Promoting the development of the Moldovan health care system with the opportunities of e-services

Project report
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Contents

List of abbreviations

EeHF	Estonian E-health Foundation
EHIF	Estonian Health Insurance Fund
EHIS	Estonian Health Information System
EHR	Electronic Health Record
EMR	Electronic Medical Record
EPS	Electronic Prescribing System
FD	Family Doctor
FM	Family Medicine
G2C	Government-to-Citizen
G2G	Government-to-Government
ICT	Information and Communications Technology
IS	Information System
NHIC	National Health Insurance Company
PACS	Picture Archiving and Communication System
PRC	Prescription Centre

Summary of the project

This report is the final output of the project entitled 'Promoting the development of the Moldovan health care system with the opportunities of e-services'. The project aimed to strengthen the Moldovan health care system by building capacity to develop practical e-health solutions. It also aimed to support Moldovan e-health strategy development in line with the development of the country's health system and information society.

Relying on the e-health implementation experience of Estonia, the project included several events facilitating knowledge transfer: a study trip for Moldovan specialists to Estonia; policy dialogue and action workshop seminars for relevant stakeholders in Moldova; and consultancy sessions led by Estonian experts during the project. This report summarises the results of the project and provides relevant experience from Estonia's e-health development and input for Moldova's e-health development and prioritisation of e-health services. The project was led by the Praxis Center for Policy Studies and was conducted in cooperation with leading experts and related organisations from Estonia and the Ministry of Health of Moldova. The project was co-financed by the Estonian Ministry of Foreign Affairs.

The aim of the report is to provide input for Moldovan e-health development and the prioritisation of e-health services to be developed in the coming years. Suggestions and advice are based on the Estonian experience in implementing public e-services, especially nationwide health services. The report on the e-health development of the Republic of Moldova was composed as a result of the Estonian-Moldovan cooperation development project entitled 'E-services in support of effective health care services for Moldovan citizens'. The project aimed to strengthen the Moldovan health care system by building capacity to develop e-health solutions. The project supported health policy development and strengthened capacity to create practical e-health solutions in line with the strategic development of the information society. Valuable input for the report was received during the three consultation visits made to Moldova, as well as during one study visit to Estonia.

The following project events can be outlined.

- **In October 2012 an introductory visit to Moldova took place**, where meetings were held with the Moldovan Health Minister, the TaskForce Group and representatives of medical institutions and specialties. Several key organisations connected to the implementation of e-health were visited: the WHO Country Office, the e-Government Centre, the Association of Telemedicine of the Republic of Moldova, the Municipal Clinical Emergency Hospital and the University Clinic of Primary Health Care.
- **In November 2012 a study visit to Estonia for essential stakeholders in Moldovan e-health was arranged.** During the visit Estonian experts outlined Estonia's progress in the area of e-services: the Estonian Health System (organisation and financing), the Estonian X-Road and overall system of e-Governance, the Estonian Health Information System and organisational and stakeholder involvement issues regarding the Estonian Health Information System. Study visits were made to the Estonian Health Insurance Fund, the Estonian E-health Foundation and East Tallinn Central Hospital.
- **In May 2013 policy dialogue took place in Chisinau**, where the further plans of different stakeholders in e-health were discussed (see the summary of policy dialogue in Appendix 1). During the visit, Orhei District Hospital was also visited in order to obtain information on e-health status outside the borders of the capital. The result of the policy dialogue was a list of possible e-health services that could be implemented in Moldova.

- **In August 2013 an action workshop and consultation visit took place in Chisinau.** The aim of the workshop was to discuss which e-health services should be the priority for implementation during the next steps along Moldova's e-health development path. Input for the workshops was gathered from various stakeholders in order to obtain an overview of the current status of e-health services: meetings were held with a representative of family doctors, the National Health Management Centre, the e-Government Centre, the Republican Centre for Medical Diagnosis, the Municipal Clinical Emergency Hospital and the WHO Country Office.

General situation

The Republic of Moldova is a small country situated in Central Europe. It occupies an area of 33,843 km^2 (Republic of … 2013). Its population as at 1 January 2013 was 3,559,497, with approximately 670,000 living in the capital, Chisinau (National Bureau … 2013).

Moldova became independent in 1991 with the dissolution of the Soviet Union. Since then it has become a parliamentary republic and has embarked on an ambitious programme of economic reforms. Its health system is organised according to the principles of universal access to basic health services and equity and solidarity in health care financing; it is funded from both the state and individuals through mandatory health insurance. The health system includes a mix of public and private medical facilities, as well as public agencies and authorities involved in the provision, financing, regulation and administration of health services. (Turcanu 2012)

Moldova has started to introduce IT solutions in different areas of governance. Significant developments in the health sector are expected with the implementation of the Moldovan e-Health Strategy 2020, which was finalised in July 2013. E-health and e-health services are topical in the country, with several donors – the World Bank, the Swiss Agency for Development and Cooperation and the Estonian Development Cooperation – supporting e-health projects.

Moldova has made good progress regarding ICT solutions and their use in governance. However, some challenges remain along the path to fully successful implementation of e-health services. In some areas and medical institutions staff exhibit limited abilities in terms of using computers. For example, the Moldovan e-Health Strategy 2020 highlights the fact that based on several independent studies only around 18% of doctors use computers in their work, and only around 12% use the Internet. When e-health services are implemented it is important that these services are used by both doctors and potential patients.

1. Moldova's achievements and priorities in health care

Since Moldova gained its independence in 1991 the health care sector has undergone remarkable development. Several health reforms have already been implemented and there are more to come.

Starting in 2004, the country began implementing far-reaching reforms in the health sector, including the following (World Bank … 2013):

- creation of an independent mandatory health insurance company (CNAM), serving as an effective tool to reduce the previously fragmented financing of health services;
- increasing hospital autonomy;
- separation of primary and secondary care purchasing (from 2008) and moving towards capitation payment for primary care and case-based payment for hospitals; and
- steps toward contracting providers on the basis of performance (from 2008), developing public-private partnerships and setting clear accreditation and quality standards.

In 2013 the Moldovan e-Health Strategy 2020 was finalised in order to prioritise e-health services in the country.

Despite these developments there are several areas that need attention and further action.

A National Hospital Master Plan was developed by the Ministry of Health in 2009 with support from the World Bank. It reflects the government's plans for developing the hospital sector up to 2018, focussing on the regionalisation of hospital services at the local level and the consolidation of the hospital network in Chisinau. Every major hospital in the capital has tried to develop its own information system, using either internal resources or hiring software developers from the private sector in the country and internationally. (Turcanu 2012)

In primary care it has been suggested that the extremely high referral rates for specialist consultations and the high referral rates to hospitals by family doctors be reduced. For FM practice in Moldova a human resource planning strategy is missing – not only aiming to revert the diminishing trend of new FDs coming in, but also to solve the problem of uneven regional distribution of health care personnel. Among other goals, encouraging FDs and nurses to adopt and incorporate available clinical guidelines in their daily routines are prioritised. One tool to achieve such goals could be effective use of ICT to manage patients' medical records and for meaningful exchange of information with other health care providers. (Evaluation of … 2012)

Regarding pharmaceutical policy, all data sources have highlighted the critical importance of pharmaceutical coverage and physicians' prescription practices in ensuring effective coverage and rational use. First, a body of evidence in this area is needed to form a basis on which to develop evidence-based public policies to regulate the pharmaceutical market, pricing and compensation benefits and pharmaco-surveillance systems. So far, data on effective coverage have been scarce and routine monitoring of quality of care and clinical outcomes is insufficient (Barriers and … 2012). Again, intelligent application of ICT solutions could effectively assist in achieving this goal.

The hospital sector shows an oversupply in Chisinau, where 50% of all hospitals are concentrated (Barriers and … 2012). Moldovan users of health services continue to value specialist care and disapprove of the gatekeeping function for referrals to specialists and hospital by family doctors in primary care. As a mechanism to bypass this gatekeeping function, people use ambulance services to increase the chance of hospitalisation. In 2010 the Ministry of Health initiated a reform aiming to improve the efficiency of hospital services by redefining the hierarchy and network of district hospitals, planning to build nine new regional hospitals and redefining the role of rayon hospitals to serve as community hospitals. The quality of hospital care is documented – most indicators are input or process-based and the few indicators intended to measure quality are not informative (Barriers and … 2012).

A health information system and e-health services are tools that can provide essential effectiveness in health care. In order to gain support from all stakeholder groups and pave the way for the comprehensive combination of benefits in the e-health area, it is wise to start by selecting e-services that target all three levels: citizens, providers and state. Currently in Moldova there is clear commitment to broad and smart integration of e-services into health system reforms in the country.

2. Situation analysis and areas for attention of e-health

The situation analysis and areas for attention are based on the project activities from September 2013 to October 2013. This chapter describes the situation in Moldova regarding the implementation of e-health. First, the current status of prerequisites regarding e-Transformation in health care is described, followed by areas of attention from a strategic point of view.

