

# ► Telemedicine by email in remote Cambodia

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## Summary

An email-based telemedicine service was implemented in two remote village communities in Cambodia. Volunteer physicians at the Brigham and Women's Hospital, Massachusetts General Hospital and the Sihanouk Hospital Center of Hope in Phnom Penh provide monthly consultations to the local clinicians. Between February 2001 and May 2005, there were 469 teleconsultations. The 214 telemedicine cases involving new patients managed in the first 28 months were reviewed. The mean duration of the chief complaint at the initial patient visit was 37 months for the first six months and had dropped to eight months by the end of the study period. Of 63 adult patients surveyed, all were either satisfied (54%,  $n = 34$ ) or very satisfied (46%,  $n = 29$ ) with their experience in the telemedicine clinic. About 78% ( $n = 49$ ) were willing to pay, on average, US\$0.63 for their visits. The introduction of basic point-of-care laboratory testing in November 2004 was associated with a reduction in patients requiring off-site referral for completion of laboratory testing (69% before to 35% afterwards,  $P < 0.001$ ). The success of the pilot telemedicine programme confirms the value of email support for non-physician health-care workers in the developing world.

## Introduction

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Cambodia ranks among the lowest countries in the world in terms of human development and wealth. There are great disparities in access to health-care services, particularly for those in rural areas, where approximately 40% of the population live below the poverty line.<sup>1</sup> Information and communication technologies (ICTs) such as email offer great potential to improve health-care delivery, but there are also unique challenges.<sup>2,3</sup>

Operation Village Health is a project that aims to improve health-care delivery in remote regions of Cambodia. It is led by Partners Telemedicine in collaboration with two non-profit-making organizations, the Sihanouk Hospital Center of Hope and American Assistance for Cambodia. The project employs email for provider-to-provider consultations for two village communities in the provinces of Preah Vihear and Ratanakiri.

Telemedicine activities occur at both sites. The present paper concerns telemedicine at the health centre in the village of Th'naut Malou, in the Rovieng district of the Preah Vihear province (Figure 1). The health centre serves approximately 4000 villagers in a region which has no mobile or conventional telephone infrastructure, running water or public transport. Electricity is supplied by solar panels and generators, albeit intermittently. Despite these

limitations, Internet connectivity has been available for the past five years to a nearby school through donated satellite services (valued at US\$285 per month) and provided by a Thai telecommunications company. It is through this infrastructure that Operation Village Health operates.

Once a month, a Cambodian nurse leaves the capital city of Phnom Penh with a driver for the 5–7 h trip to the health centre in Rovieng. The nurse is equipped with a digital camera, stethoscope, otoscope and donated medications. Patients are triaged at the health centre and those deemed appropriate and who give consent receive a teleconsultation. Patient assessments are documented and transcribed into English, and are sent via email with relevant clinical images to volunteer consultants at the Sihanouk Hospital in Phnom Penh and at Partners Telemedicine in Boston. Cases are reviewed and recommendations are returned by email within 12 h to the Cambodian nurse.

The service began in February 2001.

## Methods

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Two reviews were conducted.

## Clinical

The 214 telemedicine cases involving new patients from February 2001 to June 2003 were reviewed. Intermediate outcomes were examined, including the number of patient transfers to off-site facilities and the average

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Figure 1 Location of Operation Village Health

duration of chief complaint among newly presenting patients. In addition, a random sample of patients was retrospectively surveyed using a questionnaire examining patient satisfaction and willingness to pay.<sup>4</sup>

## Operational

In November 2004, equipment for six diagnostic tests was made available for discretionary use by the local nurse, as well as directed use according to recommendations by physicians consulting via telemedicine. The tests were: haemoglobin, glucose, urine analysis, urine pregnancy, stool occult blood and group A streptococcus. The proportion of telemedicine cases that included laboratory testing and the proportion of laboratory tests requiring completion off-site were examined retrospectively. Comparisons were made between the 57 telemedicine patient encounters occurring from November 2004 to March 2005 and the 119 telemedicine patient encounters occurring between October 2003 and October 2004, which served as unmatched historical control cases.

