Long-running telemedicine networks delivering humanitarian services: experience, performance and scientific output

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Abstract
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Reference

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Long-running telemedicine networks delivering humanitarian services: experience, performance and scientific output

Richard Wootton, a Antoine Geissbuhler, b Kamal Jethwani, c Carrie Kovarik, d Donald A Person, e Anton Vladzymyrskyy, f Paolo Zanabonia & Maria Zolfo

Objective
To summarize the experience, performance and scientific output of long-running telemedicine networks delivering humanitarian services.

Methods
Nine long-running networks – those operating for five years or more – were identified and seven provided detailed information about their activities, including performance and scientific output. Information was extracted from peer-reviewed papers describing the networks’ study design, effectiveness, quality, economics, provision of access to care and sustainability. The strength of the evidence was scored as none, poor, average or good.

Findings
The seven networks had been operating for a median of 11 years (range: 5–15). All networks provided clinical tele-consultations for humanitarian purposes using store-and-forward methods and five were also involved in some form of education. An analysis identified a total of 86 papers. 21 were listed in EMBASE, 55 were listed in PubMed, 33 were listed in Scopus and 11 were listed in PAHO’s index of traditional and complementary medicine. According to study design, the strength of the evidence was generally poor by conventional standards (e.g. 29 papers described non-controlled clinical series). Over half of the papers provided evidence of sustainability and improved access to care. Uncertain funding was a common risk factor.

Conclusion
Improved collaboration between networks could help attenuate the lack of resources reported by some networks and improve sustainability. Although the evidence base is weak, the networks appear to offer sustainable and clinically useful services. These findings may interest decision-makers in developing countries considering starting, supporting or joining similar telemedicine networks.

Introduction
Telemedicine (i.e. medicine practised at a distance) has been used to improve health care delivery in a wide range of applications. To date, most of the work has taken place in industrialized countries and there is relatively little experience in the developing world. Telemedicine’s fundamental benefit is in improving access to care, and in the developing world such access is often poor. Thus, telemedicine may provide a useful way to reduce inequities and strengthen health systems in developing countries.

In 2005, the World Health Organization (WHO) established a global observatory for e-health to monitor the development of information and communications technologies (ICT) for health care – including telemedicine – and to provide reliable information and guidance on best practices, policies and standards. According to a recent survey, telemedicine has progressed far less in lower-income countries than in high-income countries both in terms of the proportion of countries with established services and the proportion offering pilot telemedicine services. Nonetheless, several telemedicine networks around the world deliver humanitarian services on a routine basis, many to low-income countries. These networks provide tele-consultations for physicians and other health professionals needing advice about the clinical management of difficult cases, and some also provide education. Store-and-forward methods (e.g. e-mail) are often used for communication because they are generally cheaper and more convenient, but real-time methods (e.g. video links) are also used when required. Telemedicine networks delivering humanitarian services may be of interest to decision-makers considering wider implementation. Existing networks employ different organizational models and provide different kinds of services, and what represents best practice is unclear. Furthermore, data about network activities and performance are lacking.

To ensure effective and appropriate use of telemedicine in resource-limited settings, implementation must be guided by more and better evidence. The objective of the present paper is to summarize the experience gained so far with long-running telemedicine networks delivering humanitarian services; it looks at general information, network performance and scientific output. Long-running networks were selected for study because lack of programme sustainability is a commonly reported problem in telemedicine.

Methods
The work was conducted in three stages: (1) identifying relevant telemedicine networks; (2) collecting information about their activities, and (3) summarizing the resulting data.
Network selection
Long-running telemedicine networks delivering humanitarian services were identified. In this context, “long-running” was defined as having existed for 5 years or more. “Telemedicine” was defined as clinical and educational work at a distance. “Humanitarian services” were defined as actions designed to save lives, alleviate suffering and maintain human dignity delivered unconditionally (i.e. without seeking payment from their recipients). These networks were initially identified by one of the authors based on personal knowledge of the field.

A contact person at each telemedicine network was approached and asked if they knew of any other long-running telemedicine networks. This produced a list of nine networks, all of which were contacted. Two of the nine telemedicine networks were excluded from further consideration: one because it had apparently ceased operating when contacted and another because it never replied. The seven long-running telemedicine networks covered by this paper are shown in Table 1.

