



Adoption of interoperable EHRs: barriers, challenges, incentives

Veli Stroetmann¹, Dino Motti², Dipak Kalra³

¹Empirica, Germany

²London School of Hygiene & Tropical Medicine

³Eurorec, Belgium

Annex 13

to SHN Work Package 3

Deliverable D3.3

Final version, March 31, 2015

Document description

Deliverable:	Annex 13 to SHN WP3 Deliverable D3.3
Publishable summary:	In this Annex, the existing literature on barriers and facilitators for the adoption by health care providers of semantically interoperable Electronic Health Records is reviewed, from a European and an American perspective. Suggestions for braking the barriers are listed.
Status:	Final Version
Version:	1.5
Public:	<input checked="" type="checkbox"/> Yes
Deadline:	May 29, 2015
Contact:	Veli Stroetman veli.stroetmann@empirica.com Dino Motti Dipak Kalra dipak.kalra@eurorec.org Robert Vander Stichele robert.vanderstichele@ugent.be
Editors:	Veli Stroetman

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Note:

This annex was commissioned by Prof. Dr. Dipak Kalra, Project Leader, and Prof. R. Vander Stichele, Workpackage Leader of SemanticHealth Net WP3, to Veli Stroetman, Empirica, Germany.

Email: veli.stroetmann@empirica.com

1 The role of financial incentives as an initial boost

1.1 The US experience

The American approach to interoperable EHR adoption has been traditionally bottom-up and market-driven with little federal interference¹. This has resulted in rates of adoption that are among the lowest globally². The literature widely imputed this to misalignments of economic incentives and has made the case for financial incentives to drive adoption³ and use of EHR systems⁴.

The HITECH act of 2009

The Health Information Technology for Economic and Clinical Health Act (HITECH Act) of 2009⁵ intended to accelerate the adoption and use of health IT. The HITECH Act authorized Centers for Medicare and Medicaid Services (CMS) to provide financial incentives to eligible hospitals, Critical Access Hospitals (CAHs), and eligible professionals to adopt and meaningfully use certified EHR technology to improve patient care.

A number of programs for 25.9 billion dollars of financial incentives have been launched to support the use of HIT in progressive stages of “meaningful use” within this act⁶. Incentive payments dramatically accelerated broad use of EHRs by hospitals and providers. Digitizing health information collection allows for easier, appropriate sharing of that high-quality, accurate, and relevant information to connect care and empower individuals to manage their health and well-being.

To realize information-fuelled health and well-being, federal efforts aim to encourage broad adoption and use of health IT solutions across all provider and care settings. The HITECH Act established the EHR Incentive Programs to provide financial incentives for the adoption and meaningful use of certified EHR technology to improve patient care⁷. CMS implemented the EHR Incentive Programs through notice and comment rulemaking and created the necessary infrastructure to implement the program in accordance with existing Medicare and Medicaid payment policies and statutory program eligibility criteria. In addition to being able to earn the incentive payments for demonstrating meaningful use in the initial years of the program, eligible professionals, eligible hospitals, and CAHs failing to demonstrate meaningful use of certified EHR technology may be subject to payment adjustments under Medicare beginning in 2015.

¹ Motti D. Misalignments of Incentives for the adoption of Interoperable Electronic Health Records systems in the English NHS: A policy report. MSc in Public Health. September 2014.

² Jha AK, Doolan D, Grandt D, Scott T, Bates DW. The use of health information technology in seven nations. *International Journal of Medical Informatics*. 2008 Dec;77(12):848–54.

³ Taylor R, Bower A, Girosi F, Bigelow J, Fonkych K, Hillestad R. Promoting health information technology: is there a case for more-aggressive government action? *Health Aff (Millwood)*. Project HOPE - The People-to-People Health Foundation, Inc; 2005 Sep;24(5):1234–45.

⁴ Orszag PR. Evidence on the costs and benefits of health information technology. Testimony before Congress. 2008.

⁵ <http://www.healthit.gov/policy-researchers-implementers/health-it-legislation>

⁶ Motti D. Misalignments of Incentives for the adoption of Interoperable Electronic Health Records systems in the English NHS: A policy report. MSc in Public Health. September 2014.

