**Telemedicine**

Telemedicine applications had by far the largest number of evaluations. 11 of these were qualitative, descriptive or case-control studies, four were quantitative and had a control group and two of these were RCTs. In the 11 non-control group studies, the case-control studies suggest that telemedicine can provide the correct treatment initially,¹ keep patients from having to return to the hospital,² and reduce the length of chief complaints.³ ⁴ Physicians’ opinions in general show that teleconsultation systems provide additional confidence that they are making the correct diagnoses⁵ and improved their case management.⁶ The two patient surveys also show that patients feel the system enables better care³ ⁴ ⁷ or they are willing to pay a fee for its service.³ ⁴

Four studies looked at the cost of these systems. One study cataloged the costs to set up a simple remote consultation system through email.⁸ The two cost analyses found that telemedicine systems were able to decrease overall costs to the health care system by assuming that patients would not have to be taken to an ICU⁹ or by a comparison of pre- and post-implementation activities.¹⁰ Finally, a cost-effectiveness study looked at the technological transfer of teleophthalmology services from the UK to South Africa and found these new services could be provided in South Africa for £53 per DALY averted.¹¹ The three cost or cost analysis studies are limited in their scope since they did not include the cost of the physicians’ time performing the consult or receiving it. This and the fact that their system was based solely on email make it difficult to generalize their findings to larger, more formalized telemedicine implementations. In the case of the cost-effectiveness study, there was a large range in the cost of DALY averted (£44-£449) due to uncertainty in costs and this was a formative study performed during the first 12 months that the system was implemented.

For controlled studies of the effect on patient care and outcomes, a before-after study of the EHAS telecommunication/telemedicine system in the Amazon of Peru showed that evacuation of emergency cases was 40% faster after system implementation;¹² they were not, however, able to ascertain the effect this had on patients. The two RCTs performed were on tele-monitoring of diabetics or pregnant women in Poland⁷ and Hungary,¹³ ¹⁴ respectively. They were both the most rigorous evaluations performed and showed that the system could have an effect on patient outcomes, though results in the Polish diabetic study were not statistically significant.

<table>
<thead>
<tr>
<th>System or Institution</th>
<th>Evaluation Type</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>Burn care-Oman¹⁵</td>
<td>Descriptive</td>
<td><strong>Advantages:</strong> Provides uniform and appropriate initial treatment preventing hypovolemia and death; Offers best care to all burn patients; Minimizes risks of complications and sequelae of burns; is economic. <strong>Disadvantages:</strong> Increased workload on main center; Inability for physicians at main center to control patient compliance with follow-up advice</td>
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<tr>
<td>Neurosurgery-South Africa²</td>
<td>Case-control study</td>
<td>Six hospitals with teleradiology services had mean patient return rate fall to 17%. In comparison, almost half the patients seen from the hospitals with no services were returned after assessment at the specialist center (Wentworth Hospital)</td>
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<tr>
<td>Teleradiology, Durban-KwaZulu</td>
<td>Case-control study</td>
<td>Service changed patient management in 10% of cases. Undetected pathology was recognized by radiologist in 20 patients—pulmonary tuberculosis in 10,</td>
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<tr>
<td>Location</td>
<td>Type</td>
<td>Description</td>
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<tr>
<td>Natal</td>
<td></td>
<td>spinal tuberculosis in 3, miliary tuberculosis in 2 and fractures in 5</td>
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<tr>
<td>Sihanouk Hospital</td>
<td>Case-control study</td>
<td>Mean duration of chief complaint at the initial patient visit was 37 months for initial six months and eight months by the end of study period. Proportion of patients referred to other facilities decreased by 51% during last year (p &lt; 0.001).</td>
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<tr>
<td>Sihanouk Hospital</td>
<td>Physician survey</td>
<td>All referring doctors who responded made positive comments about the service and half said that it improved their management of the case.</td>
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<tr>
<td>Sihanouk Hospital</td>
<td>Patient survey</td>
<td>Patients were either satisfied (54%, n = 34) or very satisfied (46%, n = 29) with experience in telemedicine clinic. 78% (n = 49) were willing to pay, on average, US$0.63 for their visits.</td>
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<tr>
<td>Bhaktivedanta</td>
<td>Physician opinion</td>
<td>Physicians in India reported increase in confidence in managing patients with advanced diseases and treating various symptoms.</td>
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<tr>
<td>Hospital</td>
<td>Descriptive, comparison to other countries</td>
<td>Average time delay to hospitalization was 30 min compared to 44 min in an Israeli study and over 3 hours in other hospitals in Israel (similar to other places in the world); 628 patient visits to the hospital were avoided (assuming users would have come in if they didn't have monitoring).</td>
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<tr>
<td>EHAC-TTEM</td>
<td>Cost</td>
<td>Costs associated with remote consultation were approximately US $20 for all patients screened. The total cost of the hardware was US $4400 for 2 computers and 2 video cameras.</td>
</tr>
<tr>
<td>King Edward</td>
<td>Cost analysis</td>
<td>Cost of system was Rs12,000 (US$240), amount saved by not taking babies to NICU was Rs546,000 (US$10,920), giving a benefit ratio of 1:45.</td>
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<tr>
<td>Hospital-India</td>
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<tr>
<td>EHAS</td>
<td>Cost analysis</td>
<td>Prior to system, mean referrals per year were 11.1 from health posts and 14.0 from health centers. After implementation, they fell to 2.5 from health posts (p = 0.03) and 8.4 from health centers (p = 0.17). Net economic effect over four years period amounted to annual net savings of US$320,126.</td>
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<tr>
<td>EHAS</td>
<td>Before-after</td>
<td>Reduced trips to convey reports by 25%, reduced mean evacuation time from 8.6 to 5.2 hours due to increased coordination available.</td>
</tr>
<tr>
<td>Tele-ophthalmology-South Africa</td>
<td>Cost-effectiveness</td>
<td>The base case estimate of £53 per DALY averted in reducing the burden of eye disease. Practitioners in South Africa learned novel procedures that could help future patients and improve cost-effectiveness.</td>
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<tr>
<td>Contraction Monitor</td>
<td>Simultaneous randomized controls</td>
<td>Preterm birth rate in intervention group was half that of control group.</td>
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<tr>
<td>Diabetes Monitoring</td>
<td>Patient survey</td>
<td>Wanted to continue with telemedicine support (75%); wanted to change from traditional methods to telemedicine support (60%).</td>
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<tr>
<td>Diabetes Monitoring</td>
<td>Simultaneous randomized controls</td>
<td>Patients’ quality of life (based on HbA1c) improved in telemonitoring (mean score 3.4) more than the traditionally monitored group (mean score 3.2), but was not statistically different.</td>
</tr>
</tbody>
</table>

Below are the articles published between March, 2008 and October, 2009.


References


