
Abadare Country Club, Nyeri.

Prof T.M. Munyao.

Department of Clinical Medicine And Therapeutics.

School Of Medicine.
College Of Health Sciences

University of Nairobi.
Utilisation of Telemedicine And Teledermatology In Clinical Practice.

Background:

- ICT: tool for provision of e-health services in real time at a distance.

- Transmission of large volumes of complex data at speed, including pictures and sound, using fixed and mobile devices.

- Services include of specialist consultations via video-conferencing, linkage to electronic patient records.

- This paper explores uptake, utilisation and limitations of teledermatology and challenges of implementation in developing countries.

Objective.

- To explore the Current status of ICT applications in Dermatology (Medicine).

Note:
Telemedicine=Cybermedicine.
Teledermatology=Cyberdermatology.
Methods.

• We explored available **english dermatology literature** published over the **last ten years** in leading databases: **HINARI, Cochrane reviews, Pubmed and WHO Telemedicine** for:

• Cybermedicine stakeholders, domains, efficacy, accuracy, operators, training, acceptability, benefits and clinical applications in dermatology

• The paper discusses the attributes and challenges of institutionalisation of Cybermedicine public health care delivery systems in developing world setting.
Results.
Issues identified.

- Telemedicine Domains.

- Utilisation in non-dermatological Medical Specialties.

- Teledermatology:
  - Feasibility, Accuracy, Acceptance and Satisfaction.
  - Non-Inferiority to Face-to-Face.
  - Utilisation in Specific Dermatology Services.
  - Who should scan lesions?
  - Cost-benefit analysis
  - Implementation Structures.
Cybermedicine Domains.

Telemedicine/Teledermatology technology can be broadly grouped into three categories:

- Remote monitoring.
- Store-and-forward.
- Interactive (Videoconference).
- A combination of these technologies may be used and the model of care chosen will depend on organisational factors and clinical need.

Telemedicine.

Utilisation in non dermatological Medical Specialties.
## Non-dermatological Specialties...

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Objective(s)</th>
<th>Outcome(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaesthesia¹:</td>
<td>Acceptance of preoperative evaluation</td>
<td>Accepted.</td>
</tr>
<tr>
<td>Ophthalmology³</td>
<td>referral triaging</td>
<td>Accurate, efficient</td>
</tr>
</tbody>
</table>


# Non-dermatological Medical Specialties...

<table>
<thead>
<tr>
<th>Medical Specialty</th>
<th>Description</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiology</td>
<td>Thrombolysis in acute stroke</td>
<td>Prompt, feasible</td>
</tr>
<tr>
<td>Pediatric cardiology</td>
<td>Opinion of practitioners</td>
<td>Positive</td>
</tr>
<tr>
<td>Geriatrics</td>
<td>Mode of health care delivery</td>
<td>Feasible</td>
</tr>
</tbody>
</table>


TELEDERMATOLOGY

Uptake and Utilisation.
Feasibility, Accuracy, Acceptance and Satisfaction by stakeholders.
The acceptance of mobile teledermoscopy by primary care nurse practitioners in the state of Arizona.

- Pilot survey to assess acceptance of mobile teledermoscopy (MTD) by primary care nurse practitioners (NPs) working in Arizona.

- 62 participants recruited from NP and academic list servs in Arizona completed an online survey prefaced by a MTD definition, device photographs, and a practice case, followed by 33 items measuring Teledermatology Technology Acceptance Model (TeleTAM) constructs.

- Participants were highly interested in using MTD to assess skin lesions. They perceived MTD utility to greatly improve diagnosis and positively impact their practice.

Does teledermatology reduce secondary care referrals and is it acceptable to patients and doctors?: a service evaluation

Objectives: To assess if teledermatology reduces referrals and evaluate its acceptability to patients and clinicians.

Methods: A 24-month before and after comparative evaluation of a teledermatology service.
- 4 non-randomly allocated intervention practices and 18 control practices.
- Referral data for 12 months before and after the introduction of teledermatology was compared in intervention and control practices. Patient questionnaires explored their satisfaction and structured user dialogues explored the usefulness and benefits to clinicians.

Results: The difference in referral rate before and after was +2.11 referrals per 1000 practice population in the teledermatology group and +1.39 in the control group. This was NOT statistically significant in the unadjusted, analysis.

The service was very popular with patients and clinicians. Clinicians highlighted the significant educational benefit.

Conclusion: We did not find any evidence that teledermatology reduced secondary care referral rates.
- It was very popular among patients and clinicians, especially for its educational value.

doi: 10.1111/jep.12373
Feasibility and diagnostic accuracy of teledermatology in Swiss primary care:

Objectives
• To evaluate feasibility and cost of a smartphone-based teledermatology consult service. utilizing a designated medical student proxy to facilitate all consults on site, and to evaluate the service's effect upon diagnosis and management.