⁷ Update on the Adoption of Health Information Technology and related Reports to Facilitate the Electronic Use and Exchange of Health Information: Report to Congress. The Office of the National Coordinator for Health Information Technology, October 2014.

Both the incentives and payment adjustments greatly affect physicians' decisions to adopt EHRs. A 2011 survey of physicians found that the EHR Incentive Programs' payment or the proposed financial penalties is the top factor having a major influence on the decision to adopt an EHR.

Seven in ten (71 percent) of non-adopters reported that either proposed financial penalties or payments under the EHR Incentive Programs would be a major influence on their decision to adopt and EHR system.

Consequences and unsatisfactory outcomes

The incentives described above⁸ are meant to reduce barriers for early adopters and achieve critical mass^{9,10}. Without a more radical solution of the underlying misalignments of incentives, they have been criticised in the literature as a temporary measure that will not sustainably support EHR use^{11,12,13}. These incentives are even feared to be detrimental and encourage providers to hastily adopt inadequate systems just to obtain the grants¹⁴. A reported high failure rate when financial incentives are discontinued seems to confirm the lack of a sustainable business plan¹⁵.

However, despite the increase in the use of EHRs after the implementation of financial incentives, gaps and challenges remain for nationwide health IT use¹⁶.

EHR adoption among hospitals and physicians has dramatically increased since the passage of the HITECH Act, but health IT use remains low among providers practicing in long-term services and supports, post-acute care, and behavioural health settings. It is important to capture electronic health information from all sources in order to obtain a more complete picture of overall health. The use of telehealth and mobile health technologies also remains low. Greater use of these technologies has the potential to significantly impact the quality and cost of care.

While the Medicare and Medicaid EHR Incentive Programs have been a primary motivator for the adoption and use of certified EHR technology¹⁷, *these programs alone are insufficient to overcome barriers to our vision of information sharing and interoperability as outlined above. Current policies and financial incentives often prevent such exchange, even when it is technically feasible.* To ensure

⁸ Motti D. Misalignments of Incentives for the adoption of Interoperable Electronic Health Records systems in the English NHS: A policy report. MSc in Public Health. September 2014.

⁹ Orszag PR. Evidence on the costs and benefits of health information technology. Testimony before Congress. 2008.

¹⁰ Taylor R, Bower A, Girosi F, Bigelow J, Fonkych K, Hillestad R. Promoting health information technology: is there a case for more-aggressive government action? Health Aff (Millwood). Project HOPE - The People-to-People Health Foundation, Inc; 2005 Sep;24(5):1234–45.

¹¹ Frankel M, Chinitz D, Salzberg CA, Reichman K. Sustainable health information exchanges: the role of institutional factors. Israel Journal of Health Policy Research. BioMed Central Ltd; 2013;2(1):21.

¹² Payne TH, Bates DW, Berner ES, Bernstam EV, Covvey HD, Frisse ME, et al. Healthcare information technology and economics. J Am Med Inform Assoc. BMJ Publishing Group Ltd; 2013 Mar;20(2):212–7

¹³ Middleton B. Achieving U.S. Health information technology adoption: the need for a third hand. Health Aff (Millwood). Project HOPE - The People-to-People Health Foundation, Inc; 2005 Sep;24(5):1269–72.

¹⁴ Kellermann AL, Jones SS. What it will take to achieve the as-yet-unfulfilled promises of health information technology. Health Aff. 2013 Jan;32(1):63–8.

¹⁵ Khurshid A, Diana ML, Luce SD. Health information exchange: metrics to address quality of care and return on investment. Perspectives in Health Information Management. 2012;9:1e.

¹⁶ Federal Health IT Strategic Plan 2015-2020. Office of the National Coordinator for Health Information Technology (ONC), United States Department of Health and Human Services.

¹⁷ Connecting Health and Care for the Nation - A Shared Nationwide Interoperability Roadmap. DRAFT Version 1.0, 2014. Office of the National Coordinator for Health Information Technology (ONC), United States Department of Health and Human Services.

that individuals and care providers send, receive, find and use a basic set of essential health information across the care continuum over the next three years, we need to migrate policy and funding levers to create the business imperative and clinical demand for interoperability and electronic health information exchange.

