth for HRH development is hindered by telecommunication infrastructure, services, and cost. Further, universal access and universal services are not widely available in the region. Universal service and universal access are often used interchangeably. “Universal service” commonly refers to “access to affordable” telephone or telecommunication services whereas “universal access” is understood to be the “availability” of the telecommunication infrastructure and services.

Small populations, fragile economies, frequent natural disasters, and climatic conditions that are not conducive for ICT technology, also contribute to the difficulties of developing and maintaining telecommunication infra-structure to support ICT services.

Another contributing factor to the limited access and high cost of telecommunication services is the telecommunication monopolies that are common in the Pacific Islands. The telecommunication sector was a natural monopoly in the early development of
telecommunications, just as electricity and other public utilities.

The monopoly structure has taken many forms following the national independence period: many Pacific Island countries entered into contracts with the carriers of their former colonial telecommunication companies, while others established new government owned carriers. As a result of the continued monopoly structures coupled with other factors such as the high cost of international satellite or submarine fiber optic circuits and small markets, telecommunication fees in the Pacific Islands are very high and telecommunication density is quite low compared to other parts of the world.

In the early stages of the telecommunication development, the monopoly organization served its purpose. However, today, the networks, services, and consumer needs have matured and have outgrown the now impeding monopoly structure. Moreover, with increasing globalization and the advent of the Internet, as well as other telecommunication and information advancements, the inequities of the digital divide are even more apparent and cannot be ignored.

Pacific Island telecommunication carriers, users and governments are increasingly recognizing the critical importance of ICT for social and economic development, including the health and education sectors. Governments, as well as donor agencies, are also aware of the need for ICT policy reform and recognize the importance of telecommunication market liberalization. Some recent regional efforts directed at ICT cooperation and policy reform include:

- The development of the “Regional ICT Policy and Strategic Plan” by the Pacific Islands Forum (PIF) in 2001.
- The “ePasifika” project conducted by UNDP, with funding from the Japanese government from 2000 to 2004, led to the development new Pacific Island National ICT strategies and plans.
- In 2005, the PIF released a new regional cooperation policy – “Pacific Plan” – which includes a “Digital Strategy.”[6],[7]

The efforts to address policy reform, deregulation, competition, and technology advancements are helping to drastically change the telecommunication and ICT environment within the Pacific Islands. In turn, these developments will have a significant impact on the future success and sustainability of telehealth services and programs.

Regional Public Service Networks

Amidst the challenging circumstances, two regional non-commercial telecommunication networks have been serving the Pacific Islands for nearly forty years. These networks are the Pan Pacific Education and Communication Experiments by Satellite (PEACESAT) and the University of the South Pacific Network (USPNet), which was originally part of the PEACESAT project.

PEACESAT - The PEACESAT network is funded in part by the U.S. National Telecommunications and Information Administration (NTIA) and managed and operated by the University of Hawai`i. PEACESAT sites within the countries are funded and operated by local governments. The network uses the GOES-7, a U.S. National Oceanic Atmospheric Administration (NOAA) satellite, and includes twenty earth stations in the six U.S.-Affiliated Pacific Islands (USAPI), including American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Republic of the Marshall Islands, and the Republic of Palau.

The PEACESAT network supports video, data, voice, and email services mainly in the Micronesian region and American Samoa. Through the institutional networks of the University of Hawai`i, the PEACESAT serves as a gateway for the Pacific Islands to bridge to other networks internationally. PEACESAT is used for distance learning, telehealth, emergency management, and economic development at no per-minute-fee to the user. An issue faced by the PEACESAT satellite network is that of sustainability given that it is based on decommissioned satellites. Although the current satellite has a life expectancy of approximately another 10 years, there is not a back-up contingency.

USPNet - The University of the South Pacific Network or USPNet is a private educational telecommunications satellite network operated by the University of the South Pacific headquartered in Suva, Fiji. The current USP network is established through special contracts with each member country’s respective national carrier and uses a commercial satellite. This network connects USP centres in 12 member countries, primarily in the South Pacific with interactive video teleconferencing and Internet. USP uses the network for the delivery of programs and courses using distance and flexible learning formats. The member countries include Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Samoa, Solomon Islands, Tonga, Tuvalu, Tokelau, and Vanuatu [8].

The network is supported by member countries and foreign aid from the governments of Japan, Australia, and New Zealand and is undergoing a technical upgrade that will increase the network capacity. Currently there are no health professional training programs offered through USPNet and no cross connections with health care providers in the countries.

