European Commission

Benchmarking Deployment of eHealth among General Practitioners (2013)

EXECUTIVE SUMMARY

A study prepared for the European Commission
DG Communications Networks. Content & Technology

Digital Agenda for Europe

This study was carried out by

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Internal identification
Contract number: 2013.6004
SMART number: 2011/0033

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ISBN 978-92-79-31183-3
DOI: 10.2759/26426

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1. Background and methods

1.1 Background

This is the Executive version of the Final Report for the study on '*Benchmarking deployment of eHealth among General Practitioners II*'. It selectively reports and discusses the findings from the survey of 9,196 General Practitioners from 31 countries (EU27 + Croatia, Iceland, Norway, and Turkey) that was carried out with the objectives of: a) measuring the level of availability and use (combined in a general measure of adoption) of eHealth in primary care; b) explaining what drives or hampers the overall level of eHealth adoption (as measured by the composite indicators and index constructed). The findings of the survey are more extensively presented in the Final Report, and the full details on research design and methodology can be found both in the Final Report and in the accompanying Technical Compendium.

As broadly defined by the Commission in the 2004 Action Plan, eHealth is *'the use of Information and Communication Technologies (ICT) across the whole range of healthcare functions*' (European Commission, 2004). Adoption of eHealth continues to figure among the key policy priorities of Europe for it can bring several benefits and help cope with the challenges currently faced by healthcare systems in Europe, such as ensuring system sustainability while preserving quality of care in the face of an ageing population. In the new *EU 2020 Strategy* (European Commission, 2010a), the ageing process and healthcare are included among the grand societal challenges Europe is facing and which it must turn into opportunities. Within the new *Digital Agenda for Europe* (European Commission, 2010b) eHealth is part of Pillar 7 where a number of actions have been identified, such as for instance action 75: "*Give Europeans secure online access to their medical health data and achieve widespread telemedicine deployment*". More recently, the new *eHealth Action Plan 2012-2020 - Innovative healthcare for the 21st century* emphasised how eHealth could at the same time help cope with current challenges and create market opportunities and set, among others, the objectives of "*achieving wider interoperability of eHealth services*" and "*facilitating uptake and ensuring wider deployment*" (European Commission, 2012, p. 6).

Besides basic ICT information and infrastructures, the key pillars of eHealth that we have measured include:

- **Electronic Health Record (EHR)**: *systems that are used by healthcare professionals (doctors and nurses) to enter, store, view, and manage patient health and administrative information and data*.
- **Health Information Exchange (HIE)**: *is the process of electronically transferring / sharing / enabling access to patient health information and data*.
- **TeleHealth**: *is the use of broadband-based technological platforms for the purpose of providing health services, medical training and health education over a distance*.
- **Personal Health Record (PHR)**: *are electronic systems allowing patients to have secure access to, and manage, their health information.*

1.2 Sampling

We adopted a transparent sampling strategy and extracted simple random samples directly from the 'official lists'[1] defining the universe of reference in each country. To this purpose we interacted steadily with GPs national associations, which was facilitated by having UEMO (the European level association of national GPs associations) as a member of our consortium. Respondents have been given the choice of completing the questionnaire online or being interviewed by phone; depending on their choice, data were either gathered online or through phone interviewing with real-time online data input ("web-CATI" where CATI stands for Computer Assisted Telephone Interviews).

Data gathering started on 25th October 2012 and ended on 6th March 2013. The two tables below report the main sample parameters in compact fashion and country by country.

[1] We mean the lists of practising GPs obtained either from administrative bodies or from GPs national associations.

Table 1 Sample summary parameters

Universe	Defined as "*physicians working in outpatient establishments in specialties such as general practice, family doctor, internal medicine, general medicine*"
Scope	EU27 countries plus Croatia, Iceland, Norway, and Turkey
Methodology	Mixed (Online, Web-CATI, and Face-to-face)
Sample size	Total N = 9196
Sample extraction	Simple Random Sample
Weighting	Weighting by country to be able to interpret the overall data
Response rate	35% on average
Sampling error	• ±1.03% for overall sample (31 countries) • In a range between ±4.15% and ±13.84%. for country samples • In all cases, a maximum indeterminate probability (p=q=50), for a confidence level of 95.5% is applicable for each country)

Table 2 Universe, sample, and sampling errors

Country	Universe	Sample	(%) of Universe	Sampling error
Austria	12979	333	2.6%	±5.41%
Belgium	12262	406	3.3%	±4.88%
Bulgaria	4786	310	6.5%	±5.49%
Croatia	2960	250	8.4%	±6.05%
Cyprus	345	50	14.5%	±13.10%
Czech R.	7332	308	4.2%	±5.58%
Denmark	3735	306	8.2%	±5.48%
Estonia	1148	50	4.4%	±13.84%
Finland	5453	283	5.2%	±5.79%
France	104225	401	0.4%	±4.98%
Germany	53719	403	0.8%	±4.96%
Greece	3060	332	10.8%	±5.18%
Hungary	6559	268	4.1%	±5.98%
Iceland	187	53	28.3%	±11.66%
Ireland	2449	200	8.2%	±6.78%
Italy	46661	416	0.9%	±4.88%
Latvia	1315	200	15.2%	±6.51%
Lithuania	2288	212	9.3%	±6.54%
Luxembourg	392	73	18.6%	±10.57%
Malta	286	50	17.5%	±12.87%
Netherlands	8783	400	4.6%	±4.89%
Norway	2309	335	14.5%	±5.05%
Poland	6619	412	6.2%	±4.77%
Portugal	20221	513	2.5%	±4.36%
Romania	27418	403	1.5%	±4.94%
Slovakia	2236	201	9.0%	±6.73%
Slovenia	1012	167	16.5%	±7.07%
Spain	33349	469	1.4%	±4.59%
Sweden	5487	338	6.2%	±5.27%
Turkey	37600	572	1.5%	±4.15%
UK	48543	482	1.0%	±4.53%
TOTAL	**465718**	**9196**	**2.0%**	**±1.03%**

Source: For (1) HFA-DB[2] (corrected and/or validated by UEMO)

The overall sampling error is 1.03%; in 20 countries it is around 5%, in six countries it is between 6% and 7%, and only in five countries is it above 10% (for these countries results must be read only as indicative of trends). We have reached a larger sample than was planned *ex ante* (9.196 versus 8.550) as a result of more successful data gathering in some countries, which compensated for the fact that in five countries we could not reach the target sample[3].