In addition, site visits were made by Partners Telemedicine staff in November 2003 and November 2004 to evaluate operations qualitatively. Interviews and passive observation were used to identify potential obstacles to efficiency and provider adoption. A convenience sample of participating Boston-based consulting physicians was also queried via email and telephone about perceived programme weaknesses.

## Results

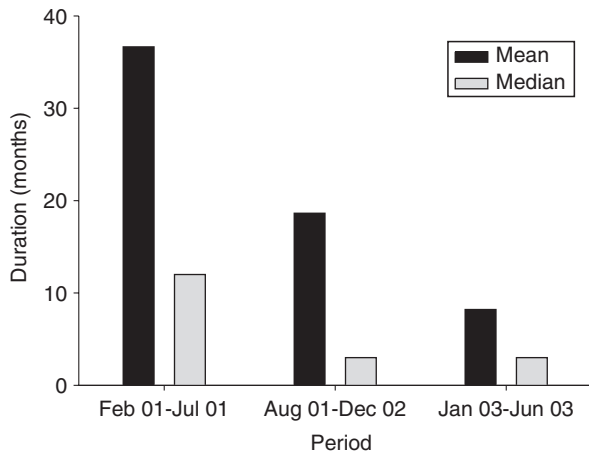
### Clinical

A total of 469 teleconsultations were carried out from 15 February 2001 to 30 May 2005. The mean duration of the chief complaint at the initial patient visit was 37 months for the first six months of the study period. This dropped to eight months by the end of the study period (Figure 2).<sup>4</sup> Similarly, the proportion of patients referred for care at other facilities decreased by 51% per year of clinic operation (95% confidence interval 27–75%;  $P < 0.001$ ) (Figure 3).

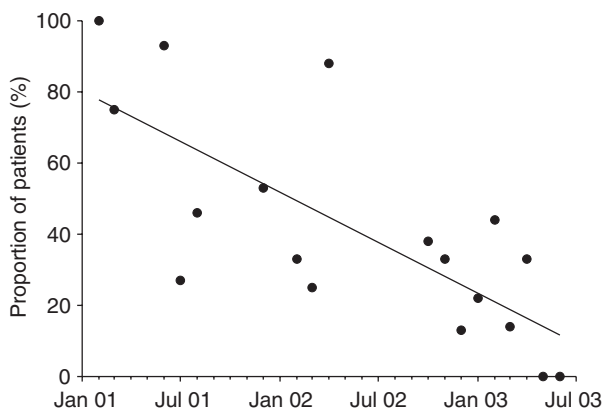
Of 63 adult patients surveyed, all were either satisfied (54%,  $n = 34$ ) or very satisfied (46%,  $n = 29$ ) with their experience in the telemedicine clinic. About 78% ( $n = 49$ ) were willing to pay, on average, US\$0.63 for their visits.

### Operational

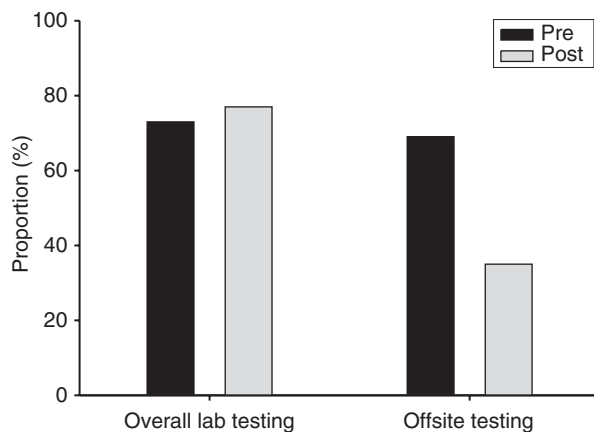
Preliminary data from the patient encounters after laboratory testing was introduced showed that the overall proportion of encounters receiving laboratory testing had not increased (Fisher's exact test,  $P = 0.71$ ) (Figure 4). Conversely, the proportion of all encounters that required off-site referral for completion of laboratory testing decreased significantly from an average of 69% to 35% ( $P < 0.001$ ).



