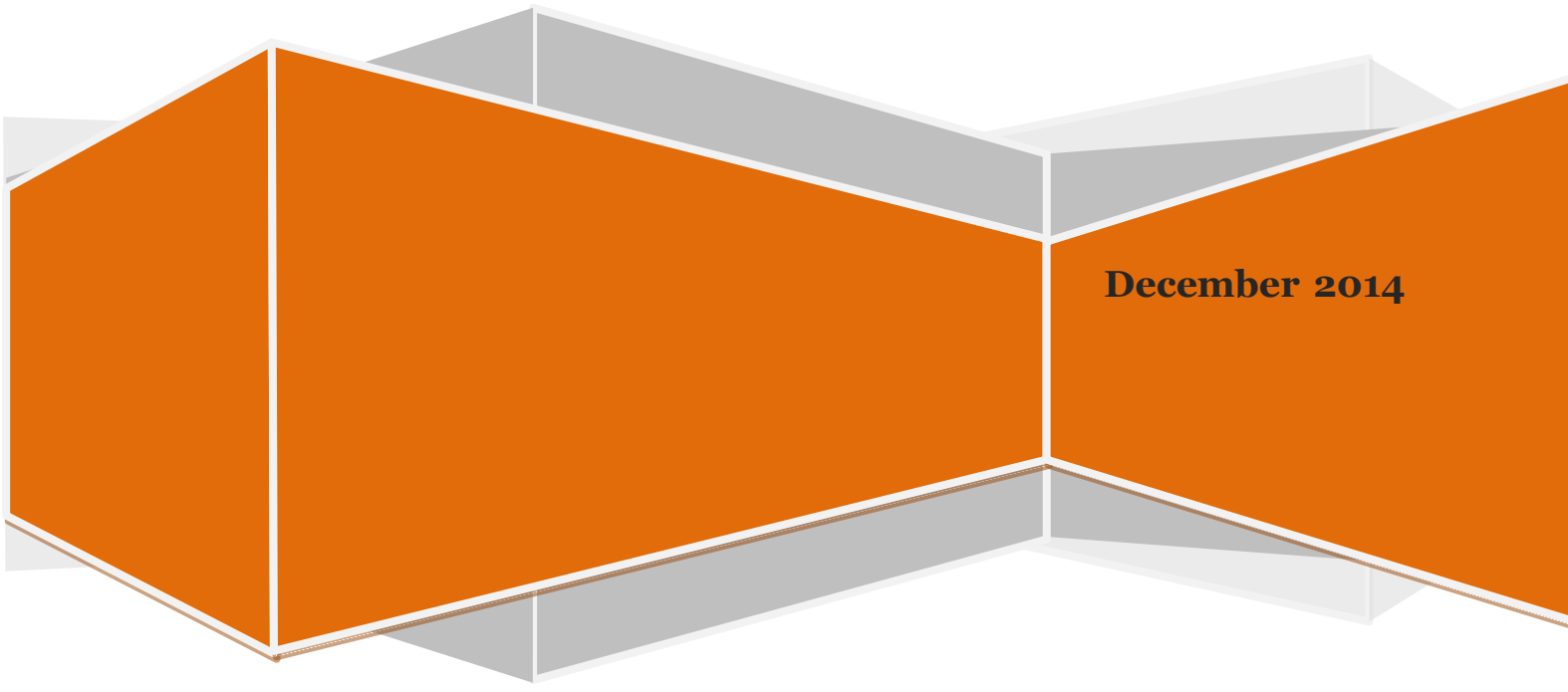
Fondation IDEA A.s.b.l.

Healthcare system sustainability in Luxembourg: a reality or a utopia?



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Abstract

Why perform a study on healthcare system sustainability?

Luxembourg is characterized by a rather generous public healthcare system that stands for universal access. However, given the economic constraints, this generosity brings the sustainability of healthcare system under question. With this report, Fondation IDEA aims at informing the relevant stakeholders on the way forward by adopting a holistic[1] and simultaneously international perspective on healthcare organisation.

