Telemedicine

– Examples & introduction to the Swedish model

Åsa Holmner Rocklöv, MSc, PhD

Department of Biomedical Engineering and Informatics – R&D
University Hospital of Northern Sweden

AND

Umeå Centre for Global Health Research
Umeå University, Umeå, Sweden

Asa.holmner-rocklov@vll.se
http://www.globalhealthresearch.net/

Telemedicine – *"Healing at a distance"*

Definition according to WHO: *"The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities*

Four elements are germane to telemedicine:

- Its purpose is to provide clinical support.
- It is intended to overcome geographical barriers, connecting users who are not in the same physical location.
- It involves the use of various types of information and communication technology - ICT.
- Its goal is to improve health outcomes.

Introduction to Västerbotten County

Total area 55 432 km²

260 217 inhabitants (2012)

4,69 inhabitants/km²

About 50.000 reindeers

The county is mainly covered by forest and stretches from coast to the mountains lining the Norwegian border (fjäll)

Introduction to the VB county council

~ 32 primary health centers and community hospitals

3 hospitals, including one teaching hospital – Umeå University Hospital

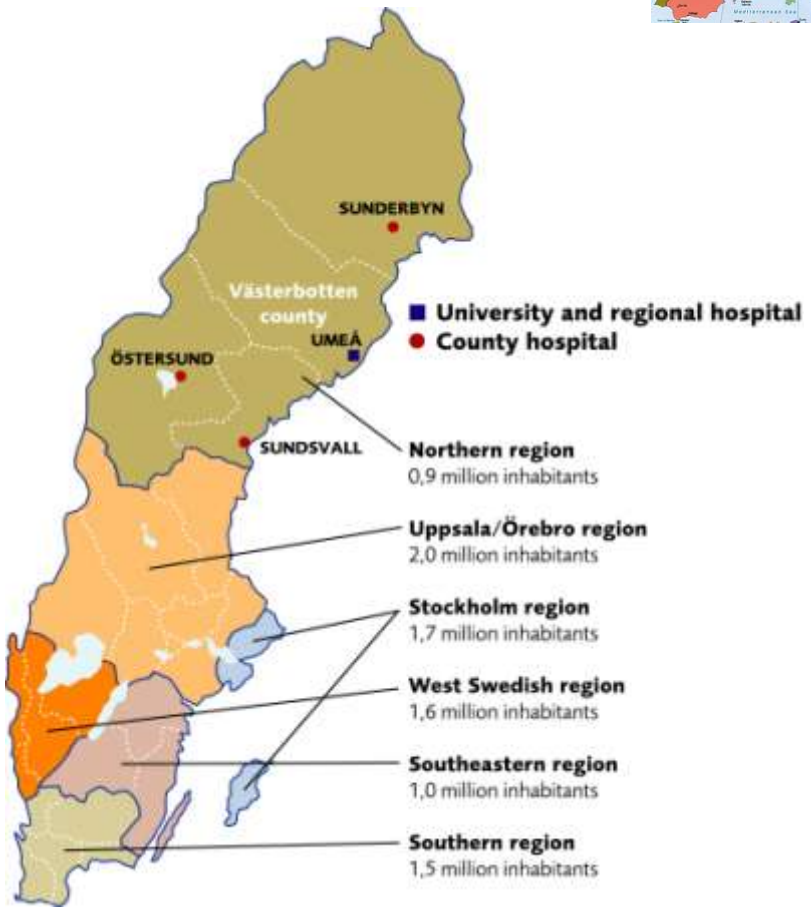
Due to the special conditions in Northern Sweden, “rural medicine” is since 2009 its own topic for the residency (specialist training/ST training) of medical doctors

Telemedicine in Västerbotten county & The Northern care region

Administrative meetings
Project meetings
Economy
Procurement

Business meetings
Education
Conferences

Clinical applications
Consultations
Follow-up visits
Rehabilitation
Hospital rounds
Remote control of diagnostics instruments



