



eHealth Benchmarking (Phase II)



Final Report

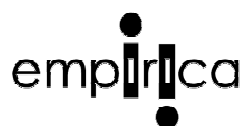
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1 Introduction

This report presents the results of the eHealth Benchmarking study carried out by empirica on behalf of the European Commission, DG Information Society and Media. The study aimed to collate and analyse existing eHealth monitoring and benchmarking sources in order to identify best practice in data gathering and to develop a framework for an EU-wide eHealth Benchmarking approach.

The report is structured as follows:

- Chapter 2 presents the main outcomes of a search for eHealth monitoring and benchmarking sources in the 27 Member States of the European Union, Iceland, Norway, Canada and the United States of America conducted by the study.
- Chapter 3 brings together key lessons learned from 12 eHealth Benchmarking Good Practice cases in the areas of content, methodology, response rate and financing.
- Based on the analysis of the identified data sources, an indicator framework for eHealth monitoring and benchmarking is presented in chapter 4, covering key eHealth actors and eHealth-related activities.
- Finally, chapter 5 contains recommendations on how an eHealth Benchmarking approach covering the EU Member States and possible further countries can be implemented in practical terms.

2 The eHealth benchmarking situation in the European Union and beyond

This section provides an overview of the outcomes of a search for eHealth benchmarking and monitoring sources in the 27 Member States of the European Union, Iceland, Norway, Canada and the United States. By means of a combination of different research methods (including a survey among the experts of the EEA Working Group on Information Society statistics, desk research on sources of eHealth data and measurements on a supranational and European level, and research on the national level carried out by a network of national correspondents), the eHealth Benchmarking study identified a total of 94 sources of eHealth indicators and datasets¹. The characteristics of the identified sources are described in Table 2-1 below. All sources identified can also be found in a searchable Online Knowledge Base at <http://kb.ehealth-benchmarking.eu>.

Table 2-1 Overview: eHealth Benchmarking sources identified by the study

Total number of eHealth benchmarking sources identified in 31 countries under observation		94
Of which	Single country sources (EU member states)	66
	Single country sources (non-EU member states)	13
	Multinational sources	15
Of which	Covering 5-10 countries	9
	Covering the EU15 Member States	4
	Covering the EU25 Member States	1
	Covering the EU27 Member States	1
Of which	Surveys	74
	Administrative process data	5
	Scientific reports	14
	Business process data	1
Of which	Continuous data gathering activities	16
	Non-continuous / one-off activities	78
Of which	Commissioned by public institutions	64
	Commissioned by private institutions	18
	No information on commissioning institution available	12
Of which	Implemented by public institutions	53
	Implemented by private institutions	30
	Implemented by private public partnerships	2
	No information on implementing organisation available	9
Of which	Main purpose: measuring eHealth/ICT availability and use	74
	Main purpose: evaluation of eHealth applications/services	10
	Main purpose: measuring attitudes towards eHealth/ICT	7
	Main purpose: analysis of eHealth market	3
Total number of eHealth indicators included in all studies identified		~4400
	Average number of indicators per source	48
	Minimum number of indicators in one source	1

¹ Cf. Annex 1 for more detailed fieldwork information.

With 79 out of 94, the majority of sources cover single countries, while 15 are sources of multinational coverage. Of these, 9 cover between 5 and 10 countries, 4 cover the former EU15 member states, and one each the EU25 and EU27 member states.

Most sources are surveys (74), 14 sources are scientific reports, five consist of data coming from administrative processes (e.g. from performance monitoring), and one consists of business process data.

78 sources draw upon non-continuous data gathering activities, i.e. data have been gathered for only one or two points in time and a continuation of data gathering is not envisaged. 16 sources are continuous, with data usually being available for two or more points in time. When taking a closer look at the continuity of the sources, one finds that among the 11 sources covering more than two points in time, there are only seven surveys based on empirical research activities. Seven of these sources are being published annually, three rely on bi-annual data collection and one has been repeated at irregular intervals. All but one of the continuous data gathering exercises take place on the national level only. With one exception they are all commissioned by national public authorities. Most of the continuous studies cover the past 6 years (2001-2007); one study goes back as far as 1998. More than half of them has been conducted / repeated very recently: 45 out of the 94 sources contain data from 2007 or 2008.

74 of the identified sources are based on a quantitative research design and developed for the collection of quantitative data. According to this purpose, most of the surveys used a structured questionnaire, whether for online, face-to-face or telephone interviews. The quality of the data resulting from these surveys depends on the quality of the indicators used but also on implementation issues such as the sampling scheme and the resulting representativeness of the survey. However, most of the identified sources provide only little or no information on how they were carried out – e.g. information about the number and training of interviewers, circumstances of interviews, survey periods, definition of the universe and sampling. Many sources claim to be representative – at least for certain populations at a given time. Of the 74 surveys identified, 51 state to be representative for the group of people they address on a national level. Among the multinational surveys several are representative on a national level, while for others the sample drawing process and weighting of the survey results has been adapted in order to achieve representativeness on a European level (e.g. in the case of Eurobarometer).

Slightly more than half of the identified sources are based on data gathering by public bodies: public universities and governmental institutions including national statistical institutes. There are two projects that were implemented by public private partnerships (PPP) while 30 sources were authored by private companies: mostly private research consultancies but also individual companies or business associations. Of those sources for which these information are available 64 were commissioned by public institutions compared to 18 by private institutions.

In thematic regard the sources pursue different purposes, depending on the nature and intentions of the commissioning and/or implementing organisations. The purpose encountered most frequently is that of measuring the availability and use of ICT in general and eHealth in particular (74 sources). A further ten aim to evaluate specific eHealth applications, systems or services. All but one of those are situated in and deal with a very particular national setting. Seven sources deal exclusively with the attitudes of citizens and/or health professionals towards the use of ICT applications in the health sector in general, the value of specific eHealth tools in particular or, even more specifically, the trust in and satisfaction

with the internet as a source of health information. Three sources provide eHealth market data.

The sources currently comprise a total of about 4400 indicators, with an average 48 indicators per source. The individual size of a source varies considerably: some sources contain only one eHealth indicator (usually surveys or reports covering wider issues such as general ICT use), while the maximum number of indicators in one source is 404. The varying number of indicators implies – among other things – variability in the analytic depth of a source, i.e. whether a certain issue (like the use of an ICT application) is covered by one indicator or a set of indicators. The use of a Decision Support Software (DSS) by General Practitioners may serve as an example: in case of a source with low analytic depth, this issue would be covered by one indicator/question (e.g. "Do you use a Decision Support Software (DSS) in your practice?"). Alternatively, a set of questions could ask for the use of different types of DSS (e.g. for diagnosis and prescribing), the frequency of use, use in different contexts (e.g. to prepare for a consultation with a patient or during consultation), etc.

Classification of sources and the eHealth Benchmarking indicator framework

All data sources were classified according to three dimensions:

- Actors: persons and organisations and their roles (professional or "client") in the medical or public health system
- Activities: typical functional activities in health or healthcare processes
- Applications: ICT used for certain activities

These dimensions were defined in the eHealth Benchmarking indicator framework. The framework aims on the one hand to reflect the complexity of the eHealth domain – e.g. in terms of the wide variety of players in the healthcare sector, health-related activities etc. – and on the other hand to sensibly reduce that complexity to allow for statistical measuring in general and benchmarking across the EU member states in particular.

Individual indicators of each data source were classified according to the three dimensions described above using the following categories (cf. Table 2-2 below). The classification allows determining for each indicator the actor(s), activity(s) and ICT application(s) covered.

The application of the classification scheme revealed a lack of discriminative power (or selectivity) both in the definition and in the factual use of the technical terms used to describe eHealth applications. The use of acronyms like "EHR" (= Electronic Health Record) or "HIS" (= Hospital Information System) in particular can cause serious confusion due to a lack of clear definitions. As a consequence, people think they are talking about – or in this case: are measuring/monitoring – the same thing, while in fact they are not. As Dave Garets and Mike Davis put it: "Bad decisions get made because people aren't talking about the same thing when they use the acronyms."²

The EHR IMAPCT study³ provides a good example for the case of Electronic Health Records⁴:

"The electronic health record (EHR) has been a key research field in medicine as well as in medical informatics for many years. A commonly used definition describes the EHR as "digitally stored healthcare information about an

² Dave Garets and Mike Davis, Electronic Patient Records, Healthcare Informatics online, October 2005. http://www.providersedge.com/ehdocs/ehr_articles/Electronic_Patient_Records-EMRs_and_EHRs.pdf

³ <http://www.ehr-impact.eu/>

⁴ EHR Impact, The conceptual framework of interoperable electronic health record and ePrescribing systems, April 2008.

individual's lifetime with the purpose of supporting continuity of care, education and research, and ensuring confidentiality at all times⁵

In other terms, EHRs are repositories of electronically maintained information about individuals' lifetime health status and healthcare, stored such that they can serve the multiple legitimate users of the record. Quite obviously, this is a rather idealistic definition and concept, probably not yet brought to real life anywhere worldwide. Systems consistent with this definition can be found only in rather confined local or regional contexts, and for persons born only recently so that indeed complete lifetime data are available.

Furthermore, to meet this challenging definition, usually an interoperable system connecting partial EHRs stored at various healthcare providers and other actors will be necessary. The EHR should include information such as observations, laboratory tests, diagnostic imaging reports, treatments, therapies, drugs administered, patient identifying information, legal permissions, and allergies. This information is stored in various proprietary formats through a multitude of medical information systems available on the market⁶."

Notwithstanding this comprehensive – and complex – definition of EHR, the analysis of the indicators found by the eHealth Benchmarking study shows quite clearly that the understanding of the EHR concept prevalent among people engaging in eHealth monitoring often deviates – sometimes to a considerable degree – from this definition. Similar examples could be made in relation to other concepts/acronyms such as ePrescription/ePrescribing, PACS (Picture Archiving and Communication System) or CPOE (Computerized Provider/Physician/Prescriber Order Entry).

It is for this reason of discriminative power that the "actor" and "activity" classification are used primarily in the following, and the "application" classification is only used as an additional descriptive element.

Table 2-2 Dimensions and categories of the eHealth Benchmarking framework

Dimension	Categories in dimension	Remarks
Actor	Citizen	Citizens in general, patients
	General Practitioner	
	Health insurance	
	Health professional (generic)	Generic category, used if actor not specified further. May include General Practitioners, Specialists, Therapists, Nurses, practice staff
	Hospital	All kinds of hospitals, including community centres, primary, secondary and tertiary care
	Informal carer	Citizens caring (voluntary) for family members, friends etc.
	Nurses and practice staff	Includes administrative practice staff, IT personnel etc.
	Nursing home	
	Paramedical practitioner	Emergency care personnel, ambulance personnel
	Pharmacy	
	Public health organisation	

⁵ Iakovidis I. (1998) "Towards Personal Health Record: Current situation, obstacles and trends in implementation of Electronic Healthcare Records in Europe", International Journal of Medical Informatics vol. 52 no. 128, pp. 105 -117

⁶ Eichelberg M et al. (2006) Electronic Health Record Standards - a brief overview, conference paper for Information Processing in the Service of Mankind and Health: ITI 4th International Conference on Information and Communications Technology

	Specialist	
	Therapist	
Activity	Administration	All kinds of administrative work, including accounting, data storage, making appointments. Does not include activities in relation to patient data storage and facility management (cf. below)
	Attitudes towards ICT	Includes respondents' attitudes towards ICT use as well as perception of impacts
	Consultation	Direct interaction between health professional and patient/citizen
	Cross border treatment	
	Diagnosis	
	eHealth/IT investment	Includes actual investments (e.g. for IT equipment), but also plans for future investment
	eHealth/IT skills	Includes both the (self-) assessment of personal and staff skills, but also skills acquisition (participation in training courses etc.)
	Facility management	
	Health information provision	General provision of health related information (e.g. via an internet portal). Does not include consultation.
	Health information search	
	ICT availability	E.g. availability of computers, internet (broadband) access, practice website etc. Does not include ICT use.
	ICT use (generic)	All kinds of ICT use that are not directly related to any other activity (e.g. use of computers or the internet in general)
	IT related process	Processes related to the use of ICT, but not of a medical nature (e.g. security measures, quality management etc.)
	Laboratory analysis	Exchange of data with laboratories (e.g. blood sample data, radiology images etc.)
	Long-term care	
	Patient data exchange (generic)	All patient data exchange not directly related to any other activity
	Patient data storage (generic)	All patient data storage not directly related to any other activity
	Prescribing	
	Professional medical education and training	
	Referring	
Rehabilitation		
Telemedicine / Telemonitoring	All kinds of remote, ICT-based diagnosis / treatment	
Treatment		
Application	ICT infrastructure (hardware)	Includes computers, servers, local networking infrastructure, internet connection, broadband connection, IT security systems etc.
	Hospital information system / clinical information system (HIS / CIS)	All kinds of information management systems used in hospitals. Can cover both administrative and medical purposes, including systems for accounting, duty roster, patient data storage, lab information systems, radiology information systems, pharmacy systems etc.
	Electronic health records (EHR) / Electronic medical record (EMR)	All kinds of systems used to store (administrative and/or medical) patient data. May be part of an HIS/CIS, may include lab information systems, radiology information systems, pharmacy systems etc.
	Computerized provider/physician/prescriber order entry (CPOE) system	All kinds of systems used to electronically transfer instructions for the treatment of patients between health professionals. May be part of an HIS/CIS.

Decision Support Systems/Software (DSS)	All kinds of systems supporting health professionals in medical decision making (e.g. in relation to diagnosis, treatment or prescription). May be part of an HIS/CIS.
Picture archiving and communication system (PACS)	All kinds of systems used to electronically store picture information (e.g. radiology or ultra-sound picture). May be part of an HIS/CIS or EHR/EMR.
Emergency medical services (EMS) IT, IT in Intensive Care Units (eICU)	All kinds of systems used in emergency and intensive care. Does not include medical technology.
ePrescribing	All kinds of systems used to transfer prescription data between a health professional/hospital and a pharmacy
Public health applications	All kinds of systems used by public health organisations. May include systems for event reporting, alert systems, public health preparedness tools, crisis management tools (detecting / managing emerging epidemic or crisis), etc.
Other tools (if used in medical terms)	All kinds of systems not included in any of the other application categories. May include systems such as bar code readers, RFID systems, smart cards, system engineering tools etc.
Personal ICT tools	All kinds of systems used by individual citizens/patients. May include biomedical sensors, telemonitoring devices, personal tools for diagnostics and treatment etc.

Coverage of actors and activities

Table 2-3 below shows a matrix of (groups of) actors and activities covered by the identified sources. Multiple pairs for one source are possible, i.e. one source may cover more than one actor or kind of activity. In case of surveys, the actor(s) are usually identical with the survey respondents. Only where surveys deal explicitly with interaction between two or more actors (e.g. in case of indicators dealing with patient data exchange), both actors were coded. Thus a General Practitioner survey dealing – inter alia – with data exchange between GP practice and pharmacy would be coded as both "General Practitioner" and "Pharmacy". The table is sorted by frequency, with the most frequently covered actors on top.

The actor group covered most often is that of General Practitioners (GPs). For this group, all activities included in the framework have been monitored by at least one source. Most of the indicators and data available for GPs deal with administration, (generic) ICT use, and attitudes towards ICT and ICT use, but also with ICT availability and (generic) patient data exchange and storage. The second actor group is hospitals, where most indicators/data available deal with ICT availability, administration, (generic) ICT use, patient data exchange and storage. Citizens – including patients – rank third and are most often asked about health information search and their attitudes towards ICT and ICT use, but also the use of ICT for administration issues such as making appointments. Sources addressing specialists rank fourth, followed by health professionals in general, covering about three quarters of the activities for each actor group. Pharmacies, health insurances and public health organisations are included considerably less frequently and also only for a limited number of activities. The study found a total of five sources dealing with nurses and practice staff (and their attitudes towards ICT and (generic) ICT use), and no sources covering therapists, nursing homes, informal carers and paramedical practitioners.

From an activity point of view, basic ICT availability, (generic) ICT use, administration, health information search, patient data exchange and attitudes towards ICT are those that are included most often in the sources identified. Less frequent, but still covered to some extent in terms of the number of sources and actors are prescribing, the assessment of ICT impacts and IT-related processes. At the bottom end cross-border treatment, facility management and telemedicine/telemonitoring are covered only rarely.

Coverage of countries

With a view to benchmarking the question of country coverage is of some importance, i.e. if the actors and activities covered by data gathering activities are carried out in individual countries or on a multinational level. The former is likely to cause problems in terms of data comparability due to differences in the indicators/question wording, data gathering instruments, sampling/representativeness, but also in relation to analytic depth, i.e. if an issue is covered rather perfunctorily (e.g. by one survey question) or in more depths (by a series of questions).

Table 2-1 above showed that most of the sources identified cover only one country. All in all, 15 out of 89 sources are multinational of which a majority contains indicators/data for 5 to 10 countries (9 sources). Table 2-4 below shows a more detailed breakdown of country coverage by actor and activity. General Practitioners are subjected to multinational data gathering most frequently. Citizens are second, followed by hospitals and specialists. For these actors the number of activities covered is however considerably lower than for GPs. For pharmacies and public health organizations only two activities (prescribing and patient data exchange) have been included in any multinational survey. For the remaining 7 actor groups (of a total of 13), no multinational surveys could be identified.

As already said above, this points to a current lack of data comparable across countries, let alone actor groups and activities. Adding to this, the individual multinational surveys of GPs, citizens and hospitals identified do not cover all activities or EU member states.

An analysis of the indicators used also revealed that there is often a trade-off between the quantitative coverage of a source – i.e. the number of activities/issues included – and its analytic depth – i.e. the number of indicators per activity/issue. Sources with a broad coverage often achieve lower analytic depth in comparison to others or greater depth only for some selected issues.

Table 2-3 eHealth benchmarking sources coverage of actors and activities

	Basic Indicators		Activity-dependent indicators														Attitude indicators		Indicators horizontal issues					
	Basic ICT availability	ICT use (generic)	Administration	Consultation	Cross border treatment	Diagnosis	Facility management	Health info provision	Health info search	Laboratory analysis	Long-term care	Patient data exchange	Patient data storage	Prescribing	Professional training	Referring	Telemedicine/-monitoring	Treatment	Attitudes towards ICT	Assessment of impacts	eHealth/IT investment	eHealth/IT skills	IT related processes	
General Practitioners	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Hospitals	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Citizens	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Specialists	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Health professionals	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Pharmacies	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Health Insurances	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Public Health Organisations	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Nurses/practice staff	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Therapist	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Nursing home	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Informal carer	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Paramedical practitioners	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

■ Covered by at least one source

■ Actor/Activity combination not meaningful

Table 2-4 Country coverage of eHealth benchmarking sources

	Basic Indicators		Activity-dependent indicators															Attitude indicators		Indicators horizontal issues				
	Basic ICT availability	ICT use (generic)	Administration	Consultation	Cross border treatment	Diagnosis	Facility management	Health info provision	Health info search	Laboratory analysis	Long-term care	Patient data exchange	Patient data storage	Prescribing	Professional training	Referring	Telemedicine/-monitoring	Treatment	Attitudes towards ICT	Assessment of impacts	eHealth/IT investment	eHealth/IT skills	IT related processes	
General Practitioners	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Hospitals	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Citizens	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Specialists	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Health professionals	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Pharmacies	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Health Insurances	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Public Health Organisations	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Nurses/practice staff	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Therapist	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Nursing home	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Informal carer	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Paramedical practitioners	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Covered by	■	At least one single-country source					■	At least one multinational source					■	Actor/Activity combination not meaningful										

3 Learning from eHealth Benchmarking Good Practice

The eHealth Benchmarking study identified twelve good practice cases in Europe and North America, which are presented online at <http://kb.ehealth-benchmarking.eu>. The methodology used for this purpose is described in Annex 2 of this report.

Although the cases vary considerably in terms of geographic coverage, analytic depths, and/or implementation methods, there are some general lessons to be learned from them.