[2] European health for all database:http:www.euro.who.intenwhat-we-dodata-and-evidencedatabaseseuropean-health-for-all-database-hfa-db2.

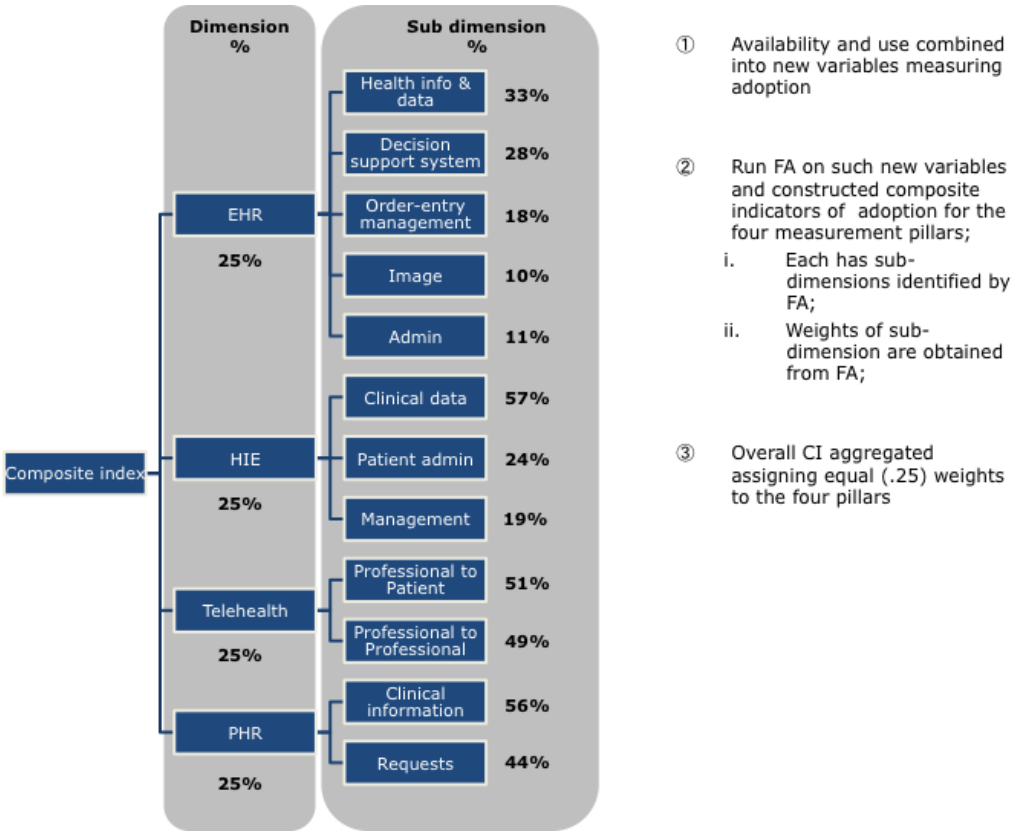
[3] The decrease in the size of the sample for Austria, Croatia, Finland, Hungary, and Slovenia is not at all significant in terms of statistical robustness, as it impacts sampling error only by 0.73% at most (in Slovenia from +/- 6.34% to +/- 7.07%).

1.3 Outline of the methodological approach

For the construction of the composite indicators presented so far and the overall composite index presented next, we have followed state of the art guidelines (OECD-JRC, 2008). In brief we used Factor Analysis (FA) to construct four composite indicators of adoption for the four measurement pillars (EHR, HIE, TeleHealth, and PHR) and then combined these four composite indicators into an overall composite index of eHealth adoption in primary care. The next figure summarises how we proceeded from FA to the construction of composite indicators of adoption and to the overall composite index of eHealth adoption[4]

Figure 1 From FA to the composite index

We have used base variables combining availability and usage and, through Factor Analysis, constructed 4 indicators of adoption for the 4 measurement pillars (EHR, HIE, Telehealth, PHR) that have been combined into an overall composite index of eHealth adoption



Important note on how to interpret the composite scores. The four composite indicators for the four measurement pillars have been constructed by processing, through the Factor Analysis, the variable of adoption that combines answers on availability and use as follow:

Don't know (not aware)= 0; Do not have it=1; Have it and do not use it= 2; Use it occasionally= 3; Use it routinely= 4.

Accordingly, all the scores range from 0 to 4. These indicators are continuous variables that represent adoption from "Not aware" (0) to "Use it routinely" (4).

[4] All the technical details are fully transparent reported in the Appendix of the Final Report.

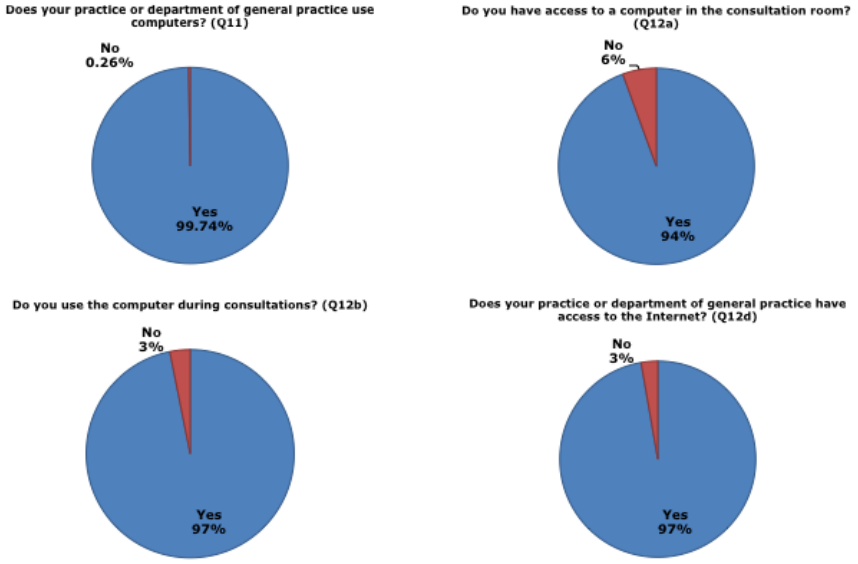
2. Main findings

2.1 Key measurement findings

Access to ICT infrastructures

The figure below shows the availability and use of basic ICT.