Data collection
In September 2011, a questionnaire was sent to each contact person to collect basic information about the networks. This was followed in October 2011 by a second questionnaire designed to collect more detailed information regarding network performance and the evidence base. Each questionnaire contained 20 questions based on the framework for network performance evaluation proposed by Wootton et al.\(^1\) This framework takes into account the perspectives of the three main user groups – requesters (i.e. physicians requesting advice on the management of difficult cases), coordinators (i.e. network managers) and experts (i.e. those who respond to the electronic referrals) – and it identifies five performance measures of relevance to each of the three user groups. A third questionnaire was sent in February 2012 to obtain information about governance, liability and confidentiality.

Data summary
From the responses to the questionnaire, a list of the scientific papers describing the work of each network was compiled. Only papers listed in Medline and dealing with telemedicine services were included in the analysis. To summarize their contents, one author extracted information from each published paper on the following: (1) study design; (2) effectiveness; (3) quality; (4) economics; (5) provision of access to care, and (6) sustainability.

A second author, working independently, then graded each point. Study design was assessed using the nine-point scale traditionally employed to measure the strength of the evidence.\(^5\) For convenience, the nine levels were converted into a quality score (1 = poor, 2 = average, 3 = good), where levels I–III were considered good, IV–VI average, and VII–IX poor. The other five topics were graded subjectively and assigned a quality score based on the amount of information provided about them (0 = none, 1 = poor, 2 = average, 3 = good). Finally, the results were reviewed by all authors and changed by consensus where necessary. Hence, the papers from each network were reviewed by all the other networks, and this increased the consistency of the results.

Results

<table>
<thead>
<tr>
<th>Network</th>
<th>Main purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa Teledermatology Project</td>
<td>Teledermatology in Africa</td>
</tr>
<tr>
<td>ITM Telemedicine</td>
<td>Advice for health-care workers treating HIV infection in Africa</td>
</tr>
<tr>
<td>Pacific Island Health Care Project (PIHCP)</td>
<td>Second opinions for Pacific Islanders health-care providers</td>
</tr>
<tr>
<td>Partners Online Specialty Consultations</td>
<td>Second opinions for rural clinics in Cambodia</td>
</tr>
<tr>
<td>RAFT</td>
<td>Health staff education in French-speaking African countries</td>
</tr>
<tr>
<td>Swinfen Charitable Trust</td>
<td>Second opinions for physicians in developing countries</td>
</tr>
<tr>
<td>Teletrauma</td>
<td>Advice on trauma care advice in the Ukraine</td>
</tr>
</tbody>
</table>

HIV, human immunodeficiency virus; ITM, Institute of Tropical Medicine; RAFT, Réseau en Afrique Francophone pour la Télémédecine.

Four of the five networks delivering tele-education provided detailed information about their activities. Three networks delivered tele-education via asynchronous methods such as computer-based learning or web-based discussion forums. Two networks also used synchronous tele-education delivered through videoconferencing. Educational activities were offered by all the telemedicine networks delivering tele-consultations in specialty areas. Consistent with the clinical activities,
tele-education was offered for trauma, dermatology and HIV/AIDS case management.

Organizational models were investigated through questions regarding the three main user groups. The number of requesters gives an idea of the size of each network and ranged from 10 to over 500. The number of requesters was loosely associated with the range of clinical services provided but not with the duration of network operation. The number of referring sites ranged from 4 to 399, and the number of countries ranged from 1 to 58. The number of sites and countries where requesters were based was roughly proportional to the number of requesters. Methods of requester accreditation – the licensing necessary to perform a clinical consultation – were different between the seven telemedicine networks, as detailed in Table 2. Three of the networks had a formal requester accreditation process; others used a more informal mechanism, consisting, for example, of personally knowing the physicians involved. One network claimed to have no requester accreditation process at all.

