
Linnaeus University & e.health Institute
and e.health in Sweden
"We set knowledge in motion for a sustainable societal development"
Evalill Nilsson
Part of the projekt capacity building program 15/2/2021

Linnæus University

eHealth Institute

The e-Health Institute works with research, evaluation, collaboration, and education within e-Health, that is to say, digital support that is meant to strengthen the individual and improve the quality and efficiency within health, nursing, medicine and care.

- Founded 2002
- Very well-known nationally
- Many projects in collaboration with society
- Focus on medicine, digital technology and big data
- A unique master programme in eHealth
- Free standing courses

https://lnu.se/forskning/sok-forskning/ehalsoinstitutet/

eHealth Institute projects

Project: Experiences of digital patient history recording

The scientific purpose of this project is to investigate in what way the introduction of digital anamnesis and e-triage affect the quality of…

Project: Using past data to prevent future fractures

Certain types of medication increase the risk of osteoporosis and fractures. In this research project, we develop a risk assessment tool which can…

Project: Expecting a child in Arabic and Swedish! Norm-critical innovative design for interactive antenatal care

Funding organisation: VINNOVA Project description Conditions for health care in Sweden…

Project: Appropriate use of medicines among the elderly in Småland

The overall aim with the project "Appropriate use of medicines among the elderly in Småland" is to improve use of medicines among the…

Project: Regional development in welfare technology and e-health services in cooperation (RUVeS)

The project RUVeS is managed by the eHealth Institute at Linnaeus university, Sweden, in cooperation…

Project: Drug use in Coronary Heart Disease

The project investigates how healthcare can support patients with coronary heart disease in their use of medicines, so that patients feel well today and at…

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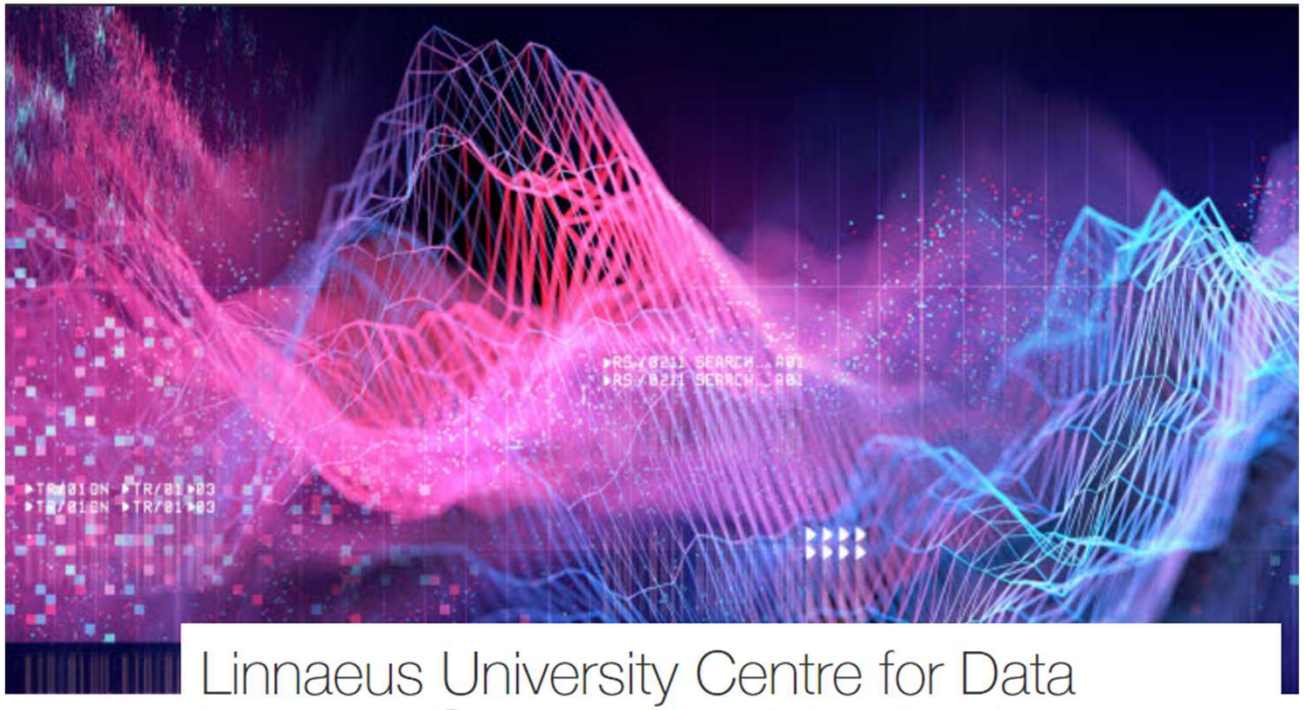
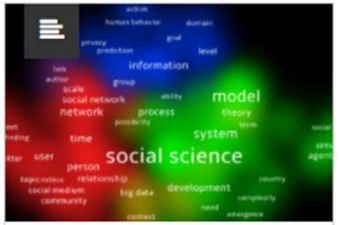


Linnaeus University Centre for Data Intensive Sciences and Applications

The DISA research centre at Linnaeus University focuses its efforts on open questions in collection, analysis and utilization of large data sets. With its core in computer science, it takes a multidisciplinary approach and collaborates with researchers from all faculties at the university.

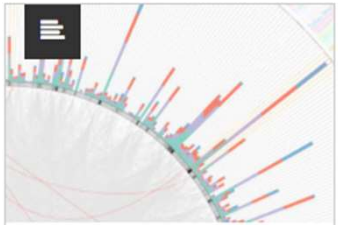
- Big data
- Data-driven methods
- IT Core
  - Self-adaptation
  - Visual analytics
  - Future Internet
  - Scalable computing
  - Signal processing
  - Statistical analysis
  - Machine learning
  - Composition & optimization

DISA Research Groups



Computational Social Sciences

The research in the area Computational Social Sciences within Linnaeus University Centre for Data Intensive Sciences and Applications (DISA) is about producing and…



Information and Software Visualization (ISOVIS)

The research group Information and Software Visualization mainly focuses on the explorative analysis and visualization of large and complex information…

AdaptWise

The AdaptWise research group conducts research in self-adaptive software systems. The primary focus is on: i) runtime approaches to provide guarantees for qualities of software systems…

Data Intensive Astroparticle Physics

The research area Data Intensive Astroparticle Physics within Linnaeus University Centre for Data Intensive Sciences and Applications (DISA) works with the…

eHealth – Improved Data to and from Patients

The research in the eHealth area within Linnaeus University Centre for Data Intensive Sciences and Applications (DISA) will result in novel ways for…

High-Performance Computing Center (HPCC)

The High-Performance Computing Center (HPCC) offers computational and storage resources to help researchers to solve big computing and big data problems.…

Data Intensive Digital Humanities

The research area Data Intensive Digital Humanities within Linnaeus University Centre for Data Intensive Sciences and Applications (DISA) is a network that brings…

Data-driven Software and Information Quality

Within the research area Data-driven Software and Information Quality, the objective of Linnaeus University Centre for Data Intensive Sciences and…

Forestry, Wood and Building Technologies

Within the research area Forestry, Wood and Building Technologies, the objective of Linnaeus University Centre for Data Intensive Sciences and Applications…

Sweden's sixth largest university in terms of number of students

- Located in Kalmar and Växjö
- 33,000 students
- 2,100 employees

eHealth in Sweden

Definition of eHealth in Sweden

eHealth

Health is physical, mental, and social well-being. eHealth is the use of digital tools and the digital exchange of information to achieve and maintain health.

Welfare technology

Digital technology aimed at maintaining or increasing safety, activity, participation or independence of a person who has or runs an increased risk of having a disability.