1.2 The UK experience - Incentives for EHR adoption in the English NHS

Incentives played an important role in spurring adoption of HIT in the NHS¹⁸¹⁹. The incentives in primary care English GPs are cited as an international benchmark for the diffusion of Health Information Technology (HIT) use in primary care with over 90% of UK practices using EHR systems already a decade ago²⁰. At the root of their widespread and relatively rapid adoption there appears to be a series of incentives that made them financially attractive or even costless for General Practitioners (GPs).

Reimbursement schemes, free computers and software, grants and ultimately pay-for-performance mechanisms like QOF have represented strong incentives for HIT adoption²¹²²²³. EHR systems in use by GPs in the English NHS, although advanced, (with the exception of GP2GP systems that allow electronic records to follow patients changing practices) are still not interoperable across levels of care²⁴. Quality and Outcomes Frameworks (QOFs) are said to be designed to report targets and not health outcomes and (apart a few exceptions like palliative registries for patients who wish to die at home) represent weak incentives for information sharing for the purpose of integration of care²⁵. The existence of separate out-of-hours services to guarantee 24h GP care coverage is instead thought to encourage computerisation and interoperability²⁶²⁷²⁸. The experience with monetary payments to GPs for the use of Choose and Book, a specialist referral booking system part of the National Programme for IT (NPfIT), have also shown the limits of incentives when stakeholders engagement and the quality of the software is lacking²⁹.

The incentives for acute hospitals

¹⁸ Payne TH, Detmer DE, Wyatt JC, Buchan IE. National-scale clinical information exchange in the United Kingdom: lessons for the United States. *J Am Med Inform Assoc.* BMJ Publishing Group Ltd; 2011 Jan;18(1):91–8.

¹⁹ Motti D. Misalignments of Incentives for the adoption of Interoperable Electronic Health Records systems in the English NHS: A policy report. MSc in Public Health. September 2014.

²⁰ Jha AK, Doolan D, Grandt D, Scott T, Bates DW. The use of health information technology in seven nations. *International Journal of Medical Informatics.* 2008 Dec;77(12):848–54.

²¹ Payne TH, Detmer DE, Wyatt JC, Buchan IE. National-scale clinical information exchange in the United Kingdom: lessons for the United States. *J Am Med Inform Assoc.* BMJ Publishing Group Ltd; 2011 Jan;18(1):91–8

²² Schade CP, Sullivan FM, de Lusignan S, Madeley J. e-Prescribing, efficiency, quality: lessons from the computerization of UK family practice. *J Am Med Inform Assoc.* 2006 Sep;13(5):470–5.

²³ Bouamrane M-M, Mair FS. A study of general practitioners' perspectives on electronic medical records systems in NHSScotland. *BMC Med Inform Decis Mak.* BioMed Central Ltd; 2013;13(1):58.

²⁴ Lluch M. Strategic Intelligence Monitor on Personal Health Systems, Phase 2 - Country Study: The United Kingdom. European Commission Joint Research Centre Institute for Prospective Technological Studies. 2013.

²⁵ Featherstone H. All together now - Competitive integration in the NHS. Policy Exchange. Policy Exchange; 2012 Nov.

²⁶ Greenhalgh T, Stramer K, Bratan T, Byrne E, Russell J, Hinder S, et al. The Devil's in the Detail - Final report of the independent evaluation of the Summary Care Record and HealthSpace programmes. University College London. 2010.

²⁷ Dobrev A, Jones T, Stroetmann V, Stroetmann K, Vatter Y, Peng K. Interoperable eHealth is worth it: securing benefits from electronic health records and ePrescribing. Bonn/Brussels: European Commission; 2010.

²⁸ Payne TH, Detmer DE, Wyatt JC, Buchan IE. National-scale clinical information exchange in the United Kingdom: lessons for the United States. *J Am Med Inform Assoc.* BMJ Publishing Group Ltd; 2011 Jan;18(1):91–8.

²⁹ Greenhalgh T, Stones R, Swinglehurst D. Choose and Book: a sociological analysis of "resistance" to an expert system. *Soc Sci Med.* 2014 Mar;104:210–9.