Methods: RCT, 10/ 2011 to 8/2012,
• smartphone-based teledermatology consult service was established. Kisoro, Uganda, and Lake Atitlán, Guatemala. Fourth-year medical students were recruited as proxies for each site, responding to consults by local doctors and transmitting photographs and clinical information via a smartphone application to a dermatology resident and attending in the USA over an encrypted website. At the Ugandan site, when indicated, the medical student performed skin biopsies under supervision, and rotating Montefiore residents transported specimens back to the USA.

Results
• 93 cases were evaluated by the consult service (57 from Uganda and 36 from Guatemala). Initial diagnoses changed completely in 55.9% (52 of 93) of cases, and management changes were recommended in 89.2% (83 of 93) of cases. The estimated total cost of supplies and technology was 42.01 USD per consult and 64.24 USD per biopsy (including processing). Given fixed upfront costs, the cost per consult decreased with each additional case.

Conclusion
• Smartphone-based systems for teledermatology consultation using a medical student proxy are feasible for delivery of care in the developing world at relatively little cost. Optimization and sustainability of this system requires and deserves further investigation in larger studies.

Measures of satisfaction for providers and patients using same day teledermoscopy consultation.

- Mayo Clinic, USA.
- determine whether patients and providers were satisfied with teledermoscopy consultation for skin lesions.

- From 2010 to 2011, patients with clinically suspicious lesions were referred for teledermoscopy by internal medicine physicians. Lesions were digitally photographed using a dermatoscope accessory lens. Images were interpreted by an on-call dermatologist. We conducted same day surveys of providers and patients after the evaluations.

- The survey response rate was 100%. Of the 20 patients surveyed, all agreed that a teledermoscopic consult was convenient and helpful. Nineteen patients (95%) strongly agreed that teledermoscopy potentially was a cost-saving tool. All providers thought the evaluations were helpful. Ninety-five percent of providers and patients reported satisfaction with the ease of use of this technology.

Non-Inferiority to Face-to-Face.
Mobile Teledermatology helping patients control high-need acne: a randomized controlled trial

• Graz Austria, 2011-201. Randomized controlled trial, high-need acne
• Regular outpatient consultation (OCA) or Telederm consultation TCA.

• End point: Therapeutic outcomes.
• TCA (Global Acne Severity Scale (GEA)-score: $\Delta = 2.25$; TLC: $\Delta = 89.08$) and in the OCA (GEA-score: $\Delta = 2.0$; TLC: $\Delta = 91.21$) excellent and almost equivalent therapeutic outcomes were achieved.

• patients were satisfied with the mobile service and no consultation request was created.

• Mobile teledermatology is an efficient, safe and well-accepted tool among patients with high-need acne constituting at least a valuable adjunct to outpatient care services. Further larger studies would be useful to confirm our findings.

J. Frühauf S.et al. JEADV 2015;29: 919–924
A prospective study on the use of teledermatology in psychiatric patients with chronic skin diseases

Background: Singapore

- To compare the use of live interactive teledermatology versus conventional face-to-face consultation.

Methods: Recruited patients were first seen by a dermatologist via videoconferencing, and then by another dermatologist in person, within 1 week. Clinical outcome measures were then assessed by a third independent dermatologist.

Outcome measures were assessed for each paired patient visit: inter-physician clinical assessment, diagnosis, management plan, adverse events and total patient turnaround time (PTAT) for each consultation.

Results

There were a total of 13 patients (mean age, 64.6 years; range 44–80) with 27 patient visits. All were male patients with chronic schizophrenia. The predominant skin condition was chronic eczema and its variants (62%), followed by cutaneous amyloidosis (23%) and psoriasis (15%).

The level of complete and partial agreement between the teledermatology and face-to-face consultation was 100% for history-taking and physical examination and 96% for the investigations, diagnosis, management plan and the treatment prescribed. The PTAT for teledermatology was 23 min, compared to 240 min for face-to-face consultations. No adverse events were reported.

Conclusion: Teledermatology was as effective as face-to-face consultation and reduced the PTAT by 90%, resulting in increased patient convenience, operational efficiency and reduced manpower need. Our study supports the safe and cost-effective use of teledermatology for the follow-up of chronic skin conditions in psychiatric patients.

Teledermatology for skin cancer prevention: an experience on 690 Austrian patients

Background: Recent studies investigated the value of teledermatology (TD) as a valid tool for a dermatologist-directed triage systems.

Objective: To investigate the feasibility of a store-and-forward TD triage system in a large number of patients.

Methods: Previously trained general practitioners selected suspicious skin tumours in the setting of a general preventive medicine screening programme and transmitted their dermoscopic images via virtual private network for decision-making. Within 48 h, two teleconsultants highly experienced in dermoscopy first assessed image quality, then made a diagnosis and answered if lesions were to follow-up, to excise or to be re-evaluated at face-to-face (FTF).

Results: A total of 955 lesions were telediagnosed [743 (78%) benign melanocytic, six (0.6%) malignant melanocytic, 186 (19%) benign non-melanocytic and 20 (2%) malignant non-melanocytic]. Excision was recommended for 111 (12%) lesions, 10 lesions (1%) were referred to FTF examination. Follow-up was recommended for 707 (74%) lesions. The vast majority of the lesions (82%) were screened as benign and an intervention was requested in only 18% of cases. Eighty-two patients (12% of the total) were lost at follow-up. The diagnostic accuracy was of 94% with sensitivity of 100% and specificity of 95.8%.