The smallest network had a total of 15 experts and the largest had 513. The number of sites where these were located varied greatly, from 1 to 502, and the number of countries ranged from 1 to 22. Differences in organizational models were evidenced by the large differences in the number of physicians using the telemedicine networks. One network indicated that not all requesters and experts were active because of constant staff turnover. This was not surprising, especially for big networks registering hundreds of physicians. All seven telemedicine networks had experts based in other industrialized countries. Two networks also had experts located in the countries where the requesters were based, and one network had experts from other developing countries. All the telemedicine networks had a process for accrediting the experts, as detailed in Table 2. Methods of accreditation included state licensure, formal credentials, clinical experience and training. Finally, in six telemedicine networks the experts were working as volunteers. Only two networks paid experts for the time they spent delivering tele-consultations.

The management of requests and the selection of the experts responsible for answering them were done by a coordinator in six of the seven networks. Thus, the coordinator appears to be a key element of the networks’ organizational model. In one network, this activity was performed entirely by the requesters themselves, whereas in another network the requesters were supported in the process by a coordinator. The coordinators and the experts were funded differently; in three of the seven networks coordinators were volunteers, whereas in the other four networks they were paid for their time.

Network performance

Network activity ranged from 50–400 tele-consultations per year. In 2010, the networks managed an average of 209 cases. In 2006–2011, three networks showed a positive trend over the 5-year period, three showed a negative trend, and one showed stable activity. On average, network activity increased by about 10% each year.

The average time to first reply to a request is an important performance measure affecting the value of the clinical tele-consultations to the referrer. Estimates from the last 12 months of operation showed that most networks took an average of 24 hours (range: 5.6–72 hours) to provide a first reply to a request. Unanswered replies to requests in 2010 were very few, particularly compared with network activity. Moreover, some requests could not be processed; in some cases, for instance, inadequate images were submitted and the referrer was unable to provide satisfactory alternatives. Overall, almost all requests were answered promptly, i.e. within 48 hours. Another performance measure is the possibility of a dialogue between requesters and experts. This feature was available for all seven telemedicine networks. On the other hand, the experts were not always informed of individual patient outcomes. In 2010, the number of cases managed by a network whose individual outcomes were fed back to experts varied from none in some networks to all in others.

Little quantitative data were available on the educational activities conducted by the telemedicine networks since their establishment. Data from the RAFT [Réseau en Afrique Francophone pour la Télémédecine] network in sub-Saharan Africa showed an increase in the number of hours of tele-education delivered each year. The telemedicine network of the Institute of Tropical Medicine (ITM) in Antwerp, Belgium, offered online learning and web-based discussion forums, but contact hours could not be quantified.

Scientific output

By the time of the survey, the seven networks had published a total of 59 papers; 44 that dealt with telemedicine and that were indexed in Medline were included in the present study. The scientific output represented by the 44 papers is summarized in Table 3. Information about study design was available for all papers. In particular, 29 papers represented non-controlled clinical series, with the number of patients observed ranging from a dozen to about 2000. The remaining 15 papers were anecdotes or case reports. Thus, all papers provided evidence classified as poor in strength. Evidence pertaining to programme sustainability and improved access to care was provided by more than half of the papers. One fourth of them also covered quality and effectiveness, while only a few provided any evidence on network economics. Overall, the quality of the scientific output was poor to average.

Other factors

Other factors relevant to the operation of each telemedicine network are summarized in Table 4, available at: http://www.who.int/bulletin/volumes/90/5/11-099143. Although governance varied across the seven networks as a function of differences in organizational models and contexts, medical liability and patient confidentiality were handled in similar ways. The factors concerning sustainability were generally different between networks, and included institutional anchoring, organizational models, technical and clinical solutions, clinical quality and benefits to patients, exit strategy, technology and funding. Uncertainties in funding were a common risk factor. Others had to do with the availability of coordinators, the training of experts, a lack of infrastructure and equipment and similar problems. Questionnaire respondents gave their views about the future plans of their telemedicine networks. These were similar across networks and had to do primarily with expansion to other countries and with the engagement of additional experts. Collaboration with other telemedicine networks was also listed as a feasible and useful plan for the future.
Table 3. Quality of the scientific output of the telemedicine networks delivering humanitarian services, based on 44 papers

<table>
<thead>
<tr>
<th>Measure</th>
<th>Study design</th>
<th>Effectiveness</th>
<th>Quality</th>
<th>Economics</th>
<th>Access to care</th>
<th>Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of papers providing evidence</td>
<td>44</td>
<td>11</td>
<td>14</td>
<td>6</td>
<td>28</td>
<td>25</td>
</tr>
<tr>
<td>Median quality score*</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Range of quality scores</td>
<td>1–1</td>
<td>1–2</td>
<td>1–2</td>
<td>1–2</td>
<td>1–2</td>
<td>1–2</td>
</tr>
</tbody>
</table>