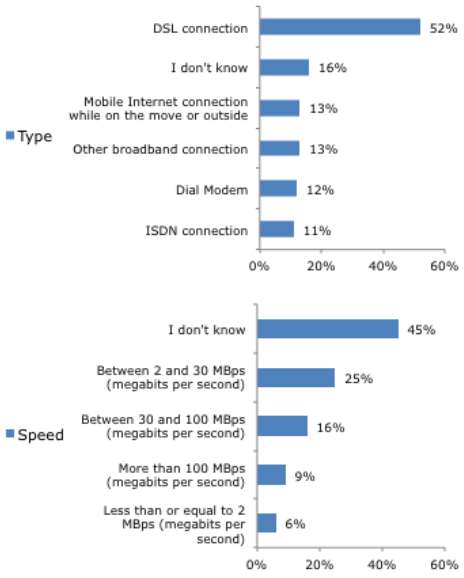
Figure 2 Basic infrastructure availability and use



Access to, and use of, basic ICT is by now almost universal

The four pie charts below lead to the following conclusions: a) access to basic ICT is by now universal; b) in future surveys these four questions could be spared and used for investigating other more relevant matters. The next figure reports the type and speed of Internet connection available to GPs, and shows a somewhat less optimistic picture: only 65% of our respondents report having broadband connection and very few have high speed Internet.

Figure 3 Type and speed of connection



Broadband connection of some sort is available to 65% of GPs, but only 9.5% report having access to very high speed Internet connection

The availability of more advanced forms of security is not so widespread as shown in the next figure (multiple answers were possible, so the total does not add up to 100%).

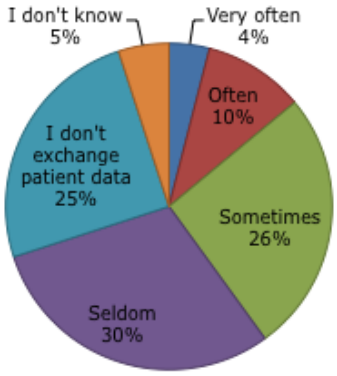
Figure 4 Security features

The majority of GPs have only basic security solutions, with smaller percentages reporting having encryption or electronic signature

Before moving to the measures obtained for the key pillars, it is worth looking at what doctors reported concerning a key enabler such as compatibility for data exchange.

Figure 5 Compatibility problems for data exchange

Compatibility problems when exchanging patients' data has been reported by 56% of the GPs



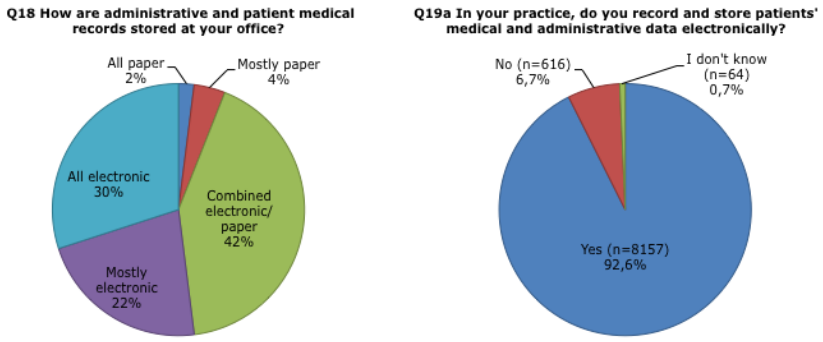
Considering that 25% of our respondents report not doing any patients' data exchange and that 40% encounter compatibility problems with some regularity, it is clear that we are in the presence of a clear bottleneck in terms of key enablers. For instance, compatibility problems represent a barrier for Health Information Exchange in that exchanged data are not in compatible formats (see later).

Electronic Health Record

Before entering into the detailed components of EHR, we asked GPs the two questions reported in next figure (the first of which is a sort of control question for the second).

Figure 6 How records are stored

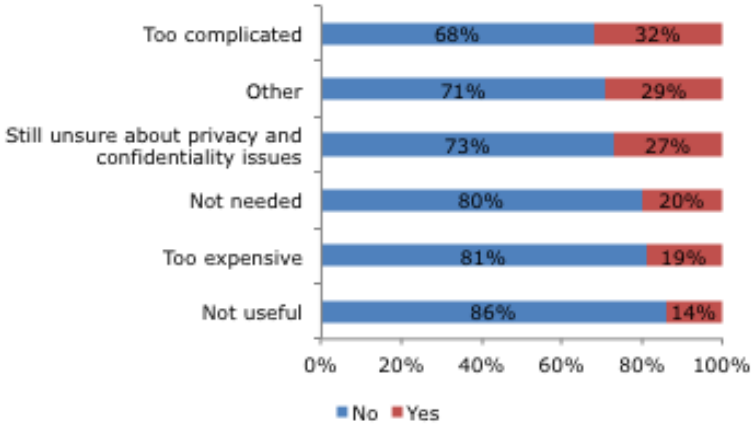
About 93% of GPs report having an EHR system, but this does not mean that full digitalisation of records is completed



The about 7% of respondents not having EHR indicated the reasons summarised in next figure.