Situation analysis

The main conclusion from the preparatory study is that Moldova is in a good position to succeed with e-Transformation in health care. This opinion is based on written reports, meetings with stakeholders and visits to care providers in the country.

1. Moldova has relatively strong public ICT infrastructure (both fibre-optic and mobile Internet access for public institutions) and central service support (a well-financed National E-Government Centre under the auspices of the Prime Minister). Public ICT infrastructure enjoys healthy financing from international donors (e.g. the World Bank) and is a priority for the Moldovan government.

2. While overall coverage of ICT use may be uneven, all necessary specific health care IT systems are available in different institutions. Several hospitals and primary care centres in Chisinau and Orhei, as well as the main government agencies and National Health Insurance Company, possess functional ICT systems, based on the information we obtained from visits to and discussions with the respective professionals. While roll-out across Moldova is perhaps unrealistic in the immediate future, there is no obstacle on the front-end user side to piloting most of the existing e-services regionally or between the selected organisations.

3. There is clear commitment for broad and smart integration of e-services into health system reforms in the country, which is expressed by the development activities at the central e-government level, and also by broad and high-level political commitment to the e-health strategy. The national e-health strategy is bold and backed by relevant analysis (readiness, needs, technical feasibility, organisational and financial arrangements etc.). Key public institutions have specific coordinated ideas and goals for e-health development (e.g. the Health Insurance Company and Agency of Medicines).

   Also, the main stakeholders support the government's actions in this direction (physicians, hospitals and public). Family doctors and consulting specialists share the understanding that e-services would enable more rapid advancement in reforms in the Moldovan health sector. However, from medical professionals' point of view e-services should support more clinical activities rather than managerial activities, as is mostly the case today.

   The regionalisation of hospital care and liberalisation of primary care services also require support from relevant e-services (information management) in order for the reforms to succeed.

4. The international community has expressed its willingness to financially support the implementation of the national e-health strategy. This has been the case with the World Bank, the WHO and bilateral donors (Switzerland, Estonia and the European Union). In any case, Moldova is ready to develop its internal capacity for e-health services.

5. The critical preconditions have been met to launch actual implementation with tangible results in a relatively short time (unique identifier, critical mass of health professionals already using computers in everyday practice, political mandate and central management unit, good analytical backing of action planning and willingness for coordination between health sector agencies). For example, the Health Insurance Company and the Medicines Agency have agreed and declared in respective development plans that the development of e-prescriptions is their priority.

6. Training of medical professionals to use ICT in their everyday work has been acknowledged as a critical success factor – both the Ministry of Health and the State Medical and Pharmaceutical University have initiated and foresee training in medical informatics for practising professionals and future medical students as an important part of the implementation of the e-health strategy in the near future.

7. There is a list of enablers – cross-sectorial services which will provide a better start for e-health services, like mPay, mCloud and an interoperability platform.

2.1. Toolkit for assessment of e-preparedness

Deployment of any new public e-service is a complex task because it depends on several stakeholders and factors. In digital settings there is no chance not to counter any artefact what is a part of the service. Therefore all parties and factors should be carefully taken into consideration and their functions described according to the service set-up. The same applies to e-health services. Table 1 (see below) presents a toolkit that can be used to assess preparedness and plan focus areas for the successful implementation of large-scale national e-health projects.

FACTOR of E-TRANSFORMATION PREPAREDNESS	CITIZENS	PRIMARY CARE CENTRES	HOSPITALS	HEALTH IN SURANCE COMPANY	STATE HEALTH AGENCIES	MINISTRY of HEALTH	GENERAL GOVERNMENT
Dedicated organisation	-	-	+/-	-	-	-	+
Front-end IT solutions	-	+/-	+/-	+	+/-	N/A	+
IT infra-structure & connectivity	+/-	+/-	+	+	++		+
Rules & legal Issues	+/-	+/-+	/-	+	+/-	+/-	+
Attitude & trustfulness	+/-	+/-	+/-	+	+	+	+

Legend: ...25% ; 25-75% ; 75+%

Table 1. E-preparedness overview in health sector of Moldova. Source: P. Ross, A. Aaviksoo, P. Kruus

The table lists the different stakeholders relevant to e-health services (columns) and the system components to be considered for the successful deployment of e-services (rows).

Dedicated organisation means a governance body with a clear management mandate and capacity. **Front-end IT-solutions** mean user applications that directly facilitate the functionalities of ICT solutions (including 'invisible' central services). **IT infrastructure and connectivity** refers to the technical capacity for fast and reliable data transfer between different users/systems. **Rules and legal issues** describe the clarity of the security, liability and responsibility of e-services management. **Attitude and trustfulness** is the measure of positive feelings regarding the potential benefits of e-services. The colour code depicts the **overall level of maturity of the factor for each stakeholder group**: green = fully accessible/functional (>75%); yellow = not fully accessible/functional (25-75%); red = not accessible/functional (<25%). The red and yellow fields highlight areas for careful attention in the current socio-technological set-up for planning a new large-scale e-health service.

Assessment starts by listing the relevant parties/stakeholders and the factors involved in full reach. The next step is to collect the available information about the factors for each stakeholder. The assignment of the colour code is done using a group consensus method (e.g. Delphi). The final step is to collect feedback from the stakeholders about the assigned level of maturity. The toolkit is designed to quickly highlight strong areas and factors that need a careful investment focus for the success of a large-scale e-health project. Using the table it is easy to plan any necessary measures and the order of actions.

Disclaimer: the assessment for Moldova is based on the brief information that was available to the experts preparing the report. A true assessment should encompass the full involvement of all stakeholders. Therefore Table 1 is presented here as an example of the toolkit and cannot be taken as a representation of the current situation in the Moldovan e-health system.

Areas for attention

There are a few strategic development issues that need attention and progress in the first phase of the implementation of the national e-health strategy in order to deliver rapid results and build a robust basis for the sustained success of reforms.

1. A health system is a highly complex phenomenon. Introducing the broad application of digital information management within the system initially increases administrative complexity further due to parallelism between traditional and e-services and natural resistance to change. Therefore, **strengthening central management capacity for national leadership of the implementation of the e-health strategy** and the **involvement of health care professionals** are two critical success factors, based on the experiences of other successful countries (Estonia, the United States and Denmark). This facilitates the concentration of adequate human capacity for administrative purposes in support of strategy implementation as well as the involvement of appropriate stakeholders in a suitable governance model.

   It is important to emphasise that health care professionals accept using e-health services only when it does not seriously increase their daily workload. Thus the transition of any e-health service from the pilot stage to a scaled-up routine care process needs endorsement and commitment by health care organisations, which should have a strategic plan in place that is further endorsed by an operational plan.

2. A sound process of **standardisation and the functioning of core national registries** is an essential precondition for the implementation of an e-health strategy. While the National Centre for Health Management maintains the core national statistical databases, it is acknowledged that a systematic approach to upgrading these into fully functional core national registries is needed (e.g. for health personnel and care providers).

   This calls for immediate, close and focused collaboration between all national agencies within the health sector as well as with care providers to agree upon the universal classification and detailed process for its maintenance and development. Similar need for coordination with other national agencies may exist for classifications of elements which are used across sectors (e.g. administrative information).

3. While population surveys reveal high public expectations of e-services in the health and social domains, it should be noted that such demands express the views of Moldovans who already use ICT and therefore have a preference for public e-services in the first place. Thus a **digital divide (or stratification) should be avoided** and development of e-services should not diminish access to health services for those who are not yet capable of making use of the technology.

   For instance, computers exist only in 20% of households of elderly people, which means that for this age group immediate benefits can be delivered indirectly – via improved care opportunities by younger relatives or via the convenience of a well-functioning e-prescription service.

   However, as mentioned above, **Moldova has a unique opportunity to make use of the high penetration of mobile phones** and overcome the problems of computer-based services by developing e-services that are naturally designed for mobile devices.

3. Prioritising e-services and e-services to start from

While the e-Health Strategy of Moldova broadly defines its footing in "support for the medium-and long-term priorities of the public health sector, paving the way for future public e-Health sector requirements, and laying the foundations for the future integration and coordination of all e-Health initiatives in the country (both the public and private sectors)", the following is a suggestion for **immediate first steps for prioritisation**.

1. The broad goal of health care reforms in Moldova is to build an **intelligent and integrated health system** for: a) citizens/patients; b) professionals/providers; and c) country/public authorities. Therefore, in order to gain support from all stakeholder groups and pave the way for the comprehensive combination of benefits, it is wise to start by selecting e-services that target all three levels: citizens (G2C), providers and the state (G2G) (see Figure 1).