Hospitals have had historically, UK included, much lower and less reliably documented levels of digitalisation³⁰. Weaker incentives and less policymaker involvement in regulating hospital EHR adoption could explain this. Hospital leaders have also seen HIT as a source of costs providing few internal benefits³¹. The literature reported far fewer incentives in the English NHS that could support the adoption and use of computer systems and interoperability among hospitals when compared to GPs^{32,33}. The literature cited the 30-day readmission limit that denies hospital readmissions and penalties for discharge summaries transmitted to GPs later than 24-48h³⁴. The latter has incentivized emailed PDF discharge letters, but not their interoperability (still not computable), the former should introduce an incentive for coordination of care and sharing of information for safe discharging, but do not discourage admissions after 30 days, still a potential source of income. These incentives are overall considered insufficient and a stronger set of incentives is needed to drive efforts towards innovations to achieve integration of care³⁵.

As a conclusion, financial incentives are a plausible initial measure but are not a guarantee for long-term EHR usage. Additional incentives will be useful to create an intrinsic motivation for health professionals to embrace interoperable health IT solutions.

³⁰ Jha AK, Doolan D, Grandt D, Scott T, Bates DW. The use of health information technology in seven nations. *International Journal of Medical Informatics*. 2008 Dec;77(12):848–54.

³¹ Benson T. Why general practitioners use computers and hospital doctors do not—Part 1: incentives. *BMJ*. 2002 Nov 9;325(7372):1086–9.

³² Lluch M. Strategic Intelligence Monitor on Personal Health Systems, Phase 2 - Country Study: The United Kingdom. European Commission Joint Research Centre Institute for Prospective Technological Studies. 2013.

³³ Hendy J, Fulop N, Reeves BC, Hutchings A, Collin S. Implementing the NHS information technology programme: qualitative study of progress in acute trusts. *BMJ*. 2007 Jun 30;334(7608):1360.

³⁴ Lluch M. Strategic Intelligence Monitor on Personal Health Systems, Phase 2 - Country Study: The United Kingdom. European Commission Joint Research Centre Institute for Prospective Technological Studies. 2013.

³⁵ Featherstone H. All together now - Competitive integration in the NHS. Policy Exchange. Policy Exchange; 2012 Nov.

2 Analysis of the barriers to EHR adoption

In addition to the inefficiency of financial incentives to sustain the usage of interoperable EHRs by healthcare professionals, there are other factors that may contribute in playing a role as “barriers” to EHR adoption. The table below lists examples of physicians’ concerns that prevent either adoption of the electronic system or its continued usage³⁶.

Table 1. Office-Based Physicians’ Top 5 “Major Barriers” to EHR Adoption.

<i>Among EHR adopters</i>	<i>Non-adopters</i>
1. Cost of purchasing a system (52%)	1. Cost of purchasing system (73%)
2. Loss of productivity (37%)	2. Loss of productivity (59%)
3. Annual maintenance cost (27%)	3. Annual maintenance costs (46%)
4. Adequacy of training (27%)	4. Finding EHR to meet practice needs (46%)
5. Finding EHR to meet practice needs (25%)	5. Adequacy of training (40%)

As seen from the table above, hesitation due to financial matters still exist. In a study in Canada³⁷, clinicians have expressed concerns regarding whether there will be a positive return on investment and whether the benefits of implementing an EMR outweigh the costs (costs include purchasing, coordinating, monitoring, upgrading and governance³⁸)

There is some hesitancy in committing to a vendor product when their platform may become obsolete if/when in the future, there would be a change in the requirements and connectivity to external sources of data.

Physicians noted important negative effects of current EHRs on their professional lives and, in some troubling ways, on patient care³⁹. They described *poor EHR usability that did not match clinical workflows, time-consuming data entry, interference with face-to-face patient care, and overwhelming numbers of electronic messages and alerts. Physicians in a variety of specialties reported that their EHRs required them to perform tasks that could be done more efficiently by clerks and transcriptionists.*

The inability of EHRs to exchange health information electronically was deeply disappointing to physicians, who continued to rely on faxed medical documents from outside providers. Physicians also expressed concerns about potential misuse of template-based notes. Such notes, which contain pre-formatted, computer-generated text, can improve the efficiency of data entry when used appropriately. However, *when used inappropriately, template-based notes were described as containing extraneous and inaccurate information about patients’ clinical histories, with some physicians questioning the fundamental trustworthiness of a medical record containing such notes.* In

³⁶ Update on the Adoption of Health Information Technology and related Reports to Facilitate the Electronic Use and Exchange of Health Information: Report to Congress. The Office of the National Coordinator for Health Information Technology, October 2014.