Conclusions: We confirm that TD is suitable to triage skin cancers.

Utilisation in Specific Dermatology Services.
The growth of a skin emergency teledermatology service from 2008 to 2014.

Dermatological emergencies.
• The Emergency Telederm addition to Telemedicine Service

• Queensland, Australia 2008-2014.

• Successful, sustainable and valuable addition to the specialist dermatology services.

Teledermatopathology.

- This study revealed that the cytological images should be used in tertiary teledermatological evaluation. Further studies should therefore be carried out to investigate the diagnostic value of different telecytological methods.

Durdu, M. and Harman, M.
Diagnostic value of telecytology in tertiary teledermatological consultation: a retrospective analysis of 75 cases.
iSlide: a ‘big picture’ Interactive Teledermatopathology e-learning system.

- iSlide is useful for dermatopathology. As only 82% of the student evaluators and 63% of the expert evaluators found the system easy to use, further work has to be done to improve the iSlide interface to make the system more user friendly.

Who should scan lesions?

1. **Teledermatologist.** However patients images showed high concordance in quality with clinicians in melanoma surveillance study. Patients overlooked few suspicious lesions.

2. **Medical students:** Uganda and Guatemala 4th yr, Feasible but high rate of misdiagnosis in 60%, and relatively low cost.

3. **General practitioners.**

4. **Patients.**

A pilot trial of mobile, patient-performed teledermoscopy.

Brisbane, Australia 2013, Randomised controlled Trial.

- **Accuracy** of Mobile teledermoscopy?
- Self Skin Exam (SSE) plus mobile teledermoscopy (24) vs. clinical skin examination (CSE)...

Outcome measures included:
(i) body sites examined, lesions photographed, and missed;
(ii) sensitivity of SSE +mobile teledermoscopy vs. in-person CSE.
(iii) concordance of telediagnosis with CSE.

- There was substantial agreement between telediagnosis and CSE.

- **This investigation demonstrates that high-quality dermoscopic images can be taken by patients at home with high accuracy.**

Cyberderm: cost-benefit analysis.
Mobile teledermatology for a prompter and more efficient dermatological care in rural Mongolia.

Rural Mongolia, Case control.

- **Reduction in costs**, both for the patients (US $76·36 per patient)
- **Decreasing referrals** to tertiary-care centres by 75% in the intervention group.
- **19,892 km and 269 h** of travel when compared with patients in the control group

Comment on Clinical data.

- Scanty Pilot data, small sample sizes.
- All related to developed world: Development, cultural, Socio-economic, literacy rates different from developing world.
Cost.

- Teledermatology can lead to **efficient care probably at lower cost**. We are therefore of the opinion that teledermatology following GP selection should be considered as a possible pathway of referral to secondary care.

van der Heijden, J.P., de Keizer, N.F., Bos, J.D.,
**Teledermatology applied following patient selection by general practitioners in daily practice improves efficiency and quality of care at lower cost.**
Images for Transmission.

• In consideration of its high qualitative performance and wide diffusion, JPEG2000 represents an optimal solution for the compression of digital dermatological images.

F. Guarneri*, M. Vaccaro, C. Guarneri and S. P. Cannavò

JPEG vs. JPEG2000: benchmarking with dermatological images
Skin Research and Technology
Volume 20, Issue 1, pages 67–73, February 2014
Implementation.
Stakeholders.

Key stakeholders in eHealth including Teledermatology include:

• Legislature.

• Government ministries of health, infrastructure, information technology, telecommunications, education.

• others working in eHealth – academics, researchers, eHealth professionals, nongovernmental organizations and donors.

Telemedicine opportunities and developments in member states
Report on second Global survey on eHealth-series Vol 2
Process.

• National eHealth policy.
• Legislation to integrate and operationalise.
• Budget to support:
  Infrastructure: Electricity, Cyber network: internet, bandwidth
  Equipment: Tropicalised computers, cameras, screens, transducers.
  Trained human resource is required Health specialists, technicians.

Telemedicine opportunities and developments in member states
Report on second Global survey on eHealth-series Vol 2
Health care Context.

• Products and services related to **telemedicine** are often part of a larger investment by healthcare institutions in information technology to facilitate delivery of clinical care.

Telemedicine opportunities and developments in member states
Report on second Global survey on eHealth-series Vol 2
Conclusions.

• Is Feasible, Accurate, Accepted by and Satisfactory to patients and health workers.

• Non-Inferior to Face-to Face consultation.

• Improved outcomes in skin cancer triage and emergency dermatology.

• Is an effective e-learning tool.

• Teledermatologist may process lesions scanned by trained Patients, Medical students and General practitioners.

• Services are immediate and cost effective.

• Establishment of service requires national policy and resources for infrastructure, training and operational costs.
• The End