In the years following the economic crisis of 2008, Luxembourg has been trying to address the sustainability issue by undertaking a number of structural reforms in the healthcare sector. Some of these reforms seem to face significant operationalization hurdles, whereas others need to catch up with the current trends in the gradually globalised healthcare industry. By placing Luxembourg's initiatives in the global healthcare trends context, we try to disentangle the hurdles Luxembourg faces and suggest ways to move forward. Towards this direction, the literature review we undertook is supported by information derived from a series of open discussions with various stakeholders. As a result of the aforementioned approach, we identified seven pillars considered as being crucial for the future development of the Luxembourg healthcare sector:

1. Given that hospital expenses are among the driver costs of healthcare budget, hospital planning and budgeting should continue to score high in the policy agenda of Luxembourg.
2. The initiative of the "*médecin référent*" is in line with the global trends towards a paradigm shift in physician's practice and remains an important aspect of the healthcare policy reforms.
3. Diffusion of biomedical research, besides the profound advantages for Luxembourg's population's health, appears as a promising sector of economic activity that needs to be boosted.
4. Making the most out of ICT solutions is a way to establish an efficient and effective way to communicate health related data. Moreover, it offers significant economic opportunities as well.

[1] By a holistic approach is meant to identifiy and to engage all relevant stakeholders while developing the healthcare sector in Luxembourg.

5. Cross-border health is a promising field for Luxembourg, in particular as its strategic place offers a substantial economic opportunity for Luxembourg and the Greater Region.
6. Heath Technology Assessment (HTA) gradually becomes an area of interest for Luxembourg, adding significantly on the information needed for effective decision making.
7. Last but not least, accounting for patients' preferences is gaining grounds across the globe, partly forming healthcare policies.

In sum, this report aims to be used as a roadmap for the ways forward in healthcare in Luxembourg with a holistic and international twist. Thus, the policy recommendations presented in this document are in no way binding but capitalize some of the most important healthcare issues Luxembourg faces. Once again the scope is to raise awareness among the various stakeholders and prepare the grounds for a productive dialogue that will frame Luxembourg's healthcare policy of tomorrow.

Introduction

Sustainability and accountability are highly placed in the global health policy agenda. Countries around the globe are trying to allocate scarce resources in a rational way. Health budget presents a vast diversity among countries but remains a sensitive topic, especially in the wake of the crisis. After all, health is a fundamental right and as the proverb goes, one can't play with health. If not guaranteed, the effects in productivity and everyday quality of life could be adverse.

But the question rises, should we really change a healthcare system that is truly universal based solely on economic constraints? In Luxembourg, a number of reforms have been adopted in the past few years, following the paradigm shifts in the international health policy arena. In order for the healthcare sector -as any other sector- to survive, it should operate in a sustainable manner. Thus, these reforms should aim at a sustainable development of providing healthcare in Luxembourg. The question that remains is the pace at which Luxembourg is incorporating these reforms and whether it does so by emphasizing their benefits, especially in the long run. The answer lies in the system itself. That is why it is pivotal to understand first the particularities of the Luxembourg setting and then try to address the policy hurdles that persist.

To rethink the existing system does not mean that everything in it is wrong and in need of radical changes. We should rather identify the strong aspects of the existing healthcare system, boost them, and introduce elements of best practice applicable to Luxembourg's setting. First thing first, look upon Luxembourg's own prevention policies! According to the European health consumer index (EHCI), Luxembourg ranked 1st in preventive services[2]. Healthcare systems do not merely comprise acute healthcare services. They include actions towards prevention of illness, health promotion and efforts for persuading other sectors to address health related issues within their jurisdiction (WHO, Tallinn Charter: "Health Systems for Health and Wealth", 2008). Therefore, it is crucial to identify and account for all relevant stakeholders in healthcare, in order to have targeted solutions.

In this respect, we are introducing a set of seven policy recommendations that aim at addressing all the relevant issues to Luxembourg's setting. These policy recommendations result from a thorough literature review regarding Luxembourg healthcare setting and the

[2] The EHIC has used the following indicators for assessing prevention in Europe from the viewpoint of the consumer and patient: infant disease vaccination, blood pressure, smoking prevention, alcohol, physical activity, undiagnosed diabetes, HPV vaccination, sugar intake.

global healthcare trends. This review is supported by open interviews with healthcare stakeholders, including medical professionals, CNS (*Caisse Nationale de Santé*) representatives, representatives from the biomedical frontier and last but not least representatives from the patient organization.

Policy Recommendations

The perturbations of the business models and technologies, notably the IoT[3] models, Big Data, connectivity, interoperability and security have profound implications on health. It is the aim of the subsequent policy recommendations to set some light on what could be done but more importantly to initiate a dialogue between all key players to set the healthcare system of tomorrow. Especially, hospital planning and budgeting score high on the policy agenda. The role of the general practitioner and the '*médecin référent*' play a significant part in those recommendations. In addition, ICT and advances in the biomedical field play a significant role in healthcare service delivery. Cross-border health can be especially for Luxembourg an economic pillar. Not to forget how crucial it is for health technology assessment (HTA) to be embedded as a fundamental part in decision making, most importantly accounting for the end-user's - i.e. patients - preferences.