³⁷ The emerging benefits of electronic medical record use in community-based care. Canada Health Infoway, April 2013.

³⁸ Boonstra, A. & Broekhuis, M. 2010. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. BMC Health Serv Res., 10, 231.

³⁹ From „Physicians’ Concerns About Electronic Health Records: Implications and Steps Towards Solutions“, Health Affairs blog, online March 11th, 2014. <http://healthaffairs.org/blog/2014/03/11/physicians-concerns-about-electronic-health-records-implications-and-steps-towards-solutions/>

addition, EHRs were reported as being significantly more expensive than anticipated, creating uncertainties about the sustainability of their use.

3 Breaking the barriers – possible approaches

Targeted training and education programmes

A significant factor in the ability to successfully procure and implement an EHR is the required time commitment to manage administrative tasks such as researching, acquiring and being trained on an EHR. Other time considerations which may inhibit adoption and use of an EMR include time to learn the system, time required to enter data, and time to convert patient records from a paper-based to electronic system⁴⁰. Although these statements seem to impose possible hindrances to clinician training, there are several advantages that would support the implementation of training programs. For instance, computer illiteracy has been named as one of the barriers of EHR adoption and even uptake. One EHR Physician Satisfaction survey reported that 72% of physicians felt they could benefit from more training to advance use of their EHR⁴¹. It has been suggested that clinicians and practice staff do not have the technical competencies, including the typing skills, to be comfortable around EHR systems.⁴² Furthermore, challenges with user-friendliness and intuitiveness of current products may act as a barrier to EMR adoption and to the full suite of functionalities being used.

On the other hand, it was found in another Canadian study that clinicians were unsatisfied not only because too little training was provided but also because the training was too soon after implementation. At such stage, physicians still had not sufficient experience with their systems to be able to ask meaningful questions.

It is therefore recommendable that training programs must be continuous, well-timed, and targeted.

Examples of training options include distance learning, e-learning, part-time or day release, through formal academic institutions (with accreditation offered as an incentive) or other means, special graduate training programmes, in-service and/or rotational programmes, mentoring opportunities and top-up courses.

Other options include training specific persons to be highly specialized in technology and/or EHR systems. This may serve as an approach to combat the aforementioned concerns on time constraints.

A Canadian study reported that the presence of a leader (clinician or organizational) that is regarded by peers to have a strong knowledge of technology was the most important facilitator of EMR adoption for the study site⁴³.

One of the initiatives of the American Medical Association: to work with policymakers and others concerned about institutional liability to *“liberalize” the ability to use office support personnel to*

⁴⁰ Boonstra, A. & Broekhuis, M. 2010. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC Health Serv Res.*, 10, 231.

⁴¹ The emerging benefits of electronic medical record use in community-based care. Canada Health Infoway, April 2013.

⁴² Boonstra, A. & Broekhuis, M. 2010. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC Health Serv Res.*, 10, 231.

⁴³ Gagnon, M. P., et al. 2010. Implementation of an electronic medical record in family practice: a case study. *Informatics in primary care*, 18(1):31-40.

reduce physician “clerical work” related to EHR use. In one study⁴⁴, physicians reported that employing scribes, allied health professionals, or other staff to interact directly with EHRs reduced the degree of interference with face-to-face patient care and the quantity of below-license work. Allowing such staff to continue or expand in these roles may mitigate many EHR-related problems.

Addressing connectivity and information exchange needs as facilitators of adoption

Another barrier to implementation is the current inability of EHRs to connect and share information with external entities outside of primary care⁴⁵. Physicians in Canada for example, have exclaimed that they will be more willing to adopt EHRs if external connectivity such as the ability to send receive electronic laboratory results, prescriptions, or referrals to specialists were embedded into the systems.⁴⁶

The establishment of healthcare record standards addresses this need as it is through the input of structured and qualified information that the communication of records between practices is made easier.