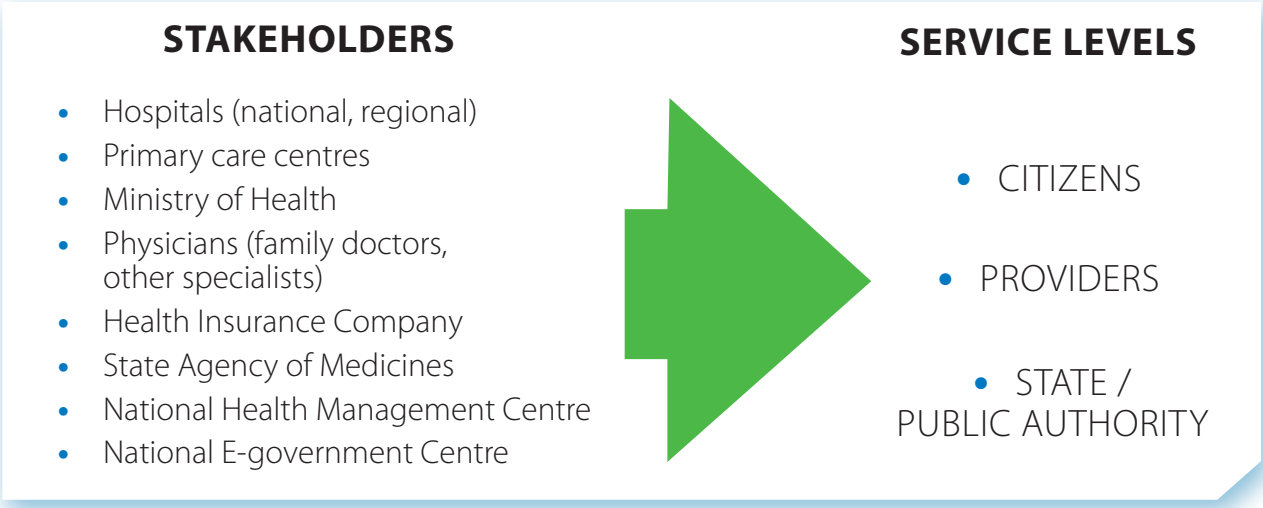


Figure 1. Prioritising services – stakeholders and service levels. Source: authors of report

2. The next set of criteria to consider stem from the understanding that national health priorities should be considered from the beginning of the data management process and that at first the level of preparedness for digital information and process management varies (geographically, organisation-wise etc.). Thus **a good candidate for the first round of e-service implementation would have the following characteristics**:
    a. feasible implementation with tangible results in 12-18 months;
    b. covers the entire health care sector, service chain and main stakeholder groups;
    c. easy/logical to expand to subsequent:
        - round of services;
        - software applications;
        - clinical areas/domains;
        - regions; and
    d. contributes to priority health programme(s): cancer, cardio-vascular diseases, diabetes, immunisation and surveillance of non-communicable diseases.

3. It is important to distinguish between ICT applications and e-services. Using the analogy of grapes as a necessary ingredient in making wine, the applications (such as electronic medical records – EMR) could be considered the ingredients and the **e-service as the process of delivering value**, similar to the wine-making process in producing the end-product.

   Thus, while for instance EMR is a digital precondition for many e-services, it should be mainly seen as a data capture, storage and presentation tool with a static outcome, not an 'e-service'. **E-services need digital data processing, usage and 'motion' – a dynamic process**. For planning purposes both the defined targets and implementation activities should consider this important difference between the e-services and the technology.

   Additional components in the successful implementation of any e-service are digital/computer literacy, information management policies and goals that are related to human (patient and professional) experience and not the technological solution per se. In the latter case there is high risk that the technology will increase the cost burden and deliver little value in terms of improved health care services.

Based on the above-mentioned arguments, **the potential 'starter pack' of e-health services for Moldova, divided into three main user groups**, is described below. Each e-service is accompanied by a short reference to the benefits delivered and a more technical justification.

3.1. Citizen/patient level

- **Mobile notifications** (screening invitations, appointment reminders, public health messages and results – linked to patient portal)

  This is easy to implement due to high mobile penetration and the availability of proven technical solutions. The platform can start with simple messaging and evolve into a more complex service platform in the future. It also has high visibility among the public and, if well-targeted, can gain the public support needed for strategy implementation.

  Main technical preconditions: functional citizen/patient registry with valid mobile phone/e-mail addresses (could be regional or local initially); clarity regarding privacy rules.

- **E-prescriptions** (convenience and access – linked to patient portal)

  For patients this would improve convenience and access to treatment with pharmaceuticals. It would also be a useful feature of the patient portal (prescription history, reminders etc.).

  This would be technically, organisationally and legally the most complicated and complex service. At the same time the service would benefit all levels and the scope could be narrowed by limiting initial participation to technically more advanced organisations/professionals. (However, this would diminish the overall impact and increase the total budget due to lengthy parallelism between paper and electronic systems and also extended 'in-fighting'.) Proper planning, coordination and perhaps the experience of other countries would reduce these risks. For a more specific description, see Chapter 5 of the report.

3.2. Health care provider level

- **Archiving and sharing of imaging and lab investigations**

  The Picture Archiving and Communication System (PACS) would be an ideal candidate for the integration of providers horizontally (networking hospitals) and vertically (primary and hospital care) – thus supporting effective hospital network planning. It has also proven to be the most highly valued e-service among professionals in many countries and therefore works towards professional support for e-health strategy implementation. Risks lie in the fear of 'democratisation' and thereby the 'corruption-reducing' effect on service use by hospitals. A more specific description is provided in a separate chapter of this report.

- **E-prescriptions** (efficiency and convenience)

  For providers, this service is a good way of proving the 'efficiency without cost increase' effect of an e-service. After the initial investment of time in learning the functionalities, a well-designed e-prescription service usually proves itself very soon to be the best solution empowering the patient-doctor relationship. For risks and considerations, see above.

- **Enhanced primary care services in rural areas**

  As high-cost technological treatment is being centralised as part of hospital network regionalisation reforms, it is wise to use ICT to keep access to higher-level specialist advice close to primary care physicians and citizens. Solutions that enable this vary from the simple to the sophisticated. For instance, access to the results of lab analysis and other investigations, e-referrals and e-consultations (for doctors via a specialised e-mail service or via a telemedicine link for patients in remote primary care centres), second opinions et al. can be considered here.

3.3. National and/or state level

- **E-prescriptions** (accountability and efficiency)

  At the national level this service enables the monitoring and implementation of effective pharmaceutical policies through the enhanced accountability of all participants in the 'service chain' (prescribing physicians, pharmacies and patients). It is also a very good tool in training and testing the computer skills of professionals and gradually introducing decision-support features (separately for physicians, pharmacists and patients).

  It may be wise for the initial service to be constructed as dedicated e-prescriptions with all functionalities embedded. Integration with end-user information systems (hospital and primary care EMRs and pharmacy ISs) should be the goal in the long run and implemented gradually in the second phase, but since there is significant heterogeneity in this area it can hinder the main goal of the e-prescription solution. For further discussion on risks and consideration, see above.

- **Disease and quality registries** (e.g. cancer)

  One way of improving the quality and efficiency of national level health policy whilst offering a valuable e-service for professionals without a forced reporting duty is by developing disease and quality registries according to modern standards and making full use of the potential of ICT.

For instance, a cancer registry that promptly collects notifications about incidents and the clinical process (from diagnosis to treatment and survival) through natural clinical processes, rapidly conducts meta-analyses and provides sophisticated analytical reports to different stakeholders would be in line with Moldova's health policy goals and serve as a good promoter of central e-services that support professional clinical work and research. Such an e-registry would also set straightforward goals for the development of the necessary standards, classifications and process dictionaries, which could be re-used in the development of subsequent e-services (registries et al.)

The registries could become highly complex, as the enormous computing power and flexible ICT infrastructure set basically no limits. It is therefore advisable at the outset to design an absolute minimum set of goals and functionalities for the registry, but implement the processes in line with future scalability goals.

It is also wise to keep epidemiological and financial goals in health care business intelligence separate (e.g. by separating governance responsibility between scientific and financial institutions respectively). Otherwise the necessary understanding of the population's health becomes distorted by financial stimuli, which is not the desired goal.

- **Policy planning and epidemiologic/statistical intelligence** (data query & reporting)

  Similar to disease registries, all aspects of national health statistics should be developed and implemented with a future vision. The best way of reducing the redundant reporting duty is to design a national-level 'health information intelligence' service from the usage/user and public reporting end, which means that analytical capacity and rapid processing in the back-office are a must for any e-service. In such a way the initial indicators and data sets that are implemented via new e-services can be less extensive, but rely on easier data retrieval from primary sources and provide a quick and meaningful analytical outcome for decision-makers and other stakeholders. This would again serve the purpose of winning supporters for the e-health strategy, which must sustain long-lasting support for investments and change management.

3.4. Brief qualitative analysis of suggested services

Using the goals defined in the e-health strategy of Moldova, we performed a rapid qualitative assessment of each suggested initial selection of e-health services in terms of their potential role in achieving the established goals.

As a result we found that the selected services would (if implemented effectively) potentially cover, at least initially, all of the sought-after impact indicators as defined in the strategy. If these indicators remain the desired goal, it could be insisted that they be considered when defining the functional requirements of the e-health services.