Most cases stress the fact that reliable quantitative data about eHealth issues are crucial for informed and appropriate policy decisions and are therefore in great demand. In order to obtain this high quality data, several issues have to be dealt with. Most important in this regard are questions of content, methodology, response rates and financing.

3.1 Content lessons

The scope of the studies is in most cases limited by the need to keep the respondent load at a reasonable level. The requirement to keep the questionnaire short also restrains the scope of the studies. One important choice to make at the beginning of each eHealth benchmarking activity relates therefore to analytic depth, i.e. whether to cover a single issue (or very few issues) in-depth, or to cover a broader range of activities and applications and opt for fewer and more general questions for each topic.

An example of a focussed in-depth survey is the US case “**Electronic health records in ambulatory care**”⁷. This survey dealt very specifically with the availability and use of different functions of electronic health records in the United States. A recommendation deriving from this study is to agree on key features of technologies that are of interest and focus first on those.

The content of the questionnaire should moreover be limited in scope so that a single respondent is able to respond to all questions him- or herself. A questionnaire so complex and encompassing that the expertise of different respondents is needed to answer all questions will have negative repercussions on the response rate. This constraint on questionnaire content has been experienced for example in the survey for the “Jahrbuch Gesundheitswirtschaft”⁸ in Germany.

While the choice of *respondents* or target groups depends on the aim of the study, it is important to bear in mind that especially in a complex organisation such as a hospital it might be useful to address different actor groups who will provide differing insights and viewpoints on the same topic.

⁷ For more information cf. the case description in the eHealth Benchmarking Online Knowledge Base at http://kb.ehealth-benchmarking.eu/browseContent_alt.do?contentId=82&action=v3#editViewToolbar.

⁸ http://kb.ehealth-benchmarking.eu/browseContent_alt.do?contentId=12&action=v3#editViewToolbar

The Greek “Study on the use of ICT in the health and social welfare sector”⁹ targeted hospital employees. By addressing the survey not only to CEOs, administrative and IT staff but also to physicians and nurses the study team was able to collect information on the employees’ different perceptions of their own ICT skills and use, thus arriving at a fuller picture of the actual and potential use of ICT than if just the management or IT personnel had been addressed.

3.2 Methodology lessons

Questionnaire design

Questionnaires dealing with eHealth topics often address innovative concepts and novel tools which many of the respondents might not yet be familiar with. eHealth related surveys therefore often run the danger of misunderstandings which then in turn impact negatively on the data validity. Since interviews about ICT and eHealth have to rely on the technical knowledge of the respondent and a common understanding of technical terms, the terms used in eHealth literature, expert discourses etc. have to be translated into something closer to the day-to-day experience of the respondents. The good practice cases identified in this study have devised different measures to deal with this problem.

Many studies have successfully involved eHealth and survey experts during the development of the questionnaire in order to adapt the questionnaire design and wording to their target groups. Focus group interviews and pre-tests of a draft questionnaire also contributed to achieve an adequate question wording. What has furthermore proven essential is to provide definitions of all technical terms and acronyms that might be unknown or unclear.

In some cases, in lieu of using the technical term itself, the research teams rather asked for specific functionalities or processes for which the technical device can be used. This type of question has the advantage to be easy to understand and can therefore be answered easily and truthfully. A disadvantage, however, is that data resulting from questions avoiding the technical terms is prone to misinterpretations. If the questionnaire asks for example “Do you store medical patient data electronically?”, a positive answer might mean that the respondent is using an EHR. However this can not be inferred from the data with certitude as he or she might store the data electronically, but without using a specific EHR system or software tool.

The EHR survey¹⁰ in the USA, for example, has asked for the uptake of different functions of EHR rather than the general use of EHRs. The survey implementing organisation considers this approach one of the most valuable features of their survey. Since the survey broke down each function separately, the research team was able to discern which functions are most likely to be adopted and which ones were likely to be adopted first. This allowed them to create a standard definition of EHR adoption that can be replicated in the future by other studies.

Sampling

The sampling procedure is highly dependent on the information about the universe available to the research team. In most of the good practice cases the executing agencies could build on some sort of data base containing at least basic information about different health actors.

⁹ http://kb.ehealth-benchmarking.eu/browseContent_alt.do?contentId=19&action=v3#editViewToolBar

¹⁰ http://kb.ehealth-benchmarking.eu/browseContent_alt.do?contentId=82&action=v3#editViewToolBar

Most often these data sets were provided by national public authorities or by health professional organisations. Quota sampling is sometimes used but often not feasible because the databases in question do not provide sufficient details about the universe. In order to avoid bias and attain a maximum reliability of the resulting data, several studies opted for census surveys. This solution however is not practicable in all the cases as - depending on the size of the universe - it might lead to high costs.

Survey implementation

The good practice cases illustrate very well the advantages and disadvantages of different types of survey administration for eHealth monitoring purposes. Those surveys that used both paper questionnaires sent by ordinary mail and online surveys, for which respondents received email alerts, experienced a notably higher response rate for the paper questionnaires. In addition to the disadvantage of a generally lower response rate, online surveys are only feasible in those countries and among those target groups that already use ICT extensively in their respective work place. This was not the case in Greece for example, where therefore paper questionnaires had to be used. An important advantage of web-based questionnaires when compared to paper is pointed out by the study "eHealth of Finland - Check Point 2008"¹¹: web-based questionnaires permit to feed the collected data directly into a dedicated database. In comparison to the manual treatment of paper questionnaires this method saves time and costs, helps to prevent coding errors and facilitates rapid data analysis. In addition to the digital results, data bases can provide an easy way to follow up the response rate and send reminders to non-respondents.

In the Greek "Study on the use of ICT in the Health and Social Welfare Sector", where mailed paper questionnaires were used, the sometimes unfitting and contradictory responses signalled to the study team a need for clarifications that could have been provided in face-to-face interview. Since the follow-up of these inconsistencies took a long time, the study team came to the conclusion that face-to-face interviews would have saved them time in the long run, although more resources would have been needed initially. In this case, additional face-to-face interviews were successfully used to collect in-depth information from selected actors and experts.

Some of the good practice cases used computer aided telephone interviews (CATI) for their surveys. This technique offers the same advantage as face-to-face interviews, namely being able to explain unclear questions and concepts during the interview itself. At the same time, it requires fewer resources and is less time consuming than face to face interviews. This method was, for example, implemented successfully by the Pilot on eHealth Indicators GP survey in 2007.

Multinational studies

For multinational studies some additional methodological aspects have to be considered. One is the appropriate translation of the questionnaire into the respective languages.

¹¹ http://kb.ehealth-benchmarking.eu/browseContent_alt.do?contentId=58&action=v3#editViewToolbar

For the multinational “Pilot on eHealth Indicators”¹² and “eHospital”¹³ studies, the proper translation of the questionnaire into numerous national languages was of key concern, in particular to ensure that technical terms were translated correctly. For the Pilot on eHealth Indicators, the chosen approach of translation by the national survey institute plus translation checks carried out by external translators was of invaluable help in order to arrive at high quality questionnaires.

Another concern is that a multinational study usually cannot be carried out by one national institution or organisation on its own, but rather necessitates cooperation with one or more partner organisation(s) in the countries to be covered by the survey. The choice of adequate partner organisations is especially crucial for surveys dealing with a very specific and specialised topic such as eHealth. For the “Pilot on eHealth Indicators” study the GP survey conduction was outsourced to a major market research company with branches in most European Member States. Quality checks proved that this cooperation worked well and yielded high-quality data. Another good practice example, the “eHospital” survey, however, had a more mixed experience with cooperation across national borders. Accordingly the conducting organisation plans to avoid the cooperation with external cooperation partners in the future as much as possible and rely instead on native speaking interviewers recruited directly and trained specifically for this purpose. The “eHospital” case study also highlighted the importance to keep the entire research process under the direct control of one project manager and one quality control team in order to ensure a homogenous quality level across all countries covered by the survey.

Fieldwork timing

The timing of an eHealth survey is also quite important. Several of the good practice cases indicated that eHealth surveys should not be conducted during the summer months since these are typical vacation months and the already hard to reach health professionals are even more difficult to get hold of. If they cannot be reached at all during the survey time, survey administrators either have to accept a lower response rate or extend the survey time and risk running late with the results. In the case of replacement physicians answering the survey request, it has to be decided beforehand whether to accept them as respondents or not.

There are only few eHealth benchmarking activities that are conducted continuously. However those that do – and also many that don’t – underline their significant surplus value. An important advantage of continuous surveys is that the take up rates of different eHealth applications can be measured, compared and analysed. Based on this information it is for example possible to devise adequately tailored policy measures.

The continuous good practice cases, such as the Finnish “eHealth checkpoint”, argue that for eHealth benchmarking purposes a set of core questions should be kept constant from one survey round to the next in order to allow for a fully congruent comparison over time. At the same time though, the fast changes taking place in the quickly evolving ICT environment, require a flexible questionnaire that can be adapted to new technologies and emerging issues.

Data analysis

With regard to data analysis and the interpretation of study results, several other issues arise: the Greek study of ICT use in the health sector for example brings up the question of

¹² http://kb.ehealth-benchmarking.eu/browseContent_alt.do?contentId=73&action=v3#editViewToolbar

¹³ http://kb.ehealth-benchmarking.eu/browseContent_alt.do?contentId=89&action=v3#editViewToolbar

composite indicators for eHealth monitoring and benchmarking purposes. In this case — the study being the first comprehensive study of ICT use in the Greek health sector — the study team was not able to introduce composite indicators. They do however call for the development of composite indicators as part of future eHealth activities.

In the case of the collection and analysis of very complex sets of data, such as in the “Economic Analysis of Electronic Communication in the Norwegian Health Sector”¹⁴ study, special attention had to be given not only to the data analysis itself but also to the communication of study results. Often data are liable to misinterpretations if the context of data collection and analytical tools and constraints is not taken into account. Potential misunderstandings arising from an over-simplified representation of study results in the press for example might be particularly unwelcome in a sensitive context such as national health policy.

The data quality of an eHealth survey can be significantly enhanced by addressing contradictory results or completing missing answers through follow-up telephone interviews. The study on “ICT use in the health sector in Greece” has successfully resorted to this method of quality assurance and was thus able to enhance the reliability of its data. A drawback of this method is the amount of additional human resources that has to be provided for this task. In the case of health professionals it is also often very difficult to reach the respective person by phone.

3.3 Response rate lessons

The difficulty of reaching out to respondents in the health sector is a general problem for eHealth monitoring and benchmarking activities. In many countries health professionals experience high workloads. Moreover, certain actors groups, such as GPs for example are also often over-researched, i.e. targeted by many research activities /surveys, and are therefore not very willing to fill in just another questionnaire.

Since a high response rate is central to ensure the representativeness of the data and to avoid bias, nearly all the good practice cases have taken preconditions to raise response rates to an appropriate level. Different measures and approaches were shown to be effective. Several of the cases mentioned that it was essential to provide for sufficient financial resources and manpower to carry out follow-up contacts to the respondents. Another facilitating factor that helped to raise response rates was the cooperation and partnership with either national health authorities and/or health professional organisations. In many cases, these authorities and organisations provided for example the cover letters for the survey questionnaire. This facilitating effect is reinforced if the survey executing agency manages to win over esteemed leaders and renowned authorities in the respective field to cooperate and to promote the survey.

In some cases, such as the EHR study in the USA, substantial financial incentives were handed out in order to persuade the health professionals to participate in the survey (up to 60 US\$ in the case of the EHR study). This rather costly method worked sufficiently well to raise response rates to the desired level.

¹⁴ http://kb.ehealth-benchmarking.eu/browseContent_alt.do?contentId=57&action=v3#editViewToolbar

In some countries the respondents are employees of public authorities. In this case, if a survey is endorsed by the national public health authorities, the participation in the survey is mandatory for all respondents. Unsurprisingly, the surveys where this was the case, were the only ones to obtain response rates of up to 100%.

The cooperation with public health authorities and private health professional organisations proved helpful not only for ensuring a high level of participation in the survey but also facilitated the publication and dissemination of the study results.

The length of the questionnaire is also important to take into account: a longer questionnaire will provide more information but might have a detrimental impact on the response rate and thus diminish the reliability of the data. What has been considered helpful for raising the response rates in nearly all of the cases is a questionnaire that is as short, concise and clear as possible. Concerning the maximum length of such a questionnaire however, different experiences have been made. While the study team responsible for the "Jahrbuch Gesundheitswirtschaft" esteems that their - rather complex - 10 page questionnaire has been too long and therefore set off large numbers of respondents, the research team conducting the "Physician Survey"¹⁵ in Canada found out that the response rate stayed the same - whether they handed out a 6-page or a 12-page questionnaire. The response rate did only go up significantly when they cut the questionnaire down to one page only. This last discovery might hint at handing out rather short and focussed questionnaires if a very high degree of representativeness is sought for, and then repeat the survey with different question sets at shorter intervals. The maximum length of a questionnaire might also differ from one country to another, since the Greek study for example pointed to different "national cultures of questionnaire responses".

3.4 Financing lessons

Unsurprisingly, the financial budget is a key factor that limits not only the scope of the study in terms of the number of respondents but also impacts heavily on the data quality. One of the good practice cases attributes its success and highly relevant output to the flexibility of the funding organisation that allowed for a redistribution of the budget when the results of the first part of the survey heavily suggested to change course and to address a different target group using a different methodology in step two of the survey.

A specific solution to finance general eHealth monitoring has been implemented by the study team of the "Jahrbuch Gesundheitswirtschaft". By teaming up with different ordering customers (professional associations, business associations), the executing agency has been able to pursue a multi client approach that allows for simultaneous general benchmarking and more specific market sizing. In this case the different partners and sponsors contribute questions to the questionnaire design either to highlight certain subjects or to gain data for market research. The advantage of this approach is that market research can be combined with research on the more general "eHealth state of the art" at a comparably low cost for all partners. The only limiting factor to this approach is the length of the questionnaire that has to be restrained.

¹⁵ http://kb.ehealth-benchmarking.eu/browseContent_alt.do?contentId=3&action=v3#editViewToolbar

4 An indicator framework for eHealth Benchmarking

The search for eHealth monitoring and benchmarking activities carried out in the EU, Iceland, Norway, Canada and the United States of America revealed a large number of data sources. In fact, the number of sources that could be identified was considerably higher than initially foreseen, as was the number of eHealth-related indicators that were found (more than 4,400). Beside the sheer quantity of sources and indicators, the research also found a wide variability in terms of geographic coverage, analytic depths, eHealth concepts used etc. From a European point of view, this variability – although certainly explainable and to a large degree unavoidable at this time – can be seen as a lack of coherence when it comes to EU-wide eHealth benchmarking.

An important step towards improving the present situation and increasing coherence is seen in the development of an eHealth indicator framework for quantitative benchmarking that covers key groups of health actors and key eHealth-related activities. The development of such an indicator framework was one of the main objectives of the present study.

As has been said above, the indicator framework should on the one hand reflect the complexity of the eHealth domain – e.g. in terms of the wide variety of players in the healthcare sector, health-related activities etc. – and should on the other hand sensibly reduce that complexity to make monitoring both methodologically and economically feasible. To achieve this, the study team identified actors and fields of activity that are deemed to be most relevant for inclusion in the framework. This was done by analysing existing definitions of the eHealth domain, with a particular focus on concepts used in the policy context. Two key inputs have been the European Commission's eHealth Action Plan¹⁶ and the definition of the eHealth market provided by the eHealth Industry Stakeholder Group for the Lead Market Initiative on eHealth¹⁷.

The eHealth Action Plan provides a definition of the eHealth domain focussing on the technical solutions used: "eHealth tools or solutions include products, systems and services that go beyond simple Internet-based applications, for instance tools for health authorities and professionals as well as personalised health systems for patients and citizens. Examples include health information networks, electronic health records, telemedicine services, personal wearable and portable communicable systems, health portals and many other tools assisting health monitoring, diagnosis and treatment¹⁸." The Action Plan also makes explicit mentioning of eHealth-related activities including telemonitoring, cross-border health care, health information search, imaging and image storing, education and training, decision support, and exchange of medical patient data between health professionals.

The understanding of the eHealth domain included in the Lead Market Initiative is founded on the interaction between key actor groups but also focuses on technical solutions:

"This area [i.e. eHealth] encompasses all interactions inside and between the three user groups: patients, health-service providers and payment institutions. The proposed lead market area comprises the following four interrelated major categories of applications¹⁹:

¹⁶ Commission of the European Communities, e-Health - making healthcare better for European citizens: An action plan for a European e-Health Area, COM (2004) 356 final.

¹⁷ Commission of the European Communities, A lead market initiative for Europe, COM (2007) 860 final.

¹⁸ COM (2004) 356 final, p. 4.

¹⁹ The market definition was proposed by the eHealth Industry Stakeholders Group, reporting to the i2010 Sub-group on eHealth. The Stakeholders group includes the following representative organisations: COCIR (European

- (1) Clinical information systems
 - (a) specialised tools for health professionals within care institutions (e.g., hospitals). Examples are Radiology Information Systems, Nursing Information Systems, Medical Imaging, Computer Assisted Diagnosis, Surgery Training and Planning Systems.
 - (b) tools for primary care and/or for outside the care institutions such as general practitioner and pharmacy information systems.
- (2) Telemedicine and homecare, personalised health systems and services, such as disease management services, remote patient monitoring (e.g. at home), tele-consultation, telecare, tele-medicine, and tele-radiology.
- (3) Integrated regional/national health information networks and distributed electronic health record systems and associated services such as e-prescriptions or e-referrals.
- (4) Secondary usage non-clinical systems
 - (a) Systems for health education and health promotion of patients/citizens such as health portals or online health information services.
 - (b) Specialised systems for researchers and public health data collection and analysis such as bio-statistical programs for infectious diseases, drug development, and outcomes analysis.
 - (c) Support systems such as supply chain management, scheduling systems, billing systems administrative and management systems, which support clinical processes but are not used directly by patients or healthcare professionals.²⁰

Further to the concepts provided in these documents, the study team identified additional priority areas, further expanded the high-level actor groups that are mentioned and restructured the activity dimension, all based on the expertise and understanding of the eHealth domain developed in a number of projects, including:

- **eHealth ERA** - analysing national eHealth infrastructures and policy strategies, <http://www.ehealth-era.org/>
- **Good eHealth** - identifying eHealth good practices to better understand developments that have been successfully implemented, <http://www.good-ehealth.org/>
- **I2Health** - better understanding interoperability issues, in particular in relation to ePrescribing and ID management, <http://www.i2-health.org/>
- **Semantic Health** - developing a roadmap for eHealth deployment and research, focusing on semantic interoperability issues of e-Health systems and infrastructures, <http://www.semantichealth.org/>
- **Scenarios4Health** - developing scenarios of ICT enabled new models of healthcare and assessing their potential economic impact, <http://www.scenarios4health.eu/>

As a result, the actor group of "health professionals" (Action Plan) or "health service providers" (Lead Market Initiative) was split into general practitioners, specialists, hospital administrative and IT staff, hospital medical staff, therapists, pharmacists and care providers to better accommodate the needs of quantitative monitoring and in particular to define groups that can be addressed by individual surveys. Nurses and practice staff (in hospitals, GP

Coordination Committee of the Radiological, Electromedical and Healthcare-IT Industry.), IHE (Integrating the Healthcare Enterprise), EHTEL (European Health Telematics Association) and the Continua Health Alliance.
²⁰ COM (2007) 860 final, Appendix 3, p. 50f.

practices and specialist practices) as well as informal carers (as a sub-group of citizens/patients) are covered by modules to be added to the surveys of the related group of health professionals and citizens respectively.

The activity dimension was expanded and divided into four sections of different indicators:

- Basis indicators, covering respondent demographics and basic ICT infrastructure
- Activity-dependant indicators, covering eHealth-related activities
- Attitude indicators, covering general and specific attitudes towards ICT as well as perception of ICT-related impacts
- Horizontal issues, including IT investment, IT support, Data protection/security, Interoperability, IT skills

The result of the prioritization process described above is graphically depicted in Table 4-1 overleaf²¹.

