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### The “Dis-location” of U.S. Medicine — The Implications of Medical Outsourcing

Robert M. Wachter, M.D.

When a patient in Altoona, Pa., needs an emergency brain scan in the middle of the night, a doctor in Bangalore, India, is asked to interpret the results. Spurred by a shortage of U.S. radiologists and an exploding demand for more sophisticated scans to diagnose scores of ailments, doctors at Altoona Hospital and dozens of other American hospitals are finding that offshore outsourcing works even in medicine. . . . Most of the doctors are U.S.-trained and licensed — although there is at least one experiment using radiologists without U.S. training.

—Associated Press, December 6, 2004

sions with patients and sifting through paper files. But as health care becomes digitized, many activities, ranging from diagnostic imaging to the manipulation of laparoscopic instruments, are rendered borderless. The offshore interpretation of radiologic studies (see p. 662) is proof that technology and the political climate will now permit the outsourcing of medical care, a trend with profound implications for health care

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## Outsourcing of Health Care

- ▶ It will grow
- ▶ It will challenge traditional arrangements
- ▶ It requires new ethical, legal and quality standards
- ▶ It will be controversial

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# Teledermatology

- Open access teleconsultation
- Teledermoscopy
- Mobile teledermatology



# The Telederm.org Project

plan was initiated successfully

Welcome to telederm.org!

The Community for Teledermatology

Telederm.org is a unique medical application for medical students, physicians and healthcare workers interested in dermatology featuring on-line discussion of interesting and unusual cases in clinical dermatology and dermatopathology. The teleconsultation service is based on the transmission of digital images following the store-and-forward method. Every user can submit clinical and dermatopathologic cases to the 'Discussion Forum' visible to all users.

See also:  
PLoS Medicine | www.plosmedicine.org | telederm.org: Freely Available Online Consultations in Dermatology, full document with 100 cases - Manuscript on Teledermatology: Online Discussion Forum in Dermatology: Teleconsultations

log on secure connection  
username  
password  
log on

Enter registration

Moderators of telederm.org | The Community for Teledermatology  
Mustafa Sarda, Turkey  
Huiqing Deng, PR China  
Shoukang Jia, China  
Karan Malik, USA  
Johannes Mraz, Cyprus  
Zongliang Fan, Croatia  
Mehmet Cakici, Romania  
Srinivas Dilip, Russia/Federacione  
Lata Sarkisyan, Croatia  
Tahir Al-Ghaili, Yemen  
Siva Nishdy, India  
Egemen Aktepe, Turkey

telederm.org is in compliance with the HITECH Act  
with the HIPAA  
Interconnecting Sites