These two networks have served the Pacific Islands well over the years. However, each has limitations. The PEACESAT network has limited capacity making it difficult to meet the increased bandwidth demands of current users and there is uneven access and use of the network by education and health care providers. The USPNet is limited to USP facilities, does not interconnect to other networks, and also is not
interconnected to health care providers. However, both networks have the potential to better support HRH.

**Universal Service Networks**

Many developed countries have adopted “universal service” or “universal access” programs or funding mechanisms directed at interconnecting education and health care organizations [9],[10]. Some may take the form of direct funding of educational networks. Others may take the form of a “universal service” mechanism that is based on carrier funding of services.

In the Pacific Islands the U.S. universal service program has interconnected the schools and libraries of the territories and Commonwealth of the Northern Marianas Islands through the “E-Rate” program.

**Education Rate (E-Rate) Network** – The Education Rate program was established under the universal service provisions of the U.S. Telecommunications Act of 1996 and provides up to 90% discounts for telecommunication services for K-12 schools and public libraries in American Samoa, the Commonwealth of the Northern Mariana Islands, and Guam. The Federal Communications Commission’s (FCC) $2.5 billion dollar annual E-Rate program, has enabled the school systems of these jurisdictions to interconnect to each other with high-speed fiber network connections and have their own dedicated off-island Internet capacity. The PEACESAT also serves as a cross-connection for these E-Rate networks.

Funding provided for the discounted telecommunication services are significant. The schools and libraries of American Samoa, Guam, and CNMI have received over $45 million over the past 9 years as shown in Table 2, below [11].

### Table 2 – E-Rate Funding by Years for U.S. Territories and the Commonwealth of the Northern Mariana Islands

<table>
<thead>
<tr>
<th>Year</th>
<th>American Samoa</th>
<th>Guam</th>
<th>CNMI</th>
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<tbody>
<tr>
<td>1998</td>
<td>$3.50</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>1999</td>
<td>$2.70</td>
<td>$0.39</td>
<td>$0.10</td>
</tr>
<tr>
<td>2000</td>
<td>$2.00</td>
<td>$0.99</td>
<td>$0.50</td>
</tr>
<tr>
<td>2001</td>
<td>$2.10</td>
<td>$2.50</td>
<td>$2.30</td>
</tr>
<tr>
<td>2002</td>
<td>$2.50</td>
<td>$1.90</td>
<td>$1.20</td>
</tr>
<tr>
<td>2003</td>
<td>$2.20</td>
<td>$2.50</td>
<td>$1.20</td>
</tr>
<tr>
<td>2004</td>
<td>$2.10</td>
<td>$5.70</td>
<td>$1.90</td>
</tr>
<tr>
<td>2005</td>
<td>$0.00</td>
<td>$2.70</td>
<td>$1.15</td>
</tr>
<tr>
<td>2006</td>
<td>$0.00</td>
<td>$0.25</td>
<td>$0.08</td>
</tr>
<tr>
<td>Total Received</td>
<td>$17.10</td>
<td>$18.92</td>
<td>$9.42</td>
</tr>
</tbody>
</table>

There is also a universal service Rural Health Care Program (RHCP) that provides discounted telecommunication services for rural health care providers. Unfortunately, the health care providers in the U.S. territories have not been able to take advantage of this program to date. Only Guam has received a small subsidy for advanced telecommunication services in the amount of $4,000 [12].

The FCC recently announced a broadband pilot program to enable better use of the RHCP. For the pilot projects selected, the program will pay up to 85% of the eligible costs, including planning. The U.S. territories might benefit from this pilot program.

**Universal Service not Universal in Pacific Islands Region**

In the Pacific Islands, in contrast to the U.S., Japan and many other countries, universal service obligations by the telecommunication carriers are not defined. For example, the universal service program in the U.S. collects and sets aside funds to support the development of infrastructure and to support services for underserved areas and, most recently, for subsidizing public service telecommunications for health and education.

In the Pacific, there are many telecommunication policy, regulatory and programmatic issues that need to be addressed to improve access to affordable services. These include making better use, through coordination and sharing, of existing network and ICT resources among the various user communities. In addition, there is a need to design and implement an appropriate universal service mechanism. This appears to be a critical, but missing element to improve telehealth access and services.

**IV. PACIFIC ISLAND COMMITMENT TO ICT AND TELEHEALTH**

Pacific Island communities increasingly understand the potential of ICT for sustainable development and the potential of telehealth for HRH. Commitment to develop these sectors is evidenced in strategic collaborations at local, national, and regional levels.

In 2002, at the United Nations Economic and Social Council, the H.E. Ambassador of Nauru on behalf of the Pacific Islands Forum Group, stated that “the use of ICT to promote 'telehealth' is also a growing tool. Such resource-sharing and co-coordinated action enables us in the Pacific to respond quickly and efficiently to potential health threats to the region” [13].