1) Pillar 1: Quality, efficiency, transparency and access to health care services

- **Visits to doctors decrease by 20%**
  E-prescriptions, PACS and enhanced primary care services can strongly contribute to this goal.
- **Patients per doctor processed per day increase by 10%**
  Mobile notifications and e-prescriptions can potentially contribute to this goal.

- **100% of public health care data are available online**
  E-prescriptions, registries and epidemiological/statistical intelligence services, PACS and enhanced primary care services can strongly contribute to this goal.
- **Citizens' perception of health care service quality increases by 20%**
  All of the suggested e-services can strongly contribute to this goal.

2) Pillar 2: Health management and governance in e-health

- **ICT skills of health care sector personnel increase**
  E-prescriptions, PACS, registries and enhanced primary care services can strongly contribute to this goal.
- **100% of health data are qualitative, error-free and available in real time**
  Epidemiological/statistical intelligence services, registries, e-prescriptions, enhanced primary care services and PACS can strongly contribute to this goal.
- **Time and cost of document creation, distribution and archiving decrease by 30%**
  E-prescriptions, registries, epidemiological/statistical intelligence services and PACS can contribute to this goal.
- **Turnover of ICT personnel in ICT sector decreases by 50%**
  All services can contribute to this goal.

3) Pillar 3: Reliable and scalable infrastructure for efficient e-health system

- **100% of information resources are available from one access point**
  All of the suggested e-services can contribute to this goal.
- **80% of health information systems are interoperable**
  E-prescriptions, PACS and enhanced primary care services can strongly contribute to this goal.
- **Security is ensured for 100% of health data**
  All of the suggested e-services can contribute to this goal.
- **90% of health data is stored and used according to one agreed format**
  E-prescriptions, PACS, registries, enhanced primary care services and epidemiological/statistical intelligence services can strongly contribute to this goal.
- **100% of medical institutions are connected to Internet**
  E-prescriptions, PACS, registries, enhanced primary care services and epidemiological/statistical intelligence services can strongly contribute to this goal.

4. Recommendations

Based on the written reports, meetings with various stakeholders and visits to several care providers in Moldova and considering Estonia's experience with e-health, the following recommendations can be made.

- Deciding on and establish an organisation with clear responsibilities and a mandate for managing the complex implementation of e-health services.

- Selecting 3-5 first services, assessed by their potential for each main user group (patient, provider and society) and assess their relevance to the goals and indicators of the national e-health strategy.

- Making a review of the core standards necessary for the implementation of the first selection of services and safeguard the human and technical capacity for standard development and maintenance.

- Developing a detailed plan for the implementation of each e-service. As a general example, two case studies (nationwide PACS – Chapter 5; and e-prescriptions – Chapter 6) are described based on the Estonian example.

- Keeping the focus on the selected services while maintaining adequate priorities in financing, but also for technical and legal development activities. The plan should contain milestones for regular assessment of the progress and adjustment of activities, if needed. Unstructured and 'broad' e-health development should be avoided to prevent inefficiency and loss of momentum due to competing interests.

5. Implementation of nationwide picture archiving and communication system in Moldova (case study)

One way of making remarkable progress in reforming and digitalising health care in Moldova is the implementation of a nationwide picture archiving and communication system. This approach was taken by Estonia approximately 10 years ago, which served as a successful pilot stage in the implementation of a nationwide health information system. The following subchapters describe the re-engineering of the radiology service in Estonia and, based on this, provide a potential roadmap for Moldova to implement a similar digitalised service.

5.1. Overview of nationwide medical information systems in Estonia

The Estonian nationwide Health Information System (EHIS) is an initiative which was instigated in 2000 to improve and extend health services for patients and citizens. Within this initiative the Electronic Health Record (EHR) project was launched, along with projects on digital registration, imaging and prescriptions. In order to effectively manage the development of these e-health projects of the EHIS, the Ministry of Social Affairs initiated the establishment of a separate administrative body – the Estonian E-health Foundation (EeHF) – in 2005. The EeHF was founded by the three largest hospitals in Estonia, the Ministry of Social Affairs, the Estonian Society of Family Doctors, the Estonian Hospitals Association and the Union of Estonian Medical Emergency. It unifies various stakeholders in Estonian health care to ensure compliance and cooperation in fostering the transformation of the organisation of health care into a digital environment.

Before the launch of the EHIS, the first fully implemented nationwide health care digital solution was the Estonian Picture Archiving and Communication System (PACS), which has been functioning since June 2006. PACS acted as proof of the concept of the EHIS, including almost all of the components of a large-scale health care information system, but was easier to launch because of the well-defined and specific scope of medical imaging. It is technically based on the PACS of two major hospitals in Estonia (Tartu University Hospital and the North Estonia Medical Centre) and acts as one central PACS for all other radiology departments in Estonia. Today, all radiology facilities in the country have the possibility to send and archive radiology images in the centralised PACS. Radiologists and all referring physicians have web-based access to the PACS if they have signed the necessary contract with responsible authority (the Estonian Health Image Archive Foundation).

The importance of the implementation of the nationwide PACS was proving the concept and viability of a cross-institutional health care information system. It also showed that external and infrastructural presumptions, technological prerequisites and the interests of different stakeholders should be favourably combined during the establishment process. As medical images are some of the largest files stored and distributed in any medical information system, deployment of PACS allowed us to understand the preparedness of the national information and communication technology (ICT) network as well as the completeness of in-house network components and the level of digitalisation of different medical documents (incl. images). It also connects health care institutions from general practitioners to large hospitals demanding recognition and fulfilment of legal regulations (access rights, security and privacy issues, contracts, archiving, audit trail etc.) and the establishment of an appropriate responsible organisation. In Estonia's case, it served as a pilot stage for the nationwide EHIS, confirming the feasibility of the concept. The Estonian PACS started as a communication and archiving environment for radiology images (x-ray, computed tomography, magnetic resonance tomography, angiography, nuclear medicine and ultrasound)

followed by endoscopy images and other image-related products such as electrocardiograms (ECG).

5.2. PACS as opportunity to pilot nationwide deployment of health care information system in Moldova

The readiness to commence large-scale information technology deployment and integration of digital medical data is high from the point of view of health policy in Moldova. Almost all stakeholders are aware of the potential of digitalisation and data sharing in health care to increase treatment quality and efficiency.

The information collected during workshops and site visits and also the literature overview reveal that several important components are in place in Moldova. Elaboration of each component and a list of initial steps in the deployment of a nationwide PACS are given below.

5.3. Components of Moldovan nationwide PACS

1. **Digitalisation of medical images.** There are several hospitals, diagnostic centres and private clinics in Moldova which have radiology equipment producing digital images. The list of equipment includes sophisticated modalities like 128-slice computed tomography (CT) and 1.5-Tesla magnetic resonance tomography (MRT). However, almost exclusively this equipment is not connected to shared imaging archives. Images are interpreted on local workstations and reports are printed out on paper. Also, images are printed out using laser printers or the like. Separate (non-integrated) modalities do not allow image sharing with other colleagues or patients and makes comparison of prior images complicated. Moreover, printing of film is relatively expensive – the estimated cost of one film being 2-4 euros – and leads to the use of a relatively large amount of resources.

2. **Local PACS installations.** To our knowledge there are a couple of hospitals that produce digital images and which are prepared to share them within the institution. These hospitals or diagnostic centres could serve as central hubs for the installation of regional PACSs which will in turn form components of a nationwide PACS and the sharing of images among different hospitals, family doctors (FD), specialist clinics and citizens.

3. **Computerisation of health care institutions.** During the site visits it was noted that some hospitals and diagnostic centres have health care information systems (Electronic Patient Records (EPR), Hospital Information System (HIS), Laboratory Information System (LIS) etc.) in place. Some were revealed to be very modern, designed according to patient flow and work processes. This is important progress in health care institutions. Also, computers are used in many institutions, though the number of them in the work place is not enough sufficient. Despite the initiation of digital data sharing in health care institutions, almost all work processes are designed according to analogue set-up and all relevant documents are on paper.

4. **Local ICT networks.** The site visits revealed that a substantial amount of work and investment is needed to create appropriate ICT networks (cabling, switches, servers, server rooms etc.) in health care institutions. At the institution level, ICT networks seem to be issues that are in greatest need of planning and investment.

a. Hospitals and other health care institutions are not supplied with a satisfactory number of health IT professionals.

5. **Organisation.**

   a. Security and user rights. A compulsory ID code for citizens is in place in Moldova. This serves as the basis for secure authentication and entitlement of user rights for all health care professionals and citizens. Moldova has a very modern central government authentication policy in place. There is a universal ID card for citizens, a national data sharing environment is under construction and mobile ID is available.

   b. Organisation responsible for planning, deployment and maintenance of nationwide PACS. There is no such organisation in Moldova. However, based on discussions with stakeholders (the Ministry of Health, health care managers, radiologists, GPs, health care IT specialists etc.) there is a clear understanding of the need for and mutual interest in establishing a new organisation. In this regard the situation is good and provides the right environment for progress.

   c. Registries. To set up Internet-based secure authentication of health care professionals there is a need for digital registries of professionals (doctors, nurses, midwives and pharmacists) and institutions. To date, registries have not been connected electronically and most are not even in digital form.

   d. Internet. Moldova has up-to-date national high speed Internet availability in most regions.