Figure 7 Reasons for not having EHR

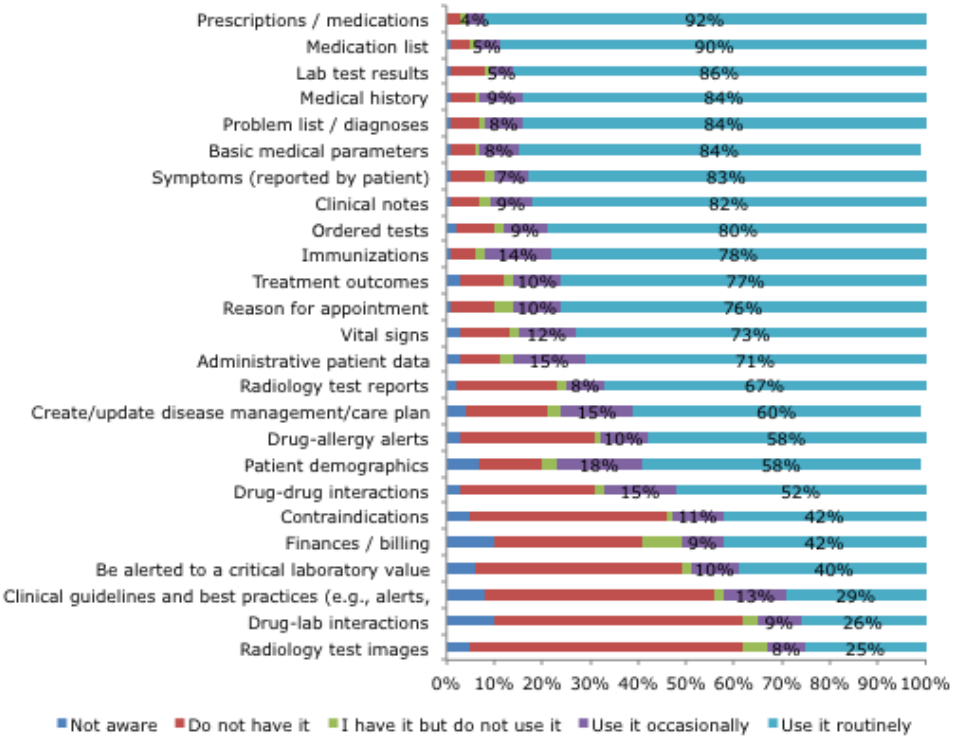
Complexity and concerns about privacy and confidentiality are the main reasons reported for not having EHR



The following figure reports the descriptive statistics on new variable obtained combining answers on availability and use. More than 75% of the respondents stated that they use routinely the following functionalities: Reason for appointment; *Treatment outcomes*; *Immunizations*; *Ordered tests*; *Clinical notes*; *Symptoms (reported by patient)*; *Basic medical parameters*; *Problem list / diagnoses*; *Medical history*; *Lab test results*; *Medication list and Prescriptions / medications.* On the contrary, half of the GPs claimed that functionalities related with Decision Support Systems such as *Radiology test images; Drug-lab interactions or Clinical guidelines and best practices (e.g., alerts, prompts) are not available in their practice.*

Adoption of EHR is fairly high for some basic functionalities, but it decreases for more advanced ones such as 'Drug-Lab Interaction' and 'Radiology Test Images'

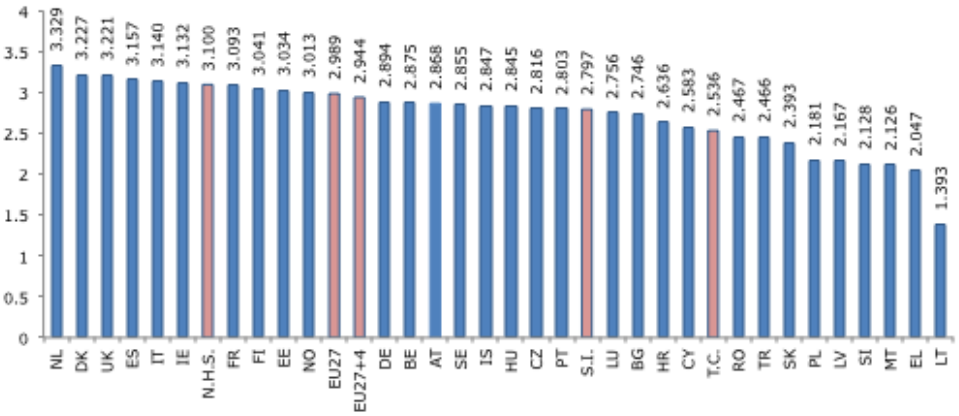
Figure 8 EHR: from awareness to use



The values of the composite indicator of EHR adoption constructed through factor analysis are reported below. As it was mentioned in the outline of the methodology § 1.3, the composite indicator is a continuous variable that represents adoption from "Not aware" (0) to "Use it routinely" (4).

The value for EU27 indicates that EHR are fully available. Differences across Europe are very marked: whereas the Netherland report 82% of full adoption, this goes down to 34% for Lithuania

Figure 9 EHR composite indicator of adoption



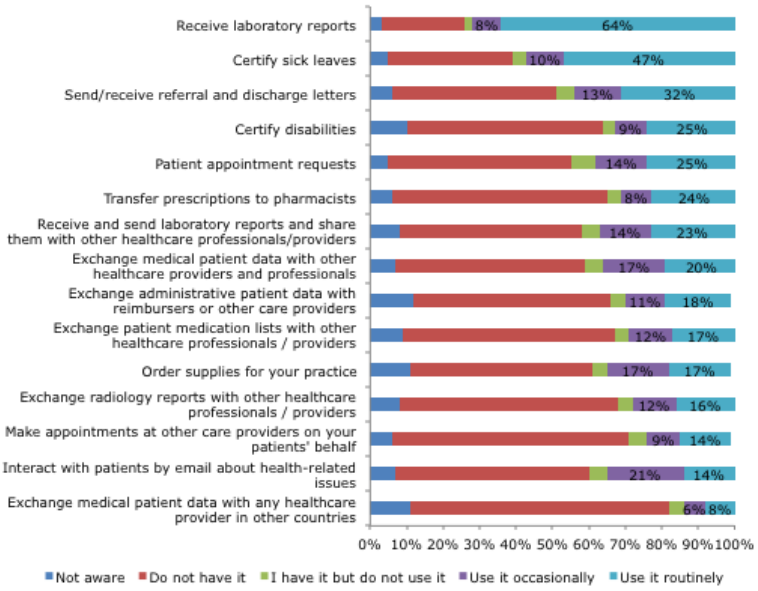
N.H.S.=National Health Service; S.I.=Social Insurance; T.C.=Transition Countries

Health Information Exchange

The descriptive findings for HIE are reported below. *Received laboratory reports* and *Certified sick leaves are the two* functionalities most commonly used routinely by GPs (64% and 47% respectively). The availability of the rest of the functionalities is still low, specially the exchange of clinical information among health professionals and healthcare providers.