As part of the Pacific Island input to the ‘World Summit on the Information Society’, the 2003 regional priorities of the Pacific Islands Forum Secretariat, as identified in the Forum’s Communication Policy Meeting in April 2002, were submitted. The regional priorities are [14]:

- Telehealth
- Human Resource Development through Distance Learning
- Development of National Policy and Regulatory Frameworks
• Improvements in Universal Access through Community Centers

These are just two examples, among many, of the growing policy-level support for ICT and telehealth. However, there is not a broad understanding of this potential across the range of key decision-makers. Moreover, many of the current users in the Pacific that are knowledgeable about the potential have not yet made their voices heard in the policy arena. As a consequence, while there is a broad and growing policy-level recognition of the importance of telehealth, it has not yet been translated into programmatic action plans.

V. EXPERIENCES AND ISSUES IN HRH DEVELOPMENT USING TELEHEALTH

Increasingly, HRH initiatives in the Pacific are using telehealth to enhance current education and training programs and to deliver the programs to new locations. The following examples show how different telehealth technologies can be used within several open and flexible distance education formats. These examples provide insight into how telehealth can advance HRH development and provide some lessons for the future.

1. **Pacific Open Learning Health Network (POLHN) of the Western Pacific Regional Office (WPRO) of the WHO – an ICT learning centres model**

POLHN was established by WPRO in 2003 with a grant from the Japanese Government. POLHN is not a telecommunications network, but rather a collaborative program among the WPRO, Pacific Islands Ministries of Health, and related local organizations such as nursing schools and hospitals. Overseas agencies are also involved such as Otago University in New Zealand which provides distance education courses.

The POLHN is headquartered in Suva, Fiji.

By April 2007, POLHN established 15 learning centres in 11 Pacific Island countries: Cook Islands, Federated States of Micronesia (Chuuk, Kosrae, Pohnpei and Yap), Fiji (Lautoka and Tamavua), Marshall Islands (Majuro and Ebeye), Nauru, Palau, Samoa, Solomon Islands, Tonga, and Vanuatu.

Each POLHN learning center has between 10 and 20 computer workstations, a server, audio conferencing equipment, printers, and an Internet connection. POLHN installed the systems and provided initial training for country healthcare and ICT personnel. POLHN also provided computer and network based distance learning programs, and is one of the first regional projects using ICT for HRH development. It is also an early eHealth success for the WHO.

The POLHN has had significant success in utilizing telehealth for HRH in the Pacific Islands region. The Tonga POLHN centre, for example, effectively operates with a full time coordinator who is responsible for managing the course schedule, advertising the courses, managing enrollment, devising the timetable, supervising students and managing access to the computer room. As a result, 95% of POLHN students finished their training course in Tonga [15], [16].

**Lessons Learned** - At the same time, the POLHN has also revealed several issues. One issue is the network maintenance and operations and how best to support it. A second issue is the telecommunication cost. Even with special discounts from the telecommunication carriers the cost remains high and the bandwidth is limited. This restricts the types of programs that can be provided over the POLHN network.

Third, the POLHN also showed that there is a need for more collaboration within and among the POLHN sites. For example, to address the needs for working personnel, special arrangements could be made for working health care students to use facilities in the evenings and on weekends. By making the centres more accessible, health care workers could interact and maintain communications with other health care professionals throughout the region.

POLHN resources could be further maximized by working closer with other governments, health care providers and educational institutions. For example, in the United States, health agencies such as the Centers for Disease Control and Prevention (CDC) could use the POLHN centers for their training and technical assistance activities. However, at this time, many of these organizations are not knowledgeable of the POLHN centers.

Finally, mechanisms for articulating higher education coursework and certifying continuing education should be expanded to increase the value of the program.

2. **Hawaii State Telehealth Access Network (STAN) – a network supported by a universal service fund**

A different telehealth network model is that of the Hawaii State Telehealth Access Network (STAN). This network, of nearly forty health care facilities throughout Hawaii, is used to deliver continuing medical education and for telehealth consultations. The STAN was established in 1999 through a partnership that involved the Hawaii Health Systems Corporation, the High Technology Development Corporation, and the University of Hawaii. The STAN network is cross-connected to the PEACESAT network at the University which enables continuing education programs to be shared between Hawaii and the Pacific Island jurisdictions.