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<b>Auftragstitel (Identifikator)</b>	<b>Is this really Vitiligo?</b>
<b>Alter</b>	8 Jahr(e) <b>Geschlecht:</b> f
<b>Lokalisation</b>	trunk; dorsal view; without any specification side not specified
<b>Anamnese</b>	Disease started at July 2004. The first element appeared at the shoulder, the element on the face appeared at July 2005. Drugs prescribed by dermatologist: Multi vitamins, Phytine (natural antioxidant) orally, Alcohol and pepper extract locally
<b>Diagnose</b>	Preliminary diagnoses – Vitiligo
<b>Frage</b>	<b>Questions: Is this really Vitiligo? Is Vitiligo typical at this age? Are the additional tests needed? What is the treatment option at this age?</b>
<b>Antwort</b>	<p><b>Massone Cesare (Admin)</b> (23.09.2005 10:06:01) It could be vitiligo, to confirm the diagnosis a 3mm punch biopsy of one lesion on the shoulder should be performed. If this confirms the clinical diagnosis, Narrow-band UVB therapy is effective and safe in childhood vitiligo. See also Njoo MD, Bos JD, Westerhof W. Treatment of generalized vitiligo in children with narrow-band (TL-01) UVB radiation therapy. JAAD 2000; 42: 245. Best regards.</p> <p><b>Zargari Omid</b> (9/23/2005 12:50:41 PM) I think this is vitiligo. Association with thyroid disorders are more common in childhood vitiligo. <b>Murat Borlu</b> (9/23/2005 1:36:59 PM) It seems like vitiligo, and it is not rare around this age. Narrow-band UVB is the best choice of treatment for this patient.</p> <p><b>Francesco D Alessandro</b> (9/23/2005 5:49:46 PM) It looks like vitiligo. I have had some good results with protopic but agree that narrow-band UVB is the best choice if available</p> <p><b>Premanshu Bhushan</b> (9/23/2005 8:24:21 PM) Yes, it is vitiligo unless and until proven otherwise. So far as the age is concerned it can be seen in childhood as early as 4 days. (Int J Dermatol. 2004 Sep;43(9):654-8.) I have seen a patient as young as 4 months.</p> <p>No additional tests are needed to diagnose vitiligo per se but ruling out other autoimmune diseases like thyroiditis is a good idea.</p> <p>Treatment options are: A) Topical mild/moderate potent steroids (Fluticasone, mometasone) applied twice daily--- usually the periorbital areas respond very well. B) If one is reluctant to use steroid she can be put on Tacrolimus either alone or alternating with steroids. C) If available and agreed Narrow-band UVB works very well and is considered a treatment of choice.</p> <p>In our setup we use topical steroids and tacrolimus application one in the morning and one in the evening for 2-4 weeks and we get good results or then we individualize the treatment according to the surface area involved and the response.</p> <p>Hope it helps. <b>Jukka Juhela</b> (9/27/2005 9:27:56 PM) Obviously this is vitiligo, but treatment after my 35 years in dermatology is for me still an enigma. We are quite pessimistic and conservative here in north to treat vitiligo at all except sunscreens and camouflage. Takrolimus is very interesting drug, but I have seen until today only non-responders.</p> <p><b>Joel A. Sabeau</b> (10/9/2005 7:44:12 PM) You may want to consider low dose ND:YAG 1064 nm laser therapy to help initiate repigmentation. Delivery of 20 joules +/- affected</p>