6. **Legal issues.** During the interviews with stakeholders, no major legal restrictions to the deployment of a nationwide PACS in Moldova were revealed. However, before this starts there is a need to conduct an in-depth legal analysis of different aspects of digital data archiving and sharing.

5.4. Roadmap for planning and deployment of Moldovan nationwide PACS

1. Decision on implementation of nationwide PACS at ministerial and health professional level. Establishment of organisation responsible for PACS deployment. This process is led by the Ministry of Health.

2. Overview of background statistics of imaging services and professionals in Moldova:
   a. Number of radiology exams
   b. Amount and distribution of radiology equipment
   c. Number and distribution of radiology departments
   d. Number of radiologists
   e. Number of radiology technicians
   f. Description of availability of IT professionals in hospitals and diagnostic institutions
   g. Number and distribution of personal computers in radiology departments and in health care institutions total

3. Analysis of need for and distribution of digital equipment in hospitals and diagnostic institutions. Reform of imaging facilities based on optimal distribution of equipment and service provision efficiency, if needed.

4. Survey on need for and type of training of professionals to use personal computers and image viewing software

5. Analysis of legal environment for cross-enterprise archiving and distribution of medical images in Moldova
6. Analysis of existing health care-related registers in Moldova
7. Based on statistics and survey, planning of necessary investments in:
    a. radiology equipment;
    b. ICT software, hardware and network in hospitals;
    c. local PACS and storage; and
    d. nationwide image and document registry, vendor-neutral archive and universal image viewer.
8. Purchase of necessary digital radiology equipment and ICT software and hardware
9. Development of necessary digital registers and coding systems
10. Training of professionals according to survey

Obviously this list of activities is not exhaustive and should be tailored according to the surveys and initial analysis of the current situation. However, the site visits, interviews and seminars have shown that such a systemic approach has the potential to lead to the successful implementation of a nationwide PACS in Moldova.

6. Implementation of nationwide electronic prescribing system in Moldova (case study)

The most widely used e-Health service in Estonia is the country-wide electronic prescribing system (EPS). The EPS has received positive feedback from the public and providers and its usage level is very high – more than 95% of reimbursable prescriptions are issued digitally (Kruus 2013). The use of electronic prescriptions has been designated as an important strategic policy in improving health care in Europe. The European Union is seeking to develop a cross-border electronic health care system which also enables EU citizens to obtain e-prescriptions anywhere in Europe. The success of the system in Estonia, European policy and the similarities of the Moldovan and Estonian health care systems provide a strong reason to believe that the EPS is a viable near-future e-health initiative for Moldova.

6.1. Overview of Estonian electronic prescribing system development

Estonia's nationwide electronic prescribing system was launched in 2010. The project took around five years to implement fully and its aim was to make the e-prescribing of medicines in every doctors' surgery and the filling of digital prescriptions in every pharmacy possible and to make pharmaceutical information electronically available to patients as well.

A large number of partners like government bodies responsible for data registries, hospital and pharmacy software producers, hospitals, family doctors and pharmacies were involved in the development process. The project has already enhanced openness and transparency in the area of the prescribing of medicines and more importantly has opened up a whole new way for future developments which aim to share information and statistics and improve medical care and the quality of decision-making among policy-makers (Estonian Health Insurance Fund 2013).

Doctors can prescribe medications to patients using their computer software and forward an electronic prescription to the national database. The e-prescription is then immediately accessible in every pharmacy at the patient's request. This paves the way for the more extensive future development of telemedicine. Patients can follow the log attached to every prescription and see who accessed the data and when. Doctors are appreciative of the system feature that enables the automatic calculation of the correct rate of reimbursement on medications compensated by the Health Insurance Fund. Furthermore, the system can provide an overview of the prescriptions issued to a patient by other doctors and the actual purchasing information regarding these prescriptions (Estonian Health Insurance Fund 2013).

Automated processing of this information in future will help to evaluate the interaction of pharmaceuticals prescribed by different doctors, patient adherence to treatment recommendations, misuse of medicaments and more. For pharmacists, things will be simplified by the fact that the majority of prescription data is already entered in the system by the doctor, which is why they are only required to add to prescription information on actually delivered medication and sales data. In most cases this can be done using a barcode reader. The prescription is then ready for e-invoicing to the Health Insurance Fund. The state can now take online control of what is going on in the field of pharmaceuticals (Estonian Health Insurance Fund 2013).

BACKGROUND AND OVERVIEW OF ESTONIAN NATIONWIDE ELECTRONIC PRESCRIBING SYSTEM DEVELOPMENT

The costs of prescription medicines accounted for 17% of total health care costs in 2011 in Estonia and reimbursable drugs were used by 68% of the insured population in 2012. There are 475 general outpatient pharmacies in Estonia and 4372 certified doctors. Thus any policy or broad IT development in this sector can have an enormous impact on the parties to the system. As far as the Estonian EPS is concerned, and as has already been mentioned, most of the stakeholders have contributed in some way to the development and implementation of the system. (Kruus 2013) The costs of prescription medicines accounted for 32.9% of total health care costs in 2012 in Moldova (34.6% in 2011). There were 1092 community pharmacies, 78 hospital pharmacies, 967 pharmacies in PhC, 12,794 certified doctors and 27,407 medical personnel in Moldova in 2012.

As Estonia has a social insurance system with one central purchaser (EHIF), data transmission between the EHIF and health providers, pharmacists and citizens has been important since the system has existed. For example, as early as 2000 it was possible for citizens to check their insurance status online by using commercial Internet bank authentication systems. The strategic goals for IT (information technology) development at the EHIF were set in 2001, when the entire information system was centralised. The goal was to implement standardised information transmission and develop the possibility of electronic transmission of medical bills and prescription data. The first developments were made in co-operation with the IT department of one of the leading banks in Estonia. Starting in October 2002, all pharmacies were obliged by law to transmit prescriptions for reimbursement to the EHIF electronically using an electronic data transmission service called TORU, setting an important precondition for the development of the nationwide e-prescribing system. By the end of 2002, EHIF had signed electronic data-transmission contracts with 76% of health care service providers and 54% of pharmacies. By 2003 the X-Road framework (a secure data transmission service provided by the central government) was already in use for certain data transmissions between the EHIF and its partners. The idea and basic principles of the EPS were drafted in 2003. (Kruus 2013)

By 2005, 100% of medical bills and prescription data for reimbursement were being submitted electronically. In 2006, use of the ID card (a secure authentication measure provided by the central government) was made compulsory for health care service providers sending medical bills and pharmacies sending prescription data for reimbursement, thus supporting the diffusion of ID card use among health providers and pharmacists. (Kruus 2013)

Thus many basic requirements for the e-prescribing system were in existence by 2006. The development project was launched in cooperation between the EHIF and the Ministry of Social Affairs with the aim of implementing an e-prescribing system wherein a patient could buy the prescription drug from a freely chosen pharmacy without the need for a paper prescription. The intention was to make it more convenient and secure to write prescriptions, save pharmacists time, enhance feedback and analytical capabilities and save costs on paper prescriptions. (Kruus 2013)

The development of the Estonian Health Information System (EHIS) could be considered the second phase of e-health development in Estonia. EHIS is regarded as the fundamental platform for ensuring standardised and fluid data transmission among relevant stakeholders: health care service providers, patients, state registries, insurance foundation, pharmacists and others (Saluse et al. 2010). By 2005 the level of IT use in the Estonian health system was quite diverse. Most care providers had already implemented different IT systems: examples include the Tartu University Hospital health care image database, the IT solutions of the EHIF and the information systems of various

health providers and pharmacies. Yet the systems were not interoperable in terms of exchanging information. (Koppel et al. 2008) EHIS was seen as a solution to this problem and a way of connecting relevant data to support health service contracting, ensuring quality and protection of patient rights and public health and making it feasible to manage relevant registries and health care as a whole. (Kruus 2013)

The concept of EHIS was presented in 2005 by the Ministry of Social Affairs as the main regulatory institution for health policy development and health system stewardship (Koppel et al. 2008). Its aim was to implement four e-health projects: electronic health records (EHR) and digital image, registry and prescriptions (EPS). In order to manage the projects, an independent administrative institution – the Estonian E-health Foundation – was established. The founding institutions were the three largest hospitals in Estonia, the Ministry of Social Affairs, the Estonian Society of Family Doctors, the Estonian Hospitals Association and the Union of Estonian Medical Emergency. Thus important stakeholders were gathered to ensure cooperation and matching requirements. The Estonian E-health Foundation is mainly responsible for the standardisation and development of digital medical documents and for managing the EHIS. (Saluse *et al.* 2010)