1. Hospital planning and budgeting

In 2008, a reform took place in the healthcare setting of Luxembourg introducing the '*statut unique*' and setting the foundation for the CNS[4]. The latest big reform dates back to the law of 17 December 2010[5]. The overall aim of the structural reforms of 2010 law was to ensure in the long run sustainable financing, quality optimization and competitiveness within the Greater Region (IGSS, 2013). A fundamental part of the reforms introduced by the law of 17 December 2010 was the planning and the budgeting of hospital care, in order to reduce hospital expenditure, one of the main driver costs of healthcare in Luxembourg.

[3] After the World Wide Web (the 1990's) and the mobile Internet (the 2000's), we are now heading to the third and potentially most "disruptive" phase of the Internet revolution – the *Internet of Things*. The *Internet of Things* links the objects of the real world with the virtual world, thus enabling anytime, anyplace connectivity for anything and not only for anyone. It refers to a world where physical objects and beings, as well as virtual data and environments, all interact with each other in the same space and time (CERP-IoT, 2010).

[4] Loi du 13 mai 2008 portant introduction d'un statut unique (Mémorial A N°60).

[5] Loi du 17 décembre 2010 portant réforme du système de soins de santé et modifiant: 1. le code de la sécurité sociale; 2. la loi modifiée du 28 août 1998 sur les établissements hospitaliers (Mémorial A – N°103).

To this day, despite the genuine willingness of the relevant parties to bring these initiatives into force, little has been done to put them into practice. In the governmental plan of 2013, the new government has readdressed the reforms outlined in the law of 2010 and in particular concerning the hospital sector, it has stressed the importance of planning. One of the fundamental aspects of the hospital planning is the '***plan hospitalier***' for the development of medicine within hospitals, and the improvement of the collaboration among the different providers in order to have an efficient resource allocation. To this end, CNS has been working with the '*Commission permanente du secteur hospitalier*' (CPH) in order to keep this hospital plan updated and in line with the current trends in hospital care (CNS, Rapport Annuel 2013, 2014). At the same time, the need for centralization of hospital services such as IT led to the creation of GIE LUXITH[6]. The latter is a tool that allows for a central electronic disposition of data regarding hospital activity. The digitalization of imaging technology data is an effort towards this direction. But this is just a step among many steps required in order to achieve efficient and effective information flow between hospitals.

In addition to hospital planning, there have been some changes introduced in hospital budgeting, namely the **global envelope budgeting**[7] and **management accounting**[8] in 2012 and 2013 respectively (CNS, Rapport Annuel 2013, 2014). Both measures were advocated by the 2010 reform as important elements for the long term prosperity of Luxembourg's health system. As far as the envelope budgeting is concerned, it has been applied for the first time in 2012 for setting the annual budgets of 2013 and 2014. In this context, CNS has negotiated the budgets with the hospitals bearing in mind the overall funding cap. In terms of management accounting, from January 2013 the new accounting plan has come into force, with projections for 2015/16 based on the numbers for 2013/14.

The *Union des Entreprises Luxembourgeoises* (UEL) has underlined the importance of both hospital planning and management accounting. In regards to the latter, UEL stressed the fact that this can only be beneficial if all hospitals adhere to a single norm of this practice (UEL, 2010). Thus, it seems crucial for all hospitals to share the same IT systems for financial

[6] GIE LUXITH is funded in 2012 and aims among others at the operationalization of strategic plan on a common IT system for the hospital sector in Luxembourg which is among the conjoint objectives of CNS and the *Fédération des Hôpitaux Luxembourgeois* (http://www.luxith.lu/).

[7] Envelop budgeting is a popular method for visualizing and maintaining a budget. The key idea is to store the cash to meet the separate categories of expenses. On a regular basis (i.e. monthly, biweekly, etc.) a certain amount of money is set aside for a specific category in an 'envelope'. With this method, the amount of money left to spend in a given category can be calculated at any time by counting the money in the 'envelope'.

[8] In management accounting, managers use the provisions of accounting information in order to better inform themselves before making decisions, which allows them to better manage and perform control functions. Compared to financial accounting, it is forward-looking and model-based.

administration. The centralization of hospitals IT via GIE LUXITH has been in line with UEL's recommendation and it shows that for structural reforms to work there is a need for changes on all levels and in all aspects relative to hospitals' functioning. Nonetheless, UEL has gone further by recommending not only ways to translate the reforms of the 2010 law into action, but also suggesting a reform of the CNS structure itself. It suggests in particular to implement a reform in response to the need for a surveillance committee along with external controls, ensuring transparent operation of the CNS as the major administrator of the '*assurance maladie-maternité et dépendance*'.