²¹ Methodological note: The matrix presented in the table is not considered to be a prescriptive system used to determine what indicators are used for a given actor/activity combination, but primarily as a means to prioritise certain areas and to present the indicators proposed by the study in a structured manner.

Table 4-1 eHealth benchmarking framework: indicators by actors

	Basis indicators		Activity-dependant indicators													Attitude indicators		Indicators on horizontal issues					
	Respondent demographics	ICT availability	Administration / Management	Health information search ²²	Prescribing	Medical patient data exchange	Electronic patient data storage	Consultation	Diagnosis	Laboratory analysis	Treatment	Professional education and training	Referring	Facility management	Telemedicine / Telemonitoring	Long-term care	Attitudes towards ICT	Assessment of ICT impacts	eHealth/IT investment	IT support	Data protection	Interoperability	eHealth/IT skills
Citizens / Patients																							
↳Module: Informal carers																							
General Practitioners																							
↳Module: Nurses / practice staff																							
Specialists																							
↳Module: Nurses / practice staff																							
Hospitals admin / IT staff																							
Hospitals medical staff																							
↳Module: Nurses																							
Therapists																							
Pharmacies																							
Care providers																							

²² This refers to generic health information search as, for instance, done by citizens/patients, rather than to decision support information used by health professionals or to professional education and training.

4.1 eHealth benchmarking indicators for quantitative monitoring

The framework presented above was populated using indicators (and exemplary questions) from the pool of more than 4,400 indicators identified by the study, covering all relevant actor/activity combinations. In cases where existing sources provided no indicators, new ones have been proposed. Where indicators on one issue came from different sources, the question wording was harmonised if necessary²³.

Indicators for the different actors can be found in the following tables:

Health actor	Table
Citizens / patients ↳ Including module for informal carers	Table 4-2 on page 25
General Practitioners ↳ Including module on nurses / practice staff in general practices	Table 4-3 on page 28
Specialists ↳ Including module on nurses / practice staff in specialist practices	Table 4-4 on page 35
Hospitals, administrative or IT staff	Table 4-5 on page 41
Hospitals, medical staff ↳ Including module on hospital nurses	Table 4-6 on page 46
Therapists	Table 4-7 on page 52
Pharmacies	Table 4-8 on page 55
Care providers	Table 4-9 on page 57

²³ E.g. when one indicator on patient data storage is based on the functionality of a system ("What specific functionalities are available in your system: patient data storage") and another on an action carried out by the respondent (Do you store electronically any of the following types of patient data:...?).

Table 4-2 eHealth Benchmarking indicators targeting citizens / patients

Area		Indicator	Exemplary questions	
Basis indicators	Demography	Age of respondent	Would you please tell me in which year you were born?	
		Educational attainment		
		Household income		
	ICT availability	Computer availability	Do you have access to a computer at home?	
		Internet access	Do you have access to the internet at home?	
		Internet bandwidth	What type of internet connection do you have?	
		Internet usage intensity	How often do you use the internet?	
Activity-dependant indicators	Administration / Management	Making appointments online	Do you use the internet or e-mail to make appointments with any of the following health actors? <ul style="list-style-type: none"> - General Practitioner - Specialist - Hospital - Therapist - Care service provider 	
		Online ordering of health products	Do you use the internet to order any of the following products? <ul style="list-style-type: none"> - Vitamins, minerals - Drugs that are available without a prescription, like aspirin - Self tests, e.g. pregnancy, HIV - Devices like blood pressure meters, clinical thermometers 	
	Health information search	Online health information search	Do you use the internet to search for any of the following information? <ul style="list-style-type: none"> - Specific diseases - Analysis of specific symptoms - Drugs and medications - Surgeries - Alternative treatment - Health care system or delivery - Lifestyle issues 	
		Second opinion online	Do you use the internet to search for second opinions on something a doctor has told you (e.g. a diagnosis or a treatment)?	
		Online self-help	Do you use the internet to participate in health-related online forums, communities or self-help groups	
	Electronic patient data storage / EHR		Patient access to EHR	Do you have access to information stored about you in a computer at the following health actors? <ul style="list-style-type: none"> - General Practitioner - Specialist - Hospital - Therapist

Area	Indicator	Exemplary questions
Consultation	Online consultation	- Care service provider Do you use e-mail or the internet to communicate about health matters with your doctor or another physician, I mean consulting about medical things, not just making an appointment?
	Doctor using computer in consultation	How frequent does a doctor (in a practice or a hospital) use a computer during consultation to show you information (e.g. to describe a treatment or explain symptoms)?
Telemonitoring / Telemedicine	Participation in telemonitoring	Did you ever use an electronic device that transmitted any of your vital data to a doctor or nurse?
	Electronic transfer of vital data	What types of data were transmitted? - Weight - Heart rate - Blood pressure - Blood sugar - ECG
	Video monitoring	Did you ever consult with a doctor or nurse via video (e.g. using a video telephone or a computer)?
Long-term care	Use of social alarm	Do you or anyone in your household have a social alarm that can be used to call help in case of a medical emergency such as call a care service provider or a doctor?
	Use of social alarm inside / away from home	Is it for use inside your home only, or also when you are away from home?
	Household members using social alarm	Is the social alarm for use by you or by somebody else in your household? - Me / respondent - Other person in household - Both
	Use of additional security features to social alarm	There are nowadays additional security features to some social alarm systems, for instance to automatically detect a fire or gas leak. Do you currently use any of these features?
	Use of additional health related features	There are also additional health related features, for instance to automatically detect when a person has fallen or some other medical crisis occurs. Do you currently use any of these features?
	Online communication with care service provider	Do you use the internet or e-mail to communicate with a care service provider that comes to your household?
Attitude indicators	Attitudes towards ICT	
	General ICT attitude	Please tell me whether you agree or disagree with the following statement: Computers and the internet are very useful in day-to-day life
	ICT helps staying healthy	Please tell me whether you agree or disagree with the following statement: Computers and the internet can help people to stay healthy
	ICT improves health care system	Please tell me whether you agree or disagree with the following statement: Computers and the internet can help to improve the health care system
	Facilitators / barriers	Please tell me whether you agree or disagree with the following statements: - When I use computers and the internet to manage my own health affairs I usually get what I am looking for

Area		Indicator	Exemplary questions
			<ul style="list-style-type: none"> - I have the necessary skills to use computers and the internet in a productive manner - I would need more help to use computers and the internet better - Costs keep me from using computers and the internet more - I feel confident that information stored about me in the computer systems of practices and hospitals is secure
	Assessment of ICT impacts	General ICT impacts	In what ways has the use of computers and the internet changed the following? <ul style="list-style-type: none"> - The way you manage your own health affairs - The relationship with your doctor - The quality of health care you receive at a practice or hospital - The time you spend on dealing with health-related issues
Horizontal issues	Data protection IT skills	Patient consent to data processing	Have you ever been asked to consent to the electronic storing or transmitting of your personal data at a practice or hospital, either orally or in writing?
		Experience of data security issues	Have you ever experienced a serious breach where your personal health information was used inappropriately or released without your consent?
		Self-assessment of IT skills	How would you rate your skill level with computers and the internet? <ul style="list-style-type: none"> - Beginner/basic - Intermediate - Advanced

Module: Informal carers

Area		Indicator	Exemplary questions
Basis indicators	Informal care	Provision of care	Do you yourself regularly provide care to another adult person in need of care, whether in your family or not?
		Informal care in own household	Does this person live in your household?
Activity-dependant indicators	Health information search	Online health information search	Do you use the internet to search for any following information that can help you with providing care to that person?
		Online self-help	Do you use the internet to participate in online forums, communities or self-help groups for people providing care to others?
	Telemonitoring / Telemedicine	Participation in telemonitoring	Did the person you care for ever use an electronic device that transmitted any of his or her vital data to a doctor or nurse?
		Electronic transfer of vital data	What types of data were transmitted? <ul style="list-style-type: none"> - Weight - Heart rate - Blood pressure - Blood sugar - ECG
	Long-term care	Use of social alarm	Does the person you care for have a social alarm that can be used to call help in case of a medical emergency such as call a care service provider or a doctor?
Use of social alarm inside / away from home		Is it for use inside your home only, or also when you are away from home?	

Area	Indicator	Exemplary questions
Attitudes towards ICT Assessment of ICT impacts	Online communication with care service provider	Do you use the internet or e-mail to communicate with a care service provider that also looks after the person you care for?
	Online communication with care recipient	Do you use the internet or e-mail to communicate with the person you care for?
	General ICT attitude	Please tell me whether you agree or disagree with the following statement: Computers and the internet can help people who provide care to others on a voluntary basis
	Facilitators / barriers	Please tell me whether you agree or disagree with the following statements: <ul style="list-style-type: none"> - I know a lot about how computers and the internet can help me in providing care - I know where to find helpful information on the internet - I know where to get a social alarm system and who will pay for it - It would be helpful if I could communicate with the care service provider via e-mail or the internet
	General ICT impacts	Please tell me whether you agree or disagree with the following statements: <ul style="list-style-type: none"> - The information I find on the internet has helped me to better care for the person I look after - The transmission of vital data to a doctor has improved the health and safety of the person I care for - The social alarm system has improved the safety and well-being of the person I care for

Table 4-3 eHealth Benchmarking indicators targeting General Practitioners

Area	Indicator	Exemplary questions	
Basis indicators	Demography	Age of GP	How old are you?
		Size of practice / institution	How many physicians work at your practice / institution, including yourself?
	ICT availability	Computer availability	Does your practice have a computer?
		Internet access	Does your practice have access to information on the internet?
		Type of internet access used <ul style="list-style-type: none"> - Dial-up / PSTN - ISDN - DSL - Other broadband - Mobile 	What type of connection to the internet does your practice have?
		Access to other type of electronic network	Does your practice have access to other electronic networks than the internet?
		Duration of internet use	For how many years has your practice been using the internet or other electronic health networks?
		Access to other health institutions' systems	Does the internet or other electronic networks allow you to connect to the computer system of any of the following organisations or persons? <ul style="list-style-type: none"> - Other GPs - Specialist practices

Area	Indicator	Exemplary questions	
		<ul style="list-style-type: none"> - Hospitals - Laboratories - Pharmacies - Care homes - Patients' homes - Health authorities - Insurance companies - Health care providers in other EU countries - Health care providers in countries outside the EU - Suppliers 	
Activity-dependant indicators	Administration / Management	Online exchange with patients on administrative issues	Does your practice use the internet or electronic health networks to interact with patients by e-mail about administrative issues such as making an appointment with you?
		Exchange of administrative patient data with other health care providers	Does your practice use the internet or electronic health networks to exchange administrative patient data with other health care providers?
		Exchange of payment-related patient data with reimbursing organisations	Does your practice use the internet or electronic health networks to exchange patient data related to payment with reimbursing organisations?
	Facility management	Online ordering of practice supplies	Does your practice use the internet or electronic health networks for ordering supplies for your practice?
	Patient data storage / EHR	Electronic storage of individual administrative patient data	Does your practice record and store individual administrative patient data?
			Electronic storage of different types of individual medical patient data
		Patient access to individual data	Do your patients have access to their individual data stored in your practice?
		Structured data entry	Do you enter the medical data into the computer using an interface with structured data entry fields?
		Coded data entry	Do you enter medical data coded according to any classification into the computer or un-coded plain text data, or both?
		Medical patient data exchange	Medical patient data exchange with health professionals

Area	Indicator	Exemplary questions
		- Health care providers in countries outside the EU
Consultation	Computer access in consultation room	Do you have access to a computer in the consultation room?
	Computer use during consultation	Do you use the computer during consultations?
	Access electronic patient data	Does the computer allow you to access any of the following electronic patient data during consultation? - Symptoms or the reasons for encounters - Medical history - Basic medical parameters such as allergies - Vital signs measurement - Diagnoses - Medications - Laboratory results - Ordered examinations and results - Radiological images - Treatment outcomes
	Patient information during consultation	Do you use a computer to show patients any health-related information during consultation?
	Consultation via e-mail	Does your practice use the internet or electronic health networks to interact with patients by e-mail about health-related issues?
Diagnosis	DSS for diagnosis	Does your practice have a software system that supports you with diagnosis?
	Use of DSS for diagnosis	How often do you use that software system?
	DSS for diagnosis and patient specific support	Does this software system give patient-specific advice based on the data you have stored about an individual patient or is it general advice or both?
	DSS for diagnosis connected to EHR	Is this software system connected to the individual patient data stored in your practice or does it store its own data?
Prescribing	Online search for medication-related information	Does your practice use the internet or electronic health networks to search for prescribing information, new drug information or contra-indications?
	DSS for prescribing	Does your practice have a software system that supports you with prescribing?
	Use of DSS for prescribing	How often do you use that software system?
	DSS for prescribing and patient specific support	Does this software system give patient-specific advice based on the data you have stored about an individual patient or is it general advice or both?
	Functions of DSS for prescribing purposes	Which of the following functions are included in this software system available to you: - drug allergy alerts - drug-drug interaction alerts - drug-lab interaction alerts - drug dosing support
	Electronic transfer of prescriptions	Does your practice use the internet or electronic health networks to transfer prescriptions to the dispensing pharmacist?
Laboratory analysis	Receiving laboratory results	Does your practice use the internet or electronic health networks to receive laboratory reports electronically?

Area	Indicator	Exemplary questions	
	Referring	Online exchange with other care providers to make appointments for own patients	Does your practice use the internet or electronic health networks for making appointments at other care providers for your patients?
		Electronic referrals and epicrisis	Does your practice use the internet or electronic health networks to send and receive referrals or epicrisis?
	Professional education and training	Continuous education via internet	Have you used the internet or computers for your continuous medical education (CME) or continuous professional development (CPD) during the last 12 months?
		Telemedicine / Telemonitoring	Provision of telemonitoring services
		Receiving vital signs data	Does your practice use the internet or electronic health networks to receive automatically any vital signs data from patients' homes or care homes?
Attitude indicators	Attitudes towards ICT use	Attitudes, motivation and perceived barriers	<p>Please tell me whether you agree or disagree with the following statements:</p> <ul style="list-style-type: none"> - the use of software and IT systems improves the quality of healthcare services - the use of software and IT systems in health should be included in the medical education - to really benefit from IT, all health actors have to share clinical information in a network - IT systems would be more used if GPs were provided with more training - Your practice would need better support with the maintenance of your IT system - The cost of IT is ultimately the decisive factor on the use of ICT
	Perception of ICT impacts	Perceived impacts of IT and eHealth	<p>In what ways has the use of information technology systems changed the following?</p> <ul style="list-style-type: none"> - your personal working processes - the working processes of your practice staff - the quality of diagnosis and treatment decisions - the doctor-patient relationship <p>Has the use of information technology systems and software had an impact on any of the following?</p> <ul style="list-style-type: none"> - the average number of patients you can help in one day - the workload on your support staff, for instance nurses - the number of patients who come to your practice - the scope of services offered by your practice
Horizontal issues	IT investment	Share of IT investments	What do you estimate is the share of IT investments compared to the overall annual turnover of your practice?
		Investment plans	Does your practice plan any minor or major IT investments in the coming twelve months?
		Applications in investment plans	<p>In what areas does your practice plan to invest and will it be to procure a new application or to upgrade an existing application?</p> <ul style="list-style-type: none"> - IT infrastructure - Electronic patient data storage / Electronic health record - Decision Support System - Electronic health card - Electronic referrals - Electronic prescribing - Telemonitoring - IT security

Area	Indicator	Exemplary questions
IT support	IT support and maintenance	Who is responsible for the support and maintenance of the IT systems and applications in your practice: Dedicated IT personnel, Nurses/practice staff, GP, External service provider
	Data protection/security	IT security features
	Data backups	Does your practice have safety copies - called back-ups - of the data stored on the practice computers?
	Patient consent to data processing	How does your practice obtain the patients' consent to data storage and transfer? Is it written, orally or is no specific consent obtained?
	Patient consent, legal requirement	Are you aware of a legal requirement to obtain patients' consent to data storage and transfer in your country?
Interoperability	Interoperability issues in data transfer	When your practice exchanges patient data electronically do you ever encounter data or system compatibility problems?
IT skills	Self-assessment of IT skills	How would you rate your skill level with computers? - Beginner/basic - Intermediate - Advanced
	Participation in IT training	How often do you participate in IT training?

Module: Nurses / practice staff

Area	Indicator	Exemplary questions
Basis indicators	Demography	Age of respondent
		Role of respondent
		How old are you? In what capacity do you work in your practice? - Nurse - Administrative staff
Activity-dependant indicators	Administration / Management	Online exchange with patients on administrative issues
		Does your practice use the internet or electronic health networks to interact with patients by e-mail about administrative issues such as making an appointment with you?
		Frequency of online exchange with patients on administrative issues
	Self-assessment of IT skills: Online exchange with patients on administrative issues	How often do you interact with patients by e-mail about administrative issues? - <Frequency> - Not part of responsibility
		How would you rate your skill level with regard to the interaction with patients by e-mail about administrative issues? - Beginner/basic - Intermediate - Advanced

Area	Indicator	Exemplary questions
	Exchange of administrative patient data with other health care providers	Does your practice use the internet or electronic health networks to exchange administrative patient data with other health care providers?
	Frequency of use: Exchange of administrative patient data with other health care providers	How often do you use the system for the exchange of administrative patient data with other health care providers?
	Self-assessment of IT skills: Exchange of administrative patient data with other health care providers	How would you rate your skill level with regard to the system for the exchange of administrative patient data with other health care providers? - Beginner/basic - Intermediate - Advanced
	Exchange of payment-related patient data with reimbursing organisations	Does your practice use the internet or electronic health networks to exchange patient data related to payment with reimbursing organisations?
	Frequency of use: Exchange of payment-related patient data with reimbursing organisations	How often do you use the system for the exchange of administrative patient data with other health care providers?
	Self-assessment of IT skills: Exchange of payment-related patient data with reimbursing organisations	How would you rate your skill level with regard to the system for the exchange of administrative patient data with other health care providers? - Beginner/basic - Intermediate - Advanced
Facility management	Online ordering of practice supplies	Does your practice use the internet or electronic health networks for ordering supplies for your practice?
	Frequency of use: Online ordering of practice supplies	How often do you order practice supplies online?
	Self-assessment of IT skills: Online ordering of practice supplies	How would you rate your skill level with regard to the online ordering of practice supplies? - Beginner/basic - Intermediate - Advanced
Patient data storage / EHR	Electronic storage of individual administrative patient data	Does your practice record and store individual administrative patient data?
	Electronic storage of different types of individual medical patient data	Does your practice record and store electronically the following types of patient identifiable data? - Symptoms or the reasons for encounters - Medical history - Basic medical parameters such as allergies - Vital signs measurement - Diagnoses - Medications - Laboratory results - Ordered examinations and results - Radiological images - Treatment outcomes
	Frequency of use: Electronic storage of individual patient data	How often do you use the system for the electronic storage of individual patient data?
	Self-assessment of IT skills: Electronic storage of	How would you rate your skill level with regard to the system for the electronic storage

Area	Indicator	Exemplary questions
	individual patient data	of individual patient data?
Medical patient data exchange	Medical patient data exchange with health professionals	Does your practice use the internet or electronic health networks to exchange medical patient data with any of the following health professionals and organisations? <ul style="list-style-type: none"> - Other GPs - Specialists - Hospitals - Health authorities - Health care providers in other EU countries - Health care providers in countries outside the EU
	Frequency of use: Medical patient data exchange with health professionals	How often do you use the system for medical patient data exchange with health professionals?
	Self-assessment of IT skills: Medical patient data exchange with health professionals	How would you rate your skill level with regard to the system for medical patient data exchange with health professionals? <ul style="list-style-type: none"> - Beginner/basic - Intermediate - Advanced
Professional education and training	Continuous education via internet	Have you used the internet or computers for your continuous professional education during the last 12 months?
Telemedicine / Telemonitoring	Provision of telemonitoring services	Does your practice use the internet or electronic health networks to provide telemonitoring services to patients at their home or in a care home?
	Receiving vital signs data	Does your practice use the internet or electronic health networks to receive automatically any vital signs data from patients' homes or care homes?
	Frequency of use: Telemonitoring	How often do you use the system for telemonitoring or receiving of vital signs data?
	Self-assessment of IT skills: Telemonitoring	How would you rate your skill level with regard to the system for telemonitoring or receiving of vital signs data?
Attitude indicators	Attitudes towards ICT use	Attitudes, motivation and perceived barriers Please tell me whether you agree or disagree with the following statements: <ul style="list-style-type: none"> - the use of software and IT systems improves the quality of healthcare services - the use of software and IT systems in health should be included in the vocational training of nurses / practice staff - IT systems would be more used if nurses / practise staff were provided with more training - Your practice would need better support with the maintenance of your IT system
	Perception of ICT impacts	Perceived impacts of IT and eHealth In what ways has the use of information technology systems changed the following? <ul style="list-style-type: none"> - your personal working processes - the working processes of other nurses or practice staff Has the use of information technology systems and software had an impact on any of the following? <ul style="list-style-type: none"> - the average number of patients you can help in one day - your workload
	IT skills	Self-assessment of IT skills How would you rate your overall skill level with computers? Participation in IT training How often do you participate in IT training?