WHO

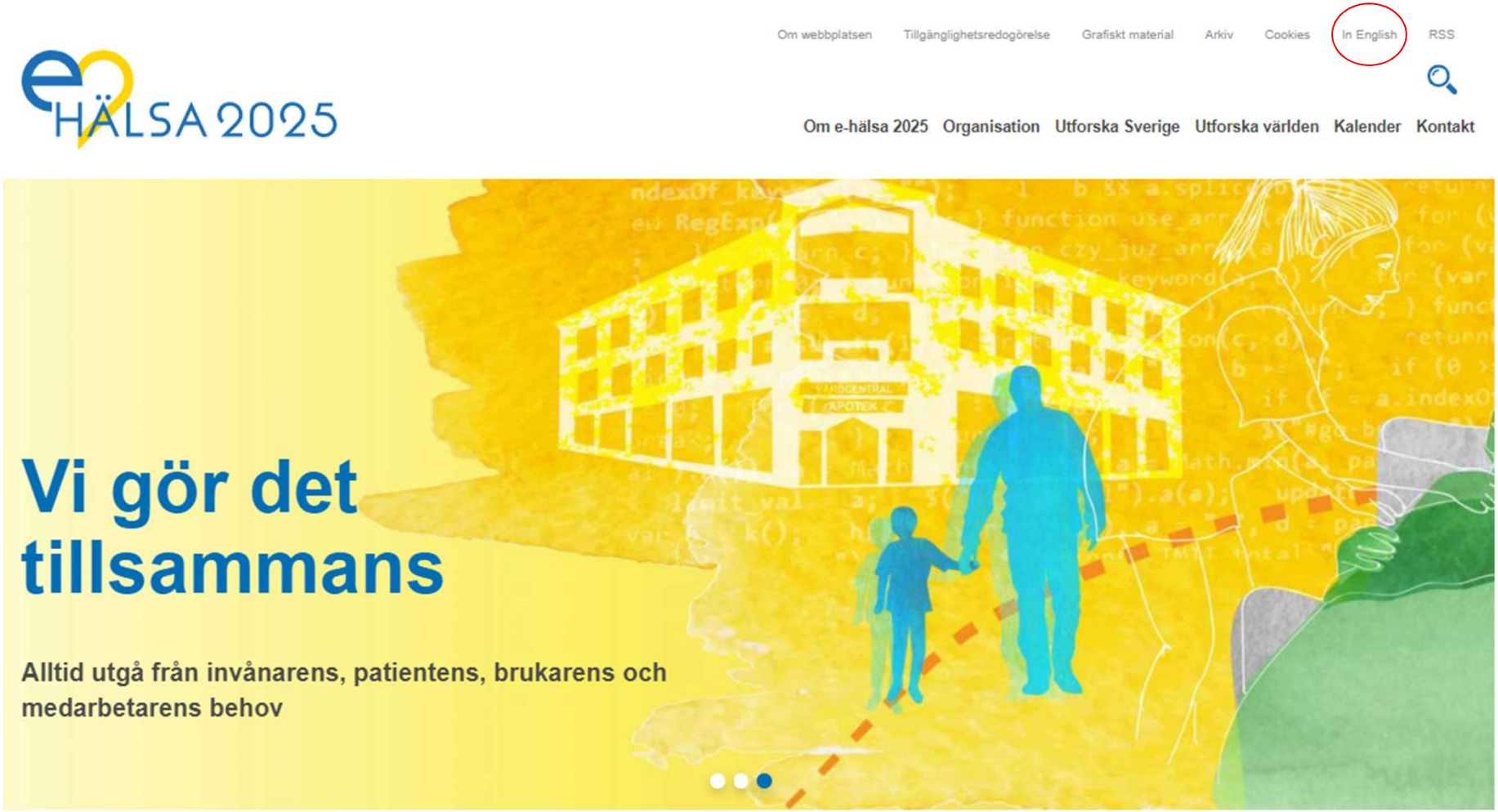
*"**eHealth** is the use of information and communication technologies (ICT) for health"*

"In 2025, Sweden will be best in the world at using the opportunities offered by digitisation and eHealth to make it easier for people to achieve good and equal health and welfare."

"Social services and health care are areas of welfare in which digitisation presents great opportunities."

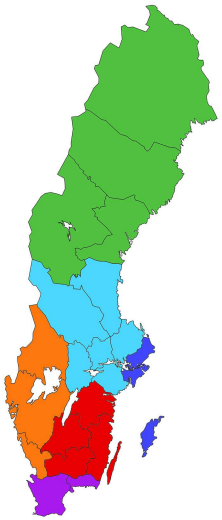
"For future work on eHealth, relevant actors in the social services and health care need a more long-term common approach."

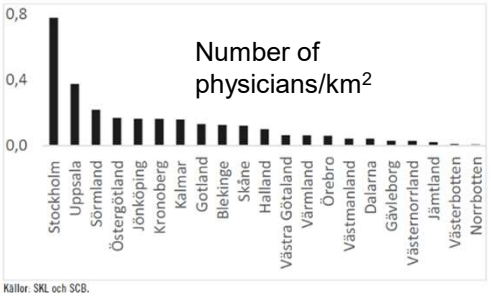
"eHealth is the responsibility of many actors."



https://ehalsa2025.se/

Swedish ehealth structure





IT-suppliers

Swedish Medtech

NGOs

Famna

Public

EU, government and parliament

Government offices

State agencies

Operators

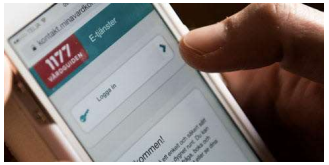
Private

Almega

Regions and municipalities

SALAR

Inera



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VISION

"In 2025, Sweden will be best in the world at using the opportunities offered by digitisation and eHealth to make it easier for people to achieve good and equal health and welfare, and to develop and strengthen their own resources for increased independence and participation in the life of society."

OBJECTIVE

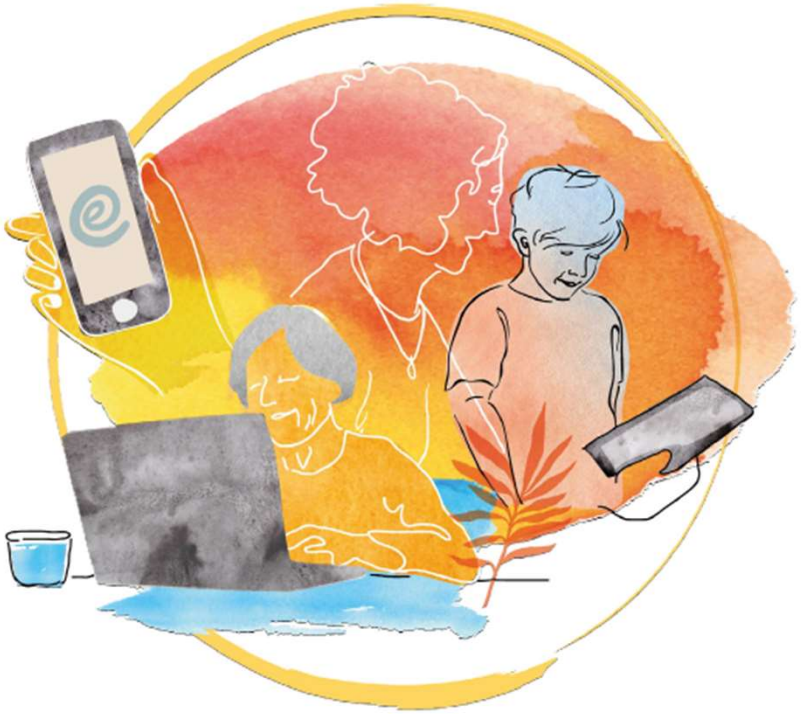
- The individual as co-creator
- The right information and knowledge
- Development and digital transformation hand in hand
- Safe and secure information processing

FUNDAMENTAL CONDITIONS

- Regulations
- Standards
- More consistent use of terms

OBJECTIVE 1

The individual as co-creator



Person-centred activities are contingent upon drawing on the needs and circumstances of patients and users and enabling everyone to be effective co-creators.

OBJECTIVE 2

The right information and knowledge

Equitable and gender-equal healthcare and social services of good quality rely on employees possessing the right information and knowledge in encounters with patients and users.

OBJECTIVE 3

Safe and secure information processing

The capacity to process and protect information appropriately needs to be constantly developed in pace with changes in the wider world.

OBJECTIVE 4

Development and digital transformation hand in hand

Digitisation is a game-changer for providers in all sectors.

Regulations

Goals in this area:

- create appropriate regulations that both guarantee the privacy and security of the individual and promote digital transformation;
- and facilitate the application and introduction of these regulatory frameworks in relevant services.

