Building Sustainable Digital Health Services in Europe: lessons learned from the COVID-19 Pandemic

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Introduction

COVID-19 has posed significant challenges and has highlighted many weaknesses in the health and social care systems of countries around the world. Faced with an international public health emergency a nation's ability to generate, share and use reliable information efficiently and across national borders in a timely manner has been shown to be of critical importance. However, the majority of public health systems have been found to be lacking the level of digital data structuring, necessary infrastructure and operational systems and processes to do so. On the one hand, the pandemic has placed pressure on all agencies and building blocks of a health system: governance, financing, service delivery, medicines and equipment, health workforce and health information. On the other hand, the same challenges faced by healthcare systems at a time of extreme crisis have proven to be an outstanding driver of change.

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On the 15th of September 2020, the Croatian Ministry of Health, the Directorate-General for Structural Reform Support and the Directorate-General for Neighbourhood and Enlargement Negotiations of the European Commission organised a workshop ''Building survivable eHealth strategies during crisis'' to share the knowledge on how to develop a resilient eHealth strategy for the 2021-2027 Multiannual Financial Framework. The workshop gathered a broad range of digital health experts from national health ministries, health care facilities, informatics, including representatives of EU funded projects.

This paper presents several eHealth innovations developed and used at local and national levels to help coping with the COVID-19 world pandemic in spring 2020 and provides a handful of practical recommendations and action points to the EU and national stakeholders.

Recommendations and action points

Practical lessons learnt during the current pandemic can be translated into the following overarching recommendations, supported by examples. The examples are simply for illustrative purposes and showcase good practices that have been delivered within one or more countries in Europe.

Recommendation 1: Ensure clear and consistent internal and external communications

Croatia managed their external communications via the official government website Koronavirus.hr for accurate and verified information on Coronavirus, including multichannel content delivery (Facebook, Instagram, Twitter, and YouTube) and internally through their national digital platform for infectious diseases monitoring.

Recommendation 2: Utilise/repurpose existing digital tools and services wherever possible

Estonia has deployed an integrated ICT infrastructure across all government agencies allowing citizens to have a digital relationship with government. This matured e-health infrastructure has made it possible to utilize and mobilize most of their health data at low cost. The Estonian national health information system (NHIS), which is based on the international data exchange standards, universal classifiers where most of the clinical documentation is stored, allowed quick re-engineering of e-services for the analysis of real-time data about the COVID-19 situation, including all of the COVID-19 laboratory test results, information about patients treated in primary health care and in hospitals as well as the number of people recovered or deceased. Estonian residents could access their test results on a national patient portal immediately after they were sent to NHIS, also patients could ask for sick

leave directly on the patient portal taking an unnecessary administrative burden off the healthcare system. Already seasoned services such as national e-prescriptions, doctor-doctor e-consultation and e-referral systems provided the opportunity to minimize the need for physical contacts in the healthcare settings, increasing extra safety and optimized resource use for both clinicians and patients.

The established national e-prescription system, running for a number of years in **Greece**, has provided a solid base for the immediate response to the COVID-19 pandemic. Utilizing existing services and infrastructure, as well as the large existing data pool, Greece has provided new functionalities for paperless e-prescription of drugs and e-referral for diagnostic tests, dispensed electronically via SMS and/or email. Additionally, the option of remote re-issuance of prescriptions for chronic patients helped eliminate unnecessary visits and reduce infection risks, especially for the most vulnerable.

Recommendation 3: In developing new services, ensure they are safe, effective and person centred

Slovakia developed a COVID-19 PASS, an electronic passport for patients with suspected and/or a confirmed case to enter into the healthcare system. Patients with symptoms can apply for a medical check-up either at the official website (https://www.old.korona.gov.sk/covid-19-patient-form.php), via the mobile app (https://www.old.korona.gov.sk/en/mojeezdravie.php) or via the call centre. After registration they receive an SMS notification about the next steps of the process within a maximum of 4 days. Some might receive an invitation to be tested for COVID-19, others might stay in quarantine and self-monitor and those with a negative test result are notified. All the data is captured and made available to the regional epidemiologists.

eHealth services for employers in **Croatia** through the eHealth Business portal provided employers with insight into the data required for the calculation and payment of salary compensation as well as information about temporary incapacity for work / sick leave report for individual employees. In addition, the CHIF has enabled employers to submit a request for a refund of paid benefits, regardless of the causes of sick leave, electronically to CHIF regional offices. Paper reports on sick leave do not need to be attached to financial compensation request, as the information necessary for the verification is obtained electronically from the CEZIH system.