Table 4-4 eHealth Benchmarking indicators targeting specialists

Area		Indicator	Exemplary questions
Basis indicators	Demography	Age of specialist	How old are you?
		Size of practice / institution	How many physicians work at your practice / institution, including yourself?
		Medical specialties	What are the medical specialties of your practice? <ul style="list-style-type: none"> - Surgical specialty - Internal medicine - Diagnostic specialty - Neurology - Other
	ICT availability	Computer availability	Does your practice have a computer?
		Internet access	Does your practice have access to information on the internet?
		Type of internet access used <ul style="list-style-type: none"> - Dial-up / PSTN - ISDN - DSL - Other broadband - Mobile 	What type of connection to the internet does your practice have?
		Access to other type of electronic network	Does your practice have access to other electronic networks than the internet?
		Duration of internet use	For how many years has your practice been using the internet or other electronic health networks?
		Access to other health institutions' systems	Does the internet or other electronic networks allow you to connect to the computer system of any of the following organisations or persons? <ul style="list-style-type: none"> - Other specialist practices - General practices - Hospitals - Laboratories - Pharmacies - Care homes - Patients' homes - Health authorities - Insurance companies - Health care providers in other EU countries - Health care providers in countries outside the EU - Suppliers
		Activity-dependant indicators	Administration / Management
Exchange of administrative patient data with other health care providers	Does your practice use the internet or electronic health networks to exchange administrative patient data with other health care providers?		
Exchange of payment-related patient data with	Does your practice use the internet or electronic health networks to exchange patient		

Area	Indicator	Exemplary questions
	reimbursing organisations	data related to payment with reimbursing organisations?
Facility management	Online ordering of practice supplies	Does your practice use the internet or electronic health networks for ordering supplies for your practice?
Patient data storage / EHR	Electronic storage of individual administrative patient data	Does your practice record and store individual administrative patient data?
	Electronic storage of different types of individual medical patient data	Does your practice record and store electronically the following types of patient identifiable data? <ul style="list-style-type: none"> - Symptoms or the reasons for encounters - Medical history - Basic medical parameters such as allergies - Vital signs measurement - Diagnoses - Medications - Laboratory results - Ordered examinations and results - Radiological images - Treatment outcomes
	Patient access to individual data	Do your patients have access to their individual data stored in your practice?
	Structured data entry	Do you enter the medical data into the computer using an interface with structured data entry fields?
	Coded data entry	Do you enter medical data coded according to any classification into the computer or un-coded plain text data, or both?
Medical patient data exchange	Medical patient data exchange with health professionals	Does your practice use the internet or electronic health networks to exchange medical patient data with any of the following health professionals and organisations? <ul style="list-style-type: none"> - Other specialist practices - General practices - Hospitals - Health authorities - Health care providers in other EU countries - Health care providers in countries outside the EU
Consultation	Computer access in consultation room	Do you have access to a computer in the consultation room?
	Computer use during consultation	Do you use the computer during consultations?
	Access electronic patient data	Does the computer allow you to access any of the following electronic patient data during consultation? <ul style="list-style-type: none"> - Symptoms or the reasons for encounters - Medical history - Basic medical parameters such as allergies - Vital signs measurement - Diagnoses - Medications - Laboratory results - Ordered examinations and results - Radiological images - Treatment outcomes

Area	Indicator	Exemplary questions
Diagnosis	Patient information during consultation	Do you use a computer to show patients any health-related information during consultation?
	Consultation via e-mail	Does your practice use the internet or electronic health networks to interact with patients by e-mail about health-related issues?
	DSS for diagnosis	Does your practice have a software system that supports you with diagnosis?
	Use of DSS for diagnosis	How often do you use that software system?
	DSS for diagnosis and patient specific support	Does this software system give patient-specific advice based on the data you have stored about an individual patient or is it general advice or both?
Prescribing	DSS for diagnosis connected to EHR	Is this software system connected to the individual patient data stored in your practice or does it store its own data?
	Online search for medication-related information	Does your practice use the internet or electronic health networks to search for prescribing information, new drug information or contra-indications?
	DSS for prescribing	Does your practice have a software system that supports you with prescribing?
	Use of DSS for prescribing	How often do you use that software system?
	DSS for prescribing and patient specific support	Does this software system give patient-specific advice based on the data you have stored about an individual patient or is it general advice or both?
	Functions of DSS for prescribing purposes	Which of the following functions are included in this software system available to you: - drug allergy alerts - drug-drug interaction alerts - drug-lab interaction alerts - drug dosing support
Laboratory analysis	Electronic transfer of prescriptions	Does your practice use the internet or electronic health networks to transfer prescriptions to the dispensing pharmacist?
	Receiving laboratory results	Does your practice use the internet or electronic health networks to receive laboratory reports electronically?
Referring	Online exchange with other care providers to make appointments for own patients	Does your practice use the internet or electronic health networks for making appointments at other care providers for your patients?
	Electronic referrals and epicrisis	Does your practice use the internet or electronic health networks to send and receive referrals or epicrisis?
Professional education and training	Continuous education via internet	Have you used the internet or computers for your continuous medical education (CME) or continuous professional development (CPD) during the last 12 months?
Telemedicine / Telemonitoring	Provision of telemonitoring services	Does your practice use the internet or electronic health networks to provide telemonitoring services to patients at their home or in a care home?
	Receiving vital signs data	Does your practice use the internet or electronic health networks to receive automatically any vital signs data from patients' homes or care homes?
Attitude indicators	Attitudes towards ICT use	Attitudes, motivation and perceived barriers Please tell me whether you agree or disagree with the following statements: - the use of software and IT systems improves the quality of healthcare services - the use of software and IT systems in health should be included in the medical

Area	Indicator	Exemplary questions
		education - to really benefit from IT, all health actors have to share clinical information in a network - IT systems would be more used if specialists were provided with more training - Your practice would need better support with the maintenance of your IT system - The cost of IT is ultimately the decisive factor on the use of ICT
	Perception of ICT impacts	Perceived impacts of IT and eHealth In what ways has the use of information technology systems changed the following? - your personal working processes - the working processes of your practice staff - the quality of diagnosis and treatment decisions - the doctor-patient relationship Has the use of information technology systems and software had an impact on any of the following? - the average number of patients you can help in one day - the workload on your support staff, for instance nurses - the number of patients who come to your practice - the scope of services offered by your practice
Horizontal issues	IT investment	Share of IT investments What do you estimate is the share of IT investments compared to the overall annual turnover of your practice? Investment plans Does your practice plan any minor or major IT investments in the coming twelve months? Applications in investment plans In what areas does your practice plan to invest and will it be to procure a new application or to upgrade an existing application? - IT infrastructure - Electronic patient data storage / Electronic health record - Decision Support System - Electronic health card - Electronic referrals - Electronic prescribing - Telemonitoring - IT security
	IT support	IT support and maintenance Who is responsible for the support and maintenance of the IT systems and applications in your practice: Dedicated IT personnel, Nurses/practice staff, Physician, External service provider
	Data protection/security	IT security features Please tell me if your practice uses any of the following security techniques? - Password protected access to computers - Password protection of sent or received files - Encryption of sent or received files and e-mails - E-signatures Data backups Does your practice have safety copies - called back-ups - of the data stored on the practice computers? Patient consent to data processing How does your practice obtain the patients' consent to data storage and transfer? Is it written, orally or is no specific consent obtained? Patient consent, legal requirement Are you aware of a legal requirement to obtain patients' consent to data storage and transfer in your country?

Area	Indicator	Exemplary questions
Interoperability	Interoperability issues in data transfer	When your practice exchanges patient data electronically do you ever encounter data or system compatibility problems?
	IT skills	Self-assessment of IT skills - Beginner/basic - Intermediate - Advanced
	Participation in IT training	How often do you participate in IT training?

Module: Nurses / practice staff

Area	Indicator	Exemplary questions
Basis indicators	Demography	Age of respondent How old are you?
		Role of respondent In what capacity do you work in your practice? - Nurse - Administrative staff
Activity-dependant indicators	Administration / Management	Online exchange with patients on administrative issues Does your practice use the internet or electronic health networks to interact with patients by e-mail about administrative issues such as making an appointment with you?
		Frequency of online exchange with patients on administrative issues How often do you interact with patients by e-mail about administrative issues? - <Frequency> - Not part of responsibility
		Self-assessment of IT skills: Online exchange with patients on administrative issues How would you rate your skill level with regard to the interaction with patients by e-mail about administrative issues? - Beginner/basic - Intermediate - Advanced
		Exchange of administrative patient data with other health care providers Does your practice use the internet or electronic health networks to exchange administrative patient data with other health care providers?
		Frequency of use: Exchange of administrative patient data with other health care providers How often do you use the system for the exchange of administrative patient data with other health care providers?
		Self-assessment of IT skills: Exchange of administrative patient data with other health care providers How would you rate your skill level with regard to the system for the exchange of administrative patient data with other health care providers? - Beginner/basic - Intermediate - Advanced
		Exchange of payment-related patient data with reimbursing organisations Does your practice use the internet or electronic health networks to exchange patient data related to payment with reimbursing organisations?
		Frequency of use: Exchange of payment-related patient data with reimbursing organisations How often do you use the system for the exchange of administrative patient data with other health care providers?
	Self-assessment of IT skills: Exchange of payment-related How would you rate your skill level with regard to the system for the exchange of	

Area	Indicator	Exemplary questions
	patient data with reimbursing organisations	administrative patient data with other health care providers? <ul style="list-style-type: none"> - Beginner/basic - Intermediate - Advanced
Facility management	Online ordering of practice supplies	Does your practice use the internet or electronic health networks for ordering supplies for your practice?
	Frequency of use: Online ordering of practice supplies	How often do you order practice supplies online?
	Self-assessment of IT skills: Online ordering of practice supplies	How would you rate your skill level with regard to the online ordering of practice supplies?
Patient data storage / EHR	Electronic storage of individual administrative patient data	Does your practice record and store individual administrative patient data?
	Electronic storage of different types of individual medical patient data	Does your practice record and store electronically the following types of patient identifiable data? <ul style="list-style-type: none"> - Symptoms or the reasons for encounters - Medical history - Basic medical parameters such as allergies - Vital signs measurement - Diagnoses - Medications - Laboratory results - Ordered examinations and results - Radiological images - Treatment outcomes
	Frequency of use: Electronic storage of individual patient data	How often do you use the system for the electronic storage of individual patient data?
	Self-assessment of IT skills: Electronic storage of individual patient data	How would you rate your skill level with regard to the system for the electronic storage of individual patient data? <ul style="list-style-type: none"> - Beginner/basic - Intermediate - Advanced
	Medical patient data exchange	Medical patient data exchange with health professionals
	Frequency of use: Medical patient data exchange with health professionals	How often do you use the system for medical patient data exchange with health professionals?
	Self-assessment of IT skills: Medical patient data exchange with health professionals	How would you rate your skill level with regard to the system for medical patient data exchange with health professionals?
Professional	Continuous education via internet	Have you used the internet or computers for your continuous professional education

Area	Indicator	Exemplary questions
	education and training	during the last 12 months?
	Telemedicine / Telemonitoring	Provision of telemonitoring services
		Receiving vital signs data
		Frequency of use: Telemonitoring
		Self-assessment of IT skills: Telemonitoring
Attitude indicators	Attitudes towards ICT use	Attitudes, motivation and perceived barriers
		Please tell me whether you agree or disagree with the following statements: <ul style="list-style-type: none"> - the use of software and IT systems improves the quality of healthcare services - the use of software and IT systems in health should be included in the vocational training of nurses / practice staff - IT systems would be more used if nurses / practise staff were provided with more training - Your practice would need better support with the maintenance of your IT system
	Perception of ICT impacts	Perceived impacts of IT and eHealth
		In what ways has the use of information technology systems changed the following? <ul style="list-style-type: none"> - your personal working processes - the working processes of other nurses or practice staff Has the use of information technology systems and software had an impact on any of the following? <ul style="list-style-type: none"> - the average number of patients you can help in one day - your workload
Horizontal issues	IT skills	Self-assessment of IT skills
		How would you rate your overall skill level with computers? <ul style="list-style-type: none"> - Beginner/basic - Intermediate - Advanced
		Participation in IT training
		How often do you participate in IT training?

Table 4-5 eHealth Benchmarking indicators hospital administrative / IT staff

Area	Indicator	Exemplary questions
Basis indicators	Demography	Age of respondent
		How old are you?
		Role of respondent
		In what capacity do you work in the hospital? <ul style="list-style-type: none"> - IT staff - Administrative staff
		Size of hospital
		How many medical staff / admin/IT staff members work at your hospital, including yourself?
	ICT availability	Computer availability
		How many computers does your hospital have?

Area	Indicator	Exemplary questions
		How many are fixed and how many mobile systems?
	Points of access to a computer	Where can members of the staff access a computer? (own office, shared admin. room, patient rooms fixed PCs, patient rooms mobile devices...)
	Internet availability	Does your hospital have access to the internet?
	Type of internet access used - Dial-up / PSTN - ISDN - DSL - Other broadband - Mobile	What type of connection to the internet does your hospital have?
	Access to other type of electronic network	Does your hospital have access to other electronic networks than the internet?
	Duration of Internet use	For how many years has the hospital been using the internet or other electronic health networks?
	Points of access to electronic networks	Where can members of the staff access the internet or other electronic networks? (own office, shared admin. room, patient rooms fixed PCs, patient rooms mobile devices ...)
	Access to other health institutions' systems	Does the internet or other electronic networks allow you to connect to the computer system of any of the following organisations or persons? - GPs - Specialist practices - Hospitals - Laboratories - Pharmacies - Care homes - Patients' homes - Health authorities - Insurance companies - Health care providers in other EU countries - Health care providers in countries outside the EU - Suppliers
	Hospital Homepage	Does the hospital have a homepage (hospital-specific)? Which of the following functions does the homepage offer: - internal telephone directory (health professionals/patients) - online appointments (health professionals/patients) - Health information (treatments, operations...)
Activity-dependant indicators	Administration / Management	Computerization of management, accounting and facility management functions
		For which of the following functions does your hospital have computerized solutions: - staff roster - patient registration - patient admission and bed allocation - appointment scheduling - operation scheduling - billing - financial accounting
		Hospital Management System
		Does the hospital have an overarching, integrated Hospital Management System? Which of the following tasks are integrated/connected to the central Hospital

Area	Indicator	Exemplary questions
		Management System: - staff roster - patient registration - patient admission and bed allocation - appointment scheduling - operation scheduling - billing - financial accounting
Patient data storage	Electronic storage of individual administrative patient data (CIS)	Does the hospital record and store individual administrative patient data, e.g. using a Clinical Information System (CIS)?
	Electronic storage of different types of individual medical patient data (EHR)	Does the hospital record and store electronically any medical patient data, e.g. using an Electronic Health Record (EHR)?
Patient data exchange	Electronic patient data exchange with reimbursers	Does the hospital use the internet or other electronic networks to exchange patient data related to payment with reimbursing organisations? How often do you exert this task?
	Online exchange with patients on administrative issues	Does the hospital use the Internet or other electronic networks to communicate with patients about administrative issues (e.g. billing, appointments)? How often do you exert this task?
Medical patient data exchange	Exchange of medical patient data with health professionals	Does the hospital use the Internet or a special electronic network to exchange medical patient data: - between hospital wards - external GPs - external specialists - Health authorities - Health care providers in other EU countries - Health care providers outside of the EU
Referring	Electronic transfer of referrals	Does the hospital use the Internet or other electronic networks to send or receive electronic referrals?
	Online referrals	Does your hospital offer the possibility to external health actors to make appointments for their patients: - via a special network - via Internet: function on your website (integrated directory) - via Internet: e-Mail
	Exchange electronic discharge letters/epicrisis	Does the hospital have a computerized system for epicrisis/discharge letters?
Diagnosis	PACS	Does the hospital have a Picture archiving and communication system (PACS)? - Does the hospital store electronic radiological images and/or diagnostic test results? - Who can access the electronically stored files? - Where can these files be accessed?
	Availability of decision support system (software) for diagnosis (DSS)	Does the hospital have software, e.g. a Decision Support System (DSS) that supports physicians in making diagnoses?
	DSS for diagnosis connected to CIS	Is this software system connected to the individual patient data stored in the hospital or does it store its own data?
Prescribing	Availability of DSS for prescribing	Does the hospital have software, e.g. a Decision Support System (DSS) that supports

Area	Indicator	Exemplary questions
		physicians with prescribing?
	DSS for prescribing connected to CIS	Is this software system connected to the individual patient data stored in the hospital or does it store its own data?
	Electronic transfer of prescriptions	Does the hospital use the internet or other electronic networks to transfer prescriptions to the hospital integrated pharmacy and/or any external pharmacy?
Treatment	Clinical Reminders/Clinical Guidelines	Does the hospital have a computerized system for clinical reminders and/or clinical guidelines?
Facility management	Supply chain management	Does your hospital have a computerized system for supply chain management?
	Supply chain management: Responsibilities	Who is responsible for ordering: <ul style="list-style-type: none"> - Medical supplies - Pharmaceuticals - Surgery supplies - Housekeeping supplies
	eProcurement	Does the hospital use the internet or electronic health networks for ordering supplies? (eProcurement)?
	eProcurement - types	What kind of eProcurement does the hospital use: <ul style="list-style-type: none"> - Internet: online single providers - Online: medical market places - Software solutions: procurement only - Software solutions: procurement integrated in EPR (enterprise resource planning system)
	IT application for pharmaceuticals supply chain management	Does your hospital have a computerized system for tracking pharmaceuticals? Does your hospital have a computerized system for pharmaceutical administration?
Attitude indicators	Attitudes towards ICT use	Attitudes, motivation and perceived barriers Please tell me whether you agree or disagree with the following statements: <ul style="list-style-type: none"> - the use of software and IT systems improves the quality of healthcare services - the use of software and IT systems in health should be included in the medical education - to really benefit from IT, all health actors have to share clinical information in a network - The hospital needs more funding in order to profit fully from the advantages that IT solutions have on offer - The hospital staff is offered sufficient IT education/training possibilities - The hospital staff participates regularly in IT trainings (in-house, external or private)
	Perception of ICT impacts	Perceived impacts of IT and eHealth In what ways has the use of information technology systems changed the following? <ul style="list-style-type: none"> - your personal working processes - administrative processes in your hospital in general - the working processes of the medical staff Has the use of information technology systems and software had an impact on any of the following? <ul style="list-style-type: none"> - the average number of patients you can help in one day - the workload on your administrative staff - the workload on your medical staff - the number of patients who come to your hospital - the scope of services offered by your hospital

Area	Indicator	Exemplary questions
Horizontal issues	IT investment	IT Investment
		IT expenses
		IT Investment Plans
		Applications in investment plans
	IT support	IT support and maintenance
	Data protection	Data protection of IT system
		Data backup
	Interoperability	Interoperability standards
		Communication standards

Last year, how much was the investment in ICT infrastructure (hardware and software) in % of the total hospital budget?