More consistent use of terms

Goals in this area:

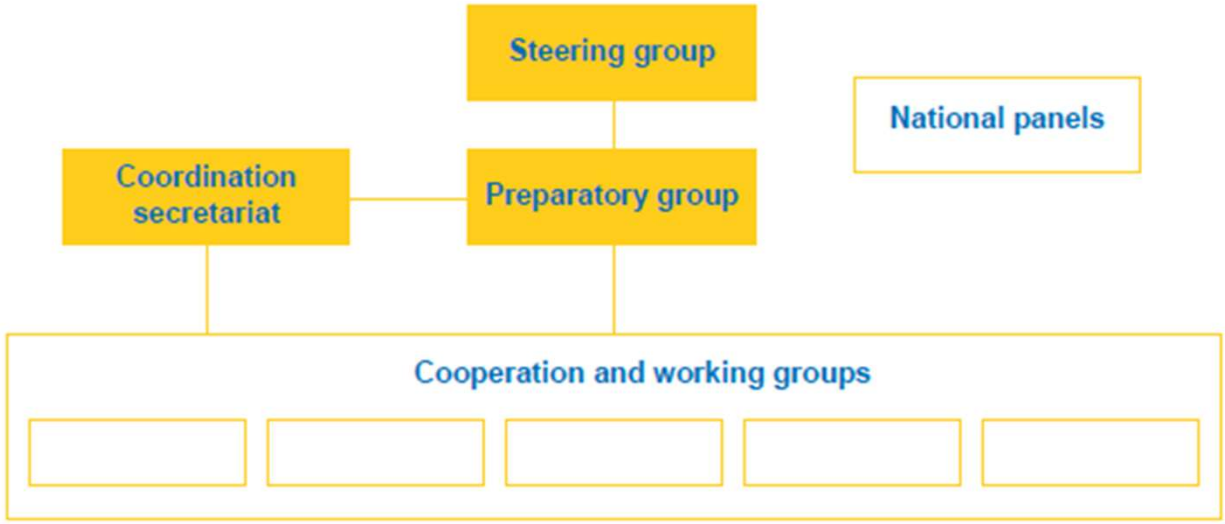
- Ensure that the concepts, terms and classifications necessary for services can consistently be managed uniformly and interpreted in a similar manner in exchanges between systems or services;
- and increase the rate of introducing common concepts, terms and classifications in services' IT support.

Standards

Goal in this area:

- Enable services' information and communications systems to send and receive relevant amounts of information in an appropriate manner, without need for additional measures.

National Vision eHealth 2025 Organisation



Indicators in three follow-up areas

Vision for eHealth 2025

Follow-up 2019

A: Need for and use of eHealth

Functions, support, and services

- The individual
- The meeting
- The employee

B: Structures that enable eHealth

Development, administration and renewal

- Regulatory framework
- Technology and infrastructure
- Standards and more uniform terminology use
- Implementation and innovation capacity

C: Social conditions for eHealth

- E-demography
- Health
- Academia and research
- Trade and industry

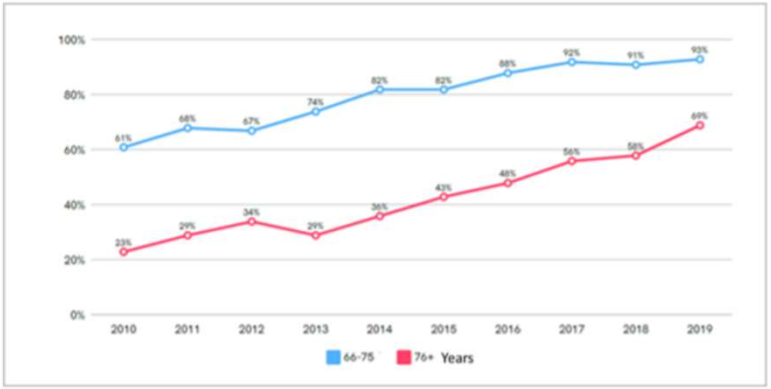


Diagram 1. Percentage of the population (66+ years) using the internet.
Source: Swedish Internet Foundation

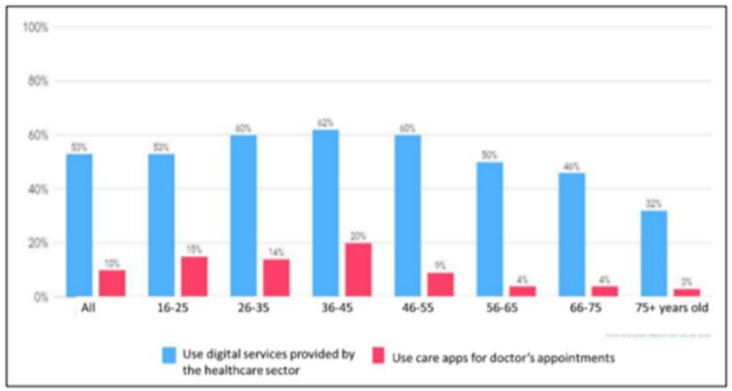


Diagram 2. Percentage of the population, broken down by different age categories, who use the digital services provided by the healthcare sector, and care apps for doctor's appointments in 2019. Source: Swedish Internet Foundation

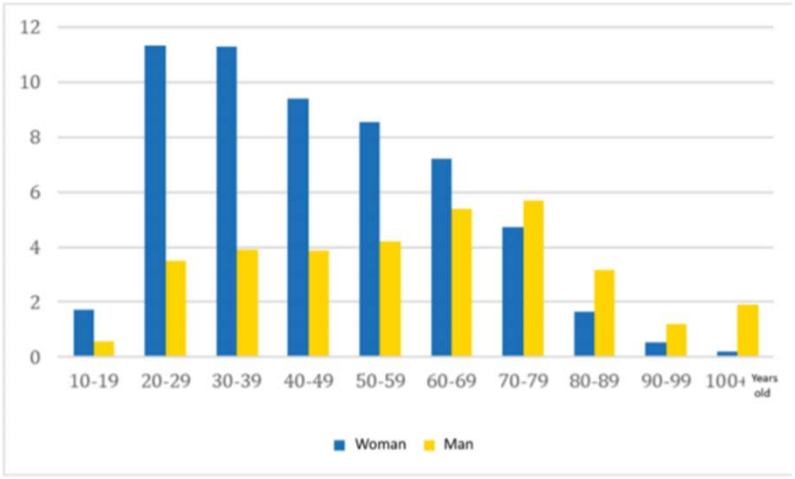


Diagram 3. Average number of logins to Healthcare Guide 1177's e-services per resident 2019, age range and gender. Note that the age category 10-19 years actually includes 16-19 years. Source: Inera

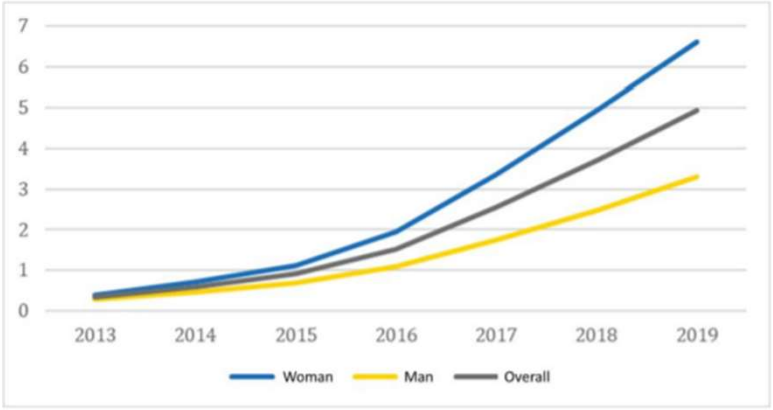


Diagram 4. Average number of logins to Healthcare Guide 1177 e-services per resident and year, in total and for each respective gender. Source: Inera