Health records themselves serve many purposes in the modern healthcare environment, but fundamentally they are the foundation of high quality, safe patient care. All clinical practice in the UK increasingly relies upon the electronic storage and communication of patient records and electronic communication of records.⁴⁷

Standards for the clinical structure and content of patient records were already created in the UK and published in July 2013⁴⁸. They were developed through extensive consultation to ensure that they address the requirements of clinicians, patients, carers and health information technology professionals. They are needed:

- to ensure that information can be recorded and integrated in electronic patient care records across professions, disciplines and specialities, while properly reflecting best practice
- to generate data that can be used for service delivery and performance management, commissioning, audit and research from data recorded for patient care at the point of care.

Better-tailored EHRs to satisfy professional needs and preferences

An additional reason why physicians may not adopt EHRs is that the systems available do not meet their need or they cannot use them to meet their requirements⁴⁹. Clinicians have also indicated that having an implementation strategy customized to their local environment and their pace of adoption

⁴⁴ From „Physicians’ Concerns About Electronic Health Records: Implications and Steps Towards Solutions“, Health Affairs blog, online March 11th, 2014. <http://healthaffairs.org/blog/2014/03/11/physicians-concerns-about-electronic-health-records-implications-and-steps-towards-solutions/>

⁴⁵ Ramaia, M., et al. 2010. Workflow and Electronic Health Records in Small Medical Practices. National Institute of Standards and Technology. www.nist.gov/customcf/get_pdf.cfm?pub_id=903654

⁴⁶ The emerging benefits of electronic medical record use in community-based care. Canada Health Infoway, April 2013.

⁴⁷ <http://www.eiceresources.org/online-learning/importance-of-good-clinical-record-keeping>

⁴⁸ <https://www.rcplondon.ac.uk/projects/healthcare-record-standards>

⁴⁹ Ludwick, D.A., & Doucette J. 2009. Primary Care Physicians Experience with Electronic Medical Records: Barriers to Implementation in a Fee-for-Service Environment. International Journal of Telemedicine and Applications. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2593889/>

was valued.⁵⁰ Electronic health records that would better tailor the needs and preferences of healthcare professionals are therefore expected to contribute to an increase in their usage.

Enabling an easier life for professionals

The structure and content of health records has a significant impact on the quality and accuracy of clinical coding.

Clinical coding is the process whereby information written in the patient notes is currently translated into coded data and entered into hospital information systems. Coding usually occurs after the patient has been discharged from hospital, and must be completed to strict deadlines so that hospitals can be reimbursed for their activity⁵¹.

Enabling the clinical information staff to produce and present clinically useful analyses using their own trust's routine data can be a strong incentive for better information management and higher data quality.

Insights from the SHN Industry Forum

A panel on clinician and patient perspectives from the “Industry Forum on Realising Semantic Interoperability Across Health IT Systems”⁵² provided the following recommendations:

- Incentives, including funding, need to be provided to ensure good documentation, including manually curated summaries
- Provide benefits to clinicians from good data such as advisory systems: a health added value
- Develop full interoperable records by starting from summaries, and growing content incrementally
- Do not adopt a one size fits all, standardise everything, approach - we may need multiple standards but they must be shown to work together
- Incentives and penalties must be developed and applied to push healthcare providers (organisations and individuals) to follow evidence based practices.

Main principles and recommendations arising from the panel on healthcare purchaser perspectives⁵³

- Health ministries should specify and promote the role of eHealth to help remodel healthcare services, empower patients and shift the focus towards prevention and wellness
- Health authorities should make investments in clinical content standards, and make them freely available for industry to use
- Health ministries should create the market conditions that promote (multi-vendor) interoperable applications and devices

⁵⁰ Gagnon, M. P., et al. 2010. Implementation of an electronic medical record in family practice: a case study. *Informatics in primary care*, 18(1):31-40.

⁵¹ <https://www.rcplondon.ac.uk/projects/improving-clinical-coding>

⁵² S. Hardman, P. Rastall, R.V. Stichele, M. Leaning, T. Gormik, A.S. Hansen. Panel 1 of the Industry Forum on Realising Semantic Interoperability Across Health IT Systems, Draft Report version 0.2, March 2015.

⁵³ J. Thorp, M. Thonnet, C. Rupprecht, M. Koncar, A. Berler, J. Devlies. Panel 2 of the Industry Forum on Realising Semantic Interoperability Across Health IT Systems, Draft Report version 0.2, March 2015.