For hospital planning to work, it is of great importance for the government and CNS to have comparable information on hospitals' activity. Towards this direction is the **'*documentation opérationnelle*'** of hospitals activity. A pilot of this initiative has been launched during the first semester of 2014 under IGSS and an advisory board assigned by the state (CNS, Rapport Annuel 2013, 2014). A fundamental part of the '*documentation opérationnelle*' is the **'*tarification à l'activité*'** which refers to diagnosis related groups system (DRG). In the DRG system, hospital cases are classified into groups based on the ICD code (International Classification of Diseases). It has been developed in order to be used as a tool for determining reimbursement, instead of the 'cost-based' reimbursement that is commonly used. The ultimate goal of implementing this '*tarification à l'activité*' is to determine the average cost of hospital treatment per patient (CNS, Rapport Annuel 2013, 2014).

CNS points out that hospital planning and budgeting consist of difficult tasks as it is crucial to engage a number of different –sometimes opposing to each other- stakeholders. The benefits of the '*plan hospitalier*' remain to be seen as most of the measures have just been launched or are about to. However, it is underscored that in order for these measures to work, it is vital to prepare the ground for them. This means that Luxembourg hospitals need to move away from the concept of 'offer everything to our customers' and rather engage on synergies within the hospital network in Luxembourg and the Greater Region. In addition, the shift from stationary to ambulatory care is becoming more and more necessary, considering the great potential it entails for lowering the average hospitalization costs.[9]

[9] The minister of health declared in a interview, that in the context of the upcoming 'plan hospitalier', a shift towards ambulatory care is planned by reducing the number of acute beds by 5% (Le Quotidien, 23 octobre 2014).

Box 1: Example of hospital system reform

France

In 2009, France has gone through a deep reform of how inpatient care is financed, organized and provided. At the core of this reform was the decentralization of the hospital system, promoted as a way to boost regional governance and modernizing the hospital system. The problems to be addressed with this policy were the compartmentalization of healthcare providers and financers, the lack of articulation between central and regional levels, the separation between management of healthcare provision and healthcare expenditure and last but not least the separation between ambulatory, hospital and social care (Ray Moynihen, 2009).

The reform proposed was a multi-layered one, characterized by regional one-stop shops. Regional governance is promoted by introducing new Regional Health Agencies (the one-stop shops) which bring together different public agencies under the same roof. These agencies set up regional objectives to ensure fair access to healthcare, improve coordination between hospitals and ambulatory care, enhance quality and improve prevention. Additionally, healthcare institutions are gaining more autonomy by being regrouped into complementary groups or communities, thus ensuring rational transfer of patients between them. Thereby, complex interventions are handled by big volume hospitals, whereas less complicated cases are relocated to smaller hospitals. In turn, these measures allow for a certain degree of flexibility for hospital directors in terms of health professionals remuneration. Nevertheless, this reform meets some strong reactions from public hospital unions who are concerned by the pay flexibility and from insurers who are worried of the state gaining more control (Ray Moynihen, 2009).

Challenges

Nevertheless, the DRG system and segmentation of hospital care are not a panacea. Attention must be given so that potential pitfalls would be avoided, such as 'cream skimming' from the part of the hospitals in the case of DRG system. In such a case, hospitals would prefer going after those patients who give them either higher returns or alternatively discharging patients earlier guaranteeing a patient and thereby money flow.

It becomes apparent that the change in mindset is of great importance. The shift from cost-based to DRG system, from stationary to ambulatory care and the global shift from curative to preventive care are more than just measures to be taken to address the deficit of healthcare

budget. It is on top of all a question of readiness of the Luxembourg system to alter its mindset on what is healthcare and how it can be provided in a sustainable way. In this respect, the following box gives a look on types of hospital business models.

Box 2: Hospital business model

First of all, there is a typology of business models that apply as well in the health-care industry, namely the shops, the chains and the networks. We can conceptualize the diagnostic activities occurring in general hospitals as solution shop activities (the shops), charging on a fee-for-service basis (FFS). These medical solution shops belong to the realm of intuitive medicine. What happens in such a shop is that their highly trained experts - the doctors - are using their intuition to synthesize data from a wide range of analytical and imaging equipment along with patient examinations. Unfortunately, in everyday practice these solution shops are operating in a disconnected way by individual specialists.