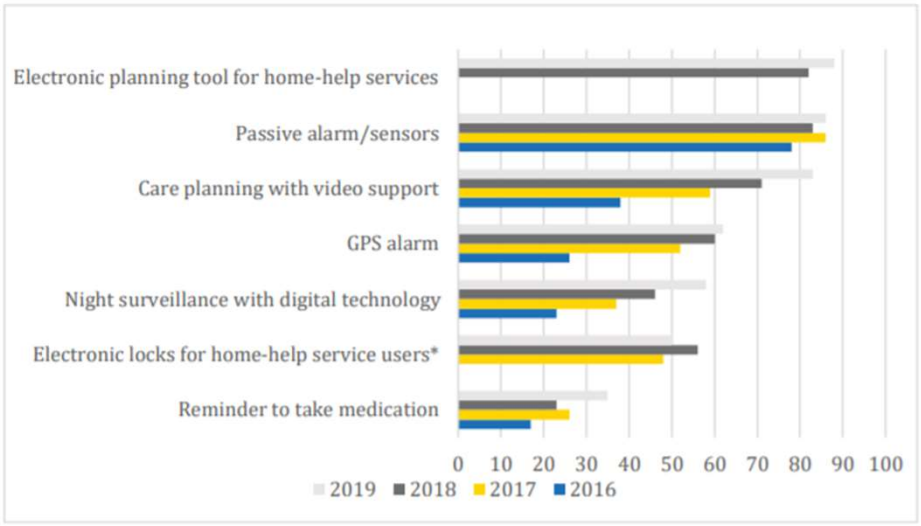


Diagram 6. Percentage of municipalities that have various kinds of welfare technology for persons in ordinary housing. [12] Source: National Board of Health and Welfare

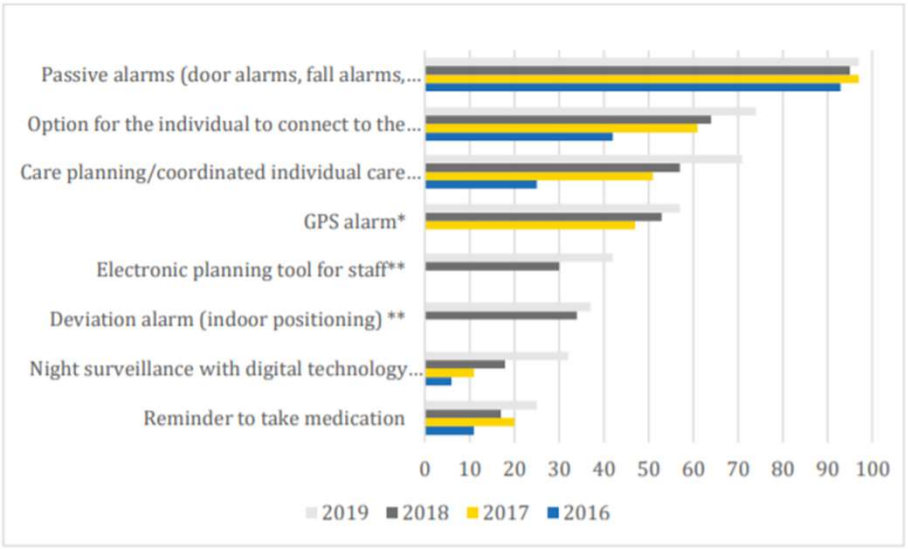


Diagram 7. Percentage of municipalities that have various kinds of welfare technology in special housing for the elderly[13]. Source: The National Board of Health and Welfare

Table VI. Number of applications and projects focusing on AI in healthcare, machine learning

	Active, May 2019	Near future	Research
Risk of illness (e.g. sepsis), prevention	1	6	4
Triaging, patient flow, rehospitalisation	2	10	2
Medical history, diagnosis, decision support	9	26	42
Treatment support, guidelines	2	8	13
Patient contact, monitoring, telemedicine	6	6	6
Patient record, administration	5th	4	4
Research, education, development	2	3	5th

Source: *Digitala vårdtjänster och artificiell intelligens i hälso- och sjukvården*, National Board of Health and Welfare, 2019

Personal data breaches in Swedish healthcare 2019

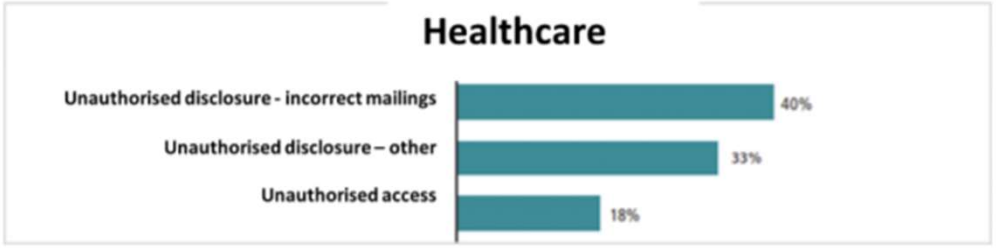


Diagram 15. Distribution of the main breaches in the healthcare sector in 2019. Total number of breaches in 2019: 656

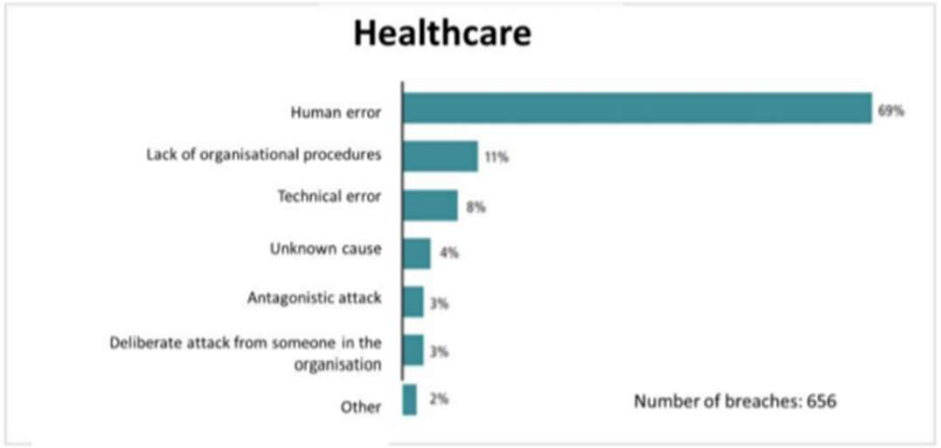


Diagram 16. Distribution of causes of breaches in the healthcare sector in 2019.

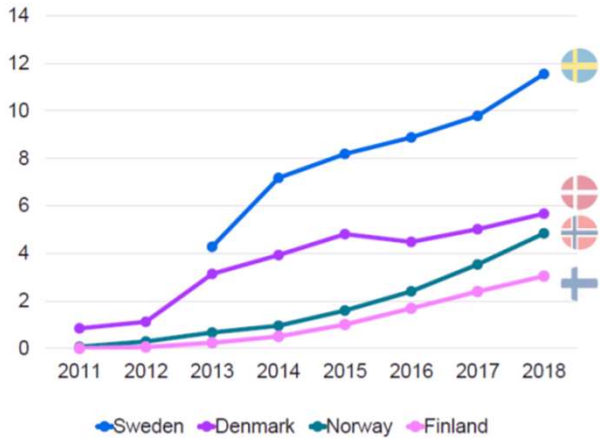


Diagram 12. Visits to national health portals per capita, April 2019.
Source: Norwegian Directorate of eHealth