The majority of the STAN health care facilities are located in rural areas in Hawaii. A major factor in this network’s sustainability is its participation in the FCC’s Universal Service Rural Health Care Program...
(RHCP). This program subsidizes the cost of the rural telecommunication services in a manner similar to the E-Rate program. The network is also sustained through partnering agreements between the health care facilities and the University of Hawaii to operate, manage, and maintain the network services including video teleconference scheduling, multiple video teleconference bridging, and in some cases managing the RHCP applications.

For health care workers in the USAPI jurisdictions, this universal service-supported STAN network, in conjunction with the PEACESAT network, has provided opportunities for sharing information, resources, and services that would otherwise not be available, including continuing education that is offered through the STAN network. For example, health care workers at the hospital in Majuro, RMI, the heaviest PEACESAT video teleconference user, receive the same timely and up-to-date information on health procedures, treatments and research as those in the State of Hawaii.

**Lessons Learned** - The STAN network exemplifies what can be achieved because of a universal service mechanism, coupled with committed partners. The members of the STAN network, although in some aspects competing health care institutions, have agreed to share their continuing education programs across all STAN members and some have developed mechanisms to “share” scarce specialists. The partners have also committed to making their continuing education resources available to the Pacific.

3. **Pacific Island Health Care Program (PIHCP), Tripler Army Medical Center (TAMC), Honolulu, Hawaii – HRH telementoring using store-and-forward technologies**

One of the most successful, sustained efforts in telehealth in the Western Pacific has been the Tripler Army Medical Center’s (TAMC) consultation outreach to the USAPI jurisdictions using store-and-forward technologies. The telehealth effort, undertaken in partnership with the Pacific Basin Medical Association (PBMA), is a component of TAMC’s Pacific Island Health Care Program (PIHCP), which brings challenging medical and surgical cases from the USAPI jurisdictions to TAMC in Honolulu, Hawaii, as part of TAMC’s medical education program. Begun in the early 1990’s using phone and fax, the telehealth program has evolved into a system in which physicians in the Pacific use a web-based standardized medical consult form to present challenging cases for consultation and possible referral to TAMC [17].

Over 3,000 consultations have been conducted to date. All consultation requests are triaged by the head of the PIHCP and referred on to the appropriate specialist(s). Initial equipment for the project was provided to the PBMA through the Akamai project at TAMC. Equipment included computer hardware and software, scanners, printers, cameras and medical peripherals. Text-based patient information is entered into a secure website and attachments, such as x-rays, EKGs, pictures and video-clips are included as needed. Although this activity is often seen as “telemedicine,” i.e., the provision of clinical care, the educational component built into the clinical reviews of cases has been as critical. Through the consultative process, the skill and knowledge base of the Pacific clinicians has been enhanced [17].

**Lessons Learned** - There are several important lessons that can be learned from the PIHCP. First, the program benefited from the commitment of the Dr. Donald Person, the program’s director. His commitment helped ensure the necessary commitment of the other physicians (i.e., the specialists who provide the consults do so above and beyond their regular duties). Second, the program has access to a wide range of TAMC and Pacific Island specialists and sub-specialists. As a result, the consultations were very valuable to the physicians in the region. Finally, the project demonstrated the value of store-and-forward consultations. Today, however, despite the success of the program, the sustainability is not assured, as priorities shift and funding is reallocated.

4. **Pacific Rim Regional Telerehabilitation Program, Honolulu, Hawaii – Multidisciplinary HRH telementoring using video teleconferencing**

In 1999, a Pacific Rim Regional Telerehabilitation Program was funded by the U.S. Department of Education’s National Institute on Disability and Rehabilitation Research. It was a collaborative effort of the Research Engineering Research Center (RERC) on Telerehabilitation, the National Rehabilitation Hospital in Washington, D.C., the Sister Kenny Institute in Minneapolis, Minnesota and health facilities in the Pacific. One component of the Pacific Rim project was the development of twice-monthly telerehabilitation clinics to provide services to patients in American Samoa, where there were no physical or occupational therapists. Over 70 teleclinics were conducted via video teleconferencing at 384kbps. The teleclinics, which addressed rehabilitation needs such as mobility training, speech-language pathology, range of motion programs, wound care, and hand therapy consultation, enhanced the skill level of the PT assistants, nurses, physicians, and family members. Although the consultation program ended when the RERC funding ceased, the PT assistants had gained valuable skills that enabled them to continue to provide an enhanced level of care [18].

**Lessons Learned** - These two telementoring examples show how two different technologies, each with its own limitations and strengths, can assist in HRH development. Web-based store-and-forward technologies function well in low-bandwidth settings and also overcome the barrier of operating across
multiple time zones. The video-conferencing modality is useful in demonstrating skills to health workers and family members and provides an opportunity for immediate feedback. However, it is more costly, less likely to be available, and can be difficult given differing time zones.