The North-south distance of the northern care region is about 1000 km

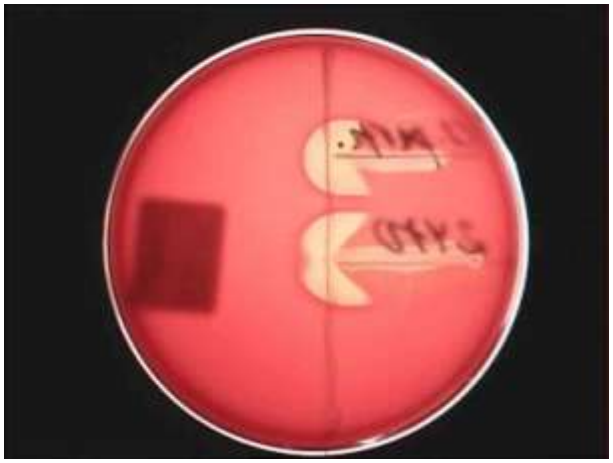
Examples from Västerbotten

Example from a prize-winning project in Västerbotten - Speech therapy at distance**.**

This work model is in regular clinical use

194 Patients (e.g. aphasia, Parkinson's disease, children with speech impairments), of which 36 in their own home,
779 treatments, of which 219 in the home,
25 care facilities participated in the study

Environment	154 840 kilometers of travel was saved for the patient
Economy	1 million SKR or about 100.000 EUR were saved during approximately one year – based only on reduction in patient travels. Staff reduced their time on the road with 1-3 days.
Patient benefits	The telemedicine treatment resulted in better results and compliance and fewer patients dropped out of rehab.



Bacteriology Umeå – Östersund (400 km)

Teleradiology Umeå - Spain (3700 km)

Remote auscultations of heart and lung

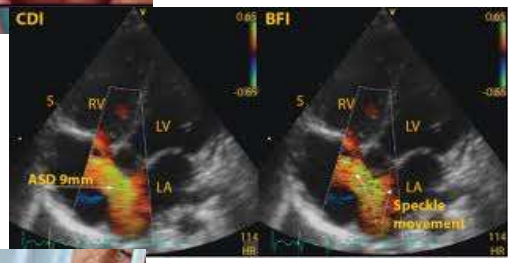
- Real-time and store-forward solution for diagnosis of children with heart murmurs

Children with cleft palate

- First meeting with specialist and speech therapis via video

Newborn with suspected heart disease

- Cardiologist in Umeå diagnoses the ultrasound examination via video



Rehabilitation after hand surgery

- Patient get treatment and rehabilitation in their home or at the nearest primary care center

Distributed radiotherapy

- Treatment planning and education

More examples

Mobile teleradiology is utilized in villages in Botswana to communicate with radiologists in the capital city of Gaborone.

(Photograph: Ryan Littman-Quinn, Carrie Kovarik: Botswana-UPenn Partnership)

ICT & Telemedicine in disasters

TelEmergency provided telemedicine service for emergency medical coverage in hurricane Katrina, 2005

Coordination of evacuations and support actions using mobile communication in wildfires

1985 1990 1995 2000 2005 2010

NASA telemedicine Spacebridge Armenian earthquake, 1988

Telemedicine was used to provide psychological treatment to children after tsunami, Nagapattinam 2004.

Global trends in telemedicine*

Table 5. Global implementation rates of telemedicine services

	Established	Pilot	Informal	No Stage Provided	Total
Teleradiology	33%	20%	7%	2%	62%
Telepathology	17%	11%	9%	4%	41%
Teledermatology	16%	12%	7%	3%	38%
Telepsychiatry	13%	5%	5%	1%	24%

** Telemedicine: opportunities and developments in Member States: report on the second global survey on eHealth* 2009. (Global Observatory for eHealth Series, 2)

Not all Member States completed all seven sections of the survey: 112 completed it entirely and 114 (59% of Member States; 81% of the world's population) completed at least one section (the Telemedicine Section).