Recommendation 4: Design services to secure a lasting legacy for the investment utilizing the skills of all actors

E-hackathons „Hack the Crisis" and „Global Hack" initiated by the private sector in **Estonia**, brought together actors from the public, third and private sectors to create solutions to help fight the crisis.

Numerous scalable solutions like Dashboard for Estonian Coronavirus stats and spread, Workforce sharing platform, Border crossing times live map to help logistics companies and others (https://accelerateestonia.ee/en/hack-the-crisis/) were created during the hackathons that are currently being used in Estonia by the public sector, hospitals and citizens. Also, the Estonian contact tracing app HOIA (translated as "take care" in Estonian) was created by 12 IT and design companies coming together to collaborate with the Ministry of Social Affairs. Since all the work was voluntary, the public cost of the app development for Estonia was low.

Recommendation 5: Do not simply focus on technology innovation. Give equal consideration to service innovation (the service design) and business innovation (the funding reimbursement models) to secure adoption and scale.

Technological innovation is aligned and integrated within with the current Digital Health Strategy in **Catalonia, Spain.** This has secured a number of key benefits: a unique entry point for citizens to eHealth services (My Health portal, LMS), the integration between service providers and corporate information systems (Shared Electronic Health Record) to guarantee that solutions can be deployed in all the regions, and to minimize investment by care providers through common tools (such as videoconferencing service and e-Consultation tool). Also, the healthcare process has been redesigned to allow professionals to work from home (installing VPNs), and improving triage systems to differentiate between patients that can be treated remotely and those who cannot.

Telemedicine was a crucial part in avoiding unnecessary contact between patients and healthcare providers, especially general practitioners. Therefore, the Slovakian Ministry of Health issued new codes for healthcare providers to reimburse their telemedicine expenses, i.e. consultation through extended electronic communication in the online environment (web application, video call), crisis psychotherapeutic intervention through electronic communication and others.

Also, the Estonian Health Insurance Fund started to reimburse the provision of teleconsultation services in specialist care, which in turn remarkably raised. In total, out of 200,000 doctor visits during the crisis, about 40 per cent were carried out online, providing a viable alternative to face-to-face consultations.

Recommendation 6: Ensure that the health care workforce is supported with training and education; improve citizen participation.

In order to encourage remote visits between citizens and health professionals in **Catalonia, Spain**, different materials were produced on the use of telemedicine tools (telephone, e-Consultation and video consultation). Use cases, inclusion/exclusion criteria and best practices were described in a user-friendly graphic way for professionals and citizens. In addition, access to eConsulta (an asynchronous secure messaging system) was facilitated by simplifying the registry process, previously done in person at the doctor's office, to a fully on-line process where citizens could register and access it from home.

Recommendation 7: Agree on a minimum data set for disease management and have a robust data governance structure to allow data to flow safely and securely to where it is needed.

Scotland's approach was to avoid building tools for public health surveillance activities in isolation – but instead developing systems that empower monitoring in the context of a broader array of assessment tools used by both people in direct contact with the NHS and those who are not.

A suite of digital tools were delivered to enable integrated COVID-19 monitoring in the community by leveraging existing solutions and partnerships. One example is a structured assessment and decision support tool for COVID-19 presentations. The tool was designed to be used by clinicians working in COVID assessment centres, Accident and Emergency Departments, but also to be used by paramedics and care home staff ensuring structured data collection, evidence-based decision making and live data feeds being available to feed the health services business intelligence functions. These tools serve to relieve pressure on front line health service delivery but, through the utilization of NHS Scotland's existing ICT infrastructure, can also create a near real time public health intelligence system. This is helping to better understand the progression of the disease across communities.

Slovakia has put a lot of effort into digitising most of the processes required to respond to the COVID-19 pandemic, in order to simplify and standardize patient flows, workflows and data flows and created the ''COVID-19 data warehouse.'' The National Health Information Centre (NHIC) collects a substantial amount of data from healthcare providers and produces relevant health indicators. On a daily basis, all hospitals (both public and private) provide updated comprehensive information about hospital bed availability in different departments (infectious diseases, intensive care units, etc.), patient situation (confirmed cases, discharged, recovered), health staff status (doctors, nurses, other medical workers

in above mentioned departments), material equipment (current state and daily consumption) and medicines (https://iszi.nczisk.sk/iszi/; https://covid-19.nczisk.sk/sk).