5. The Pacific Area Health Education Center (AHEC), University of Hawaii and Palau Community College and the Pacific Association for Clinical Training (PACT), University of Hawaii – HRH Distance Education degree, certificate and continuing education programs.

Two HRH endeavors initiated in the early 2000’s in the USAPI jurisdictions with funding from the U.S. Department of Health use telehealth technologies to enhance access to health professions degree-granting programs and for the continuing education needs of practicing health care workers.

Area Health Education Centers (AHEC) - In 2001, the University of Hawaii’s John A. Burns School of Medicine (JABSOM) AHEC program received funding to initiate the first center in the USAPI jurisdictions. Based in Palau, the AHEC program was designed to provide in-country postgraduate training for Micronesian physicians, in particular those trained at the Pacific Basin Medical Officers Training Program.

The training itself was a joint activity of JABSOM, the University of Auckland Faculty of Medicine and Health Science, which provided the curriculum and credentialing of the training component, the School of Public Health & Primary Care–Fiji School of Medicine (FSM), and Palau Community College. The post-graduate training program, which ran from 2001-2004, used a combination of face-to-face teaching and distance learning formats including video teleconferencing, distance telephone lectures with previously downloaded PowerPoint slides, videotapes, and course workbooks. Initial plans to deliver much of the coursework using video teleconferencing evolved into audio conferencing with PowerPoint slides emailed before each session, given technology problems. Eleven medical officers completed the training [2].

With additional funding received in 2004, the Palau AHEC expanded its activities to include public health courses for nurses, environmental health workers, and laboratory workers. In addition, a distance education pharmacy technician program was initiated at the Palau AHEC and at a newly created AHEC in the Common-wealth of the Northern Mariana Islands (CNMI). This program, offered through the University of Alaska in collaboration with the pharmacy program at the University of Hawaii-Hilo, is delivered completely at a distance using interactive web-based technologies. Lastly, an AHEC program was established in Yap in 2004 and one of its activities involved the development of a certificate program to train 15 health assistants in Yap, including individuals on Yap’s remote islands and atolls. Single-side band radios are being used to provide some of the instruction to the health assistants in the outer islands and curriculum materials are delivered by boat prior to the course [2].

Pacific Association for Clinical Training - A second program that utilizes distance education to address HRH needs in the USAPI jurisdictions is the Pacific Association for Clinical Training (PACT). The grantees, the Family Practice Residency program of JABSOM, was funded in 2003 for four years to plan, develop and operate a continuing education program for health workers in the USAPI. Continuing education activities are provided using both in-person training as well as a variety of distance education modalities. One of the modalities, developed to address the costly and limited bandwidth in many of the USAPI’s, utilizes a technology called Tegrity. The PACT staff videotape health professions training sessions and then using the Tegrity technology, the video of the lecturer is synchronized with the lecturer’s PowerPoint presentation or other graphics and this is burned to CDs and/or posted on-line. PACT distributes the CDs to health care professionals in jurisdictions where bandwidth is limited. Over 80 training sessions for physicians, nurses, dentists, public health workers, laboratory personnel, etc., have been captured with the Tegrity technology and provided to the jurisdictions. In Palau, all the available sessions for CME have been viewed by the physicians, who are requesting more.

Beyond the actual delivery of continuing education sessions, an equally important component of the PACT program has been the development of the human infrastructure needed for a health worker continuing education delivery program. An advisory board with membership from all jurisdictions and the main health professions associations (Pacific Basin Medical Association, American Pacific Nurses Leaders Council, and the Pacific Dental Association) was established to assist with in-country assessment of continuing education needs. The members, within their respective jurisdictions, have also developed or enhanced formal continuing professional development committees and worked on the development and/or enforcement of laws and policies surrounding re-licensure of health professionals.

Lessons Learned - These projects have revealed several important lessons. First, HRH telementoring, as noted above in the discussion of PIHCP, doesn’t always involve a classroom setting but also occurs through clinical practice. As with PIHCP, the skills of clinicians can be enhanced by their interaction with, and mentoring by, other clinicians. Whereas the interaction in the PIHCP program is through store-and-forward technologies, video teleconferencing
was used in a telerehabilitation program in American Samoa. Second, opportunities for health professions educators to gain the skills needed to adapt traditionally-delivered coursework to effective, distance education formats. The re-formatting of coursework for effective distance delivery is a time intensive endeavor. The amount of time required should be recognized when grant programs for HRH telehealth projects are established. Finally, the cases show a need for dedicated HRH development coordinators who facilitate HRH continuing education activities. Finally, these programs that are serving many of the same constituencies need to be better coordinated. Opportunities exist for enhanced collaboration and synergy among the above programs, the WHO/WPRO POLHN network, and other HRH initiatives.