Table 6. Diverse telemedicine services offered by responding countries

Telemedicine service	N°. of countries reporting service	Established	Pilot	Informal	No stage provided
Cardiology/ Electrocardiography	28	17	9	1	1
Ultrasonography	15	10	5	0	0
Mammography	12	8	4	0	0
Surgery	11	3	6	1	1
Consultation	7	5	1	0	1
Ophthalmology	6	2	2	2	0
Nephrology	5	4	1	0	0
Obstetrics/ Gynaecology	5	3	2	0	0
Diabetes	4	2	1	1	0
Patient monitoring	4	0	3	0	1
Paediatrics	3	3	0	0	0
Home care	3	1	2	0	0
Neurology	3	1	2	0	0
Neurosurgery	3	1	1	0	1
Stroke treatment	2	2	0	0	0
Urology	2	2	0	0	0
Oncology	2	1	0	0	1
Otolaryngology	2	1	0	0	1

(Responders were offered the opportunity to provide examples of other services offered in the country, not explored in all countries)

Driving forces – *telemedicine only for remote areas?*

Long distances

Västerbotten is the second largest county in Sweden

Few users

Sparsely populated; Only 260.000 people live in this county, which is one-eight of the country's area

Limited resources

Rural areas are hit hard by cutbacks

Low mobility

Snow, poor roads, maintenance

Telemedicine – *also for urban regions!*

Short distances

Short distances may disguise the advantages. Distances should also be counted in time

Traffic

The traffic situation in Stockholm is one of Europe's most tense, which has negative effects on the environment

Many potential users

The number of inhabitants in Stockholm is more than 5 times that in Västerbotten County

Technical considerations & challenges

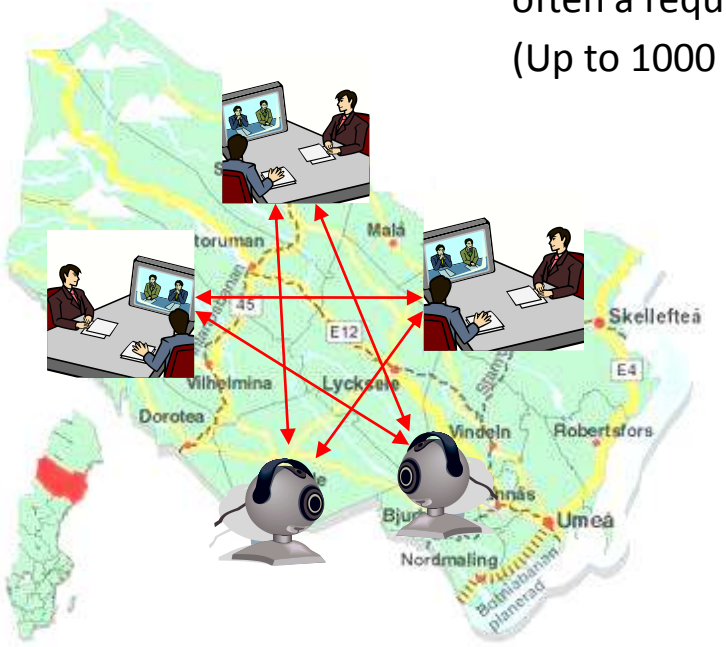
Information and communication technology	Advantages	Disadvantages
Fixed (wired) technology, including broadband	• Higher bandwidth and thus potential for e.g., high-quality video communication and real-time applications • Negligible delay	• Low penetration in developing countries, remote regions and geographically challenging regions • potentially sensitive to weather and climate extremes • Fixed location
Mobile technology (2-3G/4G),	• Good penetration globally (2G) • Relatively high penetration also in geographically challenging regions • Suitable for mobile, off-line data gathering and sharing of information	• Lower bandwidth • Lower penetration of 3G and 4G • Less suitable for real-time applications and large data transfer • Devices sensitive to heat, moisture and other environmental exposure
Satellite based communication	• Global coverage (depending on satellite type and position)	• Significant signal latency compared to ground-based communication • Sensitive to moisture and precipitation

Technical considerations & challenges

-Technical infrastructure in Swedish healthcare

SJUNET:

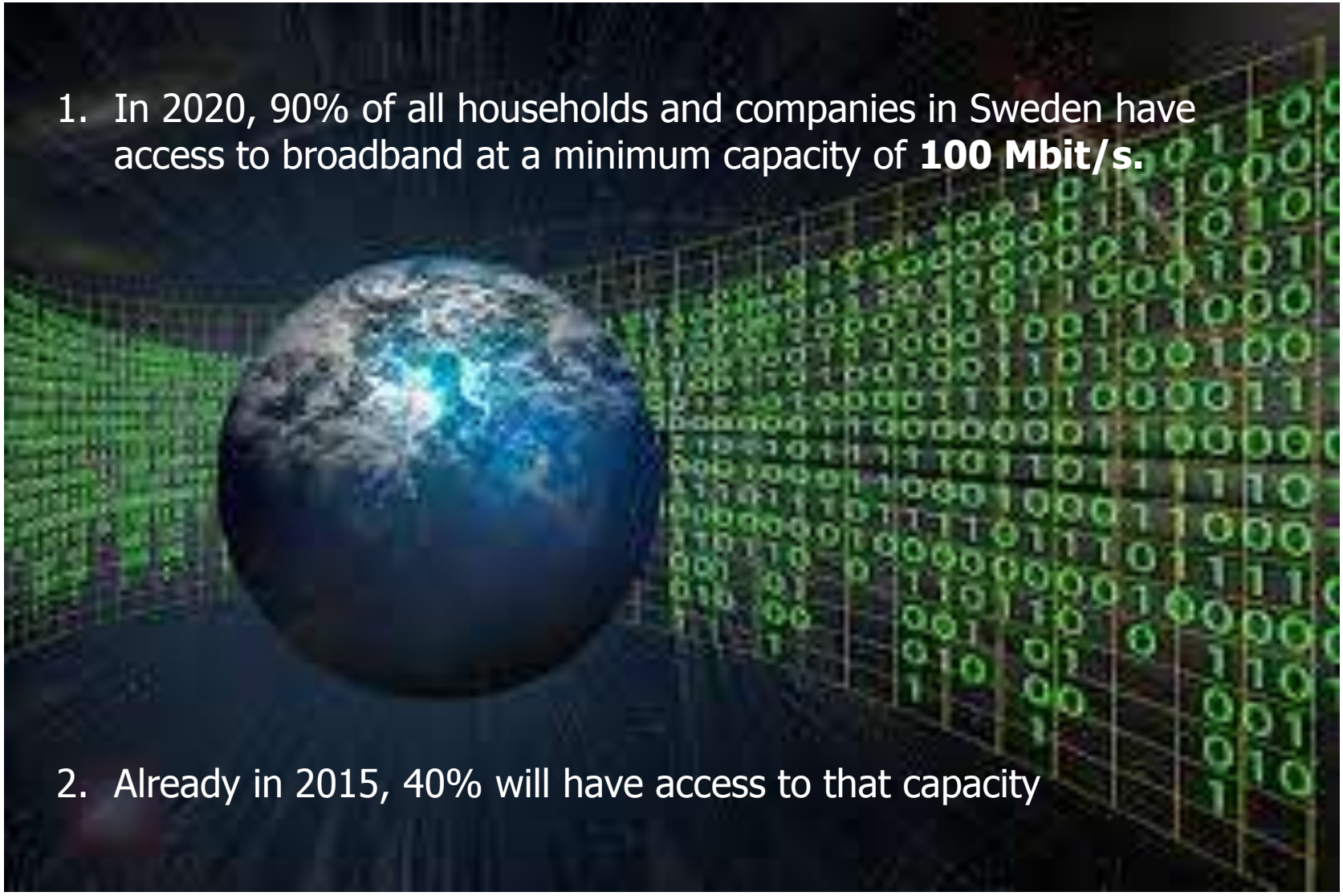
Sjunet is a robust and quality assured communications network that has been developed and adapted for health care. Sjunet have very high availability and is often a requirement to disseminate critical information. (Up to 1000 Mbit)



PLATFORM FOR VIDEO MEETINGS:

The service consists of a national infrastructure for single or multiple video connections. The video service provides a common numbering plan and can be used over Sjunet and the Internet.