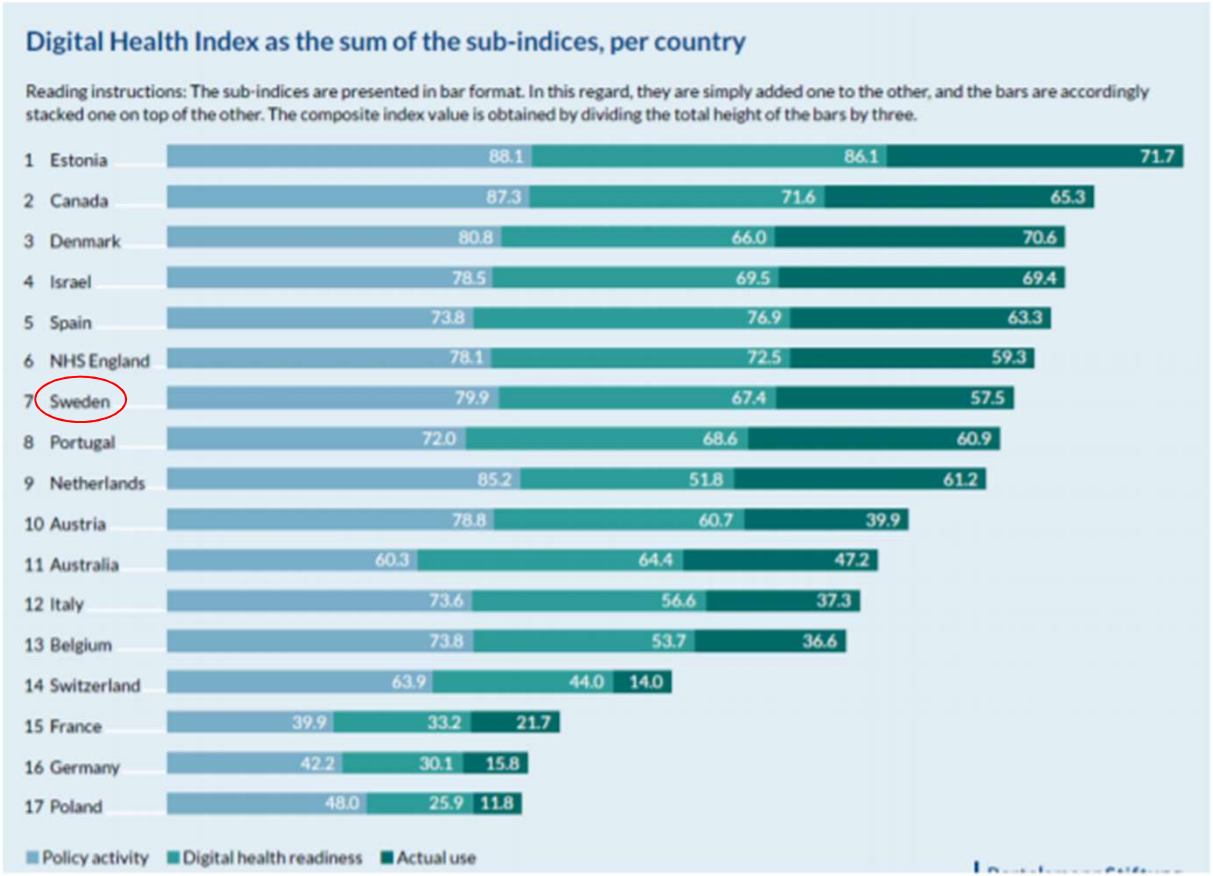
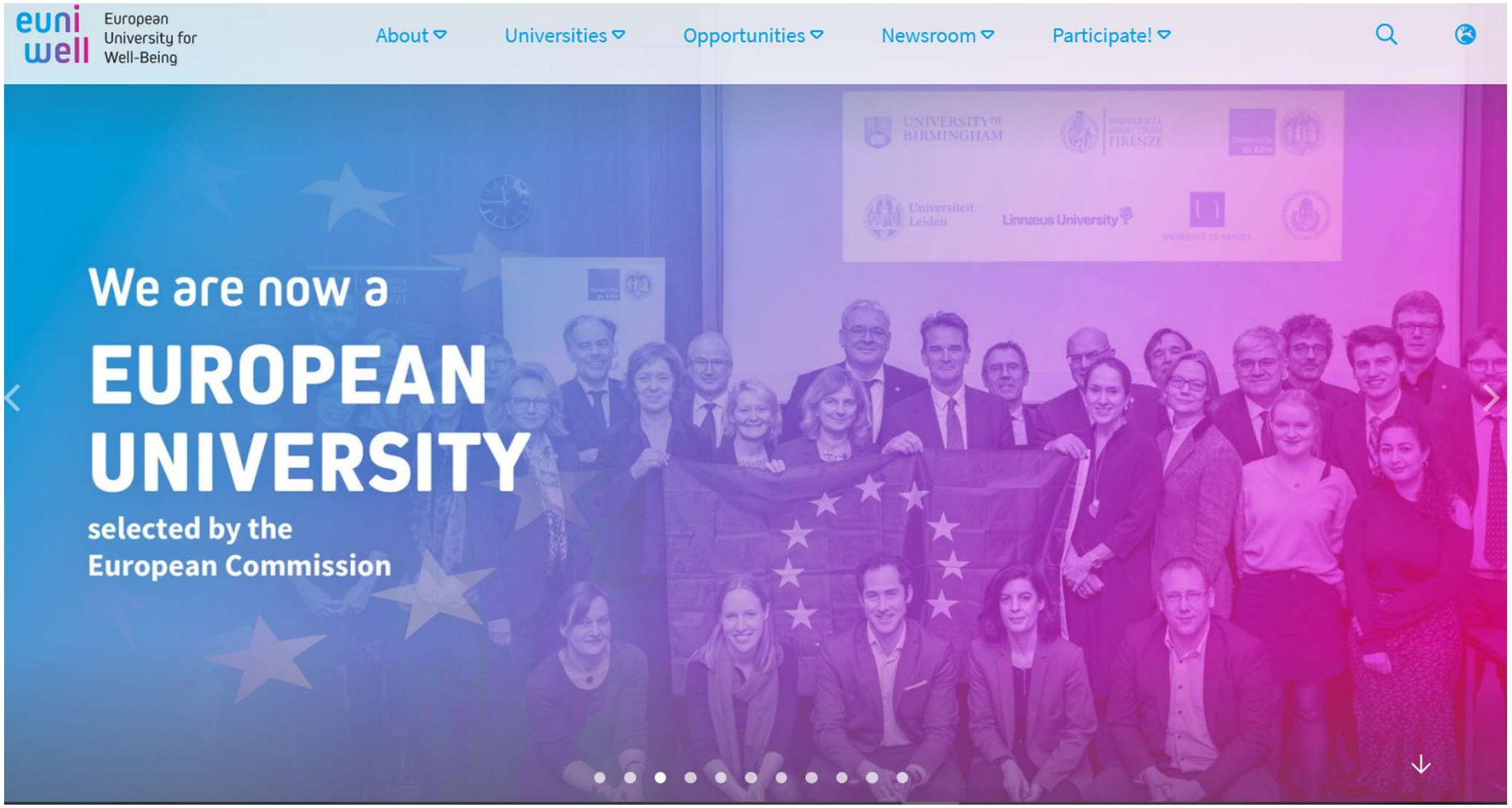


Diagram 13. Digital health index for Sweden, compared to a selection of other countries.
Source: Bertelsmann Foundation



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Digital encounters/ e-consultations in Sweden

What is an e-consultation in healthcare?

Healthcare process

- consultation
- treatment
- follow-ups
- rehabilitation

- prevention -

Different contacts

- professional – professional
- professional – patient (at home)
- professional – patient+professional

Tools

- video
- chat
- web portal
- (email)
- (telephone)

Related: self-monitorering – primary/secondary prevention

Why e-consultations in healthcare?

Increase access to healthcare
Prevent transmission of communicable diseases
Reduce transports

- Always the second choice or in some instances the better choice? If so, when?
- e-Consultations as an institution, how do we get there?
- The perspective of family relatives and other loved ones in e-consultations
- The perspective of patient-centredness and dignity in e-consultations

Research about e-consultations in healthcare

What do we already know to some extent?	Knowledge gaps?
Expectations and experiences of patients and staff Outcomes (time, cost, follow-up) Recommendations	The role of family and loved ones Interventions/training Multiple comparisons (present in the same room/F2F, telephone, chat, video, web portals…)

What does a good digital encounter look like?