Last year, how much were the expenses for current ICT costs (IT personnel salaries, maintenance etc.) in % of the total hospital budget ?

Does the hospital plan any major IT investments in the coming 12 months?

In what areas does the hospital plan to invest and will it be to procure a new application or to upgrade an existing application?

- IT infrastructure
- Electronic patient data storage / Electronic health record
- Decision Support System
- Electronic health card
- Electronic referrals
- Electronic prescribing
- Telemonitoring
- IT security

Who is responsible for the support and maintenance of the IT systems and applications in the hospital: Dedicated IT personnel, External service provider, medical staff?

Which of the following security measures have been taken to protect the data stored and transmitted by the hospital IT system?

- encryption of all stored data
- encryption of all transmitted data
- PC access only with health professional cards
- PC access with password only

Who is responsible for the back-up of

- medical data
- administrative data

How long are the time intervals between back-ups?

Which standards are in use

- for data codification
- for integration
- for connectivity?

Do you know of any other health actors that use the same standards?

Which communication standards do you use (e.g for intra- and inter-organizational data transfer):

- OVT/EDI
- HL7 CDA R1
- HL7 CDA R2
- DICOM
- XML-messaging
- structural entries in electronic patient records
- general OID-codification
- hospital specific OID-codification
- quality monitoring system
- electronic registering of errors
- data security plan

Area	Indicator	Exemplary questions
eHealth/IT skills	Offer of IT trainings (in-house /external)	Does your hospital offer IT trainings (in-house or external)? How many training sessions (duration?) are offered per year?
	Types of IT training	What types of IT trainings are offered?
	Participation in IT trainings	How many hospital employees participate in IT trainings per year (average)?

Table 4-6 eHealth Benchmarking indicators hospital medical staff

Area	Indicator	Exemplary questions	
Basis indicators	Demography	Age of Physician	How old are you?
		Specialisation	What is your medical specialisation?
		Size of Ward	How many physicians/health professionals work in your ward?
	ICT availability	Computer availability	Do you have access to a computer at work?
		Points of access to a computer	Where can you access a computer? (own office, shared admin. room, patient rooms fixed PCs, patient rooms mobile devices...)
		Internet access	Do you have access to information on the internet?
		Duration of Internet use	For how many years have you been using the internet or other electronic health networks at work?
		Access to regional/national network	Do you have access to specialized medical network (regional or national scale) other than the Internet?
		Points of access to electronic networks	Where can you access the internet or other electronic networks? (own office, shared admin. room, patient rooms fixed PCs, patient rooms mobile devices ...)
		Access to other health institutions' systems	Does the internet or other electronic networks allow you to connect to the computer system of any of the following organisations or persons? - GPs - Specialist practices - Hospitals - Laboratories - Pharmacies - Care homes - Patients' homes - Health authorities - Insurance companies - Health care providers in other EU countries - Health care providers in countries outside the EU - Suppliers
Activity-dependant indicators	Administration / Management	Online exchange with patients on administrative issues	Do you use the internet or electronic health networks to interact with patients by e-mail about administrative issues such as making an appointment with you?

Area	Indicator	Exemplary questions
	Exchange of administrative patient data with other health care providers	Do you use the internet or electronic health networks to exchange administrative patient data with other health care providers?
	Exchange of payment-related patient data with reimbursing organisations	Do you use the internet or electronic health networks to exchange patient data related to payment with reimbursing organisations?
Patient data storage	Electronic storage of individual administrative patient data (CIS)	Do you record and store individual administrative patient data?
	Electronic storage of different types of individual medical patient data (EHR)	Do you record and store electronically (any of) the following types of patient identifiable data? <ul style="list-style-type: none"> - Symptoms or the reasons for encounters - Medical history - Basic medical parameters such as allergies - Vital signs measurement - Diagnoses - Medications - Laboratory results - Ordered examinations and results - Radiological images - Treatment outcomes
	Structured data entry (EHR)	Do you enter the medical data into the computer using an interface with structured data entry fields?
	Coded data entry (EHR)	Do you enter medical data coded according to any classification into the computer or un-coded plain text data, or both?
	Patient access to individual data (CIS)	Do your patients have access to their individual data stored in the hospital IT system?
Medical patient data exchange	Exchange of medical patient data with health professionals	Do you use the Internet or a special electronic network to exchange medical patient data: <ul style="list-style-type: none"> - between hospital wards - external GPs - external specialists - Health authorities - Health care providers in other EU countries - Health care providers outside of the EU
Consultation	Use of computer during ward round	Do you use a computer during your ward round?
	Access to electronic medical patient data (EHR)	Which of the following electronic patient data do you have access to during your ward round: <ul style="list-style-type: none"> - Symptoms or the reasons for encounters - Medical history - Basic medical parameters such as allergies - Vital signs measurement - Diagnoses - Medications - Laboratory results - Ordered examinations and results - Radiological images - Treatment outcomes

Area	Indicator	Exemplary questions
	Patient information during ward round	Do you use a computer to show patients any health-related information during the ward round?
Diagnosis	Availability of decision support system (software) for diagnosis (DSS)	Do you have software that supports you with diagnosis?
	Availability of professional internet-based data bases (web pages) for diagnosis (DSS)	Do you have access to an Internet portal /web-based data base that supports you with diagnosis?
	DSS for diagnosis and patient specific support (DSS)	Does this software system give patient-specific advice based on the data you have stored about an individual patient or is it general advice or both?
	DSS for diagnosis connected to EHR (DSS)	Is this software system connected to the individual patient data stored in the hospital or does it store its own data?
	Use of DSS for diagnosis (DSS)	How often do you use this software?
	Storage of radiological images and reports (CIS/PACS)	Do you have access to a computerized system for storing radiological images and reports?
	Storage of diagnostic test results and images (CIS/PACS)	Do you have access to a computerized system for diagnostic test results and images (e.g. EKG report)?
Prescribing	Availability of DSS for prescribing	Do you have software that supports you with prescribing (DSS)?
	Use of DSS for prescribing	How often do you use this software?
	DSS for prescribing and patient specific support	Does this software system give patient-specific advice based on the data you have stored about an individual patient or is it general advice or both?
	DSS for prescribing connected to EHR	Is this software system connected to the individual patient data stored in your practice or does it store its own data?
	Functions of DSS for prescribing purposes	Which of the following functions are included in the DSS available to you: - drug allergy alerts - drug-drug interaction alerts - drug-lab interaction alerts - drug dosing support
	Electronic transfer of prescriptions	Do you use the internet or other electronic networks to transfer prescriptions to the hospital integrated pharmacy and/or any external pharmacy?
Treatment	Clinical Reminders/Clinical Guidelines	Do you have access to a computerized system for clinical reminders and/or clinical guidelines?
	Use of clinical reminders/clinical guidelines	How often do you use these systems?
	Electronic nursing process documentation	Does the medical/nursing personnel in you ward have access to a computerized system for nursing process documentation?
Referring	Electronic transfer of referrals	Do you receive electronic referrals? Do you send electronic referrals?
	Exchange electronic discharge letters/epicrisis	Do you have a computerized system for epicrisis/discharge letters?
	Exchange of epicrisis with different actors	Do you send epicrisis/discharge letters to any of the following healthcare actors: - GPs

Area	Indicator	Exemplary questions	
Facility management	Electronic order of medical supplies	<ul style="list-style-type: none"> - Specialists - Health Insurance - Other Hospitals - Health care institutions in other EU countries 	
	Responsibility: Online ordering of medical supplies	<p>Does the hospital use the internet or any other electronic network to order medical supplies (eProcurement)?</p> <p>Who is responsible for ordering medical supplies via eProcurement ?</p> <ul style="list-style-type: none"> - I use the eProcurement system myself - The nurses use the eProcurement - Administrative staff 	
Laboratory analysis	Electronic laboratory results: storage	<p>Do you have access to electronically stored laboratory results?</p> <p>Results from the hospital laboratory</p> <p>Results from external laboratories (e.g. previous examinations)</p>	
	Electronic laboratory results: exchange	<p>Do you receive electronic lab results directly from the hospital laboratory?</p> <p>Do you receive or send electronic lab results to external health professionals?</p>	
Professional education and training	Participation online tutorials	<p>How often have you participated in continued medical education via online tutorials in the last 12 months?</p>	
	Participation in interactive distance learning activities (i.e. videoconferences)	<p>How often have you taken part in interactive distance learning activities (i.e. via videoconferences) in the last 12 months?</p>	
Telemedicine / Telemonitoring	Telediagnosis/Telemonitoring infrastructure	<p>Does your hospital have a computerized system for the following telemedicine activities:</p> <ul style="list-style-type: none"> - telediagnosis? - telemonitoring? 	
Attitude indicators	Attitudes towards ICT use	Attitudes, motivation and perceived barriers	<p>Please tell me whether you agree or disagree with the following statements:</p> <ul style="list-style-type: none"> - the use of software and IT systems improves the quality of healthcare services - the use of software and IT systems in health should be included in the medical education - to really benefit from IT, all health actors have to share clinical information in a network - IT systems would be more used if medical staff were provided with more training - You / your ward would need better support with the maintenance of your IT system` - The IT systems you use in your ward are easy to use - The IT systems you use in your ward are well integrated into medical processes
	Perception of impacts	Perceived impacts of IT and eHealth	<p>In what ways has the use of information technology systems changed the following?</p> <ul style="list-style-type: none"> - your personal working processes - the working processes of other members of medical staff - the quality of diagnosis and treatment decisions - the doctor-patient relationship <p>Has the use of information technology systems and software had an impact on any of the following?</p> <ul style="list-style-type: none"> - the average number of patients you can help in one day - the workload on your support staff, for instance nurses - the number of patients who come to your ward - the scope of services offered by your ward

Area		Indicator	Exemplary questions
Horizontal issues	Data protection	IT security features	Please tell me if you use any of the following security techniques in your ward? - Password protected access to computers - Password protection of sent or received files - Encryption of sent or received files and e-mails - E-signatures
		IT support	Who is responsible for the support and maintenance of the IT systems and applications in the hospital: - Dedicated IT personnel, - External service provider, - Medical staff Do you receive a sufficient amount of help when IT problems occur?
		eHealth /IT skills	Level of IT-skills How would you rate your own level of IT skills? - Beginner/basic - Intermediate - Advanced
		IT trainings	Does your hospital offer IT trainings (in-house or external)?
		Participation in IT trainings	How often have you participated in IT trainings during the last 3 years? If you have not participated in any IT trainings: what reasons?

Module: Nurses

Area		Indicator	Exemplary questions
Basis indicators	Demography	Age of respondent	How old are you?
Activity-dependant indicators	Administration/ Management	Online exchange with patients on administrative issues	Does your hospital use the internet or electronic health networks to interact with patients by e-mail about administrative issues such as making an appointment with you?
		Frequency of online exchange with patients on administrative issues	How often do you interact with patients by e-mail about administrative issues? - <Frequency> - Not part of responsibility
		Exchange of administrative patient data with other health care providers	Does your hospital use the internet or electronic health networks to exchange administrative patient data with other health care providers?
		Frequency of use: Exchange of administrative patient data with other health care providers	How often do you use the system for the exchange of administrative patient data with other health care providers?
		Self-assessment of IT skills: Exchange of administrative patient data with other health care providers	How would you rate your skill level with regard to the system for the exchange of administrative patient data with other health care providers?
		Exchange of payment-related patient data with reimbursing organisations	Does your hospital use the internet or electronic health networks to exchange patient data related to payment with reimbursing organisations?
	Frequency of use: Exchange of payment-related patient data with reimbursing organisations	How often do you use the system for the exchange of administrative patient data with other health care providers?	
	Patient data storage	Electronic storage of individual administrative patient	Does the hospital record and store individual administrative patient data?

Area	Indicator	Exemplary questions
/ EHR	data	
	Frequency of use: Electronic storage of individual patient data	How often do you use the system for the electronic storage of individual patient data?
	Self-assessment of IT skills: Electronic storage of individual patient data	How would you rate your skill level with regard to the system for the electronic storage of individual patient data?
Patient Data Exchange	Exchange of administrative patient data with other health care providers	Does the hospital use the internet or electronic health networks to exchange administrative patient data with other health care providers?
	Frequency of use: Exchange of administrative patient data with other health care providers	How often do you use the system for the exchange of administrative patient data with other health care providers?
	Self-assessment of IT skills: Exchange of administrative patient data with other health care providers	How would you rate your skill level with regard to the system for the exchange of administrative patient data with other health care providers?
Medical patient data exchange	Medical patient data exchange with health professionals	Does the hospital use the internet or electronic health networks to exchange medical patient data with any of the following health professionals and organisations? - Other specialist practices - General practices - Hospitals - Health authorities - Health care providers in other EU countries - Health care providers in countries outside the EU
	Frequency of use: Medical patient data exchange with health professionals	How often do you use the system for medical patient data exchange with health professionals?
	Self-assessment of IT skills: Medical patient data exchange with health professionals	How would you rate your skill level with regard to the system for medical patient data exchange with health professionals? - Beginner/basic - Intermediate - Advanced
Treatment	Electronic nursing process documentation	Do you use a computerized system for nursing documentation?
	Duration of experience with system	For how long have you been using this electronic nursing documentation system in your ward?
Facility Management	Supply Ordering	Does the hospital use a computerized system for the ordering of medical and surgery supplies? - Yes: Software - Yes: Software and Internet Connection - No
	Frequency of use: Online ordering of practice supplies	How often do you order practice supplies online?
	Self-assessment of IT skills: Online ordering of practice supplies	How would you rate your skill level with regard to the online ordering of practice supplies? - Beginner/basic - Intermediate - Advanced
Professional	Continuous education via internet	Have you used the internet or computers for your continuous professional education

Area	Indicator	Exemplary questions
	education and training	during the last 12 months?
	Telemedicine / Telemonitoring	Provision of telemonitoring services
		Receiving vital signs data
		Frequency of use: Telemonitoring
		Self-assessment of IT skills: Telemonitoring
Attitude indicators	Attitudes towards ICT use	Attitudes, motivation and perceived barriers
		<p>Please tell me whether you agree or disagree with the following statements:</p> <ul style="list-style-type: none"> - the use of software and IT systems improves the quality of healthcare services - the use of software and IT systems in health should be included in the vocational training of nurses / practice staff - IT systems would be more used if nurses / practise staff were provided with more training - You would need better support with the maintenance of your IT system
	Perception of ICT impacts	Perceived impacts of IT and eHealth
		<p>In what ways has the use of information technology systems changed the following?</p> <ul style="list-style-type: none"> - your personal working processes - the working processes of other nurses <p>Has the use of information technology systems and software had an impact on any of the following?</p> <ul style="list-style-type: none"> - the average number of patients you can help in one day - your workload
Horizontal issues	IT skills	Self-assessment of IT skills
		IT training
		Participation in IT training
		How would you rate your overall skill level with computers?
		Does the hospital offer any in-house or external IT trainings to nurses?
		How often do you participate in IT training?

Table 4-7 eHealth Benchmarking indicators targeting therapists

Area	Indicator	Exemplary questions
Basis indicators	Demography	Age of respondent
		Size of practice / institution
		Therapist specialties
		<p>How old are you?</p> <p>How many therapists work at your practice / institution, including yourself?</p> <p>What are the therapist specialties of your practice?</p> <ul style="list-style-type: none"> - Occupational therapy - Speech and language therapy - Physical therapy - Other
	ICT availability	Computer availability
		Does your practice have a computer?

Area	Indicator	Exemplary questions	
	Internet access	Does your practice have access to information on the internet?	
	Type of internet access used <ul style="list-style-type: none"> - Dial-up / PSTN - ISDN - DSL - Other broadband - Mobile 	What type of connection to the internet does your practice have?	
	Access to other type of electronic network	Does your practice have access to other electronic networks than the internet?	
	Duration of internet use	For how many years has your practice been using the internet or other electronic health networks?	
	Access to other health institutions' systems	Does the internet or other electronic networks allow you to connect to the computer system of any of the following organisations or persons? <ul style="list-style-type: none"> - Other therapists - GPs - Specialist practices - Hospitals - Laboratories - Care homes - Patients' homes - Health authorities - Insurance companies - Suppliers 	
Activity-dependant indicators	Administration / Management	Online exchange with patients on administrative issues	Does your practice use the internet or electronic health networks to interact with patients by e-mail about administrative issues such as making an appointment with you?
		Exchange of administrative patient data with other health care providers	Does your practice use the internet or electronic health networks to exchange administrative patient data with other health care providers?
		Exchange of payment-related patient data with reimbursing organisations	Does your practice use the internet or electronic health networks to exchange patient data related to payment with reimbursing organisations?
	Facility management	Online ordering of practice supplies	Does your practice use the internet or electronic health networks for ordering supplies for your practice?
	Patient data storage / EHR	Electronic storage of individual administrative patient data	Does your practice record and store individual administrative patient data?
		Patient access to individual data	Do your patients have access to their individual data stored in your practice?
		Structured data entry	Do you enter the medical data into the computer using an interface with structured data entry fields?
		Coded data entry	Do you enter medical data coded according to any classification into the computer or un-coded plain text data, or both?
	Medical patient data exchange	Medical patient data exchange with health professionals	Does your practice use the internet or electronic health networks to exchange medical patient data with any of the following health professionals and organisations? <ul style="list-style-type: none"> - GPs - Specialists - Hospitals

Area	Indicator	Exemplary questions
		<ul style="list-style-type: none"> - Health authorities - Health care providers in other EU member states
	<p>Consultation</p> <p>Computer access in consultation room</p> <p>Computer use during consultation</p>	<p>Do you have access to a computer in the consultation room?</p> <p>Do you use the computer during consultations?</p>
	<p>Diagnosis</p> <p>DSS for diagnosis</p> <p>Use of DSS for diagnosis</p>	<p>Does your practice have a software system that supports you with diagnosis?</p> <p>How often do you use that software system?</p>
	<p>Prescribing</p> <p>Electronic transfer of prescriptions</p>	<p>Does your practice use the internet or electronic health networks to receive prescriptions for treatments by the other health professionals?</p>
	<p>Referring</p> <p>Online exchange with other care providers to make appointments for own patients</p> <p>Electronic referrals and epicrisis</p>	<p>Does your practice use the internet or electronic health networks for making appointments at other care providers for your patients?</p> <p>Does your practice use the internet or electronic health networks to send and receive referrals or epicrisis?</p>
	<p>Professional education and training</p> <p>Continuous education via internet</p>	<p>Have you used the internet or computers for your continuous medical education (CME) or continuous professional development (CPD) during the last 12 months?</p>
Attitude indicators	<p>Attitudes towards ICT use</p> <p>Attitudes, motivation and perceived barriers</p>	<p>Please tell me whether you agree or disagree with the following statements:</p> <ul style="list-style-type: none"> - the use of software and IT systems improves the quality of healthcare services - the use of software and IT systems in health should be included in the medical education - Your practice would need better support with the maintenance of your IT system - The cost of IT is ultimately the decisive factor on the use of ICT
	<p>Perception of ICT impacts</p> <p>Perceived impacts of IT and eHealth</p>	<p>In what ways has the use of information technology systems changed the following?</p> <ul style="list-style-type: none"> - your personal working processes - the quality of diagnosis and treatment decisions <p>Has the use of information technology systems and software had an impact on any of the following?</p> <ul style="list-style-type: none"> - the average number of patients you can help in one day - the workload with respect to administrative duties
Horizontal issues	<p>IT investment</p> <p>Share of IT investments</p> <p>Investment plans</p>	<p>What do you estimate is the share of IT investments compared to the overall annual turnover of your practice?</p> <p>Does your practice plan any minor or major IT investments in the coming twelve months?</p>
	<p>IT support</p> <p>IT support and maintenance</p>	<p>Who is responsible for the support and maintenance of the IT systems and applications in your practice: Dedicated IT personnel, Nurses/practice staff, GP, External service provider</p>
	<p>Data protection/security</p> <p>IT security features</p> <p>Data backups</p>	<p>Please tell me if your practice uses any of the following security techniques?</p> <ul style="list-style-type: none"> - Password protected access to computers - Password protection of sent or received files - Encryption of sent or received files and e-mails - E-signatures <p>Does your practice have safety copies - called back-ups - of the data stored on the</p>

Area	Indicator	Exemplary questions
		practice computers?
	Patient consent to data processing	How does your practice obtain the patients' consent to data storage and transfer? Is it written, orally or is no specific consent obtained?
	Patient consent, legal requirement	Are you aware of a legal requirement to obtain patients' consent to data storage and transfer in your country?
Interoperability	Interoperability issues in data transfer	When your practice exchanges patient data electronically do you ever encounter data or system compatibility problems?
IT skills	Self-assessment of IT skills	How would you rate your skill level with computers? - Beginner/basic - Intermediate - Advanced
	Participation in IT training	How often do you participate in IT training?