Figure 10 HIE: from awareness to use

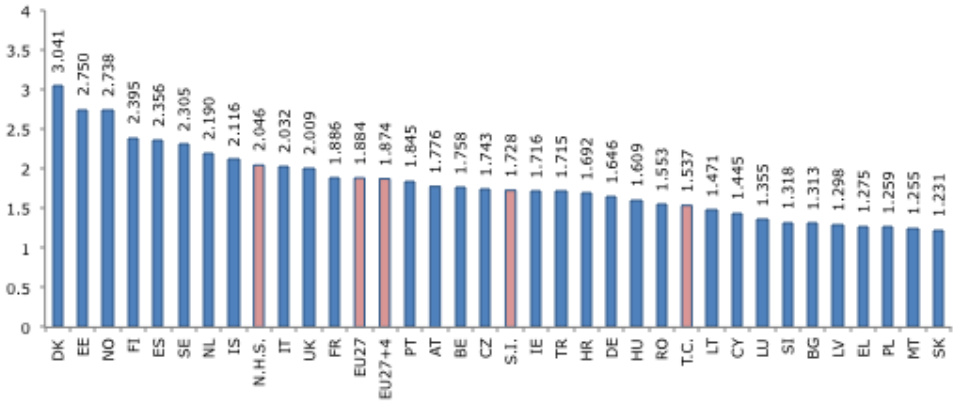
Routine use is above 60% only for simple and non-clinical features, and is limited for ePrescription and for real information exchange and sharing



The values of the composite indicator of HIE adoption constructed through factor analysis are reported below. The results for HIE can be better contextualised by recalling what we earlier presented on problems of compatibility and also using information from other items in our questionnaire: 74% receive reports back from hospitals/specialist always or often, in 78% of cased these are handed to them by the patients, only 10% inter-connect with other professionals/organisations through a shared system, and 40% have compatibility problems when exchanging patient data.

Figure 11 HIE composite indicator of adoption

The overall score for EU27 is below the value of 2 suggesting full availability is not yet reached and usage is modest; Denmark and Estonia score at the top



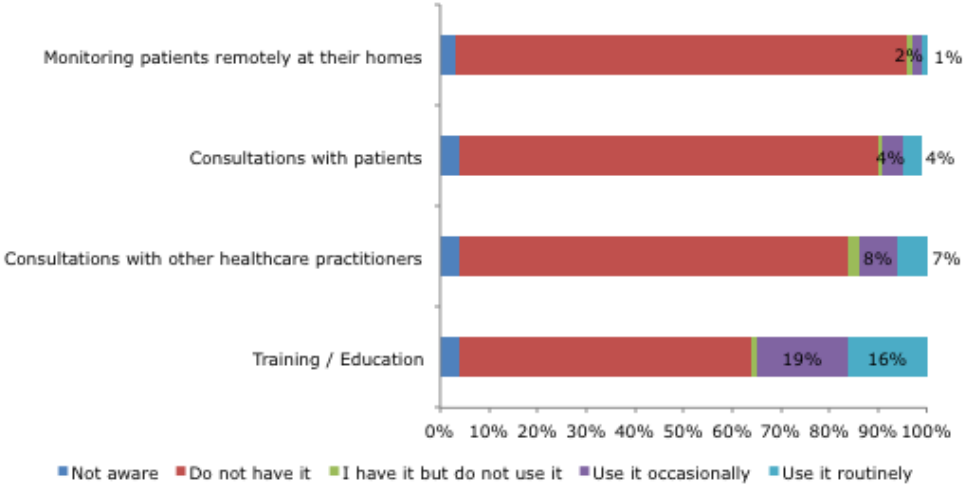
N.H.S.=National Health Service; S.I.=Social Insurance; T.C.=Transition Countries

TeleHealth

The following figure shows the descriptive findings for Telehealth. Less than 10% of the respondents claimed that Monitoring patients remotely and Consultation with patients are available in their practice. *Training / Education* and Consultation with other healthcare practitioners are used by 35% and 15% of the GPs respectively.

Figure 12 Telehealth: from awareness to use

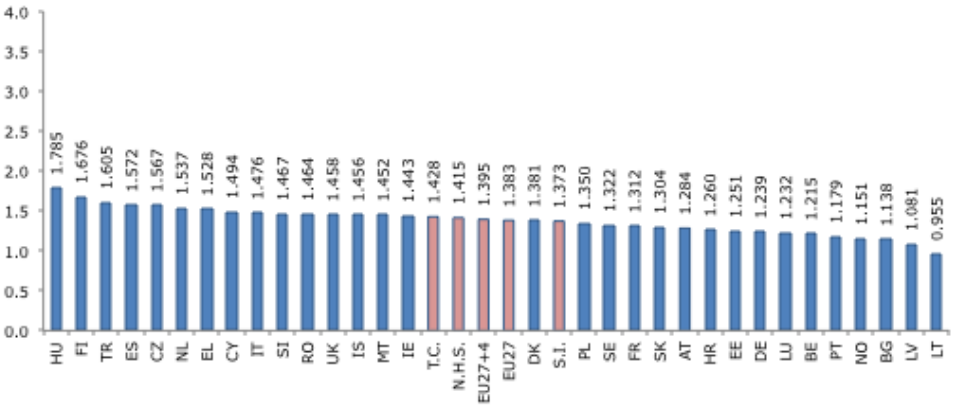
Availability of Telehealth is still fairly low, particularly for remote monitoring of patients at home



The values of the composite indicator of Telehealth adoption constructed through factor analysis are reported below. We remind the reader that the indicator score ranges from 0 to 4 as it has been computed processing the variable obtained combining answers on availability and use as described at the end of § 1.3.