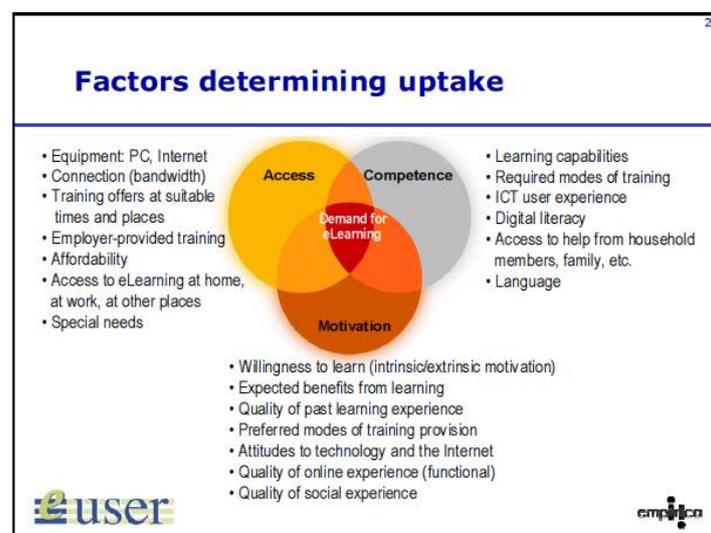
- The financial incentives within healthcare do not mandate interoperability - this needs to change
- Health ministries, insurers and commissioners should promote person centred care contracts that require healthcare providers to collaborate and co-ordinate care and to engage patients
- Health authorities should define the needs for standards, but not develop standards. Ministries should then purchase rights for free use of standards
- Ministries need help in how to promote the use of standards
- We need evidence for the added value of semantic interoperability, to convince healthcare funders & procurers - position it as an infrastructure, and as a protection of jobs - or evidence for the services

ACM Model: the role of Access, Competence and Motivation

The ACM model (Access, Competence and Motivation) could be a useful framework for analysing the factors influencing motivation, adoption and uptake of Semantic Interoperability Solutions. The ACM model was originally developed by (Viherä .1999) and (Nurmela and Viherä, 2001) in order to improve the adoption rate of ICTs, specifically e-services. The basic idea is that the use of ICTs improves the communication possibilities and interaction of the user. The ACM model allows characterisation of the different user profiles regarding their readiness to adopt eHealth services (Gareis, 2005).

The ACM model allows classifying potential users according to eight possible combinations of the three variables Access, Competence and Motivation. Maximum propensity for using an ICT on-line application is assumed to apply for persons who have all three:

- (1) full access to end user devices,
- (2) the necessary digital skills and experience to use the e-services, and
- (3) the motivation to use the electronic services instead of more traditional ways.



Based on the ACM model, improvements for the adoption of eHealth patient empowerment applications are possible in these three areas (see (Monteaguado et al, 2007)). The model can be used to research the factors which influence uptake and further adoption.

4 Outlook

Financial incentives are a plausible initial measure but are not a guarantee for long-term EHR usage. When analyzing the barriers that prevent prolonged EHR adoption, it has been found out that the main concerns of physicians include (1) financials *e.g.* whether the costs—purchasing, coordinating, monitoring, upgrading and governance of—electronic health record systems would give them a positive return, or whether the system itself would be obsolete or not in the future; (2) inadequate knowledge of the system and lack of support from vendors; and (3) having EHR systems that do not meet their needs.

Training upon EHR implementation is essential in order for clinicians to be comfortable with their EHR and the resultant change in clinical and administrative workflow. It can also be expected that ongoing training post-implementation and coaching from clinician peer leaders would result in physicians using additional, more sophisticated functionalities⁵⁴. These may either increase the competence of healthcare professionals with regards to the usage of EHR systems, which would in turn create an intrinsic motivation to continue using the systems, or may result to specialised individuals who may be put in charge of EHR systems and may also serve as a leader who would guide other healthcare professionals into EHR adoption. Furthermore, the training and education programs would enable good practice of following health record standards. The existence of standard, regularized, qualified electronic data in EHRs would facilitate a more efficient electronic communication of records, *i.e.* an electronic transfer of records between various healthcare practices.

⁵⁴ The emerging benefits of electronic medical record use in community-based care. Canada Health Infoway, April 2013.