National objectives in Sweden



Global ICT development (2011)

Total mobile-cellular subscriptions reached almost 6 billion by end 2011, corresponding to a global penetration of 86%.

Growth was driven by developing countries, which accounted for more than 80% of the 660 million new mobile-cellular subscriptions added in 2011.

By end 2011, there were more than 1 billion mobile-broadband subscriptions worldwide.

Mobile broadband has become the single most dynamic ICT service reaching a 40% annual subscription growth in 2011.

Although developing countries are catching up in terms of 3G coverage, huge disparities remain between mobile-broadband penetration in the developing (8%) and the developed world (51%).

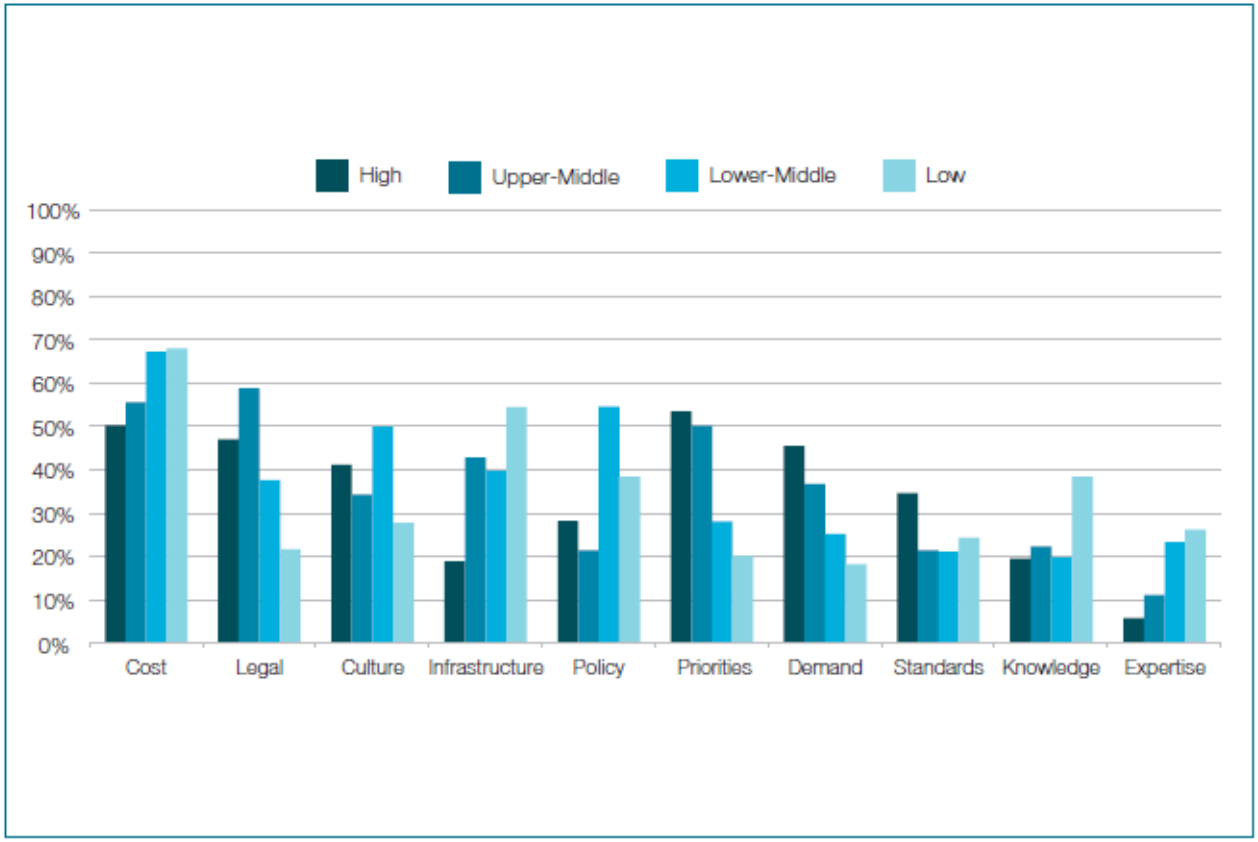
Fixed (wired) broadband growth in developed countries is slowing (5% increase in 2011), whereas developing countries continue to experience high growth (18% in 2011).