6. University of Guam – Regional Distance Education in Nursing, Telehealth and Distance Education Consortium Activities, and Telecenters for the Remote Islands of Micronesia

The University of Guam, established in 1968, began in 1952 as the Territorial College of Guam. From the beginning, as the Western Pacific region’s only four-year institution of higher education, one of its missions has been to serve as a regional institution for CNMI, Palau, the Marshall Islands, and the Federated States of Micronesia.

UOG’s School of Nursing, Social Work and Health Sciences (SNSWHS), which offers the only Baccalaureate in Nursing degree in the Western Pacific, has been involved in regional nursing continuing education outreach efforts as well as outreach to the associate degree nursing programs of the USAPPI community colleges for over two decades. In the early 1990’s, with funding from the U.S. Department of Health and Human Services, UOG implemented a distance education program for nurses in Palau, using the PEACESAT network. In 1997, with funding from the Sasakawa Pacific Islands Nations Fund (SPINF), the School of Nursing was able to expand this effort into a regional program. The program involved training site operators and coordinators in each jurisdiction on how to manage distance education courses. Several UOG accredited courses were developed and offered to regional nurses, including Nutrition for Health Professionals and Leadership/Management for Nurses while this program existed. Today, the School of Nursing continues to provide continuing education sessions every month to nurses across Micronesia using the PEACESAT network.

Emerging from the initial UOG-SPINF project in 1997, the UOG School of Nursing received funding in 1999 from the U.S. Department of Health and Human Services, Office for the Advancement of Telehealth to establish a Pacific Basin Telehealth Consortium and to develop a Regional Telehealth Plan and foster the development of jurisdictional telehealth plans. Although the consortium is no longer active, UOG maintains consortium contacts through the Association of Pacific Island Nursing Leaders Council (APNLC), Pacific Island Health Officers Association (PIHOA), and other Micronesia health related organizations [19]. The website developed by the consortium and hosted by Secretary of Pacific Community (SPC) remains active - http://www.spc.int/Health/DistanceEducation. The web-site was developed to serve as a site that would maintain an inventory of existing telecommunication and telehealth resources in the Pacific region [20]. It has unfortunately never been sufficiently funded to take on the enormous task of maintaining a current database of telehealth projects.

The five-year SPINF grant also enabled UOG, under the direction of Bruce Best, to establish almost 30 solar-powered telecenters across the outer islands of Micronesian, with support from each of the governments as well as the U.S. Department of Health and Human Services. Using HF email systems, the remote schools and dispensaries of the region are now able to send email, voice and attached images. In providing health services, these HF email networks address issues such as miscommunication which is more likely when relying only on a verbal description without the aid of a visual picture; and lost or incomplete handwritten records.

Lessons Learned - Given UOG’s numerous and ongoing activities in telehealth, there are many lessons that may be learned. First, the sustainability of projects is affected by many factors including, the continued availability of outside support; sustained telehealth leadership both within the project and within funding agencies; turn-over of site coordinator and site operator personnel; and other external factors such as natural disasters and the local economy.

Second, given the state of the telecommunications infrastructure, technical difficulties are still quite common in distance education programs. Thus, programs should be designed with alternative formats for providing the program content.

Finally, to maximize the potential of telehealth in the Pacific region, issues relating to health worker licensure, academic program accreditation and articulation of coursework among institutions, and certification of continuing education sessions. These issues need to be addressed regionally so that certificate, diploma, and degree educational programs in health, as well as continuing education programs for health workers, can be shared. Without doing so, the emerging telehealth networks will not be fully or effectively used.
VI. EXPERIENCES AND ISSUES IN ICT HUMAN RESOURCE DEVELOPMENT

An often overlooked component of telehealth programs is the need for ICT human resource development. ICT is a foundation for successful telehealth and distance education programs and it is critical to have individuals skilled in ICT. This includes both individuals who are responsible to develop, operate and maintain the technology and the health workers.

The first example in this section describes a project that developed in-country ICT personnel. The other examples describe types of ICT training for health workers and policy-makers in the health sector.

In the Pacific, there are in-country ICT training programs offered by academic institutions such as the University of the South Pacific, National University of Samoa and Vanuatu Polytechnic. In addition government agencies and the private sector offer ICT training in other countries. One of the differences with the PICTA program described below is that the courses were offered through distance learning.