In addition, we have the value adding process (VAP) businesses (the chains) which focus on process excellence. Hospitals following the VAP model bill for the results/outcome and not for the input. Thereby they have a fixed price basis for each procedure offered. Medical specialty hospitals, ambulatory surgical centers and retail clinics such as MinuteClinic in US are forming part of a growing number of VAP businesses in the healthcare industry. It has also been demonstrated that focused VAP hospitals can deliver care at prices 40 to 60% below those in hospitals where the solution shop and VAP model are intermingled (M.Christensen, 2008).

The third type is the facilitating networks businesses (the networks). These networks are beginning to emerge in healthcare to tackle different issues that the previously described ones cannot address adequately. In this kind of model, the size and the composition of the customer base are critical drivers of the value. In this respect, facilitated networks make money through membership fees. Some networks tie professionals together so that they support each other such as Sermo (http://www.sermo.com) an online community of physicians. Others are targeting patients and they have proved to be an effective business model for chronic diseases. In particular, chronic diseases that require from the patient and their families to go through significant behavioural changes benefit a great deal from networks like the PatientsLikeMe.com (http://www.patientslikeme.com), a social networking web site focusing on communities of among others parkinson's, amyotrophic lateral sclerosis and HIV patients on CarePlace (http://www.careplace.com), connecting rare diseases patients.

Hospitals business model undergoes a disruption nowadays. This should not come as a surprise though. Due to regulation, contracting, pricing and reimbursement systems, many of hospital activities become more complicated and cumbersome for the general hospitals to handle. Therefore, we need them to give market share to disruptive business models, patient by patient, disease by disease. We will always need hospitals. We will just need fewer of them, as scientific progress drives the shift from intuitive to precision medicine.

But why are hospitals so costly? Previously general hospitals were essentially solution shops, whereas today they commingle VAP and solution shop activities. The reason for that is the technological and scientific progress which standardized processes and treatments (a characteristic of VAP businesses). What the general hospitals still try to do - and this is stille the case in Luxembourg - is to do everything for everybody. But this has never been a viable proposition for any business model, why would it then be for healthcare industry, particularly for hospitals? Yet that is what most managers and directors of hospitals do as they feel it is their obligation to do so.

In other words, what 'modern' hospitals do is to try to define the problems and the causes (solution shop) and then tackle it in a convenient, effective and affordable way (VAP). But the problem here is that these jobs are done in an incoherent way. It is rather anticipated that the hospitals business model will undergo a disruptive innovation that will gradually move from solution shops to VAP hospitals and the introduction at the end of the spectrum of facilitated networks. There are two waves of disruption, first disentangle the two models and then bring the solution to the patients.

For the first wave, it is important to deconstruct hospitals activities into solution shops and VAP activities by creating hospitals within hospitals or by building distinct facilities. Solution shop hospitals such as Mayo Clinic (http://www.mayoclinic.org) rely on intuitive medicine. And that holds because diseases remain part of intuitive medicine as they arise by the interdependent intersection of two or more body systems. For one to develop an integrated solution in line with the integrated nature of the disease, he/she needs to study the disease bearing in mind this intersection. Once the diagnosis is made and recommendations have been made, the patient is directed to the VAP department of Mayo clinic or whichever VAP organization he/she chooses to have the treatment. So VAP hospitals are usually specialty hospitals and as such they are always backed up by general hospitals. As a result of their focus on performing specific tasks, they are often accused of 'cherry picking' of the youngest, healthiest and most profitable patients. But then again, why not? Patients who suffer from multiple interdependent diseases - as is the case with elderly - would have to go to general hospitals. The latter are still in place but they are just getting fewer and fewer.

To this day, healthcare industry is structured in such a way that our problems are taken to the solutions. The first wave of the disruption of the hospitals would be the separation of business models in two types of hospitals: solution hospitals and VAP/specialty ones. The second wave would be to take the solution to patients through virtual decentralization/telemedicine. It is expected that as ambulatory clinics will move up-market, we will have to bring medical technology to small groups either to the doctor's practice or to the patient him/herself that would ultimately enable to do at home what was done in the physician's practice. This is already the case considering the widespread use of self-administered tests for different kind of conditions from pregnancy to HIV.

And then again, it is important not to miss the forest for the trees. In order for healthcare to continue on becoming more affordable and accessible without compromising on quality, a cascade of disruptions is required. These disruptions will bring location and ability to provide care in the front of the following diagram aiming at patient level.