* 0 = none; 1 = poor; 2 = average; 3 = good

Discussion
The present study summarizes the experience gained to date with existing telemedicine networks that deliver humanitarian services. All of the seven well-established, long-standing networks studied provided reasonable evidence that they were improving access to care in the developing world. However, the overall quality of the scientific output emanating from these networks is still rather weak. This applies to study design and to the evaluation of other important parameters, including effectiveness, service quality and economics. Stronger evidence is therefore needed to increase the appropriate use, scale and impact of telemedicine in resource-limited settings. This need for stronger evidence underscores that more and better evaluations need to be conducted. Given their size and relative success, long-running telemedicine networks should be the subject of controlled evaluations in future.

Another relevant finding from the study pertains to network performance. Measuring the performance of a telemedicine network is essential for understanding whether the network is working as intended or having the desired effect. By adapting a recently developed framework for network performance evaluation, we documented the seven telemedicine networks’ performance and the services they provided. Differences in services and performance could be explained by different organizational models.

Notwithstanding the use of different organizational models, clinical case load was strikingly similar across networks: all seven networks were providing only a few hundred teleconsultations annually. This activity level may stem from the fact that the networks are run by a single individual or a small number of committed enthusiasts or “clinical champions.” Since the present networks collectively appear to meet only a tiny fraction of the potential demand from the developing world, one may wonder why their activity levels are not increasing rapidly. Although the reasons could be many, small-scale organizational models may be one. Future work might therefore be directed at investigating new organizational models that would facilitate large-scale network operation. Improved collaboration between existing networks may prove beneficial as well, since it would attenuate the lack of resources reported by some networks and improve sustainability.

The findings of the present study have two main implications. First, telemedicine networks delivering humanitarian services appear to be sustainable – at least as operated to date – and they deliver clinically useful services. Second, the evidence summarized in this paper, albeit weak, may be useful to decision-makers. It may, for instance, encourage ministries of health in developing countries to establish, support or join similar telemedicine networks.

The present study has several limitations. For one thing, the list of networks studied may not be exhaustive; other long-running telemedicine networks around the world may also be delivering humanitarian services. However, we believe that we have covered the main active networks. Furthermore, the study was not a systematic review and the assessment of the quality of the scientific studies emanating from the networks was necessarily subjective. Moreover, we examined only successful networks (and arguably, experience from unsuccessful networks may be equally informative). Finally, the experience of the telemedicine networks was reviewed by people responding on behalf of the networks and may reflect reporting bias.

The present study emphasizes the need to generate stronger evidence and more and better evaluations of telemedicine networks and their effectiveness in improving outcomes and access to health care. Future research should address these topics. Nonetheless, the present study provides reasonable grounds for supporting the future expansion of telemedicine networks offering humanitarian services in developing countries.

Acknowledgements
We are grateful to our colleagues in the various networks for their willingness to share the data about network operation.

Competing interests: None declared.
Research

Telemedicine networks delivering humanitarian services

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Summary

Objectives To synthesise the experience, performance and scientific output of humanitarian telemedicine networks in operation for five years or more.

Methods A total of nine humanitarian telemedicine networks were identified, of which seven gave detailed information on their activities, including performance and scientific output. Information was extracted from peer-reviewed research papers describing the networks’ designs, effectiveness, quality, economic impact, access to healthcare and sustainability. The robustness of the evidence was evaluated by means of a five-point scale: none, low, medium, high, acceptable.

Results The seven networks were operational for an average of 11 years (range 5–15 years). All networks provided clinical teleconsultations for humanitarian purposes using delayed data storage and transmission, five of them also included some form of education. The smallest network counted 15 experts, the largest more than 500. The annual clinical load varied from 50 to 500 cases. In total, 59 research papers were published by these networks, of which 44 were listed in Medline. The evidence, based on study design, was generally of low quality according to conventional standards (29 papers described uncontrolled clinical series). More than half of the papers provided evidence of sustainability and improvements in access to care. Uncertainty regarding funding was a common risk factor.