Figure 13 Telehealth composite indicator of adoption

The overall score for EU27 is very low indicating very little availability and very little use. On average countries with Health systems on Transition score slightly higher than EU average



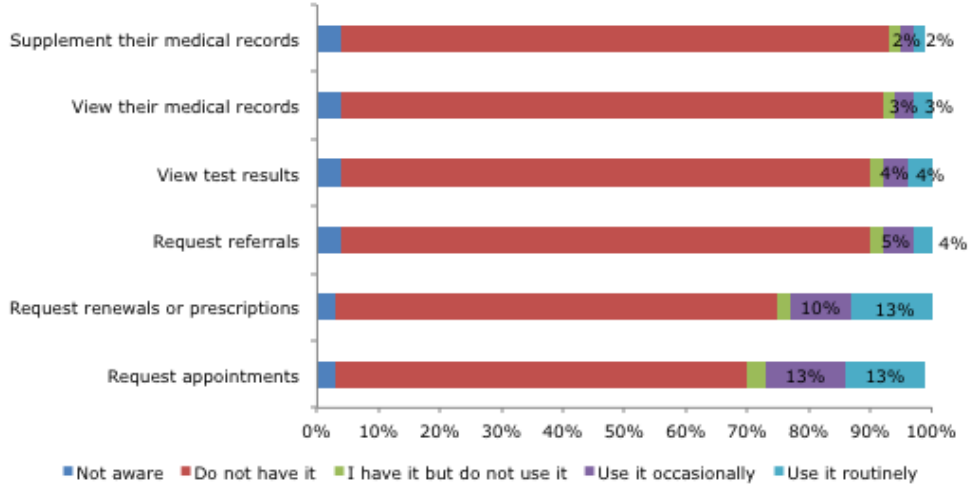
N.H.S.=National Health Service; S.I.=Social Insurance; T.C.=Transition Countries

Personal Health Record

The descriptive findings for Personal Health Record are reported below. Around 25% of the respondents claimed that their patients are *requesting renewals or prescription* and *appointments* online. Availability of functionalities related with medical information is still limited.

Figure 14 PHR: from awareness to use

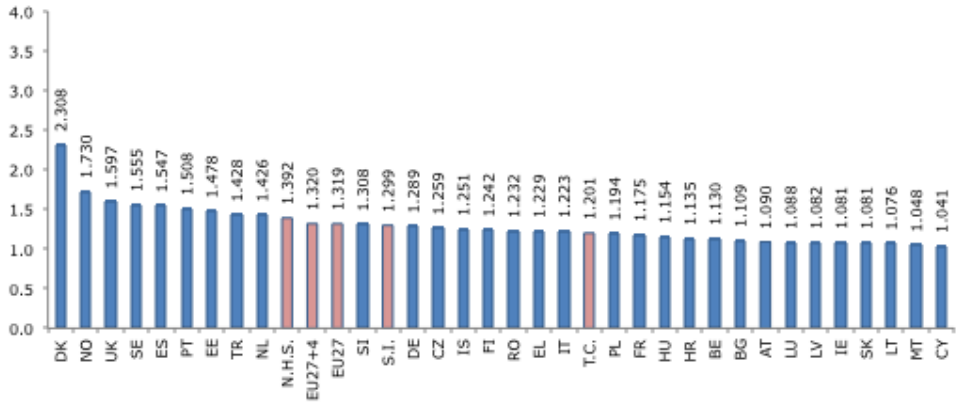
Availability of PHR is also low, particularly for the possibility for patients to view their medical records



The values of the composite indicator of Personal Health Record adoption constructed through factor analysis are reported below.

Figure 15 PHR composite indicator of adoption

The overall score for EU27 is very low indicating very little availability and very little use



N.H.S.=National Health Service; S.I.=Social Insurance; T.C.=Transition Countries

Overall composite index

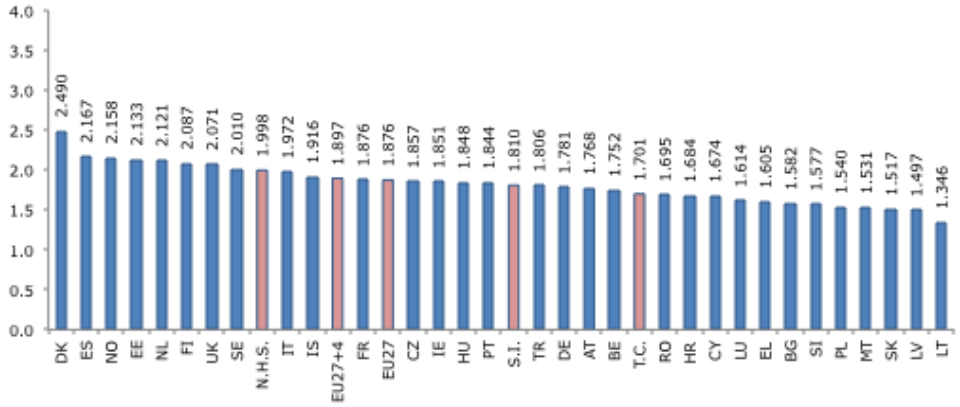
Despite the known limitations of using composite indicators for benchmarking (Codagnone & Lupiañez, 2011), it has been decided that this is the best method to aggregate multiple variables from different countries in view of the complexity of our dataset. There is no alternative to such approach when one analyses 210 variables for 9196 individuals in 31 countries and wants to send a few clear policy messages.

The values of the overall composite index of eHealth adoption, constructed by combining the four composite indicators and

assigning them equal weights (25%), are reported below. The composite index is also a continuous variable that represents adoption from "Not aware" (0) to "Use it routinely" (4).