Table 4-8 eHealth Benchmarking indicators targeting pharmacies

Area	Indicator	Exemplary questions
Basis indicators	Demography	Age of respondent
		Size of pharmacy
ICT availability	Computer availability	Does your pharmacy have a computer?
	Internet access	Does your pharmacy have access to information on the internet?
	Type of internet access used - Dial-up / PSTN - ISDN - DSL - Other broadband - Mobile	What type of connection to the internet does your pharmacy have?
	Access to other type of electronic network	Does your pharmacy have access to other (regional or national) electronic networks than the internet?
	Duration of internet use	For how many years has your pharmacy been using the internet or other electronic health networks?
	Access to other health institutions' systems	Does the internet or other electronic networks allow you to connect to the computer system of any of the following organisations or persons? - Other Pharmacies - GPs - Specialist practices - Hospitals - Laboratories - Care homes - Patients' homes

Area	Indicator	Exemplary questions	
		<ul style="list-style-type: none"> - Health authorities - Insurance companies - Health care providers in other EU countries - Health care providers in countries outside the EU - Suppliers 	
	Smartcard/Health card reader	Do you have access to a smartcard/health card reader in your pharmacy?	
Activity-dependant indicators	Administration / Management	Procurement Do you use the Internet to buy supplies? Which sort of procurement solutions do you use: <ul style="list-style-type: none"> - Internet: online single providers - Online: medical market places - Software solutions: procurement only - Software solutions: procurement integrated in EPR (enterprise resource planning system) 	
	Diagnosis	Diagnosis and Medication: decision support tool Do you use an electronic decision support tool on which to base your advice to patients concerning non-prescription drugs?	
	Prescribing	ePrescribing	Do you receive electronic prescriptions <ul style="list-style-type: none"> - via the Internet - via a dedicated network - via health cards as a storage medium
		Access to ePrescriptions (security)	What of the following do you need to access the ePrescriptions: <ul style="list-style-type: none"> - Health professional card - Patient Health Card - Patient and Professional Health Card - enter password to access DataBase - enter password to access Health Card as storage medium
		Importance ePrescribing	What is the average share of paper based vs. electronic prescriptions that you receive per months?
	Patient data storage	Storage of administrative patient data	Does your pharmacy store administrative patient data?
		Storage of medical patient data	Does your pharmacy store patient-related medical information (medications)?
	Patient data exchange	Patient Data Exchange	Do you exchange payment related patient data with reimbursers?
	Health Information Search	Use of online databases for health information search	Do you use the Internet (e.g. online databases) to search for health and medication related information?
	Professional education and training	Continuous education via internet	Have you used the internet for your continuous professional education during the last 12 months?
Attitude indicators	Attitudes towards ICT use	Attitudes, motivation and perceived barriers Please tell me whether you agree or disagree with the following statements: <ul style="list-style-type: none"> - the use of software and IT systems improves the quality of healthcare services - the use of software and IT systems in health should be included in the vocational training of pharmacists - your pharmacy would need better support with the maintenance of your IT system - The cost of IT is ultimately the decisive factor on the use of ICT 	

Area	Indicator	Exemplary questions	
	Perception of ICT impacts	Perceived impacts of IT and eHealth In what ways has the use of information technology systems changed your personal working processes? Has the use of information technology systems and software had an impact on any of the following? - your workload - time needed for administrative tasks	
Horizontal issues	IT investment	IT investment annual average	How much is your average annual budget for IT investments?
		IT investment plans	Do you plan to introduce new software or hardware in your pharmacy in the following 12 months? Which activities would be concerned)
	IT support	IT support and maintenance	Who is responsible for the support and maintenance of the IT systems and applications in your pharmacy: Dedicated IT personnel, Care staff, External service provider
	Data protection/security	IT security features	Please tell me if your pharmacy uses any of the following security techniques? - Password protected access to computers - Password protection of sent or received files - Encryption of sent or received files and e-mails - E-signatures
		Data backups	Does your pharmacy have safety copies - called back-ups - of the data stored on the practice computers?
		Patient consent to data processing	How does your pharmacy obtain the patients' consent to data storage and transfer? Is it written, orally or is no specific consent obtained?
		Patient consent, legal requirement	Are you aware of a legal requirement to obtain patients' consent to data storage and transfer in your country?
	Interoperability	Interoperability issues in data transfer	When your pharmacy exchanges client data electronically do you ever encounter data or system compatibility problems?
IT skills	Self-assessment of IT skills	How would you rate your overall skill level with computers? - Beginner/basic - Intermediate - Advanced	
	Participation in IT training	How often do you participate in IT training?	

Table 4-9 eHealth Benchmarking indicators targeting care providers

Area	Indicator	Exemplary questions	
Basis indicators	Demography	Age of respondent	How old are you?
		Size of organisation	How many care personnel works at your organisation, including yourself?
	ICT availability	Computer availability	Does your organisation have a computer?

Area	Indicator	Exemplary questions	
	Internet access	Does your organisation have access to information on the internet?	
	Type of internet access used <ul style="list-style-type: none"> - Dial-up / PSTN - ISDN - DSL - Other broadband - Mobile 	What type of connection to the internet does your organisation have?	
	Access to other type of electronic network	Does your organisation have access to other electronic networks than the internet?	
	Duration of internet use	For how many years has your organisation been using the internet or other electronic networks?	
	Access to other health organisations' systems	Does the internet or other electronic networks allow you to connect to the computer system of any of the following organisations or persons? <ul style="list-style-type: none"> - Other care homes - General practices - Specialist practices - Hospitals - Laboratories - Pharmacies - Patients' homes - Health authorities - Insurance companies - Suppliers 	
Activity-dependant indicators	Administration / Management	Use of standard office software	Does your organisation use standard office software, for instance word processing and spread sheet analysis like Microsoft Office?
		Computerization of management, accounting and facility management functions	For which of the following functions does your organization have computerized solutions: <ul style="list-style-type: none"> - staff roster - care documentation - billing
		Use of IT by care staff	Does the care staff in your organisation use any of the following in their work Laptops Hand-held computers Mobile phones
		Exchange of administrative client data with other health care providers	Does your organisation use the internet or other electronic networks to exchange administrative client data with other health care providers?
		Exchange of payment-related client data with reimbursing organisations	Does your organisation use the internet or other electronic networks to exchange client data related to payment with reimbursing organisations?
Facility management	Online ordering of supplies	Does your organisation use the internet or other electronic networks for ordering supplies?	
Patient data storage / EHR	Electronic storage of individual administrative client data	Does your organisation record and store individual administrative client data?	
	Electronic storage of different types of individual medical client data	Does your organisation record and store electronically the following types of client identifiable data?	

Area	Indicator	Exemplary questions
		<ul style="list-style-type: none"> - Basic medical parameters such as allergies - Medical history - Medications - Care schedules - Dietary needs
	Structured data entry	Do you enter the data into the computer using an interface with structured data entry fields?
Medical patient data exchange	Client data exchange with health professionals	<p>Does your organisation use the internet or electronic health networks to exchange medical client data with any of the following health professionals and organisations?</p> <ul style="list-style-type: none"> - Other care homes - General practices - Specialist practices - Hospitals - Laboratories - Pharmacies
Telemedicine / Telemonitoring	Receiving vital signs data	Does your organisation use the internet or electronic health networks to receive automatically any vital signs data from clients' rooms or homes?
	Client participation in telemonitoring	Do any of your clients ever use an electronic device that transmits any vital data to a doctor or nurse?
	Electronic transfer of vital data	<p>What types of data are transmitted?</p> <ul style="list-style-type: none"> - Weight - Heart rate - Blood pressure - Blood sugar - ECG
Long-term care	Use of social alarm	Do any of your clients have a social alarm that can be used to call help in case of a medical emergency such as call a member of the care staff or a doctor?
	Use of additional security features to social alarm	Do any of your clients use additional security features to the social alarm system, for instance to automatically detect a fire or gas leak?
	Use of additional medical features to social alarm	Do any of your clients use additional health related features, for instance to automatically detect when a person has fallen or some other medical crisis occurs?
	Provider of social alarm service	Are these services provided by your organisation or by an external service provider?
Attitude indicators	Attitudes towards ICT use	<p>Attitudes, motivation and perceived barriers</p> <p>Please tell me whether you agree or disagree with the following statements:</p> <ul style="list-style-type: none"> - the use of software and IT systems improves the quality of care services - the use of software and IT systems helps us to improve service delivery to remote areas - the use of software and IT systems reduces costs - the use of software and IT systems helps us to respond faster to emergencies - the use of software and IT systems in health should be included in the education of care personnel - IT systems would be more used if care providers were provided with more training - Your organisation would need better support with the maintenance of your IT system - The cost of IT is ultimately the decisive factor on the use of ICT

Area	Indicator	Exemplary questions
Perception of ICT impacts	Perceived impacts of IT and eHealth	<p>In what ways has the use of information technology systems changed the following?</p> <ul style="list-style-type: none"> - your personal working processes - the working processes of your organisation's care staff - the quality of the care services your organisation provides - the carer-client relationship <p>Has the use of information technology systems and software had an impact on any of the following?</p> <ul style="list-style-type: none"> - the average number of clients you can help in one day - the scope of services offered by your organisation <p>Thinking of your clients, would you agree to the following?</p> <ul style="list-style-type: none"> - The use of ICT enables older people to live more independently - The use of ICT leaves older people even more isolated - Acceptance of ICT-based services amongst older people is very low
	Horizontal issues	IT investment
Data protection/security	IT support	<p>IT support and maintenance</p> <p>Who is responsible for the support and maintenance of the IT systems and applications in your organisation:</p> <ul style="list-style-type: none"> - Dedicated IT personnel - Care staff - External service provider
	IT security features	<p>Please tell me if your organisation uses any of the following security techniques?</p> <ul style="list-style-type: none"> - Password protected access to computers - Password protection of sent or received files - Encryption of sent or received files and e-mails - E-signatures
	Data backups	<p>Does your organisation have safety copies - called back-ups - of the data stored on the practice computers?</p>
	Client consent to data processing	<p>How does your organisation obtain the clients' consent to data storage and transfer? Is it written, orally or is no specific consent obtained?</p>
Interoperability	Client consent, legal requirement	<p>Are you aware of a legal requirement to obtain clients' consent to data storage and transfer in your country?</p>
	Interoperability issues in data transfer	<p>When your organisation exchanges client data electronically do you ever encounter data or system compatibility problems?</p>
IT skills	Self-assessment of IT skills	<p>How would you rate your skill level with computers?</p> <ul style="list-style-type: none"> - Beginner/basic

Area	Indicator	Exemplary questions
		- Intermediate - Advanced
	IT training for staff	Does your organisation offer IT training to the care staff?
	Participation in IT training	How often do you participate in IT training?

5 Recommendations for an eHealth Benchmarking approach

The recommendations provided in this chapter are based on the work of empirica, on experiences reported in the 12 eHealth Benchmarking good practice cases and on input received from the participants of an eHealth Benchmarking expert workshop, held in Prague on 18 February 2009 (cf. Annex 3 for the workshop agenda and Annex 4 for a list of participants).

As has been argued above, the findings of the eHealth Benchmarking study strongly suggest a need for a coherent monitoring and benchmarking approach, covering the European Union Member States and ideally also further countries. This need was also expressed by the experts that took part in the eHealth Benchmarking workshop in Prague. Empirical evidence was seen as particularly important for decision making in a policy context (at the European, national and regional level, but also among policy bodies outside the EU), for the benefit of health care providers and patients, as well as for business planning on the side of the IT industry.

The present chapter aims to develop such an approach, following a series of three subsequent steps:

- Step 1: Development of a common set of eHealth indicators
- Step 2: Collection of eHealth data
- Step 3: Understanding eHealth developments

The chapter concludes with an outline of how this approach could be implemented.

5.1 A common set of eHealth indicators

Indicators are necessarily at the core of every quantitative monitoring activity. A fact which is well reflected by more than 4,400 indicators relating to eHealth identified by the eHealth Benchmarking study in its analysis of existing measuring activities in the EU and beyond. Among other things, the sheer mass of indicators provides a good indication of the importance of a well-defined and concise set of indicators that is needed to build a target-oriented monitoring activity. With its eHealth Benchmarking indicator framework (as presented in chapter 4), the present study made a first attempt at defining such an indicator set, covering key health actor groups.

In this context, target-orientedness refers primarily to the overall purpose of data gathering, which needs to be defined first since it is essential to guide the process of indicator compilation / development. The eHealth Benchmarking study developed a simple classification for data sources in the course of its information gathering work that groups sources according to four major purposes:

- Measuring of eHealth availability and use
- Evaluation of eHealth applications
- Measuring of attitudes towards eHealth
- Assessment of eHealth markets

From relevant policy documents such as the eHealth Action Plan²⁴ and the Lead Market Initiative²⁵ but also from feedback received from various eHealth stakeholders in the course of the workshop in Prague it seems that the focus of data gathering on the policy as well as on the end-user side is currently very much on eHealth adoption (i.e. measuring availability and use), while the primary interest of the IT industry is in market data, either in terms of IT investment or eHealth usage data. It is for this reason that both the indicator framework and the recommendations developed in the following are largely concerned with measuring eHealth availability and use as a key purpose of eHealth Benchmarking at the EU-level.

The call for conciseness of the indicators originates from experiences made by many data gathering activities analysed by this study in relation to the concepts and terms that were used for questionnaire development. As argued in chapter 2, references to high-level, IT application-related concepts such as EHR (Electronic Health Record), PACS (Picture Archiving and Communication System) or DSS (Decision Support System) are usually difficult due to a lack of discriminatory power (i.e. different understandings of a seemingly unified concept remain hidden behind an application acronym). In a more practical regard, they also often prove difficult to use in actual surveys because they are not or wrongly understood by the respondent. Experiences made in practice suggest that these concepts need to be translated into something closer to the day-to-day experience of doctors, nurses and other health professionals. Strategies to achieve this include for instance the involvement of health professionals in questionnaire development, the conduction of focus groups with health professionals or pre-tests of draft questionnaires. Having a glossary of key terms and acronyms was also considered helpful. See the lessons learned from the good practice cases in relation to questionnaire design (section 3.2 on page 15) for more details.

Coordination with other organisations

Because of the wide-spread need for eHealth-related data it makes sense to co-ordinate any monitoring and benchmarking activity with other organisations, including such supranational bodies as are also active in this field. The Organisation for Economic Co-operation and Development (OECD), the World Health Organization (WHO) or the International Labour Organization (ILO) can be mentioned in this regards. In order to achieve comparability of results from outside the European Union thought should be given to also establish cooperation with related institutions in the United States of America or Canada carrying out similar activities. These may include the Office of the National Coordinator for Health Information Technology, the American Hospital Association and the Harvard School of Public Health to name just a few. Some of their eHealth survey activities are further described in the eHealth Benchmarking good practice cases and the Online Knowledge Base of cases identified.

Co-ordination should aim at achieving comparability of data across a large number of countries as far as reasonably possible, primarily by agreeing on a common indicator set and on methodological issues such as sampling approaches, survey implementation and data analysis, as further described in the following sections.

5.2 Collection of eHealth data

Based on the eHealth Benchmarking indicator framework, the possible options for data gathering can be defined. These options should be in line with the aims of the framework and

²⁴ Commission of the European Communities, e-Health - making healthcare better for European citizens: An action plan for a European e-Health Area, COM (2004) 356 final.

²⁵ Commission of the European Communities, A lead market initiative for Europe, COM (2007) 860 final.

allow for the collection of comparable data across the EU and also other countries (such as OECD Member States outside the EU). Ideally this implies the use of common data gathering methods for each respondent group (e.g. Computer Aided Telephone Interviews (CATI) or online surveys), the synchronisation of field work time to avoid large gaps between data collection in different geographic areas and appropriate translation of questionnaires into different languages. See the lessons learned from the good practice cases in relation to multinational studies and timing (section 3.2 on page 15) for more details.

The value of a data-set is usually increased considerably if data are available that cover a period of time, since such time-series data allow to determine developments and trends that cannot be deduced from one-off data. Although continuous monitoring seems today to be rather an exception than the rule, many good practice cases analysed by this study (including those that were of a non-continuous nature) underline the significant surplus value of time-series data. For this reason it is recommended to repeat the data gathering for each respondent group at regular intervals, e.g. every two to four years. Longitudinal comparability then becomes another key concern, i.e. at least a part of the data must be comparable over time. One way to achieve this would be to split the indicator set into two parts:

- A core set of indicators that remains stable for several surveys
- An extended indicator set that is adapted for every survey to reflect recent developments (e.g. in IT applications), policy priorities etc.

This approach was for example chosen by the Finnish "eHealth Checkpoint" study (cf. lessons learned in relation to timing on page 15). Further to facilitating comparability over time, this kind of split also increases the flexibility of the indicator set in terms of inclusion into data gathering activities of different scope (e.g. large, dedicated surveys compared to modules included in existing data gathering activities).

Co-operation (with supranational bodies) was already mentioned as being of importance for the development of the indicator set. From the analysis of the good practice cases it becomes clear that it can also be very helpful when setting up a survey. Several cases mentioned that co-operations and partnerships with e.g. national health authorities or health professional organisations helped in promoting the survey among the targeted population and thus ultimately to increase the response rate. See the lessons learned from the good practice cases in relation to response rate (section 3.3 on page 18) for more details.

5.2.1 Inclusion in existing data gathering activities

One of the two main options seen by the eHealth Benchmarking study to collect data on the indicator set is by means of eHealth-related questionnaire modules included in existing data gathering activities such as the Eurostat ICT household surveys targeting citizens / patients but also by commissioning dedicated Eurobarometer surveys like the Flash Eurobarometer 126 covering General Practitioners in the EU15 Member States in 2002.

The obvious advantages of these approaches are the application of best data gathering and data treatment methodologies available, while the drawbacks include the long preparation period, limited scope of questions in case of a module solution and the "competition" with other topics for inclusion in the surveys.

Process data

Another means of data collection could be to use data coming out of the use of eHealth systems such as electronic patient records or hospital information systems. This type of data

was termed "process data" for the purposes of this study but is seemingly not used to any notable extent in the EU today. One example of the use of process data can be found in Canada. There, the Canadian Institute for Health Information (CIHI)²⁶ collates data on Canada's health system and the health of Canadians directly from health service providers (including hospitals, regional health authorities, medical practitioners and governments), analyses the data and disseminates the results. The main purpose here seems to be one of assessing the status of the Canadian health system, to identify health trends, analyse costs etc. This deviates to a certain degree from the need for evidence as seen by policy makers and other stakeholders in the eHealth field in the EU at this time. Furthermore, this kind of process data collection seems to necessitate a high degree of eHealth adoption across key health care providers and – in case of the EU – across countries. Also issues of data and privacy protection, authentication, different regulatory framework conditions and ethics need to be considered.

Currently it seems that process data collection shows a high promise for the future but will need to be investigated more closely also along the lines of the issues mentioned above.

5.2.2 Dedicated surveys

The second main option to collect data on the indicator set is seen in dedicated surveys addressing key groups of health actors. While these cannot build on best methodological practice to the same extent as the existing data gathering activities mentioned above they can be considered to be more flexible in terms of preparation/set-up and also the number of indicators to be included. Basically, a dedicated survey can be conducted among every potential target group, but different approaches will have to be developed, in particular in terms of sampling, respondent selection, questionnaire development and data gathering method.