1. Pacific ICT Academy (PICTA)

The Pacific ICT Academy (PICTA) was established in American Samoa in September 2005 to provide training in Cisco networking, Microsoft and Oracle applications. The knowledge, skills and abilities in working with these software programs are needed to maintain telecommunications networks. The program provided academic credit as well as prepared the students for the professional certification tests.

PICTA was established through a partnership between the American Samoa Community College (ASCC), Department of Education, Pacific eCommerce Develop- ment Corporation and the University of Hawaii TIPG. The classes were delivered through interactive video teleconferencing with instructors at the UH TIPG and local on-site facilitators at the ASCC.

Of the 21 registered students, 19 successfully completed the program. Students attended a one-year program, held daily from 8AM to 12 noon, with mandatory weekend laboratories [21]. Many students were sponsored by their employers (government agencies as well as private sector) with the understanding that they would remain employed with the agencies for a period of two years. Due to retention issues, the participants were obligated to reimburse the company the full cost of the training program ($20,000) if he or she did not meet this requirement.

Prior to this program there were no on-island opportunities for this type of training or for taking the professional certificate tests (e.g., Cisco certifications). It was extremely costly for students to travel off-island to take short, intensive courses and the pass rates of the certification tests off-island were also low, due to the need for increased foundational work, no local facilitators, and the shorter amount of time to learn a great deal of new material.

The local program facilities have received feedback from participant supervisors that the quality of technical support and response time has dramatically increased from PICTA graduates. Also, the graduates have established a local cohort of technical colleagues for continued networking and information sharing.

The program design is a useful model for technical ICT training, and collaboration with local educational institutions and the private sector.

2. Tokai University Medical School and JICA ICT Training Programs – ICT training for health personnel, including policy makers

Under the leadership of Dr. Isao Nakajima, the Tokai University Medical School, has a long history of involvement in health and telehealth/eHealth activities. In the early 1990’s, the Tokai University Medical School joined the PARTNERS (Satellite Experiments for International Cooperation) project and developed tele-health activities for Asia and the Pacific Islands. In the late 1990’s, under an initiative of Dr. Shigeru Omi, Regional Director of the WHO/Western Pacific Regional Office, Dr. Nakajima studied the possibility of health and telehealth/eHealth for the Pacific Island nations.

This extensive eHealth background led to Tokai University and Dr. Nakajima to be appointed by the ITU to conduct an eHealth expert training course, hosted at Tokai University. Ten individuals from developing coun-tries, primarily Asia, have participated to date. In 2006, with SPINF funding, the Tokai University designed a special, 3-month, ICT training course for Pacific Island health personnel. In 2006, two Fijian experts from the Health Ministry of Fiji attended the course at the University and an additional four trainees will be invited over the next two years to participate [22].

The Japan International Cooperation Agency (JICA) has also developed ICT training for health personnel in developing countries. Different JICA programs are targeted to high-level government officials and technical staff, rather than to practicing health professionals.[23].

Relatedly, one of the issues to be considered is that the Japanese Official Development Assistance (ODA) is often targeted to building infrastructure (i.e., schools, hospitals, bridges, roads, etc.) rather than courses, or instructional materials for human resource development. In light of this, Dr. Nakajima’s continuous contributions are particularly notable.

3. U.S. National Library of Medicine (NLM) and the National Network of Regional Medical Libraries – hands-on ICT training for health workers

There are many different types of ICT training for health workers, ranging from learning how to use a
computer to learning how to access health information on the Internet. For over two decades, the NLM and its National Network of Regional Medical Libraries have funded health facilities to provide computer training for their health workers and has sent Regional Library staff to conferences and facilities to train health workers on how to search for health information on-line. Although such training has been provided by the University of Guam’s Medical Library in the past, the demand for such training continues to grow because health professionals and consumers increasingly have access to computers now and are requesting to learn how to use them for health-related purposes. Given the cost involved in either a health professional traveling to a workshop for such training or an individual traveling to a jurisdiction to offer a course, a cost-effective alternative may be to increase the capacity of the libraries at the USAPI community colleges to offer such training.

4. Telehealth Training Institutes

In contrast to the example above, which addresses the training of health professionals on computer use, a specialized type of telehealth training involves learning how to develop and manage a telehealth system. Such training involves learning how to develop tele-clinics and operate telemedicine remote sites; use the technologies for telemedicine and distance education; develop telehealth policies and procedures, and address medico-legal issues. In the early 2000’s, the U.S. Department of Health and Human Services and the Department of Business, Economic Development and Tourism funded a week-long telehealth training for health professionals from the Pacific and also funded the participation of individuals from the Pacific at the University of California-Davis Telemedicine Training Center [24]. As new telehealth programs are established in the Pacific, the need for this specialized type of training will grow.