In essence the EHIS is a state-provided framework which aims to transmit data through a central server. The system does not substitute internal IT systems of health care service providers or pharmacies, but provides the possibility to connect internal IT systems to EHIS and exchange medical data throughout the health system. (Saluse *et al.* 2010) Thus EHIS also made it possible to link prescription data (then solely in the EHIF system) to the nationwide EHR, to bring together personal data and medical records, digital pictures and other important health-related data. (Kruus 2013)

At the same time, the development of the e-prescribing system was still to be co-ordinated by the EHIF, although the Ministry of Social Affairs also had an important role (Saluse *et al.* 2010): a contract for the procurement of necessary software and hardware was signed in 2007 in order to build the central database – the prescription centre (PRC). As defined by law, the PRC is a database established to make it feasible to prescribe and process prescriptions and medical device cards and make reimbursements to insured individuals. The PRC is designed to protect the health of patients using prescription drugs and to provide supervision as to whether the pharmaceuticals provided are justified and appropriate, as well as to make it feasible to compile pharmaceutical statistics. Put simply, the PRC is a system which makes it possible to gather data from different national registries and system users and to use the data to organise the provision of the digital prescription service to various stakeholders. (Kruus 2013)

Several important developments were made in 2008 and 2009: a module was developed to enable the integration of the information systems of health care service providers and pharmacies with the PRC, a module for writing digital prescriptions and dispensing drugs was developed and a module for patient authentication was developed in pharmacies. All of the costs with regard to integration of the information systems (IS) of health care service providers and pharmacies with the PRC had to be covered by those involved. Also, a Mini Information System Portal (MISP) was developed by the EHIF in order to make it possible for doctors and pharmacies to use the service online even if they had no local IS. (Kruus 2013)

As part of the overall health information system implementation process, several broad campaigns were organised and user training events were prepared for health care workers between November 2007 and December 2008. The training courses focussed on filling in and transmitting digital documents. Several courses were also conducted by health care service providers and related software development companies. (Saluse *et al.* 2010)

The EPS was activated on 1 January 2010, from which date pharmacies were obliged by law to process prescriptions through the PRC (unless a few objective reasons were met). Due to the fact that many doctors were still issuing paper prescriptions, processing prescriptions through the TORU data transmission service remained active until January 2011. Since then, doctors have been obliged to issue digital prescriptions. In July 2011 all data transmission started going through the PRC. Since January 2012 all non-reimbursable prescriptions have also been digitalised. By 2012 almost all doctors and pharmacies had joined the system, whose usage level is characterised in Figure 2 – showing a clear positive trend since the implementation of the system. (Kruus 2013)

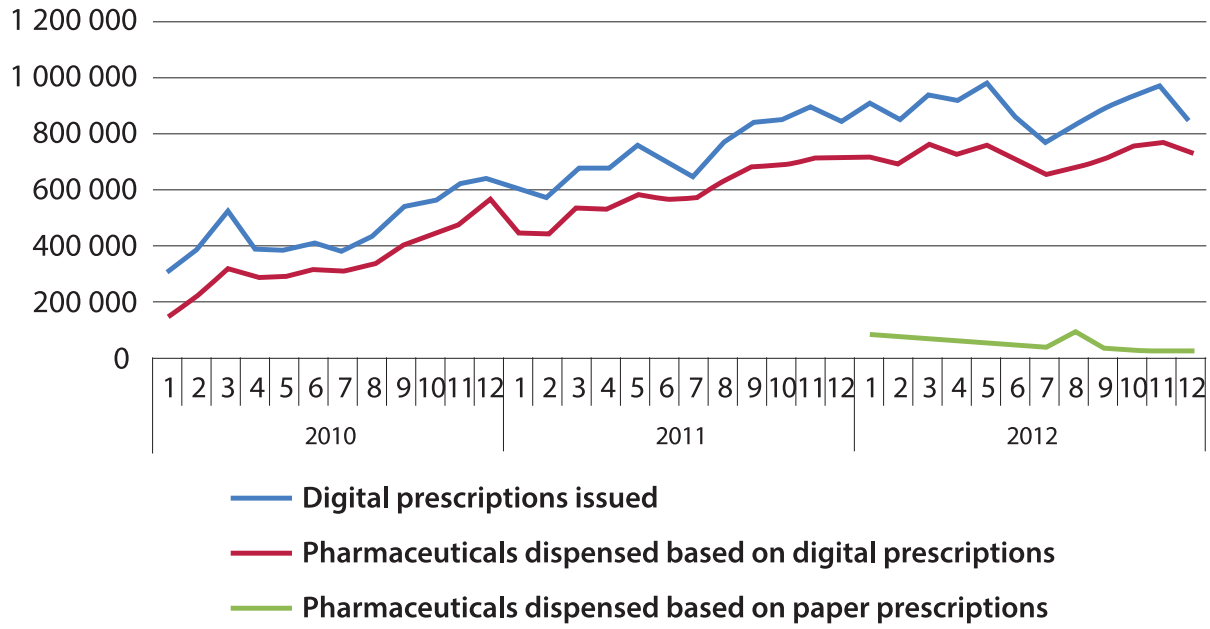
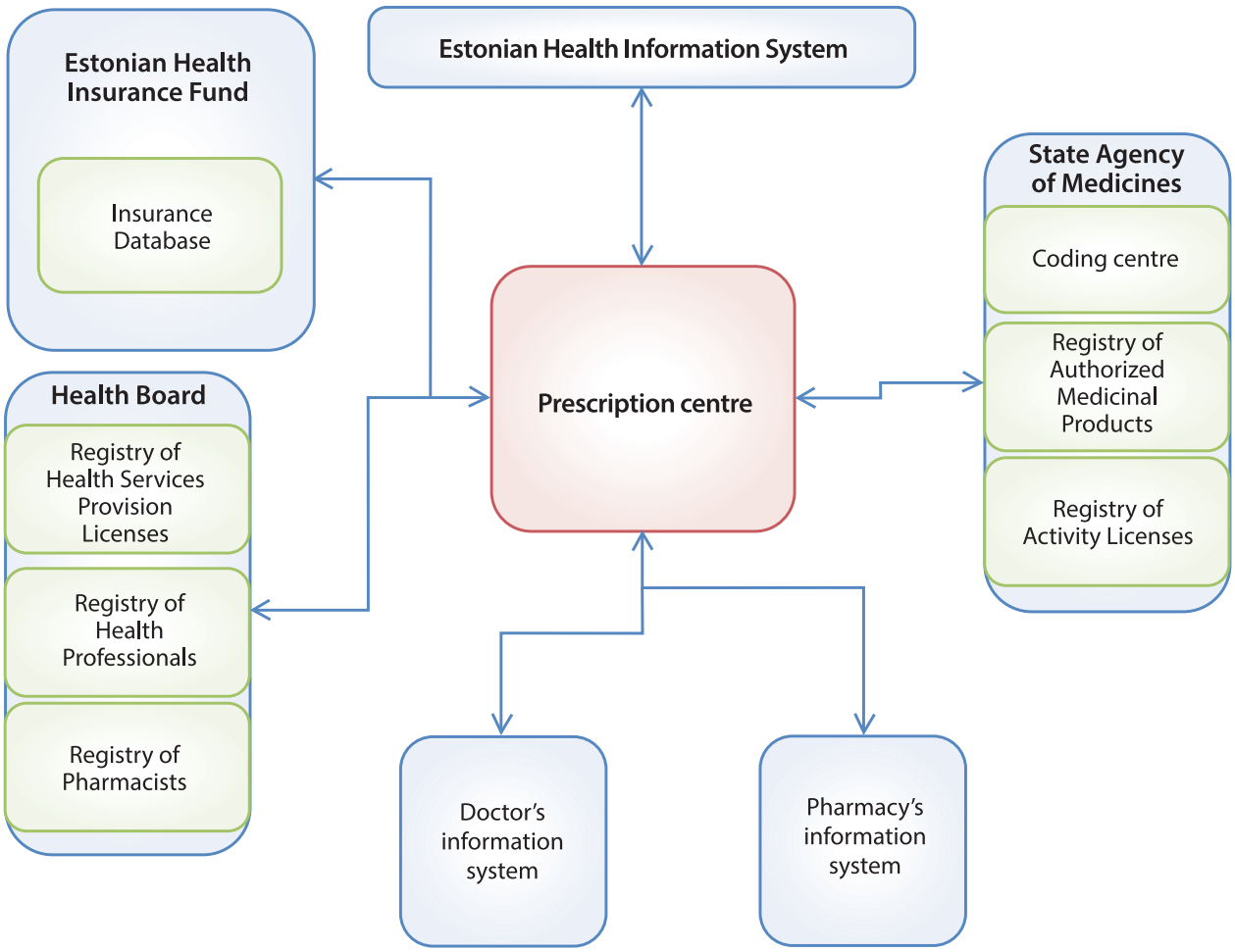


Figure 2. Digital prescriptions issued, pharmaceuticals dispensed based on paper prescriptions and pharmaceuticals dispensed based on digital prescriptions (only includes prescriptions processed through PRC). Source: Kruus 2013

In addition to doctors, patients and pharmacies, national registrars are also involved in the system, as the PRC gathers and checks relevant data from different registries. The following registries transmitting data were involved:

- National Registry of Health Professionals, National Registry of Health Services Provision Licences and National Registry of Pharmacists (registrar: Health Board);
- Insurance Database (registrar: EHIF); and
- Coding Centre, Registry of Activity Licences and Registry of Authorised Medicinal Products (registrar: State Agency of Medicines).