For the target groups included in the eHealth Benchmarking indicator framework these issues are discussed in some more detail in the following.

Citizens / patients

For the target group a general population survey is the obvious source of data. This might include a module for informal carers based on a screening. Other modules may be helpful, e.g. for chronic disease patients.

Oversampling of informal carers and chronic disease patients might be necessary. Proven standard sampling procedures are advisable. According to national standards, this may include register based sampling, random dialling approaches or quota sampling. The usual stratification may be based on age, sex, region, urban-rural distribution and labour market status.

The most advisable methods of data gathering are CATI and face-to-face, with a cost advantage on the side of CATI surveys.

General Practitioners

The natural data source would be a survey of general practitioners. Standard address sources are available from address dealers or national registers. A random sampling from these sources is advisable. Stratification may include region and urban-rural distribution. In some countries also the size of practice may be used as a stratification criterion.

²⁶ An independent, not-for-profit organization, cf. <http://www.cihi.ca> and http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=profile_e.

An interview would involve one GP per practice selected through random selection. A practical definition of GP practices includes all primary care organisations specialising in family medicine and internal medicine but excluding paediatrics. A module on nurses / practice staff in general practices may be included.

The most advisable methods of data gathering are CATI and face-to-face, with a cost advantage on the side of CATI surveys.

Specialists

The universe of specialists is very heterogeneous. A survey of specialty doctors would very likely need a focus on some specialties. Standard address sources should be available from address dealers or national registers. Stratification must include specialty. It may include region and urban-rural distribution. In some countries also the size of practice may be used as a stratification criterion.

An interview of one doctor per practice would be carried out, whereby the doctor should be randomly selected. One module on nurses / practice staff in general practices may be included.

The status of Specialties may vary across Member States. As an example, a list published by the German Bundesärztekammer (central doctors organisation) shall be presented²⁷, which serves as a template for the statutes of continuous medical education.

Table 5-1 List of specialties according to the German Bundesärztekammer template for continuous medical education

Area	Specialty	Focus
Anaesthesiology		
Anatomy		
Occupational health		
Ophthalmology		
Bio-chemistry		
Surgery	General surgery	
	Vascular surgery	
	Cardiosurgery	
	Paediatric surgery	
	Orthopaedy and accident surgery	
	Aesthetic and plastic surgery	
	Surgery of the chest	
	Visceral surgery	
Gynaecology and obstetrics	Gynaecology and obstetrics	Endocrinology and reproduction medicine
		Gynaecologic oncology
		Special obstetrics and perinatal medicine
Ear, nose and throat medicine	Ear, nose and throat medicine	
		Speech, vocal and hearing dysfunctions
Dermal and venereal diseases		

²⁷ http://www.bundesaerztekammer.de/downloads/MWBO_Stand_28_03_2008.pdf

Human genetics		
Hygiene and environmental medicine		
Internal medicine and general medicine	Internal medicine and general practice	
	Internal medicine	
	Internal medicine and angiology	
	Internal medicine and endocrinology and diabetology	
	Internal medicine and gastroenterology	
	Internal medicine and haematology and oncology	
	Internal medicine and cardiology	
	Internal medicine and nephrology	
	Internal medicine and pneumology	
	Internal medicine and rheumatology	
Paediatrics	Paediatric haematology and oncology	
	Paediatric cardiology	
	Neonatology	
	Paediatric neurology	
Child and youth psychiatry and psychotherapy		
Laboratory medicine		
Microbiology, virology and infection epidemiology		
Oral and maxillofacial surgery		
Neurosurgery		
Neurology		
Nuclear medicine		
Public Health		
Pathology	Neuropathology	
	Pathology	
Pharmacology	Clinical pharmacology	
	Pharmacology and toxicology	
Physical and rehabilitative medicine		
Physiology		
Psychiatry and psychotherapy	Psychiatry and psychotherapy	Forensic psychiatry
Psychosomatic medicine		
Radiology	Paediatric radiology	
	Neuroradiology	
Forensic medicine		
Radiotherapy		
Transfusion medicine		
Urology		

Advisable methods of data gathering are CATI and face-to-face, with a cost advantage on the side of CATI surveys.

Hospitals, medical staff and hospitals, administrative or IT staff

Like specialists, also hospitals are a very heterogeneous group. Apart from acute hospitals also non acute hospitals are in the market, such as psychiatric, geriatric and rehabilitation hospitals. Other hospitals may be specialised, such as imaging centres, laboratory/pathology, cancer/oncology centres, cardiology centres, pharmacies servicing hospitals and GP's and care centres. This heterogeneous field may make it necessary to have a stratified approach. Standard address sources should be available from address dealers or national registers. Stratification must include specialty. It may include region and urban-rural distribution.

As for the survey of medical staff it may be necessary to analyse different target groups, such as hospital doctors from different specialties and also hospital nurses.

A survey of administrative and IT staff may also make sense. The most advisable methods of data gathering are CATI and face-to-face, with a cost advantage on the side of CATI surveys.

Therapists

Therapists do not only include psychotherapists as the everyday usage of the word suggests, but rather includes other therapeutic profession beyond the MDs. These include for instance physiotherapists, midwives, speech therapists and occupational therapists.

The most advisable methods of data gathering are CATI and face-to-face, with a cost advantage on the side of CATI surveys. Standard address sources should be available from address dealers or national registers. Stratification must include specialty. It may include region and urban-rural distribution.

Pharmacies

Pharmacies should be a relatively well defined group. Address sources should be available and CATI interviews appear to be feasible without major problems.

Care providers

Care providers for older people (both nursing homes and home care providers) should also be a relatively well defined group. Address sources should be available and CATI interviews appear to be feasible without major problems.

5.3 Understanding eHealth developments

Apart from descriptive reporting of tables, it is necessary to go beyond this type of simplistic monitoring and pursue an approach of analytic benchmarking to reveal a maximum value for policy decision makers and other stakeholders and to support the understanding of eHealth developments in the EU and beyond.

Approaches may include for instance the development of ICT/eHealth user and non-user typologies which will allow describing very specifically these to better focus policy action.

Within the interpretation and analysis of the survey results, there is always a need for contextual information on the extent to which it is possible or meaningful for health actors in particular countries, regions or administrative contexts to engage in some eHealth activities. Such data need to be obtained from other source including for instance the analysis of national healthcare systems and eHealth-related policies in the Member States.

5.3.1 Data analysis

User and non-user Typologies

Typologies may be based on selected indicator combinations like for instance in the SeniorWatch project (2000-2002) where a typology of older people with respect to ICT usage and involvement was developed which looks as follows:

1. The experienced frontrunners: computer users, advanced skills or frequently using computers (> once a week): 27% of the population 50+
2. The old age beginners: computer users, less skills / using computers less often: 13% of the population 50+
3. The technologically open-minded: non-users, but keen on learning or wishing to improve computer skills: 29% of the population 50+
4. The digitally challenged: non-users, neither keen on learning nor wishing to improve computer skills: 31% of the population 50+

Here ICT involvement is a compound indicator which takes account of attitudes, skills and usage data. The rationale behind is the fact that users are different as to their usage intensity, non-users differ regarding their openness to become involved. It became apparent that the older population covers the whole variety of ICT involvement and about one third is gravely at risk of being left behind.

Multivariate Statistical Analysis Options

Multivariate data analysis methods will enable disentangling of the different factors that are involved and result in a better understanding of the issues around the use of eHealth by health actors and a more useful evidence basis for policy. Key sets of variables that are usually included in measurement and analysis are:

- Socio-demographic (age, socio-economic, etc.)
- ICT-related (access, skills, attitudes, usage styles, etc.)
- Domain-related (activities and interests in the targeted fields)
- Contextual (evolution of the Information Society and level of development of eHealth and online services in the Member States)

Not all of these data can be provided by surveys. Especially contextual data but also and to some extent domain-related data will have to come from other sources like for instance the national analysis results of the eHealth systems and policies in the EU Member States. Multivariate analysis techniques will enable an assessment of the separate and conjoined impacts of the factors described above.

5.3.2 Target-oriented presentation of results

Cross-table and bar chart data presentation

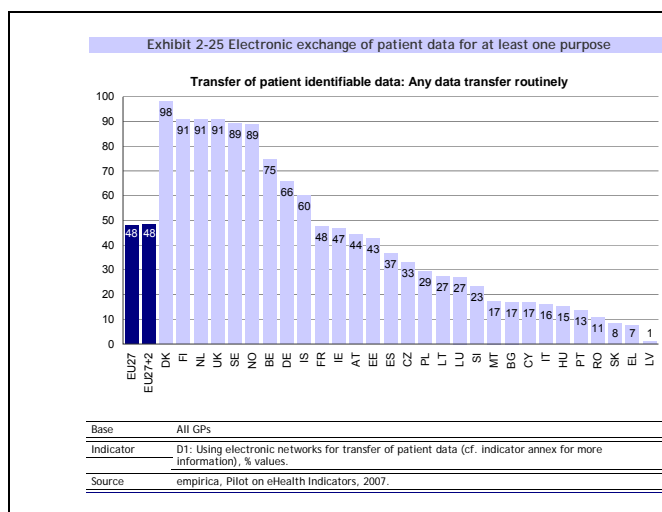
Cross-tabular presentation of simple frequencies (typically percentages of actors engaging in a certain activity), and its graphical counterpart, the bar chart, constitute the first and most basic step in data presentation. The requirement for this step is that case level data have been aggregated and that weighting (if and where appropriate) has been applied.

Data tables are mainly used for presenting findings on ICT adoption and eHealth activity. The following two examples are taken from the Pilot on eHealth indicators project:

Exhibit 5-1: Examples of basic data presentation formats from Pilot on eHealth indicators

Exhibit 2-15 DSS functionalities in detail				
	DSS for diagnosis	DSS for prescribing	General advice	Patient specific
EU27	59.4	32.0	41.9	19.3
EU27+2	59.7	32.3	42.1	19.4
BE	63.1	35.3	32.8	36.9
BG	59.7	24.8	32.0	20.9
CZ	69.7	22.4	23.4	12.2
DK	94.3	58.6	53.3	30.3
DE	83.0	43.1	58.1	19.4
EE	92.0	53.3	50.0	13.3
EL	7.9	8.6	5.4	4.8
ES	50.2	32.3	37.5	13.2
FR	44.7	14.2	22.2	18.9
IE	53.0	22.9	34.0	9.2
IT	65.5	30.0	54.1	21.0
CY	15.3	5.6	5.6	8.3
LV	1.1	1.7	0.6	0.6
LT	6.5	9.1	8.4	2.3
LU	38.2	8.0	12.8	8.0
HU	92.8	58.6	62.5	21.1
MT	9.8	8.7	8.7	6.5
NL	87.6	60.1	68.3	53.1
AT	56.2	27.8	47.8	18.4
PL	15.4	10.0	12.0	6.3
PT	59.2	34.5	38.7	19.4
RO	5.3	7.9	6.6	3.6
SI	30.1	27.2	29.1	4.9
SK	87.4	39.8	61.3	23.0
FI	95.6	78.0	80.4	38.4
SE	82.0	80.5	42.7	17.6
UK	79.8	42.8	64.3	28.0
IS	86.4	41.7	31.1	22.3
NO	90.7	72.1	60.8	31.4

Base All GPs
 Indicators B3a: Availability of DSS for diagnosis, B3b: Availability of DSS for prescribing, B5: DSS giving either general or patient specific advice, (cf. indicator annex for more information), % values.
 Source empirica, Pilot on eHealth Indicators, 2007.



Source: Benchmarking ICT use among General Practitioners in Europe. Final Report. p.35, 42

Compound indicators / benchmarking

Compound indicators (CI) can be defined as a mathematical combination (or aggregation) of a set of indicators. CI have experienced a surge in popularity, mainly because of their promise to capture and reduce the complexity of multi-dimensional concepts, such as education, welfare, electronic business etc. However, there are conflicting views on the merits of CI, particularly if they are highly aggregated. Criticism seems to be increasing as the use of compound indicators in policy and in public life becomes more common.

Notwithstanding the concerns about CI, it is recommended that policy should not shy away from using and actively promoting the development of CI. There are many good examples of the usefulness of CI, particularly in policy areas which do not lend themselves to be measured by one or two simple indicators only. The "Human Development Index" of the United Nations, indices on pollution and environmental development, or corruption indices can serve as examples. Moreover, CI have always been an important instrument in the financial sector and in economics.

CI are a powerful instrument to trigger public debate about policy objectives, particularly if they involve a clear benchmarking element, and policy should capitalise on this potential.

Quality criteria for CI

A transparent construction procedure of the CI is the basic requirement for quality assessment; it must be comprehensible and reproducible, also allowing for the disaggregation of the CI. This involves the following criteria:

- **Component indicators:** the set of component indicators used for the CI must be given, along with the sources and the spatial and temporal scope of each indicator. It should be made clear to users if the selection of component indicators is likely to give rise to any particular bias. For example, the questionnaire used in most e-business surveys has a bias towards manufacturing activities with the result that CI built on this data tend to be more relevant for manufacturing than for service sectors or construction.
- **The computation method or algorithm** must be given, as different methodologies impose different restrictions on data. A simple sum of sub-indicator rankings, for example, means the loss of absolute level information, whereas the calculation of a standardized score based on the difference between a single indicator value and the indicator's mean divided by the standard error may lead to an overweighting of extreme values.
- **Weighting:** Weighting can influence results in two ways:
 - The weighting of component indicators relative to each other must be made transparent. Data-weighting must be used with care, as it is a highly controversial issue.
 - Moreover, when survey data are used as component indicators, results are inevitably influenced by the weighting scheme applied to the aggregation of case level survey data.

The following represents an example of the use of compound indicators from the Pilot on eHealth indicators project.

Exhibit 5-2: Example of a compound indicator data presentation format from Pilot on eHealth indicators

Country	Electronic storage of patient data		Computer use in consultation		Electronic transfer of patient data				Overall eHealth use	
	Electronic storage of individual administrative patient data	Electronic storage of individual medical patient data	Use of a computer during consultation with the patient	Use of a Decision Support System (DSS)	Transfer of lab results from the laboratory	Transfer of administrative patient data to reimbursers or other care providers	Transfer of medical patient data to other care providers or professionals	ePrescribing (transfer of prescription to pharmacy)	Average index score	Usage level
EU27	4.0	3.7	3.3	2.3	2.0	0.6	0.5	0.3	2.1	
EU27+2	4.0	3.7	3.3	2.3	2.0	0.6	0.5	0.3	2.1	
DK	4.8	4.8	4.6	3.8	4.8	3.0	3.7	4.9	4.3	eHealth frontrunners
NL	4.9	4.5	4.7	3.7	4.2	1.8	1.3	3.5	3.6	
FI	5.0	4.7	5.0	4.3	4.5	0.7	2.7	0.0	3.4	
SE	4.8	4.1	2.4	4.1	4.1	0.6	0.7	4.0	3.1	
UK	4.8	4.3	4.7	3.1	4.2	1.9	1.3	0.3	3.1	
BE	4.2	4.3	3.8	2.5	3.7	0.4	0.6	0.1	2.4	
DE	4.6	3.2	3.6	3.2	3.2	0.2	0.2	0.0	2.3	
EE	4.9	3.0	4.7	3.6	2.0	0.2	0.1	0.0	2.3	
HU	5.0	4.6	3.2	3.8	0.6	0.1	0.1	0.0	2.2	
BG	4.7	4.2	3.8	2.1	0.3	0.4	0.2	0.1	2.0	
FR	3.7	4.1	3.6	1.5	1.6	0.7	0.2	0.1	2.0	eHealth average performers
AT	4.0	3.7	2.7	2.1	1.9	0.7	0.6	0.1	2.0	
ES	3.4	4.1	3.3	2.1	1.5	0.2	0.6	0.2	1.9	
IT	4.2	3.4	4.1	2.4	0.4	0.1	0.4	0.0	1.9	
IE	3.2	3.6	2.8	1.9	2.0	0.5	0.1	0.0	1.8	
SK	4.5	2.6	3.6	3.2	0.2	0.1	0.1	0.0	1.8	
CZ	3.4	3.4	3.0	2.3	1.2	0.5	0.3	0.0	1.7	
PT	3.7	3.2	3.2	2.3	0.1	0.3	0.4	0.1	1.7	
LU	3.5	3.7	2.9	1.2	1.4	0.0	0.0	0.0	1.6	
CY	2.8	3.8	1.6	0.5	0.5	0.1	0.1	0.0	1.2	
MT	2.5	3.3	1.4	0.5	0.5	0.2	0.3	0.0	1.1	
SI	4.3	1.4	0.9	1.4	0.5	0.4	0.0	0.1	1.1	eHealth laggards
EL	2.5	3.2	1.0	0.4	0.2	0.2	0.2	0.1	1.0	
PL	2.7	2.4	0.5	0.6	0.5	0.7	0.1	0.0	1.0	
RO	2.3	2.2	1.1	0.3	0.2	0.2	0.1	0.0	0.8	
LT	1.9	1.0	0.4	0.4	0.4	0.8	0.1	0.1	0.6	
LV	1.3	2.3	0.1	0.1	0.1	0.0	0.0	0.0	0.5	
NO	4.9	4.5	4.7	4.1	4.4	1.1	1.7	0.1	3.2	
IS	5.0	4.6	4.2	3.2	2.6	0.3	0.9	0.9	2.7	

Indicators Compound indicators of eHealth use (cf. indicator annex for more information). Index scores ranging from 0 (not used at all, white table cell) to 5 (used by all GPs in the country, dark blue table cell).

Source empirica, Pilot on eHealth Indicators, 2007.


Source: Benchmarking ICT use among General Practitioners in Europe. Final Report, p.60

Country Briefs

It has proven very useful for the public attention to develop so-called “Country Briefs” describing the situation in each of the surveyed countries. These Country Briefs contain amongst others key data from the primary survey research. All of this information is provided in the form of charts, tables and short descriptive texts.


The Country Briefs are particularly valuable as their contents can easily be used for insertion in policy documents and presentations without the need for further “polishing”. The figure below shows the layouts from the recent Pilot on eHealth Indicators study.

Exhibit 5-3: Examples of the country brief presentation format from Pilot on eHealth indicators



EUROPEAN COMMISSION
Information Society and Media Directorate General

Pilot on eHealth Indicators



Benchmarking ICT use among General Practitioners in Europe 2007

Country Profile: Netherlands

Key findings: eHealth among GPs in the Netherlands¹

The Netherlands are one of the frontrunners of ICT use among General Practitioners in the European Union. This concerns both the availability of ICT infrastructure (computer, Internet) and the use of ICT for different eHealth-related purposes. When comparing the overall use of eHealth solutions in the EU27, the Netherlands come in second, being outnumbered only by the absolute frontrunner Denmark.

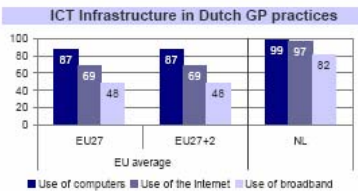
In terms of infrastructure, 99% of the Dutch GP practices use a computer. Almost the same share, that is 97% of the practices, disposes of an Internet connection. In the Netherlands, broadband represents the most common form of access to the Internet with 82% of GP practices resorting to broadband connections.

to the availability of a computer in the consultation room as compared to the actual use of the PC in consultations with the patients, there is nearly no gap as both availability and use are nearly universal (99% of practices and 94% of practices respectively).

The storage of electronic patient data is common practice in the Netherlands. All types of medical patient data are stored in digital form in more than 80% of GP practices. This means that the Netherlands shows results that are well above the EU27 averages.

In the Netherlands the use of electronic networks for the transmission of medical patient data is well established and widespread. 84% of GP practices receive analytic results from labs and still 28% exchange data with other health care providers. In both cases the Netherlands hold one of the top positions vastly above the EU27 average exchange rates for medical data. The Netherlands show exceptionally high usage rates when it comes to the transfer of any kind of medical patient data, as well as with regard to the transfer of administrative patient data. Especially remarkable in the Netherlands is the high occurrence of ePrescribing which is used by 71% of the practices. The Netherlands are one of only three EU member states where ePrescribing is extensively used.