5. ICT Training and Certification for Educators

The final example of ICT training is not from the health sector, but rather the education sector, and describes a type of training that may be useful for health workers. Although the use of ICT plays an ever increasing role in education and health, ICT training is often not part of an academic program. To address this lack in education, the American Samoa Department of Education, the Pacific eCommerce Development Corporation and UH TIPG established two courses in ICT education for teachers in American Samoa. The two classes – Computer Literacy and Instructional Technologies and Distance Learning Theory and Practice are offered by American Samoa Community College. They are now required of all teachers in American Samoa as part of their teacher certification. Over 355 teachers have been trained in the eight sessions taught to date. Upon completion of the program, teachers receive four ASCC credits and meet the ICT requirement for teacher certification. The results of this training are visible in the teachers’ work in creating computer-generated newsletters, brochures and PowerPoint presentations for the classroom, and in the implementation of two distance learning classes in algebra and physics.

Currently in the Pacific Islands, there are few health professions programs or certifications that incorporate ICT training as a requirement. It may be beneficial for HRH programs to consider similar actions.

VII. SUMMARY

An important component of economic development and the health of a nation’s population is a health system that efficiently and effectively addresses key health issues. HRH development is necessary to assure that there is an adequate number and mix of health workers trained to deliver needed health services. Since the 1970s, there have been efforts in the Pacific Islands to meet the HRH development needs utilizing telehealth technologies. Several barriers must be overcome, however, to more effectively and efficiently use telehealth technologies for HRH development.

One of the major barriers is the access and cost of telecommunication services. With the advances in telecommunications technologies and the liberalization policies seen in the international arena, it is timely to consider actions that could increase access and decrease cost in the Pacific Islands, particularly for telehealth applications. Such actions could include:

1) accelerating the development of ICT national strategies and telecommunication regulatory frameworks which acknowledge the vital role of ICT in health and education; and include, when feasible, universal service mechanisms for rural underserved areas and the health and education sectors, and

2) improving the coordination of efforts by the governments of the Pacific Islands and other stakeholder governments to support, expand and sustain the non-commercial and public networks, such as PEACESAT and USPNet.

Another barrier to the efficient and effective use of telehealth for HRH development is the lack of a regional coordinating body (or bodies) in this arena. This is complicated by the fact that in the Pacific Islands, multiple regional organizations exist whose memberships often overlap (e.g., WHO/WPRO, PIF, SPC, Pacific Island Health Officers Association, and the Pacific Islands Health Ministers and Directors organization). This at times hinders communication, cooperation and collaboration among islands and the ability to undertake region-wide efforts to address key issues.

There would be much value in improving the
linkages between the health, education, and ICT sectors, and the local, regional, and international funding agencies. It is a universal problem and not unique to the Pacific Islands. However, when resources are scarce, as they are in the Pacific, such coordination is critical in order that redundant activities are not funded and that gaps can be identified and addressed.

It is strongly recommended that a mechanism to foster these linkages be developed. It is not clear whether an existing organization, such as WPRO, should take on this role, whether a new entity such as a Pacific Island WHO Collaborating Center on eHealth should be established, or whether the responsibility should spread across several organizations.

A third barrier is the small number of ICT technical personnel in the Pacific – individuals who are critical to developing and maintaining telehealth systems. In addition, there is a lack of ICT training opportunities for health workers and health professions faculty. Several potentially useful models were described, including enhancing the capacity of local institutions of higher education to provide such training.

A fourth barrier is the lack of policies that support the articulation of coursework and the certification of continuing education. It is not sufficient to have affordable, accessible telecommunication networks; there must be programs and content available to be provided over the network, to as broad an audience as possible. It would be important for institutions of higher education and HRH licensure entities to develop mechanisms for sharing HRH programs.

The environmental scan of telehealth and HRH development activities in the Pacific Islands region provides a perspective on the needs, the many challenges, best practices, and the opportunities. The potential for further development is enormous and it is clear that networking, sharing resources, and working collaboratively among all small island environments will be needed to survive and to thrive.

CAVEATS

The authors work for a funding agency, the public service telecommunications sector, and the government health sector and are, involved in HRH development in the Pacific Islands region. The organizations exemplify the “three-legged stool” of support and cross-sector communication and coordination that is needed to develop a viable telehealth platform in the Pacific. We are grateful for the opportunity to share our experiences in this conference paper. However, the views are our own, and do not necessarily reflect the views of our organizations.

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