Figure 16 Composite index of eHealth adoption

The value of the CI at EU27 (1.876) is just below 2, meaning we are close but not yet at full availability of eHealth applications



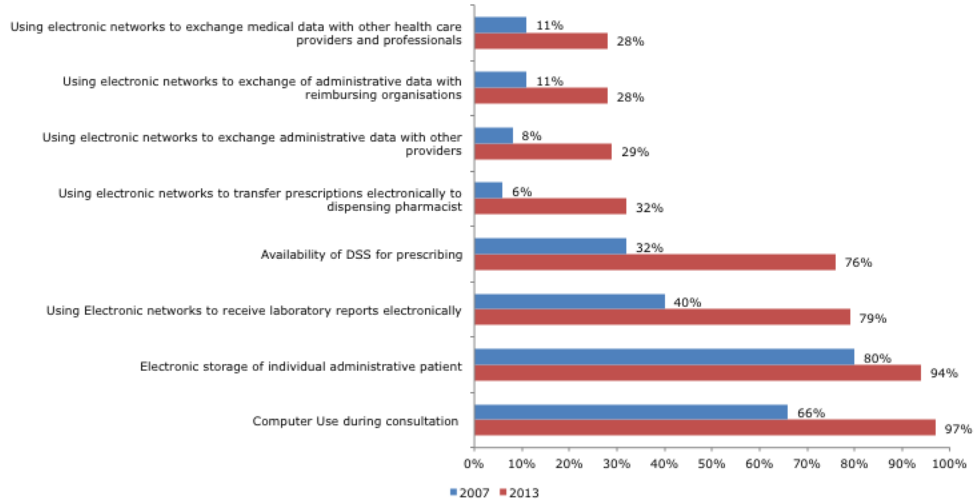
N.H.S.=National Health Service; S.I.=Social Insurance; T.C.=Transition Countries

2.2 Comparison 2007-2013

The questionnaire allows for some comparison with the 2007 survey funded by the EC, although there are clear limits in this comparison (see Final Report). For this reason we report only a few descriptive findings at aggregate level, summarised in the figure below.

Figure 17 Use of selected functionalities: 2007 & 2013

The increase between 2007 and 2013 is considerable for all the items



The increase between 2007 and 2013 is particularly marked for the *use of computer during consultation, for receiving laboratory reports electronically, for availability of DSS for prescribing* and is considerable for all other items with the partial exception of electronic storage of medical data.

2.3 Explaining adoption levels

Besides measuring adoption levels we have also performed several analyses to explain the differences in these levels, considering country differences (through multilevel analysis and also in descriptive ways), different attitudinal profiles of doctors with respect to impact and barriers, and also fitting our data into a Structural Equation Model that explains the overall composite index of adoption in terms of several attitudinal and behavioural variables.

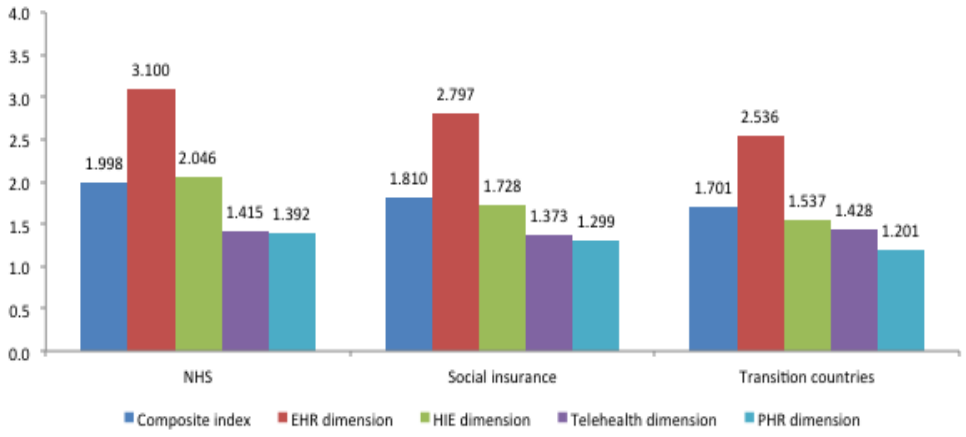
We performed a multilevel analysis of variance to assess the extent to which the variability of the composite indicators and of the composite index can be attribute to country fixed effect or to individual level characteristics. Country effects account for: a) 30% of the composite index variance; b) 41% of the EHR composite indicator variance; c) 32% of the HIE composite indicator variance; d) 14% of the Telehealth composite indicator variance; and e) 13% of the PHR composite indicator variance.

By the standards of multilevel analysis, the percentages of variance that country effects account for are fairly high are a clear indication of the importance of specific country factors. When we look more descriptively and plot the level of the indicators and index we find further concrete support and exemplification of how these differences matter.

Results show that, for instance, on average NHS countries have higher adoption levels on all dimensions.

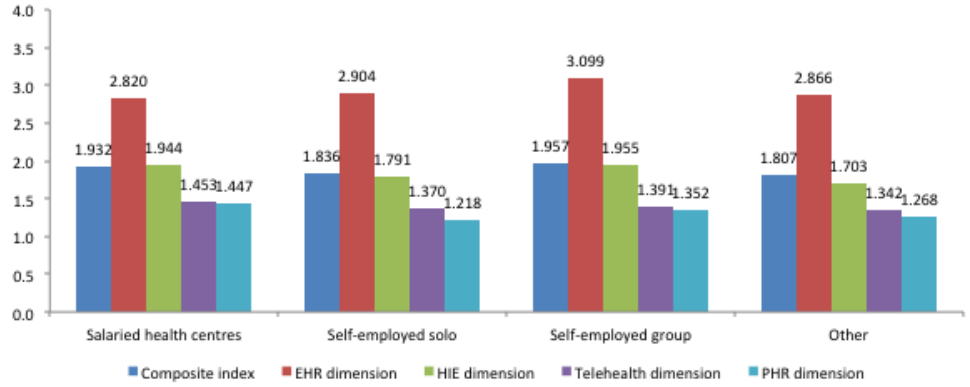
There are, however, clear exceptions to this rule, as the cases of Estonia and the Netherlands clearly show. This means that a strong and systematic policy push can offset potentially unfavourable institutional settings

Figure 18 eHealth adoption by health system types



Also looking at the differences by type of practice indicate that organisational settings, which are to a large extent shaped by countries peculiarities, play a role in explaining different adoption levels.