The intricate architecture of the e-prescribing system in Estonia is described in Figure 3, which shows the integral role of the prescription centre (managed by the EHIF) in providing the service, yet also the importance of other parties in doing so – pharmacies, physicians, state institutions and national registries.



Coding Centre / Licences x 2 / Authorised

Figure 3. Architecture of Estonian EPS. Source: Kruus 2013

The Estonian e-prescribing process is described below (Kruus 2013):

1. **Prescribing** – the doctor issues a prescription.
    a. Selection of patient or patient identification
    b. Diagnosis selection
    c. Active substance selection from list
    d. Reimbursement rate selection
    e. Other relevant data
2. **Transmitting** – instead of printing or paper-based documentation, the prescription data are sent to the PRC using X-Road
3. **Dispensing** – the pharmacist dispenses the drug based on the prescription.

    The patient must identify themselves at the pharmacy (based on their ID code).

    a. The pharmacist selects the correct prescription(s) from the PRC database, based on the ID code
    b. of the person. The relevant data about the patient, doctor and drug is automatically generated for the pharmacist.

c. In the event of problems understanding the prescription, the pharmacist contacts the doctor over the phone.

d. Once the drug has been dispensed, a notice is sent back to the PRC.

4. **Administering** – no changes regarding e-prescribing have been detected during the phase of administering the drug.

5. **Monitoring** – monitoring can be conducted at different levels: patient-specific prescription data can be seen by the doctor and the patient, while statistical monitoring can be done by relevant institutions such as the Ministry of Social Affairs, the EHIF, the Health Board and the State Agency of Medicines.

   a. The patient can access their outstanding prescriptions online from the patient portal or citizen portal and can also see whether doctors or pharmacists have accessed their data. The patient can also authorise other people (e.g. relatives) to buy the drugs on their behalf.

   b. The doctors can receive information as to whether the prescribed medicine has been dispensed and also see other prescriptions issued to the patient.

   c. The Ministry of Social Affairs, the Health Board, the State Agency of Medicines, the EHIF and the Estonian Data Protection Inspectorate can obtain statistics and reports on prescribing data.

   d. Monitoring is also done at the EHIF, where an administrator checks the flow of the system and conducts changes to base data (e.g. reimbursement rates and classifications of drugs). An operator provides a support service in the event of technical faults.

6. **Re-prescribing** – if the patient's disease or illness is long-term in nature and easily controllable, due to which a specific drug is used under a constant treatment plan, a new prescription can be issued over the phone.

6.2. EPS as opportunity to pilot nationwide deployment of health care information system in Moldova

The information collected during the workshops and site visits and also the literature overview reveal that several important components are in place in Moldova for EPS development.

- The **public** demand for EPS is high (Government Centre survey).
- An Information System for **Family Doctors** is under development.
- The **Family Doctor Association** is an important stakeholder in implementation and can provide input with regard to the training of family doctors (1500/1700 family doctors being members of the association).
- The **National Health Insurance Company** has named EPS a development initiative with the aim of improving accessibility to medicines. One of its strategic goals is to develop the concept of e-prescriptions by December 2015 and then to launch the system.
  The **State Agency of Medicines** has recently been reformed and has developed information systems for medicine-tracking (currently being piloted in one region). Support for better analysis and statistics of medicines (which should be part of the EPS), although currently the State Agency of Medicines and NHIC servers are separate.

- **Pharmacies** are privately owned, but drug reimbursement could be an incentive for IT adoption.

Pharmaceuticals worth approximately USD 35 million are procured annually through the Medicines Agency, while the remainder – worth USD 140 million; roughly 60% of the total volume – are imported through private channels. (More than 70 private importers/distributors operated in the country in 2010.) Only medicines authorised and registered in the State Nomenclature can be imported. In 2011, a total of 6134 products were registered, with approximately 800 active substances; however, not all were available on the market (Turcanu 2012).

6.3. Components of potential Moldovan nationwide electronic prescribing system

1. **Infrastructure for public e-services, Internet availability**

    a. There is a compulsory ID code for citizens in Moldova. This serves as the basis for secure authentication and entitlement of user rights for all health care professionals and citizens. Moldova has a very modern central government authentication policy in place. There is a universal ID card for citizens, a national data sharing environment is under construction and mobile ID is available.

    b. Computerisation of relevant institutions

    c. Registries. To set up Internet-based secure authentication of health care professionals there is a need for digital registries of professionals (doctors, nurses, midwives and pharmacists) and institutions. To date, different registries have not been connected electronically and most are not even in digital form.

    d. Internet. Moldova has up-to-date national high speed Internet availability in most regions.

2. **Organisational – responsible authority**. The organisation responsible for planning, deployment and maintenance of nationwide EPS. **The National Health Insurance Company** has stated EPS as a development initiative with the aim of improving accessibility to medicines. One of its strategic goals is to develop the concept of e-prescriptions by December 2015 and then launch the system.

3. **Legal issues.** Data security acts.
   During the interviews with stakeholders no major legal restrictions to the deployment of a nationwide EPS in Moldova were revealed. However, before this starts there is a need to conduct an in-depth legal analysis of different aspects.

4. **Financing – system development**. There is a need for a lasting mechanism of financing. An agreement for the covering of later administrative costs will have to be made. Also, the covering of the administrative and development costs of the care providers and pharmacies implementing the system should be discussed.

6.4. Roadmap for planning and deployment of Moldovan nationwide electronic prescribing system

1. Decision on the implementation of a nationwide EPS, including organisation. Establishment of the organisation responsible for EPS deployment. This process is led by the Ministry of Health.

2. Overview of background statistics of medicinal products, related services and professionals in Moldova:

   a. Description of availability of IT professionals in hospitals and pharmacies
   b. Number and distribution of personal computers
   c. Medicinal product registries
   d. Reimbursement system

3. Survey of the need for and type of training of professionals to use personal computers and training of professionals accordingly.

4. Analysis of legal environment – need for changes and barriers from Data Protection Law. There is a legal basis for the use of electronic health records instead of paper records and right to the use of patient health information.

5. Establishment of required electronic document standards for electronic health records.

6. Analysis of existing health care professional registers in Moldova.

7. Based on statistics and the survey, planning of necessary investments in:

   a. ICT software, hardware and network in hospitals; and
   b. nationwide electronic prescribing system.

8. Development of necessary digital registers and coding systems.

9. Public information campaign for citizens, professionals and stakeholders.

10. Safeguarding reliable Internet coverage for all system participants (including in rural areas).

11. Maintaining compatibility with other state information systems.

This list of activities does not cover all stakeholders or aspects and should be tailored according to surveys and the initial analysis of the current situation.

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Appendix 1. Summary of policy dialogue

Scenario discussion

QUESTIONS FOR DISCUSSION (to be added to each scenario)

Please describe the change in the process or services that the new e-health system would bring about.

Discuss who has or will have to do something differently compared to the service today. Consider the whole PATHWAY for the patient and all relevant stakeholders who are INVOLVED in the actual health care process, starting from relatives up to the government and everybody in between (including family doctors, pharmacies, hospitals, local and state governments, relatives et al.).

For THIS discussion it is important to focus on SERVICE encounters and EXPERIENCE. Please focus on what the stakeholders are doing WHILE PROVIDING services (and not legal, administrative, technical or other 'background' activities).

CASE 1

Alexandr is a 57-year-old office worker in a logistics company. He has type 2 diabetes, diagnosed seven years previously. He is slightly overweight (BMI=30) and has mild hypertension (155/85). He is married and has a 9-year-old son and a 13-year-old daughter. He lives in a suburb of Chisinau. He is on complex medication for his diabetes and hypertension and needs to see his family doctor every six months, as well as his endocrinologist, because his condition is poorly controlled. He was admitted to hospital with hypertension two years ago. He does not like seeing doctors, so he usually goes there if prescriptions need to be filled or when he feels bad.

Discussion: There is a **need to increase the level of knowledge** in order to improve the **self-management** of patients (with chronic diseases). The starting point is a **medical electronic patient** and a database is necessary, plus **exchange of information with the stakeholders or institutions** involved. An electronic patient with a central system is needed to ensure the **required service according to protocol**, including **informing the patient** about appointments (SMS/e-mail). Automated **messaging to a mobile phone** one week before the patient has to attend the appointment. It is necessary to monitor the patient through the system: the **patient can introduce data about the status** of their chronic disease. The patient is obliged to **test for the date appoint to lab**. They come to the lab and the **results of the test are sent automatically to their electronic card**. The doctor can see if the patient needs a change of treatment. We **exclude certain visits** to the doctor. We must ensure that the patient **learns** and **gives self-reports** about their health situation. We need to **evaluate patient risk factors**, and the electronic system will **generate certain messages**, with the patient receiving information about their health – for example what the chance of a heart attack is. We create certain **resources in their workplace** – they eat as healthily as possible, and once a week or once a month there are activities for the institution or worker: they have ways of implementing healthy lifestyles. Security in the **workplace** and **healthy lifestyle** training tools could be **part of the strategy/new system**.