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# The Telederm.org Project

**Community members 970**

New members 2007 201

- New members per month: ~22

**Total requests 3668**

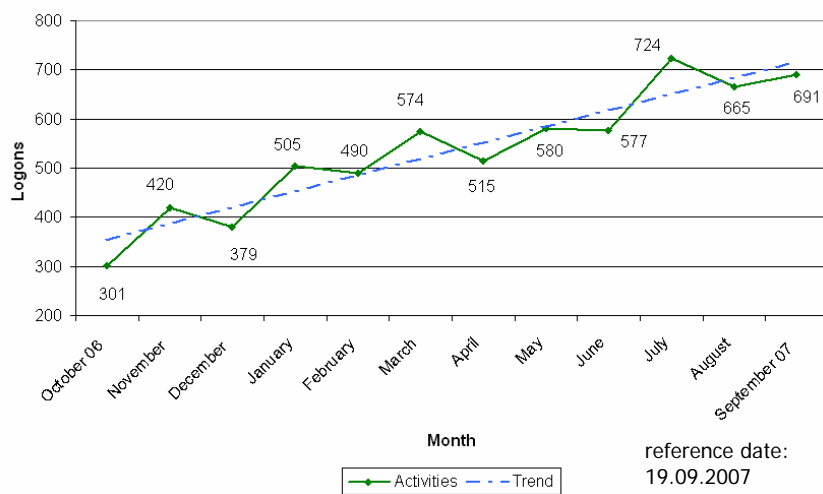
New requests 2007 332

- New requests per month: ~39

reference date:  
19.09.2007



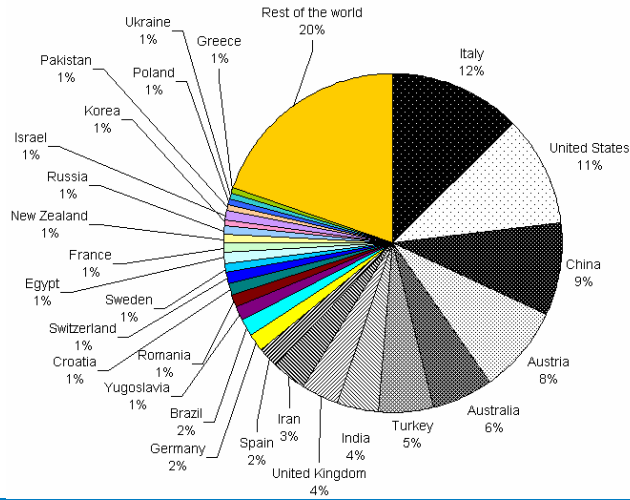
## Telederm.org Activities 2006 - 2007



reference date:  
19.09.2007



# Global Community



# Global Activity





Open access, freely available online

Health in Action

# telederm.org: Freely Available Online Consultations in Dermatology

H. Peter Soyer\*, Rainer Hofmann-Wellenhoft, Cesare Massone, Gerald Gabler, Huiting Dong, Fezal Ozdemir, Giuseppe Argenziano

**Introduction**

e-Health matters. It can improve access to healthcare and boost the quality and effectiveness of the service offered. e-Health describes the application of information and communications technologies across the whole range of functions that affect the health sector.

This is the introductory statement of a recent communication from the European Commission that produced the report "e-Health—Making Healthcare Better for European Citizens: An Action Plan for a European e-Health Area" [1]. Easy access to expert medical information and consulting independent of social, economic, ethnic, and regional factors is regarded as a major goal of medical policy today.



DOI: 10.1371/journal.pmed.0020067.g001

Figure 1. Discussion Forum Image Viewer Allows Magnification of an Unusual Elbow Lesion

promote the worldwide exchange of knowledge and expertise in all aspects of dermatology.

are free, and are controlled and subsequently activated by the moderator. Each user is also given a





## Teledermatology

- Open access teleconsultation
- **Teledermoscopy**
- Mobile teledermatology



## Handheld Dermoscopy Devices

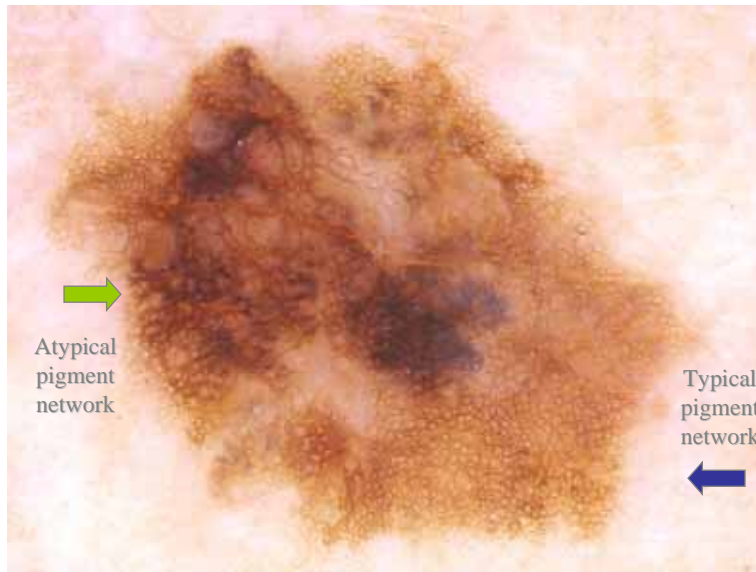




## Digital Dermoscopy Devices



Fast, good, expensive  
Easy capture & storage  
Sequential monitoring



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## Teledermoscopic Multicenter Study