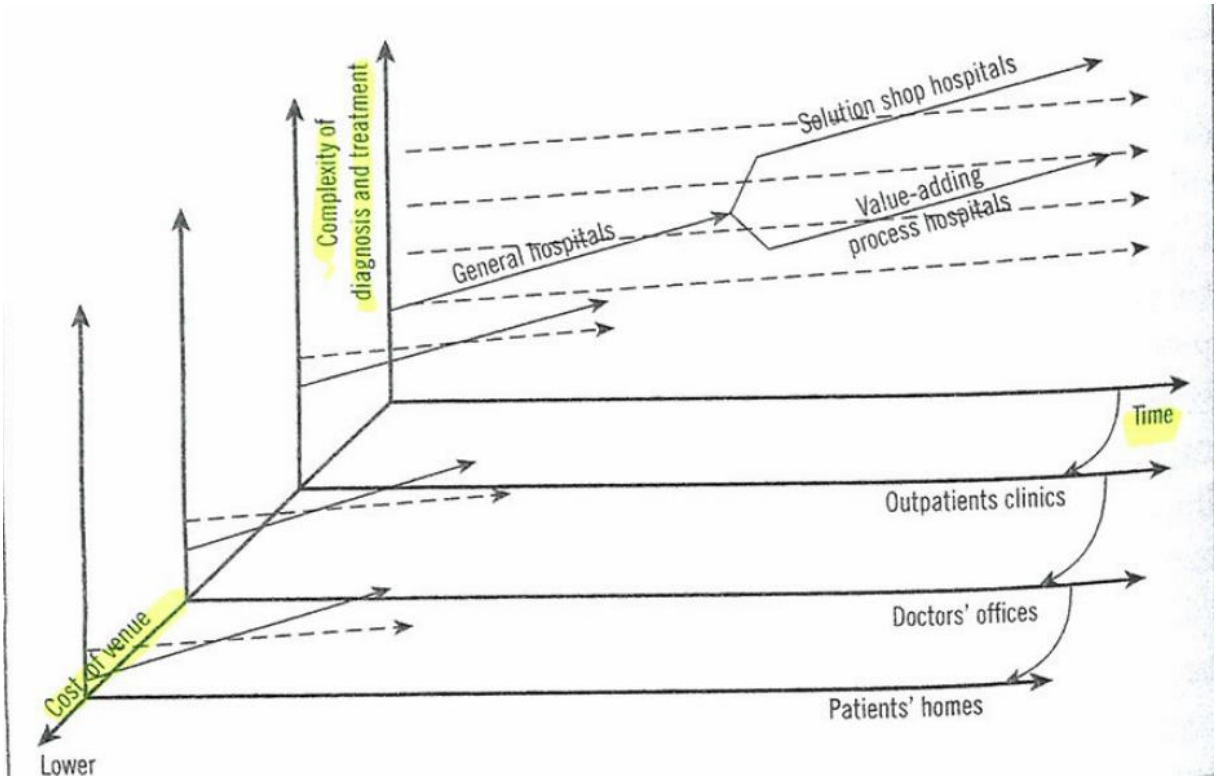

Figure 1 Continuous cascade of disruption in healthcare (M.Christensen, 2008)

Focused hospitals to disrupt today's hospitals might not be a feasible solution for Luxembourg due to lacking critical mass. Still, this measure is applicable in the Greater Region, where focused hospitals are already established. Nevertheless, although hospital planning and budgeting along with a cascade of disruptive innovations target the hospital sector directly, UEL proclaims that rationalization of physicians is of high importance and easier to achieve (UEL, 2010).

2. Médecins référent / Physician's practice

Freedom of choice of provider; liberal status of doctors

The launch of the initiative '*médecin référent*'- initially planned for 1st January 2012- was in 1st July 2012. Interestingly, the launch period lasts from 2012 until 30 June 2015. The reasons for both the delay and the long initiation period of the initiative can be explained by the implementation hurdles CNS has to face, most importantly the pricing issues. Towards this direction, the Association of Medical doctors and dentists (AMMD) and the '*Commission de nomenclature*' had an exchange of opinions on what should be the scope and how to implement this initiative. The general principles, resulting of this meeting, that were supported by both parties touch upon the launch period, the evaluation criteria needed, the administration of the '*Dossier de Soins Partagé*' (DSP), the targeting of the population and financial impact of this initiative.

Almost a year after the launch of the initiative, CNS reports that general practitioners have initially embraced the launch of the initiative. Nevertheless, a limited number of them have responded to a small fragment of the requests/declarations for '*médecin référent*'. At the same time, the preparations for the evaluation mechanism of the initiative have started with the collaboration of the '*Commission d'évaluation*' and AMMD. CNS acknowledges that the evaluation of the performance of this newly launched service for has to be revised and hence improved.