The use of video consulting in general practice: semi-structured interviews examining acceptability to patients

Sophie Johnston
c/o Brian McKinstry, Usher Institute of Population Health Sciences and Informatics, University of Edinburgh, UK

Margaret MacDougall
Usher Institute of Population Health Sciences and Informatics, University of Edinburgh, UK

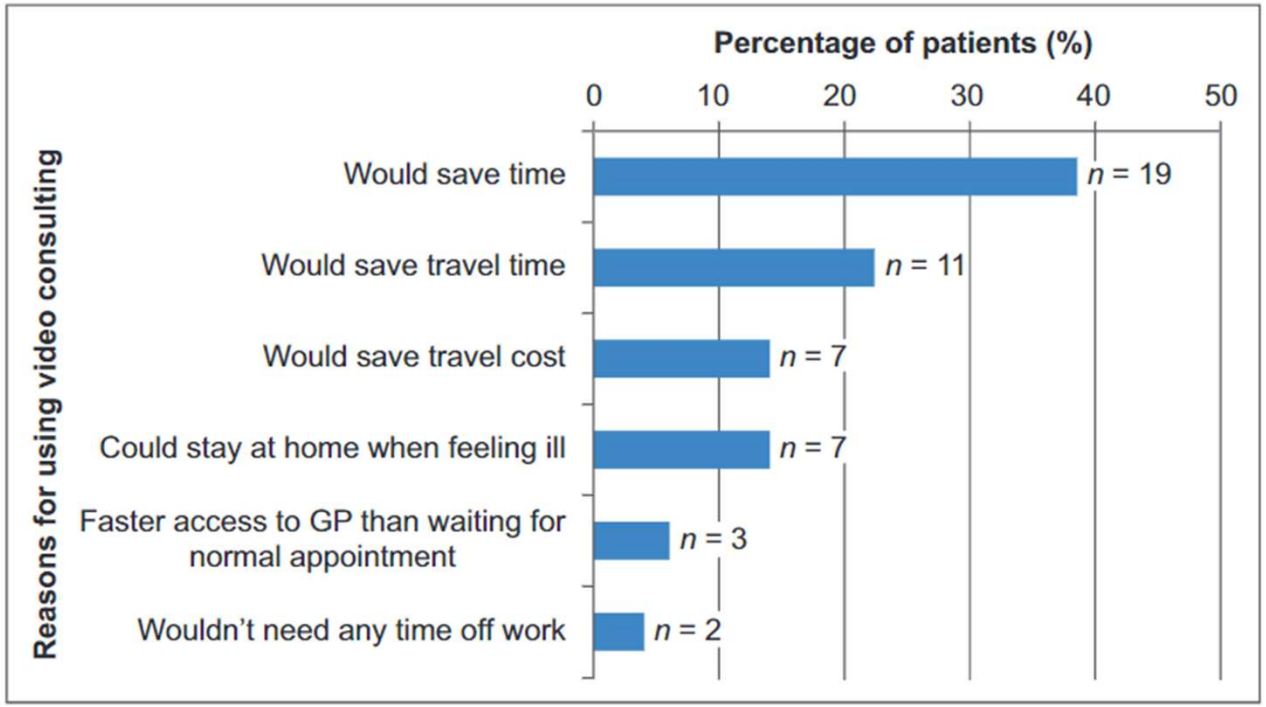
Brian McKinstry
E-Health Group, Usher Institute of Population Health Sciences and Informatics, University of Edinburgh, UK

Background and Objective To increase patient access to healthcare, the U.K. Government has encouraged new technology-based approaches including telephone consulting, email-consulting, short message service messaging and video consulting over the Internet. However, little is known about patient acceptance of video consulting as a consulting method. We aimed to explore primary care patients' views on the possible utility of video consulting.

Method and Results We used semi-structured interviews to survey 270 patients in Lothian. Three diverse general practices were purposively chosen. Sequential patients attending the practice at different times of day were invited to participate. Patients were asked to indicate their level of computer proficiency and provide their views on the use of video consulting and what specific applications it might have. We found that 50% (95% Confidence Interval (CI) 43.9%–56.1%) of patients would use video consulting. Patients under 60 years were over two times more likely to use it (Odds Ratio (OR) 2.2, 95% CI 2.1–6.6) and evidence of a positive trend between increasing computer proficiency and those who would video consult was found ($\chi^2 = 43.97$, $p < 0.0005$, $n = 270$). Patients who had used commercial video services (such as Skype) were approximately six times more likely to favour video consulting than those who had not (OR 5.9, 95% CI 3.5–9.9).

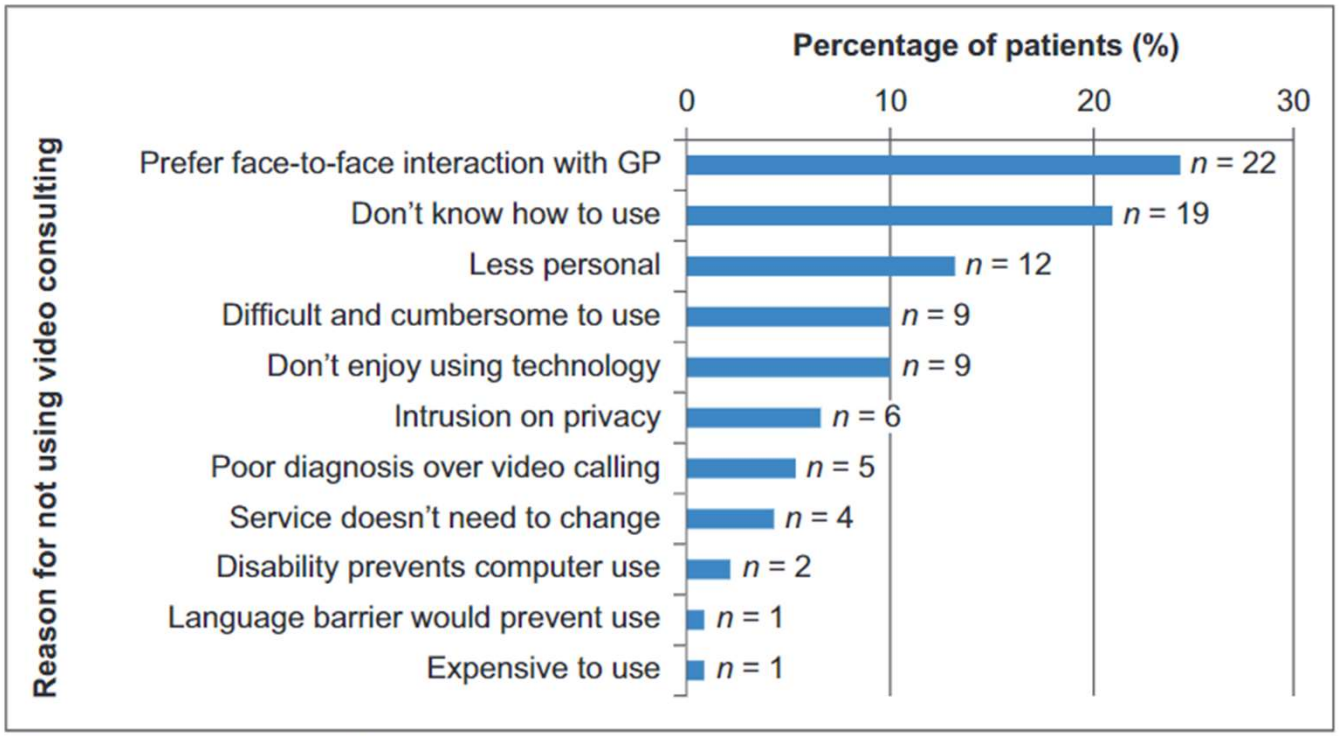
Conclusions This suggests strong patient interest in video consulting in primary care. However, it is possible that in the short to medium terms, there may be access inequality favouring younger and more technically able people. Further studies are needed to determine the content, safety, efficacy and cost effectiveness of employing this medium.

Johnston et al. The use of video consulting in general practice: semi-structured interviews examining acceptability to patients