Recommendation 8: Utilise data-driven evidence-based practice that delivers trust across all professional groupings and the wider population when planning, designing and delivering services.

It is important to ensure that professional groups and citizens can fully trust innovative digital solutions and can accept them without fear. To provide transparent statistics of the pandemic situation in Estonia, a dedicated web page with daily statistics and open data sets were set up to download for public (https://www.terviseamet.ee/et/koroonaviirus/koroonakaart). Many European countries and regions have adopted a similar open approach to citizen data sharing in the context of Covid19.

The STOP-COVID19 app was released in **Catalonia, Spain** to collect data about a citizen's status of symptoms, and then mapped these into interactive tools, which were accessible by the healthcare providers and citizens. Data collected about contact tracing of COVID-19 patients at a regional level in Catalonia is currently being integrated with the Spanish Health Ministry systems, thus creating a national database for contact tracing.

Czechia used a centralized contact centre with a central EPI dashboard integrating several data sources (both new and existing). Czechia created the eRouška application, which helps the public health office to trace persons at risk of being infected due to a contact with a positively tested person. In contrary to other similar apps, eRouška does not collect information about a person's location. It only searches for other who have downloaded eRouškas. The app does not require active internet connection. Thus it can work anywhere, even in a subway.

Recommendation 9: Ensure that systems are in place or can be accessed transforming data to information and intelligence and securing real time monitoring and management at individual, service, regional and national levels.

The National Patient Registry for COVID-19 in **Greece**, developed according to WHO recommendations and the specifications set by the Hellenic National Organisation of Public Health (EODY), records all relevant patient data and monitors treatment and outcomes in order to enable better management at individual and national level, and to help evaluate the incidence, the prevalence and the impact of the disease and assist in the design of appropriate therapeutic protocols. The registry is interoperable with the national e-Prescription System and the national EHR system. Furthermore, in Greece the national

Reporting Business Intelligence System was upgraded so as to monitor the availability of resources in the health units (such as consumables, number of ICU or other beds, etc.), and the impact of the pandemic (such as ICU coverage, performed tests, number of cases, intubations, discharges, deaths, etc.) in order to ensure that these resources were properly allocated and the future needs projected.

Recommendation 10: Support organisations to better understand, acquire and utilise digital tools and services that support citizen empowerment

Organisations have to become aware that investing in digital solutions and supporting digital transformation is crucial in making global health systems, governments and public administrations more resilient, and in building capacity to establish and utilise efficient, interoperable, secure and trust-based data spaces across organisations, countries and sectors.

Overall, delivering digitally transformed processes, services and solutions to professionals across domains as well as to the public, has to be continuously supported by digital skills empowerment and training efforts, as digital literacy has become a prerequisite to tackle challenges in these ever-changing circumstances.

As one of the first solutions of its kind globally, on April 14th **Croatia** launched Andrija.AI, a digital assistant for informing and advising citizens about COVID 19 and facilitating the organization of medical follow-up. The struggle with the pandemic emphasized the importance of close cooperation between citizens and the Ministry of Health. In partnership with the Ministry of Administration, which is responsible for the digitalization of all public administration processes, and with the help of Croatian companies in the Croatian Association for Artificial Intelligence CroAI, the digital assistant Andrija was created. Andrija.AI as a project is systematically upgraded in cooperation with all stakeholders and contains the latest protocols, guidelines and knowledge, which changes frequently during crisis. Chatting with Andrija is like chatting with the leading epidemiologists. While using it, citizens help its development. The number of calls to medical professionals across all health centres in Croatia has reduced, by referring people directly to the central coronavirus hotline, individuals can be given the necessary reassurance that they need to stay at home and so take pressure off the health system.

The "**Scottish** Tech Army" was created by volunteers from Scotland's technology community, applying their talents, creativity and commitment to the rapid delivery of solutions to the immediate and ongoing problems being faced by communities and charitable organisations trying to support people affected by the COVID pandemic. This is an example of how volunteers from the tech industry, who were furloughed from their employment could not only support businesses and organisations

(charities and community groups) to manage through the challenges of COVID-19 but also support their own health and wellbeing by creating a sense of purpose and worth.