Also, some services for the doctor to be **reminded that the patient is coming the next day** – time-critical **information availability**. Availability of **analysis and lab results**. **Prescribing medications** will be possible without extra visits and the patient can go to the pharmacy to collect them. The portal will be l**inked to other required data like information about** health and diseases and resources to **chat with other patients (social networking** possibilities) **and different specialists**. **Tips for chronic disease** patients – how they should act in

different situations. In conclusion, **educational materials should be part of the EHR platform in Moldova for the doctor and the patient**.

System for patients of **reminders on action** that should be taken – taking drugs, controlling blood pressure and so on. Telemedicine services that support patients should be **part of the strategy**.

Communicable diseases are in relation to habits or social background. This must be taken into consideration.

Table 1. E-services and IT solutions described by working group on 'working-age multiple chronic patient with limited interest in cooperation'

E-SERVICES	IT-SOLUTIONS
	UNIVERSAL ENABLERS
	Hospital information system • Doctor/professional information system (user interface) Laboratory IS Data exchange
SERVICES FOR PATIENTS	
Information service for patients • Monitoring/overview of health status	**Nationwide electronic health record** • **Database** **Patient portal** • **Individualised content** Decision-support algorithms for patients/relatives • Automatically triggered messaging Pharmacy IS
Education service • Eating style advice	
Self management service • Reminders • Advice to action (behaviour, consult etc)	
Social engagement service • Spouses & relatives • *Peers* • *'Disease groups'*	
Services **in workplace**	
E-prescription	
SERVICES FOR HEALTH PROFESSIONALS	
Information service for professionals • Monitoring/overview of health status	**Nationwide electronic health record** • **Database** • **Lab-/test-results** **Decision-support algorithms for professionals** **Laboratory IS**
E-Prescription	
Professional virtual "management" team	
Decision support service	
Professional development services • Research using big data • *Quality measurement/feedback*	
SHARED/INTEGRATED SERVICES for MULTIPLE TARGET GROUPS	
Shared decision making and disease management • Professionals and patients	
SERVICES for STATE/PUBLIC AUTHORITIES	
Information service for public authorities • Child health monitoring • Food at school	
Research using big data	

CASE 2

Marina is 70 years old, retired and living on her own in a small flat in Tiraspol. She has a son and daughter who only get to visit her once every 4-6 months, as they work abroad. Marina has generally been a healthy woman, but for the last five years has been treated for high blood pressure (165/90) – but only when she feels she needs the medication. Five years ago she was admitted to hospital after contracting severe influenza and then pneumonia. She tends to forget certain things, so her children think she might have dementia. Her family doctor does not agree with this, considering it normal, and has not ordered any tests or referred her to a psychiatrist. Her family doctor is more worried about chronic obstructive pulmonary disease and has suggested that Marina avoid flus and any other such infections..

Mapping of needs. Monitored constantly by doctors. Safety of movement in apartment. Recommendable interoperability ambulance and fire fighter. Smart monitoring of patient and connection of social worker. Communication with children who are working abroad, who should be monitoring their parent with the social worker. If there is software for monitoring, it should be possible for the children to communicate with the doctor about needs. Lots of ICT measures like Skype for communication between the parent and children. The family should be able to communicate through the system – give the doctor and other related parties information about the patient's behaviour.

Mobile delivery for home and home delivery of medications. With a mobile phone the patient will be notified about the arrival of medication. Measurements in database, deleted after two months for example. There is a great need to ensure re-engineering: instigate legislation, regulation between different institutions, use of equipment and software and associated and connected systems. An interoperability system will be needed. Women and children need to be trained. Work progress with medical staff involved.

Mobile ID could be useful. Registries about chronic diseases. Need for links with other registries – medical workers, population registry etc. Telemedicine for online consultation and monitoring of the patient. E-prescription system. Notifications and reminders system. Measurements and archive. Patient rights and legal framework. ICT networks. Need to ensure re-engineering of today's workflows. Regulate data protection area. Software requirements. Training of all stakeholders. Authentication system. Focus on the rights of accessing data – what are the rights of family doctors, family, specialist (how far can they go)? Note: health-related information is very sensitive data.

Table 2. E-services and IT solutions as described by working group on 'lone elderly chronic patient with concerned relatives'

E-SERVICES	IT-SOLUTIONS
UNIVERSAL ENABLERS	
Process reengineering • rights, • financial flow, • authority, • privacy Training about e-health and new rules • Professionals • Patients/relatives	Mobile phone ID Registry of chronic patients Registry of doctors/hospitals/admissions/…
SERVICES FOR PATIENTS	
Self-service for patients • Applying for medicines + mobile delivery • Communication of symptoms	**Telemedicine** - **Bracelet** - **Measurement of movement** **Nationwide electronic health record** • **Database** ***Patient portal*** **Decision-support algorithms for patients/ relatives** • **Automatically triggered messaging**
Self management service • Notification reminder • Constant monitoring	
Professional **quality monitoring** - > patient feedback, complaints	
SERVICES FOR HEALTH PROFESSIONALS	
Professional virtual "management" team	Nationwide electronic health record • ***Shared care health record*** Decision-support **algorithms** for professionals Doctor **direct communication** with pharmacy *Pharmacy IS*
Information service for professionals • Constant monitoring	
Quality measurement/feedback	
E-Prescription	
SHARED/INTEGRATED SERVICES for MULTIPLE TARGET GROUPS	
Collaborating shared care virtual network • all services beyond healthcare • social worker - > social support service	NInteroperability platform Nationwide electronic health record • ***Shared care health record***

CASE 3

Andreea is a 30-year-old mother of a 4-year-old son, Adrian. They live just outside Chisinau in their own small house. Andreea's husband works as a consultant for an international company and goes on frequent business trips. Andreea is an accountant and has been trying to return to work for the last year, but Adrian often falls ill when he goes to kindergarten, usually with a respiratory infection of more than average severity. Andreea therefore has to visit their family doctor often with regard to Adrian's illnesses. They have been to hospital twice for tests, but nothing special has been discovered to explain Adrian's frequent bouts of illness. So far doctors have simply told her to observe Adrian's condition and treat him with non-specific medicines.

There is a need to improve primary care and hospital level and to have a unique medical card for the patient. All stakeholders need access to the system – family doctors need information to cooperate with other medical

specialists. Family doctors have to work very well with other sectors/hospitals. Territorial hospitals should be included in the system. If the family doctor cannot solve the case, they must refer it on to a specialty doctor. Include territorial institutions and cooperation with social assistance.

We can implement a medical card to help boost the efficiency of doctors. The social system and ambulatory service providers should be on the stakeholder list also. Specialists could then consult family doctors. Interoperable systems could provide better possibilities for rehabilitation – access to service through the acknowledged need for service. Closer cooperation between hospital and primary care thanks to e-health systems. A referral system provides better accessibility to services. Waiting/appointment system needed. There is a need to generate initial information at the primary health care level: who is monitoring the patient, why the patient has been hospitalised and what the result is. Children's education – eating habits: we will create a system for children to monitor their eating habits. The system will be given to relatives, spouses etc.

Difference between current and future situation regarding e-health services: the patient/citizen will have more freedom of choice (possibility to choose doctor/specialist). Note: the patient has the right to make their own decision about their service provider. E-referring of patients is not yet understood and requires greater understanding.

Table 3. E-services and IT solutions as described by working group on 'mother with sick child'

<table>
<tr><th>E-SERVICES</th><th>IT-SOLUTIONS</th></tr>
<tr><td colspan="2">UNIVERSAL ENABLERS</td></tr>
<tr><td>Process reengineering
• Territorial service - > More freedom- choice
• Training about e-health and new rules
• Professionals
• Patients/relatives</td><td>Mobile phone ID
Registry of chronic patients
Registry of doctors/hospitals/admissions/…</td></tr>
<tr><td colspan="2">SERVICES FOR PATIENTS</td></tr>
<tr><td>Self-service for patients
• Appointment booking (more freedom; choice!)
• referral</td><td rowspan="3">Telehealth</td></tr>
<tr><td>Self management service
• Advice</td></tr>
<tr><td>Social assistance</td></tr>
<tr><td colspan="2">SERVICES FOR HEALTH PROFESSIONALS</td></tr>
<tr><td>Professional virtual "management" team
E-Referral</td><td>Seamless information flow between primary and hospital care
• Nationwide electronic health record
Advice
• Decision-support algorithms for professionals</td></tr>
<tr><td colspan="2">SHARED/INTEGRATED SERVICES for MULTIPLE TARGET GROUPS</td></tr>
<tr><td>Collaborating shared care virtual network
• Territorial service - > advice</td><td></td></tr>
</table>


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