**Figure 2** Duration of patients' primary chief complaint at initial visit, during three phases of the study period. (Redrawn with permission from *Telemed J E Health* 2005;11(1), published by Mary Ann Liebert, Inc.)



**Figure 3** Proportion of patients referred off-site for care during the study period. (Redrawn with permission from *Telemed J E Health* 2005;11(1), published by Mary Ann Liebert, Inc.)



**Figure 4** Overall laboratory testing per patient encounter and percentage of all laboratory testing requiring off-site completion (pre-intervention versus post-intervention)

The interviews, observations and informal enquiries identified several operational challenges as important for capacity building and sustainability. These included:

- increased emphasis on clinician education,
- quality assurance of local patient assessments and consultant responses,
- improved efficiency of documentation and transcription of patient encounters,
- improved information management through use of a networked database and electronic medical records,
- improved provider satisfaction and adoption.

## Discussion

The results of the present study suggest that the decrease in duration of chief complaint among initial patient visits was a benefit of telemedicine. The decrease in referrals to off-site facilities was probably the result of improved communications between the local provider and consultants, and increased local provider independence (i.e. there was a learning effect). However, the decrease in referrals may also have reflected other factors, such as less severe illness among clinic patients over time (and therefore less need to transfer patients), and the growing practice of sending blood for testing to the laboratory at Sihanouk Hospital in Phnom Penh (rather than transferring the patients themselves). The introduction of point-of-care testing appeared to improve the ability to manage patients locally and reduce the need for transfer. In the long term, the value of telemedicine centres on the ability to educate local health-care providers. Increased local capacity occurs through knowledge transfer from the telemedicine providers. The patient survey indicated broad satisfaction and a willingness to pay for telemedicine.

Telemedicine initiatives in the developing world face a number of challenges, and have gained the attention of international agencies such as the World Health Organization.<sup>5,6</sup> Strategies for integrating these initiatives into existing health systems require a collaborative approach, the identification of best practices and well designed trials.<sup>7</sup> Operation Village Health is an example of such an approach.

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## ► Difficulties in moving routine medical checks from the specialist level to the general practitioner level

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### Summary

We began a project to move routine medical checks for appropriate patients from the specialist level to the patient's normal general practitioner (GP). The GP's analysis and conclusions would be checked by the specialist, using electronic messaging. The idea for the project came from the top level of the regional health authority. Despite that, the project was closed down before pilot testing began. We used stakeholder theory as a post-project evaluation to analyse what happened and where it went wrong. A common mistake in project planning is to focus the planning effort on system tasks and not to pay attention to a well-thought-out handling of the project's stakeholders. This was what happened in our project. Ideal objectives and good political intentions are not enough to implement a new e-health service.

### Introduction

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Many routine medical checks that are performed by specialists in hospital outpatient clinics could be done by the patient's normal general practitioner (GP). In principle, the GP's analysis and conclusions could be checked by the specialist, using electronic messaging. This idea was initiated from the top level in the Northern Norway Regional Health Authority. There were several good reasons for this approach:

- to reduce long waiting lists to see specialists;
- to achieve better cooperation between primary care and the specialist level, using existing infrastructure for electronic message exchange;
- to reduce patients' travelling time and cost.

The project, as proposed, defined a service that was opposite to conventional telemedicine projects, where the GP 'orders' a telemedicine consultation from a specialist. In the present case, it was the specialist who would order a specific consultation to be performed by the GP.

The challenges in the project were not technological, since usually it is not technology issues that undermine a project – it is everything else.<sup>1</sup> The problems encountered were related to the selection of an appropriate illness group and the corresponding specialist department, to find the GP offices belonging to the hospital and at a certain distance from the hospital, and for each GP to identify individual patients with a suitable clinical picture. After the first selection, we ended up with one specialist department (A in Table 1) and 23 GPs from 10 different health centres. It turned out to be more difficult to retain the specialist department and subsequently to recruit a new one (B or C). In the end, this was the main reason why the project was terminated without running a pilot test.

A common mistake in project planning is to focus the planning effort on work tasks and not to pay attention to handling the project's stakeholders.<sup>2</sup> This was also the case

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