	Kappa values	Sensitivity	Specificity
● Face-to-face diagnosis	0.740	72%	96.9
● Great experience (n = 3)	0.750 - 0.870	81.8 - 90.9%	93 - 100%
● Medium experience (n = 6)	0.480 - 0.685	54.5 - 90.9%	84 - 93.8%
● Low experience (n = 2)	0.350 - 0.396	45.5%	87.5 - 90.6%

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## Telediagnosis of Pigmented Lesions



- 18 patients (M:F=12:6) referred to our Pigmented Skin Lesions Clinic
- camera resolution: 1632x1224 pixels
- for each patient clinical data as well as clinical and dermoscopic images were available

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www.plosone.org

OPEN ACCESS Freely available online

PLOS ONE

## Melanoma Screening with Cellular Phones

Cesare Massone<sup>1</sup>, Rainer Hofmann-Wellenhof<sup>1</sup>, Verena Ahlgrim-Siess<sup>1</sup>, Gerald Gabler<sup>2</sup>, Christoph Ebner<sup>1</sup>, H. Peter Soyer<sup>1\*</sup>

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**Background.** Mobile teledermatology has recently been shown to be suitable for teledermatology despite limitations in image definition in preliminary studies. The unique aspect of mobile teledermatology is that this system represents a filtering or triage system, allowing a sensitive approach for the management of patients with emergent skin diseases. **Methodology/Principal Findings.** In this study we investigated the feasibility of teleconsultation using a new generation of cellular phones in pigmented skin lesions. 18 patients were selected consecutively in the Pigmented Skin Lesions Clinic of the Department of Dermatology, Medical University of Graz, Graz (Austria). Clinical and dermoscopic images were acquired using a Sony Ericsson with a built-in two-megapixel camera. Two teleconsultants reviewed the images on a specific web application (<http://www.dermahandy.net/default.asp>) where images had been uploaded in JPEG format. Compared to the face-to-face diagnoses, the two teleconsultants obtained a score of correct telediagnoses of 89% and of 91.5% reporting the clinical and dermoscopic images, respectively. **Conclusions/Significance.** The present work is the first study performing mobile teledermoscopy using cellular phones. Mobile teledermatology has the potential to become an easy applicable tool for everyone and a new approach for enhanced self-monitoring for skin cancer screening in the spirit of the eHealth program of the European Commission Information for Society and Media.

**Citation:** Massone C, Hofmann-Wellenhof R, Ahlgrim-Siess V, Gabler G, Ebner C, et al (2007) Melanoma Screening with Cellular Phones. PLOS ONE 2(5): e483. doi:10.1371/journal.pone.0000483

**INTRODUCTION**

The development of user-friendly technology has brought personal digital assistants (PDA) and cellular phones into everyday use. The power of these devices allows their use in more demanding tasks such as processing medical images; their use in telemedicine and particular in teledermatology has been recently proven and the name "mobile teledermatology" has been coined.[1,2] In the first pilot studies limitations in image definition of cellular phones have been found, because the optics of the first generation cellular phones did not allow close-up or macro imaging.[1-3] Nevertheless, these studies have shown the usability and the feasibility of these new devices in teledermatology.[1-3] In fact, the unique aspect of mobile teledermatology is that this system might become

invasive, *in situ* technique, has the potential to improve up to 49% the diagnostic accuracy for melanoma if used by experts.[14,15] In this study we investigated the feasibility to perform melanoma screening with both clinical and dermoscopic images acquired using a new generation of cellular phones.