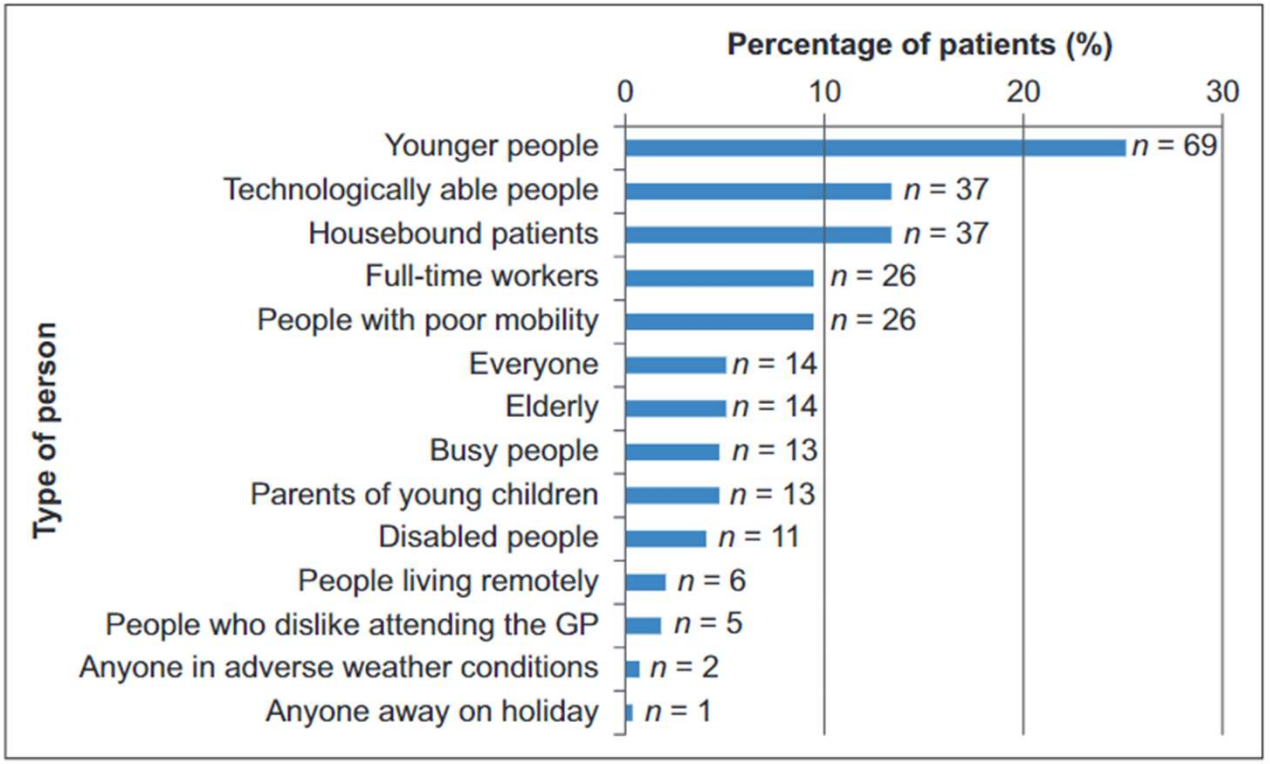
[a]Frequencies involve multiple responses per patient

Figure 1 Patient reasons for using video consulting[a]



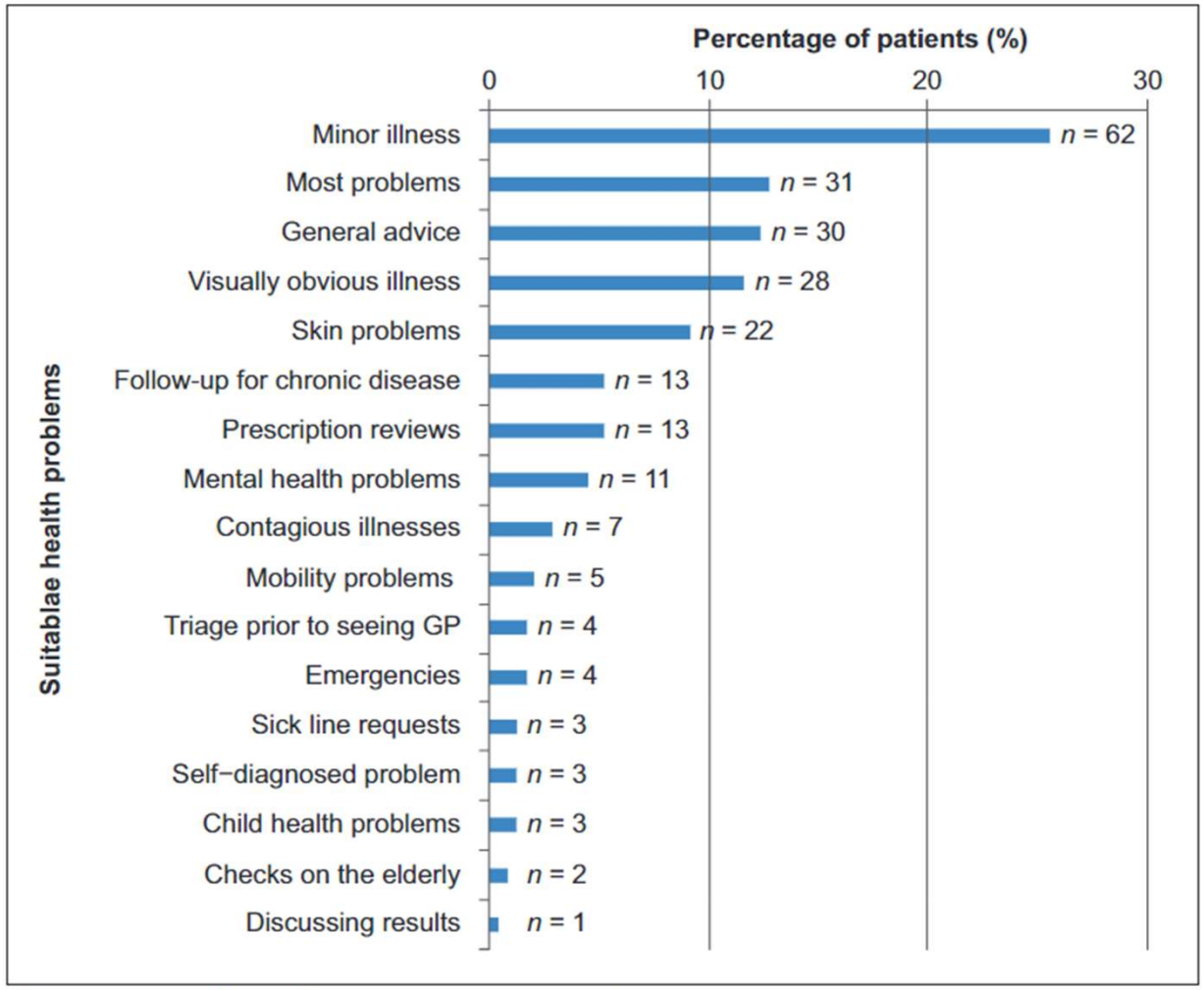
[a]Frequencies involve multiple responses per patient

Figure 2 Patient reasons for not using video consulting[a]



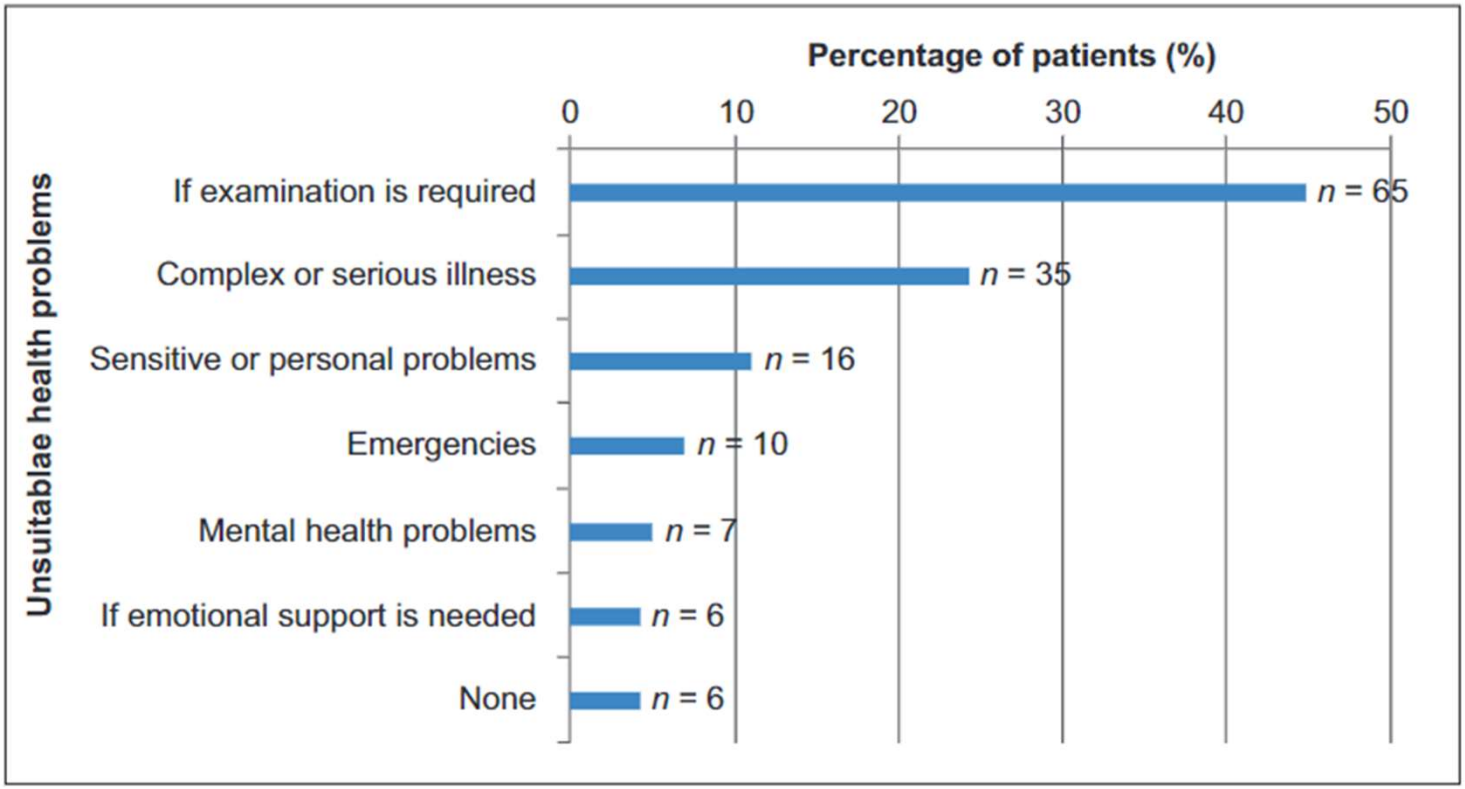
[a]Frequencies involve multiple responses per patient