Conclusions Improved collaboration between networks could help to alleviate the resource shortages reported by some papers, while improving sustainability. Although the evidence base was weak, the networks appear to provide sustainable and clinically useful services. These results could interest policymakers in developing countries considering launching, supporting or joining similar telemedicine networks.

Résumé

Réseaux de télémédecine à long terme offrant des services humanitaires : expérience, performances et production scientifique

Objectif Synthétiser l’expérience, les performances et la production scientifique des réseaux de télémédecine à long terme offrant des services humanitaires.

Méthodes Neuf réseaux à long terme opérant depuis cinq ans ou plus ont été identifiés et sept d’entre eux ont fourni des informations détaillées sur leurs activités, notamment sur leurs performances et leur production scientifique. Les informations ont été extraites de revues évaluées par des pairs, décrivant les réseaux aux niveaux plan d’étude, efficacité, qualité, économie, offre d’accès aux soins et durabilité. La solidité des preuves a été évaluée comme suit : nulle, faible, moyenne ou bonne.

Résultats Les sept réseaux étaient opérationnels depuis en moyenne 11 ans (nombre variant de 5 à 15 ans). Tous les réseaux fournissaient des téléconsultations cliniques à des fins humanitaires au moyen de méthodes d’enregistrement et de retransmission, et cinq d’entre eux étaient aussi impliqués dans une certaine forme d’éducation. Le réseau le plus petit comptait 15 experts, et le plus large, plus de 500. La charge de travail clinique allait de 50 à 500 cas par an. Au total, 59 revues avaient été publiées par les réseaux, dont 44 étaient répertoriées dans Medline. La solidité des preuves, basée sur le plan d’étude, était généralement moyenne selon les normes conventionnelles (par exemple, 29 revues ne mentionnaient pas de méthodes statistiques contrôlées). Plus de la moitié des revues ont prouvé la durabilité et une amélioration de l’accès aux soins. Le financement incertain représentait un facteur de risque courant.

Conclusion Une collaboration améliorée entre les réseaux pourrait aider à atténuer le manque de ressources signalé par certaines revues et à améliorer la durabilité. Malgré la faiblesse de la base de données, les réseaux semblent offrir des services durables et cliniquement utiles. Ces résultats pourraient intéresser les décideurs des pays en voie de développement quant au lancement, à la prise en charge ou à l’association de réseaux de télémédecine similaires.

Резюме

Действующие продолжительное время телемедицинские сети, предоставляющие гуманитарные услуги: опыт, эффективность и научные результаты

Цель Подвести итоги, включающие в себя опыт, эффективность и научные результаты действующих продолжительное время телемедицинских сетей, предоставляющих гуманитарные услуги.

Методы Из девяти сетей, действующих продолжительное время (пять лет и более), семь предоставили подробную информацию о своей деятельности, включая эффективность и научные результаты. Информация была получена из рецензируемых научных статей, описывающих изучение конструкции сетей, эффективность, качество, экономические показатели, а также предоставление доступа к медицинской помощи и надежность работы. Достоверность предоставленных фактов была оценена по следующей шкале: отсутствует, низкая, средняя, высокая.

Результаты Семь сетей функционируют в среднем на протяжении 11 лет (диапазон 5–15 лет). Все сети предоставляли клинические телеконсультации с целью оказания гуманитарных услуг, используя методы с промежуточным хранением данных, а
Resumen

Redes de telemedicina de larga trayectoria que ofrecen servicios humanitarios: experiencia, rendimiento y resultados científicos

Objetivo
Resumir la experiencia, el rendimiento y los resultados científicos de las redes de telemedicina de larga trayectoria que ofrecen servicios humanitarios.

Métodos
Se identificaron nueve redes de larga trayectoria (aquellas que llevaban 5 años o más en funcionamiento). Siete de estas redes proporcionaron información detallada sobre sus actividades, incluyendo aspectos como el rendimiento y los resultados científicos. La información se extrajo a partir de documentos con revisores externos que describían el diseño de estudio de las redes, así como su efectividad, calidad, economía, acceso a la asistencia y sostenibilidad. La solidez probatoria se clasificó como nula, baja, normal o buena.