**MATERIALS AND METHODS**

Eighteen consecutive patients (MF = 12/6; mean age: 43,38; median age: 45; range: 14-78) were selected in the Pigmented Skin Lesions Clinic of the Department of Dermatology, Medical University of Graz, Graz (Austria) during two routine working days. Only patients who agreed to the study and signed the patient consent were enrolled. The face-to-face (FTE) diagnoses (16

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# Teledermatology

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## ► Mobile teledermatology: a feasibility study of 58 subjects using mobile phones

Christoph Ebner<sup>\*</sup>, Elisabeth MT Wurm<sup>\*</sup>, Harald Kittler<sup>†</sup>,  
Gian Piero Lozzi<sup>‡</sup>, Gerald Gabler<sup>§</sup>, Rainer Hofmann-Wellenhof<sup>\*</sup>  
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### Summary

We investigated the diagnostic agreement between teledermatology based on images from a mobile phone camera and face-to-face (FTF) dermatology. Diagnostic agreement was assessed for two teledermatologists (TD)

## Methodology I

- Urgent-care dermatological patients from the outpatient clinic of the Department of Dermatology, Medical University of Graz, Graz (Austria)
- Inclusion criteria: adults with visible skin conditions
- Only patients who agreed and signed an informed consent have been enrolled
- 58 out of 83 invited patients met the inclusion criteria and gave informed consent to the study protocol



## Study Procedure



- Basic data including age, gender, daily medications, and history of the skin lesions were collected
- Each patient was given a Nokia 6230i mobile phone
- Study coordinator taught patients how to use the camera and asked to take 3 photos of their skin lesions
- Skin lesions from any subjects who did not want to take photos on their own were taken by the coordinator

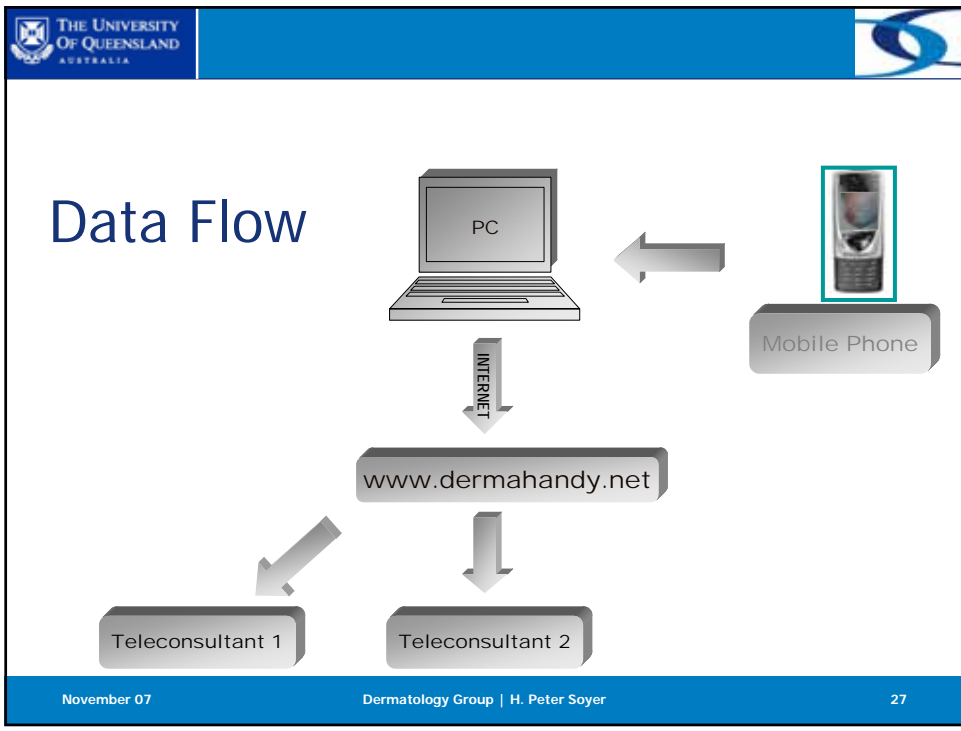


## Nokia 6230i



Nokia, Espoo, Finland

- Resolution: 1280 x 1024 Pixel (1,3 Mpx)
- Transferred to PC via Nokia Connectivity Wire DKU- 2