There is also a number of other initiatives deployed to empower citizens during the pandemic. For instance, in **Greece** the 'https://covid19.gov.gr/' portal was created to provide information, guidance, and support to citizens. The platform features a geographical map that demonstrates and readily updates the 4-tier coronavirus alert and containment system currently in place, for each region of the nation, so that all locally enforced preventive measures are properly communicated to the citizens. Additionally, the e-government portal 'https://www.gov.gr/', was launched earlier than scheduled because of the pandemic, and, although it is not strictly health related, it enables the e-processing of time-consuming bureaucratic procedures, providing electronic access to hundreds of services to assist in the enforcement of social distancing.

Recommendation 11: Review and refresh digital health and care strategies in light of experience, including connectivity, standards, interoperability, data governance and security, consent and trust issues.

Having an up to date Digital Health Strategies can create an environment that allows a country or region to secure a "quick response" to the challenges of the pandemic, providing an appropriate basis develop and deploy innovative solutions and to sustain digital transformation into the medium and long term. Interoperability of services and sustainability of digital tools can be achieved by having clear guidance and effective governance including updated digital health roadmaps that are regularly reviewed and refreshed by health authorities. This ensures that all actors have clarity as to the rules of engagement within a health system, which serves to reduce the risk in the development of new digital tools or services.

Catalonia's Health Plan defines "digital health" as one of the main pillars of healthcare. This general approach to healthcare is complemented by the *Digital Health Strategy*, providing an approach for health information systems to guarantee interoperability and integration among healthcare providers. From a more service-oriented perspective, a new model for remote interactions utilising mobile tools is being developed, helping transformation to be achieved not only technologically, but also from a healthcare practice perspective.

Experience from many countries has shown that the areas of data security, digital data structuring and standardization, and interoperability are key issues that require special attention and focus.

When it comes to data security, data processing should take place in a lawful manner, meaning that only relevant data are collected and processed, all necessary technical and organizational security measures are applied and the processing of personal data is always carried out in the context of the principles of accountability, proportionality, data minimization, transparency, privacy-preserving, security, integrity and confidentiality.

For data structuring and interoperability, coexistence between present and emerging or upgraded systems – especially when it should be achieved in the tight timeframe of crises, where the pressure for data analytics and effectiveness is heightened – is a major challenge for the already highly diverse and heterogeneous digital health systems. Therefore, interoperability calls for – among others – careful planning, a collaborative environment, and proper regulatory interventions, use of internationally agreed standards and taxonomies, and faith in the healthcare ecosystem. Without doubt, requirements of meaningful use of data and definition of data flows should be met, wide adoption of standards and integration profiles should take place, choosing the right technologies and implementing the right interfaces is of the utmost importance, implementing security, privacy and data protection requirements is also critical, proper testing prior to the release is necessary, and so on.

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Conclusions:

All of the countries are faced with similar epidemiological and demographic challenges. Multi-morbidity is becoming an increasing challenge, health systems are not well prepared to manage chronic multi morbid patients as existing health system design has been built around historic acute, episodic models of care. Too many health care systems are still doctor and not patient centred, based on hospitals not on systems thinking and where knowledge is not managed adequately. Patients are having to navigate through complex health systems which creates many challenges both for the individual such as equity of access but also for the delivery organisations in terms of safety, effectiveness and value for money. Healthcare itself is data rich but information quality is poor. Therefore, health care is in need of innovative solutions. Technology and innovation can play a significant role in addressing the challenges being faced by European healthcare systems, but what is lacking is a cultural change. Adoption can be facilitated by having a long-term strategy and a robust resilient ICT infrastructure that can evolve to cope with the constantly evolving world of technology and service innovation. However, in Europe we need to put more thought into how we safely introduce new technologies into our existing systems. We need to develop an approach to the use of digital solutions that underpin the delivery of sustainable healthcare services (digital does not necessarily mean getting rid of paper). It should secure improved clinical practice and preserve patient's privacy

and empower citizens through access to trusted information and advice. Change is a long-term process that initially requires visionary thinkers and then perseverant leaders to make it a reality. We cannot rely on global crises such as the current pandemic to be the enablers of transformational change.