Resultados
Las siete redes llevaban una media de 11 años en funcionamiento (intervalo: 5–15). Todas las redes proporcionaban teleconsultas clínicas con fines humanitarios utilizando métodos de almacenamiento y transmisión. Cinco de ellas también estaban implicadas en alguna forma de educación. La red más pequeña contaba con 15 expertos, frente a los más de 500 de la red más grande. El número de casos anuales fue de entre 50 y 500. Las redes han publicado un total de 59 documentos, 44 de ellos están recogidos en Medline. En base al diseño del estudio, la solidez probatoria fue en general baja para los estándares convencionales (por ejemplo, 29 documentos describían series clínicas no controladas). Más de la mitad de los documentos evidenciaron la sostenibilidad y el acceso mejorado a la asistencia. Las redes parecen ofrecer servicios sostenibles y clínicamente útiles. Estos resultados pueden ser interesantes para los responsables políticos en países en vías de desarrollo, para la puesta en marcha, el apoyo o la adhesión a redes de telemedicina similares.

References
44. Vassallo DJ. A guide to sending e-mail telemedicine referrals. Trop Doct 2003;33:34–5. PMID:15685219

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Research


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Table 2. General information about the telemedicine networks delivering humanitarian services

<table>
<thead>
<tr>
<th>Information</th>
<th>Africa Teledermatology Project</th>
<th>ITM Telemedicine</th>
<th>Pacific Island Health Care Project</th>
<th>Partners Online Specialty Consultations</th>
<th>RAFT</th>
<th>Swinfen Charitable Trust</th>
<th>Teletrauma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities provided</td>
<td>Clinical/educational</td>
<td>Clinical/educational</td>
<td>Clinical/educational</td>
<td>Clinical/educational</td>
<td>Clinical/educational</td>
<td>Clinical/educational</td>
<td>Clinical/educational</td>
</tr>
<tr>
<td>Clinical specialties offered</td>
<td>Dermatology</td>
<td>HIV/AIDS</td>
<td>All specialties</td>
<td>All specialties</td>
<td>All specialties</td>
<td>All specialties</td>
<td>Trauma, orthopaedics, neurosurgery</td>
</tr>
<tr>
<td>Equipment purchase and maintenance</td>
<td>Support from the American Academy of Dermatology and the Commission for Development Studies, Austrian Academy of Sciences</td>
<td>Belgian Development Cooperation for web site maintenance and education of participants based in resource-limited settings</td>
<td>US$ 250 000 start-up grant. Continued funding as part of core budget in jurisdictions and the TAMC</td>
<td>Revenue from other sites, block grant from Partners HealthCare</td>
<td>Financed by the network for 2 years, then by local funds</td>
<td>Charitable funds</td>
<td>State budget for the hospitals</td>
</tr>
<tr>
<td>Educational activities</td>
<td>Technology used in tele-education</td>
<td>Computer-based learning</td>
<td>Computer-based learning</td>
<td>–</td>
<td>Audio computer-based learning</td>
<td>–</td>
<td>Audio, video</td>
</tr>
<tr>
<td></td>
<td>Modality used in tele-education</td>
<td>Asynchronous</td>
<td>Asynchronous</td>
<td>–</td>
<td>Both synchronous and asynchronous</td>
<td>–</td>
<td>Synchronous</td>
</tr>
<tr>
<td></td>
<td>Clinical specialties offered</td>
<td>Dermatology</td>
<td>HIV/AIDS</td>
<td>–</td>
<td>All specialties</td>
<td>–</td>
<td>Trauma</td>
</tr>
<tr>
<td>Requesters</td>
<td>No. of requesters</td>
<td>Hundreds registered; approximately 50 actively submitting</td>
<td>Approximately 400</td>
<td>More than 300</td>
<td>10</td>
<td>More than 500</td>
<td>403</td>
</tr>
<tr>
<td></td>
<td>No. of requesting sites</td>
<td>About 80</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>More than 50</td>
<td>399 (not all are active)</td>
</tr>
<tr>
<td></td>
<td>No. of countries</td>
<td>15</td>
<td>42</td>
<td>9</td>
<td>1</td>
<td>15</td>
<td>58</td>
</tr>
</tbody>
</table>
(continues ...)
### Telemedicine networks delivering humanitarian services