## Methodology II

- The two teleconsultants were both consultant dermatologists with more than 15 years professional experience
- Cases were reviewed independently
- Diagnoses of the two teleconsultants were compared to the face-to-face diagnosis (**pragmatic reference standard**) of the senior registrars in charge of the outpatient service



## Triage options

- Dermatologic diagnosis using standard procedures with classical conservative treatment recommendations (Standard)
- Immediate clinical admission to a dermatological unit (Admission)
- Follow-up visit for a surgical procedure (Surgery)
- **Visit a dermatologist for face-to-face consultation (Consult Dermatologist)**

58 Subjects		48 S	6 S	4 S
FTF-Triage		Standard	Admission	Surgery
Teletriage TD1	31 S	Standard	6 S	4 S
	15 S Consult Dermatologist			
	2 S	Admission		
Teletriage TD2	34 S	Standard	6 S	4 S
	10 S Consult Dermatologist			
	4 S	Admission		
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Diagnostic agreement between FTF-diagnosis, teledermatologists (TD) 1 and 2

Face-to-face vs TD1	Count	Percent
Complete Agreement	41	70.7
Relative Agreement	15	25.9
Disagreement	2	3.4
Face-to-face vs TD2		
Complete Agreement	44	75.9
Relative Agreement	8	13.8
Disagreement	6	10.3

Complete agreement was defined as full accordance between the dx of the TDs.  
Relative agreement was defined as differing diagnoses in the same diagnostic category.

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### Interobserver agreement between teledermatologists (TD) 1 and 2

TD1 vs TD 2	Count	Percent
Complete Agreement	43	74.1
Relative Agreement	9	15.5
Disagreement	6	10.3

Complete agreement was defined as full accordance between the dx of the TDs.  
 Relative agreement was defined as differing diagnoses in the same diagnostic category.



## Usability of Mobile Phones

- The study coordinator shot the images for 50 (86.4%) of the 58 patients
- Of these, 40 patients (age range 18 to 85) were unable to use the built-in camera of the mobile phone unassisted and 10 subjects choose not to attempt to photograph their lesions
- The remaining 8 patients (13.8%), who ranged in age from 19 to 45 years, successfully shot images of their skin lesions following a short instruction



## Summary of Results

- In almost 3 out of 4 cases (TD1: 70.7%; TD2: 75.9%) a skin condition can be diagnosed remotely with mobile phones
- 9 out of 10 cases (TD1: 96.6; TD2: 89.7%) are in the same diagnostic category provided by the face-to-face consultants
- In a real teletriage setting TD1 could have treated 53% (TD2 59%) patients remotely

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## Diagnostic Agreement in Telederm

- Chao et al: 95%
  - Lewis et al: 93%
  - Schiener et al: 90%
  - High et al: 85%
  - Krupinski et al: 83%
  - Otzas et al: 80%
  
  - Our cellular phone study: 70%
  - Our PDA study: 80%
  - Our recent study: TD1: 70.7% TD2: 75.9%
- TD1: 96.6% TD2: 89.7%



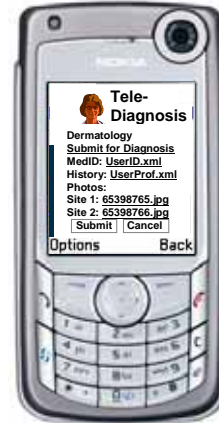
## Mobile Teledermatology

- ▶ Triage of dermatologic conditions for tourists
- ▶ Monitoring of chronic dermatoses (e.g. psoriasis)
- ▶ Primary treatment for simple dermatoses (e.g. acne in adolescents)
- ▶ Screening for skin cancer



## mTeleMed Application

- Speed diagnosis and lower costs by automating data collection and submission
  - Patient billing info
  - Personal history
  - Basic case information
  - Site photos
- Integrate with Telephony for real time sessions



## Future Impact on Dermatology

- ▶ Time and place-independent care delivery
- ▶ Classical referral chain will be interrupted
- ▶ Super-specialization will become a reality



Soyer & Soyer August 2001