Figure 3 **Type of person for whom patients think video consulting would be most useful[a]**



[a]Frequencies involve multiple responses per patient

Figure 4 Suitable health problems identified for discussion in a video consultation[a]



[a]Frequencies involve multiple responses per patient

Figure 5 **Unsuitable health problems identified for discussion in a video consultation[a]**

Definition of quality healthcare – *National Academy of Medicine (NAM) of the National Academy of Sciences, Engineering & Medicine, US*

Safe – avoiding injuries to patients from the care that is intended to help them.

Timely – reducing waits and sometimes harmful delays for both those who receive and those who give care.

Effective – providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (avoiding underuse and overuse).

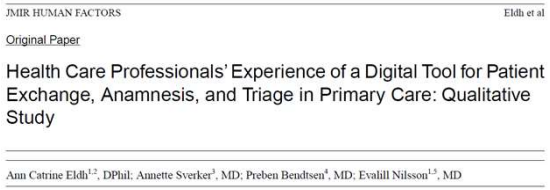
Efficient – avoiding waste, in particular waste of equipment, supplies, ideas, and energy.

Equitable – providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status.

Patient-centred – providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions.

Primary care chat with automated medical history taking (interviews with staff and patients)

Safety
Trust in the system or no reflection


JMIR HUMAN FACTORS Eldh et al

Original Paper

Health Care Professionals' Experience of a Digital Tool for Patient Exchange, Anamnesis, and Triage in Primary Care: Qualitative Study

Ann Catrine Eldh[1,2], DPhil; Annette Sverker[3], MD; Preben Bendtsen[4], MD; Evalill Nilsson[1,3], MD

Timely
Increased availability (many different ways of contact, fast route)

Effective
Automated history-taking, some improvements are necessary, especially chest pain
Patients sometimes struggle to answer, what is vital for healthcare to know

Efficient
Number of cases vital: low number, no flow
Patients do not use the system as intended
Written answers take longer time than spoken
Not for all cases/diagnoses?
Pictures improves efficieny
Automated history-taking, less risk of missing out on vital information?

Primary care chat with automated medical history taking (interviews with staff and patients)

Equitable

Young, digital literates have an advantage
Express yourself in writing (good if you have difficulties with spoken language)

Patient-centred

Freedom of time and place
Saves time and travel (communicable diseases)
Written conversation easy to revisit, but should it be saved verbatim (word by word)?
Feeling of anonymity – sensitive issues
Asynchronous chat – pros and cons (may prolong)
Patient in charge
Translation assistance
Automated history taking not designed from a patient perspective
Internet connection
Difficult for other people
- Low ehealth/digital literacy
- Low ability to express yourself in writing

Patient Education and Counseling 99 (2016) 689–705

Contents lists available at ScienceDirect

Patient Education and Counseling

journal homepage: www.elsevier.com/locate/pateducou

Review article

E-consulting in a medical specialist setting: Medicine of the future?

Linda C. Zandbelt[a,*], Froukje E.C. de Kanter[b], Dirk T. Ubbink[c]

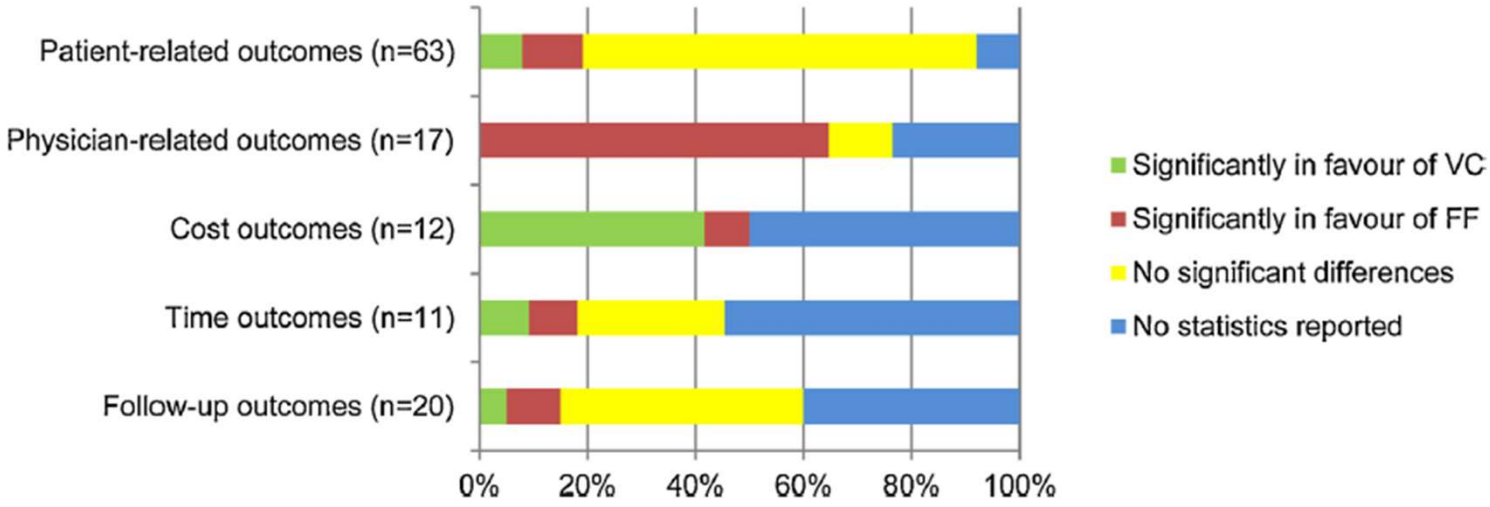


Fig. 2. Graphical summary of outcomes for videoconferencing (VC) vs. face-to-face (FF) consultations. *N* = number of outcome variables reported.

Recommendations

Technical aspects

- Computer/padlet/telephone, camera/microphone, internet connection, IT support

Preparations

- Premises (sound, light, furnishing), outfit, other persons in the room, back-up plan (telephone?), practice/training, instructions to patients

Differences from F2F/presence in the same place

- Both body and spoken language will have to be adjusted, eye contact will be different, and empathy/confirmation will have to expressed in partly new ways,
- Other means to use the computer/take notes,
- Examination with more assistance from the patient her/himself (and loved ones) and/or technical devices

Project: The good digital encounter

Two tracks:

1) Investigation of an integrated video consultation service and a primary care chat service from a systemic perspective (quantitative and qualitative methods: effectiveness, satisfaction etc).
2) Training and analysing healthcare professionals in communicating with patients through video conferencing and chat services to create a model for the patient-centred, dignified and functional digital encounter (action research).

   As a more general outcome of the project, we intend to suggest competence strategies for the development of necessary skills needed to connect people, technology, and organisation when implementing new tools for patient-healthcare professionals digital encounters.


Digital Care Research Network
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