**Research**

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<table>
<thead>
<tr>
<th>Information</th>
<th>Africa Teledermatology Project</th>
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<th>RAFT</th>
<th>Swinen Charitable Trust</th>
<th>Teletrauma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accreditation of requesters</td>
<td>Someone in the network knows them personally</td>
<td>Alumni of the SCART/eSCART course; physicians working in resource-limited settings for international organizations; manual approval of a membership</td>
<td>Approval by the medical director based on recommendations of ministers/secretaries of health and local laws and regulations of jurisdictions</td>
<td>None</td>
<td>Verification of credentials by local coordinator</td>
<td>Known personally to someone on the board or to a third party known by them</td>
<td>Have to be physicians (service not for the patients directly)</td>
</tr>
<tr>
<td>Experts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of experts</td>
<td>25</td>
<td>6</td>
<td>100</td>
<td>30</td>
<td>50</td>
<td>513</td>
<td>502 (not all are active)</td>
</tr>
<tr>
<td>No. of expert sites</td>
<td>Approximately 20</td>
<td>1</td>
<td>14</td>
<td>15</td>
<td>20</td>
<td>513</td>
<td>502 (not all are active)</td>
</tr>
<tr>
<td>No. of countries</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Location of experts</td>
<td>Same country that the requests are from; other industrialized countries</td>
<td>Other developing countries; other industrialized countries</td>
<td>Other industrialized countries</td>
<td>Other industrialized countries</td>
<td>Other industrialized countries</td>
<td>Other industrialized countries</td>
<td>Same country where the requests are from; other industrialized countries</td>
</tr>
<tr>
<td>Accreditation of experts</td>
<td>Experience in dermatology in the developing world. Internal review of experts. Training</td>
<td>Linked with institutional collaborations; relevant work experience in resource-limited settings</td>
<td>Selected and approved by the medical director, vetted by the Surgeon General of the US Army, credentialed by TAMC, certified by the American Boards of Medical Specialists, and licensed by at least one of the 50 states in the USA</td>
<td>Practising physicians within the network subject to rules and accreditation requirements by the State of Massachusetts</td>
<td>Verification of credentials by local coordinator</td>
<td>Known personally to someone on the board or to a third party known by them</td>
<td>No special requirements; clinical experience in special questions and scientific degree</td>
</tr>
<tr>
<td>Funding of experts</td>
<td>The consultants are volunteers</td>
<td>The consultants are volunteers</td>
<td>The consultants are volunteers</td>
<td>The consultants are volunteers</td>
<td>The consultants are volunteers</td>
<td>The consultants are volunteers</td>
<td>The network pays for their time</td>
</tr>
<tr>
<td>Coordinators</td>
<td>Management of requests and selection of experts</td>
<td>Made by requesters</td>
<td>Made by a coordinator</td>
<td>Made by both requesters and a coordinator</td>
<td>Made by a coordinator</td>
<td>Made by a coordinator</td>
<td>Made by a coordinator</td>
</tr>
<tr>
<td>Funding of coordinators</td>
<td>The coordinators are volunteers</td>
<td>The network pays for their time</td>
<td>The network pays for their time</td>
<td>The network pays for their time</td>
<td>The network pays for their time</td>
<td>The network pays for their time</td>
<td>The network pays for their time</td>
</tr>
</tbody>
</table>

AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus; ITM, Institute of Tropical Medicine; RAFT, Réseau en Afrique Francophone pour la Télémédecine; SCART, short course on antiretroviral treatment; TAMC, Tripler Army Medical Center; USS, United States dollars.
### Table 4. Other features of the telemedicine networks delivering humanitarian services