ICT Infrastructure in Dutch GP practices




Category	EU27	EU27+2	NL
Use of computers	87	67	99
Use of the Internet	69	69	97
Use of broadband	48	48	82

■ Use of computers ■ Use of the Internet ■ Use of broadband

Base: All GPs. Indicators: R4, C1, C2 (cf. annex for more information). % values. Source: empirica, Pilot on eHealth Indicators, 2007.

In contrast to most other European countries, the Netherlands score well above average with regard to all aspects of eHealth use covered by the survey. This relates to the local use of a computer for consultations and data storage as well as to the networked transmission of patient data. With regard

eHealth Use by GPs in the Netherlands



■ NL ■ EU27

Indicators: Compound indicators of eHealth use (cf. annex for more information), % values. Source: empirica, Pilot on eHealth Indicators, 2007.

The Netherlands do not have an explicit national eHealth strategy. However, legislation with regard to the establishment of a national Electronic Health Record (EHR) is under way. The first pilot phases for the establishment of an Electronic Medication Record (EMD) and an Electronic General Practitioner's Record (WDH) that will be included in the larger framework of the national EHR, are already being run.

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Source: Benchmarking ICT use among General Practitioners in Europe. Country Profile Netherlands

5.4 Implementing the eHealth Benchmarking approach

Based on the analysis of the eHealth benchmarking sources identified by the study and on the eHealth Benchmarking indicator framework developed in this report, this final section outlines how the eHealth Benchmarking approach can be implemented in order to further broaden the base of data that is available for eHealth benchmarking by addressing the main gaps in today's coverage this study identified.

One term that was used repeatedly in the course of the eHealth benchmarking expert workshop in Prague referred to an eHealth observatory as a kind of overarching instrument that could be used to implement a co-ordinated eHealth Benchmarking approach in the EU and beyond.

Under the framework of such an observatory, concrete implementation steps could be the following:

- Development of questionnaires for key health actor groups (cf. below), consisting of a stable core set of indicators covering key issues and an extended set of indicators covering further issues.
- The collection of data by means of dedicated surveys. These could for example be one or more pilot surveys of limited scope (in terms of country coverage, questionnaire and/or sample size) or one or more full-scale surveys, depending on the resources available.
- Analysis of the survey data, contextualisation of the findings (with data/information from existing studies in the eHealth field) and presentation of results in formats suitable to the target groups.

While ideally all health actors included in the eHealth Benchmarking indicator framework should be covered by the observatory, practical considerations and resource restrictions in particular are likely to limit its initial scope. A key question to be answered is therefore that of which groups should be covered first. Based on the major gaps identified in current monitoring, the need for comparative data as expressed by key eHealth stakeholders and the relevant policy priorities of the European Commission in the eHealth domain as expressed in key documents such as the eHealth Action Plan and the eHealth Lead Market Initiative, it is proposed to first focus on three types of health institutions and the health actors working in them:

- Hospitals (medical staff including nurses)
- Specialist practices (specialist physicians including nurses/practice staff)
- Elderly care providers (care staff)

Option 1: Hospitals (medical staff including nurses)

Medical staff in hospitals is one of two major groups of health professionals that is currently not covered by an EU-wide survey of eHealth availability and use (the other group being specialist physicians, cf. below). The two studies covering hospitals in a larger number of countries that were identified targeted rather administrative or IT staff and adopted each a specific thematic perspective:

- "The eHospital - Assessment of Current Healthcare IT Application Profiles and Future Outlook for eHealth in European Hospitals" covering 10 EU Member States with a primary focus on hospitals' eHealth investment plans (respondents: Chief Information

Officers (CIOs), alternatively IT Managers or IT Administrators; most recent data from 2007)

- The eBusiness W@tch sector study on hospital activities covering the EU15 Member States with a primary focus on general IT availability (primarily infrastructure and applications relevant for doing eBusiness), including some eHealth applications, and IT impacts (respondents: head / senior member of IT department or member of management, managing director in smaller hospitals; data from 2006)

Hospitals can be regarded as highly complex eHealth environments due to their structure of different wards, including for example emergency care, surgery, internal medicine, diagnosis etc., but also administrative departments, IT departments etc., that necessitates a wide range of different IT systems that must also be networked in order to allow for data exchange between the different departments. At the same time, members of medical staff, i.e. physicians and nurses, are the main users of eHealth applications, making these two groups a primary source for in-depth usage data, including insights into practical implementation issues and problems encountered in day-to-day use that are likely to have an impact on eHealth adoption.

From a policy perspective, eHealth in hospitals plays an important role in both the eHealth Action Plan and the eHealth Lead Market Initiative. The eHealth Action Plan also makes specific mentioning of nurses/practice staff as deserving dedicated attention. However, in terms of benchmarking activities this attention seems up to today to have been limited to a bare handful of national surveys that include single questions targeted at nurses/practice staff (three identified by this study: one from the UK, two from Estonia).

One main challenge in implementing a hospital medical staff survey will be to cover the various specialties/departments found in a hospital.

In terms of activities covered, the survey could include the following (cf. section 3.1 for more details): basic IT availability, administration/management, patient data storage, medical patient data exchange, consultation, diagnosis, prescribing, treatment, referring, facility management, laboratory analysis, professional medical education, telemedicine/telemonitoring, eHealth/IT investment, data protection, interoperability, eHealth/IT skills, attitudes and perceived impacts.

Option 2: Specialist practices (specialist physicians including nurses/practice staff)

Specialist physicians are the second major group of health professionals that are currently not covered by EU-wide eHealth availability and use surveys. Further to General Practitioners they constitute the second major group of health professionals working in practices. In terms of the eHealth environment they are working in, this will probably be similar to that of general practices, however with specific characteristics depending on the specialties.

As part of the group of health professionals they are covered by the eHealth Action Plan and the eHealth Lead Market Initiative.

One main challenge in implementing a specialist survey will be to cover the various specialty areas, including surgical specialities, internal medicine, diagnostic specialties, neurology and others. As in the case of the hospital medical staff survey it is proposed that the specialist survey also includes nurses/practice staff in its scope.

In terms of activities covered, the survey could include the following (cf. section 3.1 for more details): ICT availability, Administration/Management, Facility management, Patient data storage/EHR, Medical patient data exchange, Consultation, Diagnosis, Prescribing, Laboratory analysis, Referring, Professional medical education and training, Telemedicine/Telemonitoring, Attitudes towards ICT use, Perception of ICT impacts, IT investment, IT support, Data protection/security, Interoperability, IT skills.

Option 3: Care providers (care staff)

The third option proposed here covers an area that is currently not included in any monitoring activity identified by this study: eHealth availability and use by care providers, in particular providers of care to older people. In technical regard, the eHealth environment found among care providers is probably less complex than in hospitals or GP/specialist practices. On the other hand it is one area where applications relating to telemonitoring and long-term care are likely to be more common than elsewhere, since older people constitute the main target group for these types of applications. While both telemonitoring and more advanced long-term care applications (2nd and 3rd generation telecare) are not very widely used today except in a few countries, existing applications are usually found in professional institutional or home care settings. A survey of care provider staff would have a high complementarity to existing data on eHealth and telecare use by older people gathered by means of population surveys²⁸.

The link to the demographic change also makes up the value of this kind of data for the policy process, since the issue is currently high on the political agenda. Additionally, telemonitoring is highlighted as an important eHealth application in both the eHealth Action Plan and the eHealth Lead Market Initiative.

In terms of activities covered, the survey could include the following (cf. section 3.1 for more details): ICT availability, Administration / Management, Facility management, Patient data storage / EHR, Medical patient data exchange, Telemedicine / Telemonitoring, Long-term care, Attitudes towards ICT use, Perception of ICT impacts, IT investment, IT support, Data protection/security, Interoperability, IT skills.

The key characteristics of each of the three options described above are summarized in the table below. Information in the table is of an indicative nature at this early stage of the planning, based on experiences made by empirica in various monitoring activities in the past years and on the analysis of the good practice cases collated by the present study. The information will need to be further substantiated when a decision for one of the options has been made.

²⁸ Such as the SeniorWatch and SeniorWatch 2 observatories, <http://www.seniorwatch.eu>.

Table 5-2 Overview of data gathering options

	Option 1	Option 2	Option 3
Targeted institution	Hospitals	Specialist practices	Care providers
Respondent(s)	Medical staff, including nurses	Specialist physicians, including nurses / practice staff	Care staff
Geographic coverage	EU27+2	EU27+2	EU27+2
Methodology	CATI	CATI	CATI
Estimated interview length ¹	~20'	~15'	~10'
Main benefits	Coverage of an important field of activity and health professionals respectively. Currently no EU-wide eHealth availability/use survey. Constituting a large and complex eHealth environment, consisting of many different, often networked, applications.	Coverage of an important field of activity and health professionals respectively. Currently no EU-wide eHealth availability/use survey. Good complementarity to the GP survey, since second major group of health professionals working in practices and eHealth supposedly similar to that of general practices	Coverage of a field of activity currently not included in any eHealth monitoring activity. Better insight into use of telemonitoring and long-term care applications. Good complementarity to existing data on eHealth use by (older) citizens / patients.
Main challenges	Adequate coverage of different departments / specialties. Indicators and question wording must be adapted to terminology and IT skills level of medical staff/nurses.	Adequate coverage of different specialty areas. Indicators and question wording must be adapted to terminology and IT skills level of specialists/nurses.	Indicators and question wording must be adapted to terminology and IT skills level of care staff.

¹ Actual interview length depends on the number of indicators included in the questionnaire.

6 Annex 1: eHealth Benchmarking fieldwork

The study conducted a search for eHealth benchmarking and monitoring sources in the 27 member states of the European Union, Iceland, Norway, Canada and the United States by means of a combination of different research methods as further described below.

The search was carried out in spring and summer 2008, following a two-stepped approach:

- Step 1: Identification of supranational and EU-level eHealth benchmarking and monitoring sources by the study team
- Step 2: Identification and description of national sources by a team of national correspondents from the "European Network for Information Society Research".

The first activity of Step 1 was a survey carried out among the experts of the EEA Working Group on Information Society statistics, operated by Eurostat since the early years of this century and with whom empirica has established working relationships already in 2002/03, and the national policy experts and decision makers with whom empirica cooperated in the eHealth ERA project over the past two years. The survey was conducted via email and by telephone interviews with some of the different experts from both groups. Following this survey the empirica study team identified sources of eHealth data and measurements on a supranational and European level. The survey of existing data sources covered publications by international organisations or supranational bodies (European Commission, Eurostat, UN, OECD, WHO...), public and private research institutions and private business (market research companies, research consultancies...). Expert networks contacted by the study team provided several additional sources also on the national level that were passed on to the national correspondents for verification and/or gathering of further information.

To guide the information collation process of Step 1, the national correspondents were provided with a guideline document and a research template developed by empirica, based on which they examined potential sources dealing with eHealth issues on the national level. These sources included official (national) statistics, studies by research institutions, studies and policy documents of national ministries as well as studies carried out or commissioned by professional or industry associations, consultancies, patient associations and the like. This first part of the data gathering process provided the study team with information on the following characteristics of each data source: name/title, type of data gathering, source, year of publication, country coverage, a summary description, target group(s), years of available data, information on rights restrictions and representativeness of the data.

Based on this information, the empirica study team carried out a review of the sources provided by the national correspondents. Only those studies that concurred with the quality guidelines and definitions provided by the eHealth benchmarking framework were selected to be included in the second part of the process.

In order to obtain meaningful and comparable information on the indicators and data contained in the different national sources, the national correspondents were provided with a second template specifying the information to be delivered. Results reported back to empirica were to include the source name or title, the individual indicators, the questions used in questionnaires or interviews if applicable (both in the original language and translated into English), information on the year of the data accumulation, bibliographical details where applicable and the actual data as far as possible, that is unless its publication was hindered by rights restrictions. Furthermore the different indicators were to be attributed to one or several actors, applications and activities as specified in the benchmarking framework. For

this purpose the national correspondents received classification guidelines defining the three categories and their components.

During the whole data collection process the national correspondents were given feedback and further guidance where necessary in order to ensure the quality of the outcome. Finally, all incoming data and information underwent a quality check in particular in relation to the actor/activity classification.

7 Annex 2: Methodology for the selection of Good Practices

In order to identify the good practice cases, first of all two independent quantitative reviews have been conducted. The reviews evaluated the 96 sources contained in the data base across the following three criteria:

- Scope of activities covered
- Depth of coverage per activity (indicators per activity)
- Innovativeness or uniqueness of activity coverage

Both reviews resulted in a ranking list of all sources. From both ranking list the average score of each source was calculated. Out of the ensuing averaged ranking list, the top 20 positions were chosen as a long list of potential good practice cases.

In a second step, all twenty long listed cases have undergone a thorough qualitative assessment by two independent reviewers. This second review looked more in depth into quality of the data and the information to be gained through each case. In order to obtain a maximum of information and the widest-possible coverage of experiences, very similar cases (e.g. same actor coverage, same executing agency and same national context) have been given special attention to, so as to single out the most interesting study. Also, in order to obtain maximum benefit with regard to the transferability of the lessons learned from the cases, those studies that focused only on one particular, national, eHealth application (e.g. one specific health portal) have been earmarked as less useful.

Finally, in a third and last step, the quantitative long list, as well as the additional information obtained by the qualitative reviews has been discussed with a larger group of experts. This expert group decided on the shortlist containing the final twelve good practice cases.

The complementary information needed for the detailed description of the good practice examples has been obtained by a third wave of national correspondent assignments. The national correspondents have been guided in their task by a good practice description template developed especially for this purpose. The template included the following information requests:

1. Main actors involved in implementation, roles and relationships
2. Background and objectives (incl. budget)
3. Implementation
4. Strengths / weaknesses
5. Lessons learnt, facilitators, constraints

Point 3 in this list, "implementation", included a quality assessment of the data source with regard to: Relevance, Accessibility and clarity of information, Validity of measurement, and Population validity. Point 4 and 5, "strengths and weaknesses" and "lessons learnt, facilitators and constraints" were elicited through interviews with survey stakeholders.

8 Annex 3: eHealth Benchmarking workshop: agenda

Workshop on Monitoring and Benchmarking e-Health in Europe and the World

at the
"Hotel Ambassador – Zlata Husa"
Vaclavske namesti 5-7, 111 24 Praha 1
Czech Republic

18th February 2009, 13:00 – 16:00 h

Workshop details: <http://www.ehealth-benchmarking.eu/workshop/workshop.html>

Workshop Programme

12:00 Registration, Coffee and Tea

13:00 Welcome and Introduction

Lucilla Sioli, European Commission, DG Information Society and Media, Acting Head of Unit "Economic and Statistical Analysis"

13:10 The e-Health Benchmarking in Europe studies of the European Commission:
from e-Health Indicators to e-Health Benchmarking

- **Overview and Good Practices of e-Health Monitoring in Europe and the World– Results from the e-Health Benchmarking and the e-Health indicators studies**

Ingo Meyer, empirica GmbH, Bonn (Germany)

13:30 Questions and Answers

13:40 The State-of-the-art of e-Health Monitoring and Benchmarking in Europe and
the World – Good Practices

- **Good Practice Case: Hospitals: The eHospital Census – An Assessment of Current Healthcare IT Application Profiles and Future Outlook for eHealth in European Hospitals (Europe)**
Uwe Buddrus, dii GmbH, Leipzig (Germany)
 - **Good Practice Case: Hospitals: The use of ICT in the Health and Social Welfare Sector (Greece)**
Foteini Psarra, ATLANTIS Research, Thessaloniki (Greece)
 - **Good Practice Case: GPs and Citizens: Perceptions et usages des NTIC dans la santé en France 2007 - 2008 (France)**
France Lafisse, Patrice Cristofini, Orange Healthcare, Paris (France)
 - **Good Practice Case: GPs: ICT and e-Health use among General Practitioners in Europe 2007**
Ingo Meyer, empirica GmbH, Bonn (Germany)
-

15:00 Plenary discussion on the Future of e-Health Monitoring and Benchmarking in Europe

- **IT industry perspective:** *Veronique Lessens, AGFA & COCIR*
- **Healthcare provider perspective:** *Pascal Garel, European Hospital and Healthcare Federation (HOPE)*
- **National government perspective:** *Luc Nicolas, Federal Public Service Public Health, Belgium*
- **Health service provider perspective:** *Prof. Dr. Michael Thick, NHS, United Kingdom*
- **Consumer perspective:** *Catherine E. Chronaki, Foundation for Research and Technology - Hellas (FORTH), Greece*
- **Medical association perspective:** *Vincenzo Costigliola, European Medical Association (EMA)*
- **European Commission policy perspective:** *Michael Palmer, European Commission DG Information Society and Media, Unit H1*
- **Plenary Discussion**

Chair: Werner B. Korte, empirica GmbH

15:50 Concluding remarks

Lucilla Sioli, European Commission, DG Information Society and Media, Acting Head of Unit "Economic and Statistical Analysis"

9 Annex 4: eHealth Benchmarking workshop: list of participating experts

Monitoring and Benchmarking e-Health in Europe and the World

Workshop on 18 February 2009, Prague

List of Workshop Participants

Berens	Frank	Ministry of Health (NL)
Bowman	Jacqueline	Scope Communications
Buciu	Adrian	STS Romania
Buddrus	Uwe	dii GmbH
Cabrnoch	Milan	MEP
Čeledová	Libuše	Ministry of Labour and Social Affairs; Assessment Service (CZ)
Čevela	Rostislav	Ministry of Labour and Social Affairs; Assessment Service (CZ)
Chronaki	Catherine E.	FORTH
Cigan	Heidi	EC DG INFSO and Media, C4
Costigliola	Vincenzo	European Medical Association (EMA)
Debruyne	Hans	Deloitte
Denz	Martin	EHTEL
Doubravsky	J.	Pike Electronic
Dzenowagis	Joan	WHO
Garel	Pascal	European Hospital and Healthcare Federation (HOPE)
Grätzel	Philipp	E-HEALTH-COM
Hoeksma	Jon	e-Health Insider
Jansa	Jaroslav	MacTechCity, Ltd.
Jensen	Henrik Bjerregaard	MedCom
Jerlvall	Lars	SKLAR Sweden
Kinorová	Judita	Technology Centre
Korte	Werner B.	empirica
Kosina	Vaclav	Czech Statistical Office
Kulhankova	Iveat	Pears health cyber
Langkafel	Peter	SAP AG
Lafisse	France	Orange Healthcare
Lessens	Veronique	AGFA
Mana	Martin	Czech Statistical Office
März	Petr	Pears health cyber
Petra	Martochova Pavlikova	GS1
Maurincombe	Eric	Agfa Health Care
Meyer	Ingo	empirica
Moldenaers	Ingrid	Deloitte
Nicolas	Luc	Health Ministry Belgium
Palmer	Michael	EC DG INFSO and Media, H1
Polacek	Milos	ICZ a.s.
Psarra	Foteini	ATLANTIS Reserach

Richardsson	Heléne	eHealth Stakeholder Group, SKL
Robinson	Simon	empirica
Sansoni	Anna Maria	EC DG INFSO and Media, C1
Schug	Stephan	EHTEL - European Health Telematics Association
Seetzen	Berthold	Philips
Simo	Jan	Slovak Republic
Sioli	Lucilla	EC DG INFSO and Media, C4
Stroetmann	Karl	empirica
Stroetmann	Velitchka	empirica
Struk	Petr	MEDTEL
Thick	Michael	NHS Connecting for Health
Turk	Marjan	Ministry of Higher Education, Science and Technology Slovenia
Twomey	Cilian	UEMS - European Union of Medical Specialists
VandePutte	Aurelie	EC DG Enterprise, F5
van Emelen	Jan	MLOZ
Vasilea	Ionel	STS Romania
Wahlfors	Lennart	Valvira
Whitehouse	Diane	Castlegate Consultancy
Wichmann	Pia	Systematic
Wolszczak	Jacek	Ministry of Interior and Administration (PL)
Wyss	Stefan	Swiss Delegation
Zvárová	Jana	Institute of Computer Science AS CR