From the side of the doctors, they seem to be willing to make the initiative of '*médecin référent*' work but the implementation appears to be a difficult task. It is important to invest in good and extensive communication on the benefits occurred from implementing such an initiative. Beginning this year, the '*médecin référent*' will be responsible for filling in with the help of the patient the '*fiche de prévention*'. With this document, the doctor will provide all necessary explanations concerning the risk factors the patient is facing and the best way to prevent these risk factors. In terms of financing of preventive policies, there has been a

substantial increase of 39.9% from 2012 to 2013 (CNS, Rapport Annuel 2013, 2014). The drop by 7.7% in drug expenditure by introducing generics in the market has contributed towards this direction (CNS, Rapport Annuel 2013, 2014). Luxembourg appears to change its attitude towards healthcare provision, aiming at a more personalized and at the same time preventive approach.

Nevertheless the question remains, why is the take up of '*médecin référent*' so slow? Could it be that the freedom of choice of provider and the liberal status of doctors hamper the implementation of the initiative? As Dr. Stein states in his publication '*Reflektionen zum zukünftigen Status der Ärzte in Luxemburg*' the freedom of choice of the healthcare provider is a fundamental element and an indicator of the high quality of Luxembourg's health system. He explains that the contact with the doctor is a personal one rather than an institutional one. He also highlights that it is of high importance to preserve the independent status of doctors, as it is rendering Luxembourg an attractive labour market for well-trained international doctors.

The medical population in Luxembourg is providing *grosso modo* the same health services to its residents but with fewer doctors than anywhere else in Europe (ALEM, 2011). The OECD[10] anticipates that there is going to be greater need in doctors globally in the near future. As a result, the recruitment of medical doctors will become crucial for Luxembourg, which already hires the majority of its medical doctors from abroad. Next to that, a 'generation shift' in the medical population has been taking place over the last few years. More and more, younger doctors value their time and are not willing to give up as much of it as their older peers. In that sense, Dr. Stein's point of view holds true, meaning that sustaining the liberal status of the doctor and the freedom of choice will sustain the doctor flow covering the medical needs of Luxembourg. But will it work in the long run?

A counterargument to liberal status of doctor is that the true reason behind the 'need' for this element is the risk of miscommunication of information between doctors and between ambulatory and stationary practice under a liberal scheme. The key to this problem lies in the implementation of an electronic health record system. The '*Dossier de Soins Partagé*' initiative (launched earlier in 2014) aims to overcome this hurdle by bridging the existing communication gap between providers, facilitating provision of care and protects patient's rights. An important issue in this case - as in the general context of the healthcare system - is

[10] Organisation for Economic Co-operation and Development.

the need for the practitioner to realize that there are radical changes in the traditional physician's practice.

In his paper, Dr Stein highlights that the liberal status can be sustained but in an innovative form, following for instance the example of Scandinavian countries, by implementing a flat rather than a traditionally hierarchic system. He promotes the liberal status of the doctors, but with the doctor in a role of coordinator rather than chief of a department (usually the case when doctors are employed). This flat system, based on democratic election of the doctor as a coordinator, would allow for a better interdisciplinary collaboration between doctors and healthcare professionals. Reinforcing the '*Conseil Medical*' in the context of decision making and in line with the flat management system would benefit the system as well.

It goes without saying that the initiative of '*médecin référent*' and the physician's status in general are rather complex issues. For sure, an evaluation of the first will allow for a better understanding of both and potential room for improvement. A cost-effectiveness evaluation of the initiative is planned in the long run. A reasonable and most informative research design to estimate the cost-effectiveness of this initiative would be to have two patient groups and applying a difference-in-difference (DiD) approach. This meaning that one group will have a '*médecin référent*', the other will not. Thus it would be possible to assess both health outcomes and the associated costs. Given the recent healthcare reforms supporting preventive medicine, it would be expected that the first group will do better. The DiD approach allows for a random allocation of treatment-service (that of '*médecin référent*'), minimizing potential sampling bias and in turn guaranteeing a safer interpretation of the results.

CNS believes that the initiative '*médecin référent*' benefits the healthcare system in general. It places this effort in the larger frame of primary care promotion and preventive medicine. The aim is to tackle the healthcare system 'abuse' by avoiding unnecessary consultations, limiting the number of exams performed and optimizing the drug consumption of the insured. The governmental program has underscored that the law of 17 December 2010 has reinforced the role of the general doctor with the introduction of the status '*médecin référent*'. However, to this day the status of the doctor remains subject to change as the role of the '*médecin référent*' this time in preventive medicine is revisited.

Box 3: Coping with prospective shortages in the medical workforce

Netherlands

Interestingly, according to an estimate published in 2002, the Netherlands would suffer from a deficit of nurses at about 10% in 2007, a shortfall of general practitioners at 11% in 2012. In order to address the imminent shortages in health human resources, Netherlands reorganized and reallocated professional skills by introducing two new professions in its healthcare market, namely the physician assistant and the nurse practitioner.