<table>
<thead>
<tr>
<th>Factor</th>
<th>Africa Teledermatology Project</th>
<th>ITM Telemedicine Project</th>
<th>Partners Online Specialty Consultations</th>
<th>RAFT Swinfen Charitable Trust</th>
<th>Teletrauma</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Governance</strong></td>
<td>Site managed by a core group. IT support from the Medical University of Graz; clinical work from Carrie Kovarik</td>
<td>Funding for the project was obtained through a grant from the Directorate General for Development Cooperation</td>
<td>The project was established in 1990 by TAMC and is sponsored by the US Congress. It is codified in Federal Law and governed by a medical director</td>
<td>The network is managed by the Center for Connected Health, a non-profit teaching hospital. There are two dedicated coordinators and one corporate manager</td>
<td>General management is by the Regional Trauma Hospital. The methods are according to the Ukrainian Telemedicine and E-Health Development NGO</td>
</tr>
<tr>
<td><strong>Medical liability</strong></td>
<td>Reliance on the “Good Samaritan” clause; liability not completely eliminated</td>
<td>Experts belong to the ITM or partner institutions</td>
<td>Consultants are located at TAMC, and are licensed, credentialed and vetted. Requesters have liability until patients arrive at TAMC</td>
<td>Physicians sign a terms and conditions statement when referring patients to the network</td>
<td>It is a not-for-profit telemedicine service. United Kingdom medical insurers cover doctor-to-doctor advice according to the so-called “Good Samaritan” clause</td>
</tr>
<tr>
<td><strong>Patient confidentiality</strong></td>
<td>Data held on a secure server; access to cases only permitted by requesters and experts. Use of full-face photos, names or dates of birth is discouraged. Patient consent is obtained</td>
<td>Referrers sign a “policies agreement” and a disclaimer is made available on the web site. The second-opinion advice is free of charge</td>
<td>Patient Referral Form; informed consent document. Data are stored in a secure, password protected database. HIPAA rules, privacy impact statements and Privacy Act System of Record Notice</td>
<td>Data are uploaded to a secure web site. An encryption service is used for e-mails</td>
<td>Data are stored on a secure, password-protected server, and can only be accessed via encrypted connections</td>
</tr>
<tr>
<td><strong>Sustainability factors</strong></td>
<td>Motivation, personal relationship and trust of requesters and experts</td>
<td>Institutional project</td>
<td>Provision of travel and definitive medical care for indigenous persons at no cost to the patient or to the jurisdiction; funding included in core budget to support graduate medical education</td>
<td>Teleconsultations are also commercially available to patients in other developed countries. This produces the financial margin necessary to sustain this programme in Cambodia</td>
<td>Core group of retired/semi-retired board members</td>
</tr>
<tr>
<td><strong>Risk factors and challenges</strong></td>
<td>Work on minimal funding but need of some continued funding for web site maintenance</td>
<td>Linkage to other institutions in the field</td>
<td>Lack of infrastructure, technical and medical expertise, deteriorating equipment. Inadequate financial resources; inadequate administrative, logistical, and ancillary support</td>
<td>Market demand in developing countries; capacity to offer free consultations to patients in Cambodia; lack of training of local experts in Cambodia</td>
<td>Clear technical and organization solutions; clear methodology of clinical usage; quality of recommendations</td>
</tr>
</tbody>
</table>

(continues ...)
Research
Telemedicine networks delivering humanitarian services

<table>
<thead>
<tr>
<th>Factor</th>
<th>Africa Teledermatology Project</th>
<th>ITM Telemedicine</th>
<th>Pacific Island Health Care Project</th>
<th>Partners Online Specialty Consultations</th>
<th>RAFT</th>
<th>Swinfen Charitable Trust</th>
<th>Teletrauma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future plans</td>
<td>Reach new locations and countries; engage the few dermatologists in the African countries where consults are provided to become experts; expand the educational activities</td>
<td>Collaboration with other networks, under an international umbrella</td>
<td>Continue to improve access to care, expedite referrals/consultations, and continue to mine the PIHCP database for education and training</td>
<td>Train local experts to take over tiers 1 and 2 of severity of incoming requests, expand to other countries (China, India), with local non-profit partners</td>
<td>Expand within countries to reach district hospitals throughout Africa (as well as pilot projects in Latin America)</td>
<td>Become part of a network of networks</td>
<td>Telemedicine has to be introduced into clinical protocols in trauma and orthopedics</td>
</tr>
</tbody>
</table>

HIPAA, Health Insurance Portability and Accountability Act; ITM, Institute of Tropical Medicine; NGO, nongovernmental organization; PIHCP, Pacific Island Health Care Project; RAFT, Réseau en Afrique Francophone pour la Télémedecine; TAMC, Tripler Army Medical Center.