The percentage of individuals using the Internet in the developed world reached the 70% landmark by end 2011. In Iceland, the Netherlands, Norway and Sweden more than 90% of the population are online.

Key statistical highlights: ITU data release June 2012

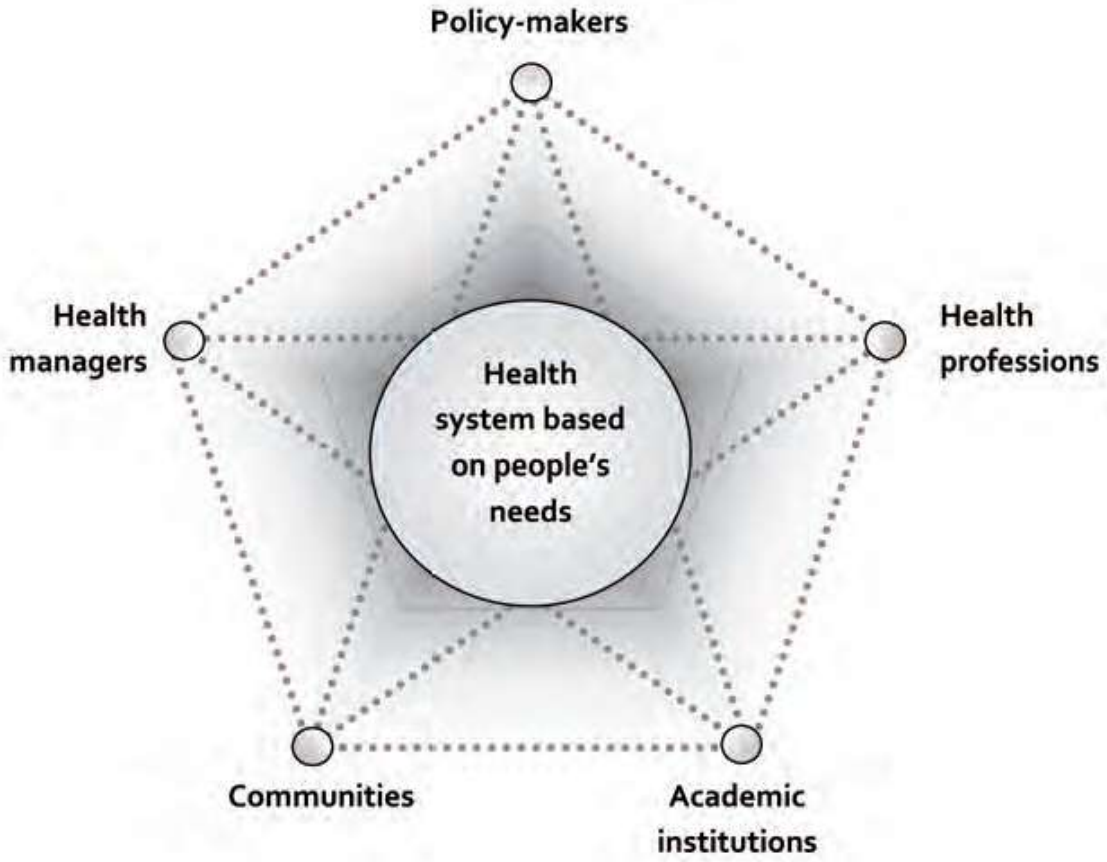
Barriers for large-scale implementation of telemedicine

Figure 32. Barriers by World Bank income group



Clinical work models

Telemedicine: opportunities and developments in Member States: report on the second global survey on eHealth 2009. (Global Observatory for eHealth Series, 2)



Source: World Health Organization, 2000.

Terima Kasih

Tack

Thank you

Åsa Holmner Rocklöv, MSc, PhD

Asa.holmner-rocklov@vll.se

Umeå Centre for Global Health Research

VÄSTERBOTTENS LÄNS LANDSTING

simkes UNIVERSITAS GADJAH MADA