Figure 19 eHealth adoption by practice types



Using cluster analysis, we identified four meaningful profiles of GPs in terms of their self-reported perception of barriers and impacts.

The large majority of the sample falls in the other three profiles: '**Realists**' (emphasis on both benefits and barriers, high level of adoption), '**Reluctant**' (emphasis mostly on barriers, fair level of adoption) and '**Indifferent**' (low adoption and little emphasis on either impacts or barriers). Only a minority of GPs (13% of the sample) are 'Enthusiasts' who use eHealth routinely in their practice, perceive mostly its benefits, and do not place excessive emphasis on the barriers

A number of barriers are still strongly stressed by GPs: financial, technical, regulatory, and concerns about the doctor-patient relation

When looking both at the quantitative data from the survey and at the qualitative insights obtained from the focus groups we see that there are still a number of barriers for eHealth adoption that are clearly perceived by GPs. Financial barriers concern the lack of incentives and resources, as well as of remuneration for the alleged increase in work-load caused by eHealth. Technical problems include inter-operability bottlenecks, lack of system resilience and security, which are particularly salient for HIE. The lack of regulatory framework concerns above all issues of confidentiality and privacy in relation to both EHR and especially PHR.

Among the perceived impacts, the one that is considered as most important is the possibility to access structured and up to date clinical data. Impacts in terms of efficiency are met with clear scepticism, and clearly GPs do not see much positive change in terms of doctor-patient relationship. Positive impacts are perceived with less emphasis than barriers; combining the survey results with the insights of the focus groups we can conclude that GPs are sceptical about many of the potential impacts

Finally, we fitted our data into a Structural Equation Model showing which are the explanatory variables that most affect the level of eHealth adoption in general (i.e. the dependent variable here is only the level of the overall composite index of eHealth adoption). The structural model of adoption largely confirms the hypotheses of the behavioural models reviewed in the Technical Compendium: Perceived usefulness is the key explanatory

variable for eHealth adoption, and it is reinforced by ease of use, behavioural control, social influence, and social norms

The model, however, presents us also with the apparent paradox that the level of the composite index of adoption is negatively correlated with perceived benefits and positively with perceived barriers. This means that GPs who use eHealth more tend to notice the barriers and to grow sceptical about the benefits. This may in turn imply that a lot more could be done to create the best possible conditions to enable GPs to fully leverage the potentiality of eHealth.

3. Preliminary policy implications

The data presented here concern only doctors working in primary care, and we cannot draw from them conclusive generalisations on the status of eHealth adoption in general[5]. Having clarified this, in the reminding of this section we look at these policy targets and provide a few preliminary considerations based only on our data concerning primary care. In what follows, we look at the relevant policy targets in the DAE and the 2012 eHealth Action Plan and provide a few preliminary considerations based only on our data concerning primary care. These include: a) promote eHealth uptake; b) achieve wide inter-operability; c) give Europeans online access to their medical records (i.e. PHR); and d) achieve wide deployment of telemedicine (i.e. Telehealth).

Access to computers and Internet is universal, but few doctors use high-speed Internet in their offices

If we look at access to basic infrastructure the situation is clearly positive, although further efforts are needed to deepen this in particular areas such as high speed Internet. If bandwidth-demanding applications are to take off in primary care, GPs will certainly need access to higher speed Internet than they currently have on average. This points to the importance of broadband related policies in healthcare.

There are clear inter-connection and inter-operability bottlenecks hampering information exchange and sharing

Planned efforts on inter-operability are very salient, as this is a key barrier toward adoption, especially for HIE. Electronic access to inter-connection is low, and many GPs still communicate with specialists and hospitals by traditional channels. One key problem in this respect is the lack of common standards for the exchange of patient data.

[5] Such conclusive generalisation would have to use our data in combination with: a) the results of the 2010 and 2012 surveys of eHealth Deployment in hospitals; b) Eurostat data on use of the Internet for health related purposes; and c) all the results and output produced in the period 2009-2013 by IPTS Strategic Intelligence Monitor on Health Systems (SIMPHS; See http://is.jrc.ec.europa.eu/pages/TFS/SIMPHS1.html for the output of SIMHS1 and http://is.jrc.ec.europa.eu/pages/TFS/SIMPHS2.html for the output of SIMPHS 2). SIMPH2 outputs include also an online survey of citizens in 14 European countries reporting their usage of, among others, TeleHealth services and Personal Health Records. It was obviously also beyond our scope to review all these sources to develop policy implications and recommendations for eHealth as a whole. All these sources are available to the Commission, which will be in a much better position to review them holistically and assess the level of progress toward the relevant targets include in the DAE and in the 2012 eHealth Action Plan.

Digitalisation of records is far from complete despite the good level of adoption of EHR; the overall adoption level in EU27 is moderate, with very high country differences; adoption is particularly modest for Telehealth and Personal Health Records

In general, more policy efforts are needed to facilitate uptake of more advanced features. In primary care mere availability of PHR is below 20%, whereas only about 4% and 10% declare they have the possibility of, respectively, monitoring patients at home and making online consultations with them.

Given moderate adoption of TeleHealth and PHR, the current policy targets seem well chosen as catalysts to stimulate efforts by Member States. Policy focus should also be maintained on basic enabling factors

There are still some basic issues to be solved both at technical and regulatory level before more advanced services and application can take off.

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European Commission

Final Report Benchmarking Deployment of eHealth among General Practitioners (2013) – EXECUTIVE SUMMARY

Luxembourg. Publications Office of the European Union

22 – pages

ISBN 978-92-79-31183-3
DOI: 10.2759/26426

KK-03-13-341-EN-N

DOI: 10.2759/26426 ISBN 978-92-79-31183-3