The physician assistant was a model inspired by US, where the professionals work under the doctor's supervision and have a range of responsibilities governed by their individual work setting. This initiative was launched as a pilot training program in Utrecht (2001) and Arnhem/Nijmegen (2002). The nurse practitioner is adopted from US and UK. These nurses can take on responsibilities and tasks formerly allocated to physicians. Thus, the Dutch health policy makers tried to incentivize nurses by offering them new career opportunities. Both initiatives are aimed at bridging the shortage of physicians.

The nurse practitioner started as a small frame experiment and became a norm of the Dutch healthcare system by 2009. Nevertheless, a part of the medical profession community has an antagonistic relationship with nurse practitioners. They perceive them as a threat to physician's traditional monopolies such as prescription of drugs. However, studies have shown that nurse practitioners provide longer consultations with equal or improved quality, better continuity of care and at decreased costs. Another aim of this initiative was to decrease the workload of doctors, an effect that hasn't been yet verified. For sure though, better management of chronic diseases and more attention of what the patient needs have prevailed (Gezondheidsraad, 2008).

Dutch general practitioners maybe prefer practice nurses to nurse practitioners as the latter have more autonomy and thereby they are more invasive into doctors 'territory'. However, nurse practitioners can perform tasks formerly performed by doctors, at equal or better quality and potentially lower cost. Therefore their role will continue to expand globally.

Box 4: Control of outpatient supply

Switzerland

In Switzerland, the healthcare system was characterized by compulsory contracting of medical practitioners, whereby all practitioners have a right to enter into a contract with all insurers (competitive private market vs. government health insurance monopoly in Luxembourg). Additionally, the payment arrangements for health professionals were predominantly fee-for-service arrangements. These elements combined have led to higher average incomes of doctors in Switzerland and has provided a favorable context for the problem of supplier-induced demand.

Interestingly, the free circulation of physicians across the European Union has been accompanied with fear for Switzerland. This fear derived from the rapid influx of doctors from outside the country, given the lack of language barriers, exacerbating the existing problems of supplier induced demand. For Switzerland, fee-for-service arrangements and compulsory contracting, along with the European regulations, were seen as a threat for the healthcare system's sustainability.

Among the options proposed for reforming the healthcare system in Switzerland was the abolition of compulsory contracting, which was quite unpopular. Another option was the new planning model of outpatient supply, in which the regional governments - i.e. cantons - will plan for healthcare resources. A third option was for patients to choose between a 'basic model' and a 'cooperation model'. The latter would be more like a managed care arrangement with capitation style payments and selective contracting between insurers and doctors. The Swiss population has been in favor of an 'alternative model' (close to the 'cooperation model') for their insurance as it may reduce freedom of choice of provider but in return it allows for premium discounts.

Nevertheless, more competition in a less regulated managed-care-like system has its risks as well. By selective contracting there is the risk of the 'good risks' that would populate the cooperation model, whereas the basic model will consist mainly of bad risks. Trying to control SID might then jeopardize solidarity. Today, Switzerland mandates basic health insurance, has almost 12% of its population enrolled in HMOs and cantons finance more than 50% of hospitals costs directly or via a DRG system enacted since 2012.

Box 5: From disciplinary silo to interdisciplinary development

Canada

In Canada, the issue of health human resources has been in the political agenda for quite some time now. Quantitative assessments have been performed, dealing with oversupply in the early 1990s to shortage in the late 1990s. In 2001, the Commission on the Future of Healthcare in Canada has been assigned to carry out consultations and compile policy recommendations for the future of Canada's public health system. The goal of this assignment was to ensure the sustainability of a universally accessible, publicly funded system that offers quality services, balancing prevention and health maintenance with care and treatment.

Through this project the importance of human resource planning was emphasized. In this context, a social policy think-tank, the Canadian Policy Research Network (CPRN) issued a report in 2002 recommending a national coordinating strategy with a focus on expertise, data analysis, best practice and public reporting. What the report highlighted was that it is crucial to overcome the silo approach - in which every profession, jurisdiction and healthcare sector designs its own policy - and engage in human resource management involving all relevant stakeholders.

Challenges

(The Innovator's prescription)

It becomes apparent that 'disrupting' the traditional physician's practice is a necessity and is not rooted in envy for their remarkable work. It is rather a natural course of action, as disruption of professions is a natural and necessary step in making an industry's products and services more affordable and accessible. As the Figure 2 shows below, the business model of physicians practice will evolve disruptively.

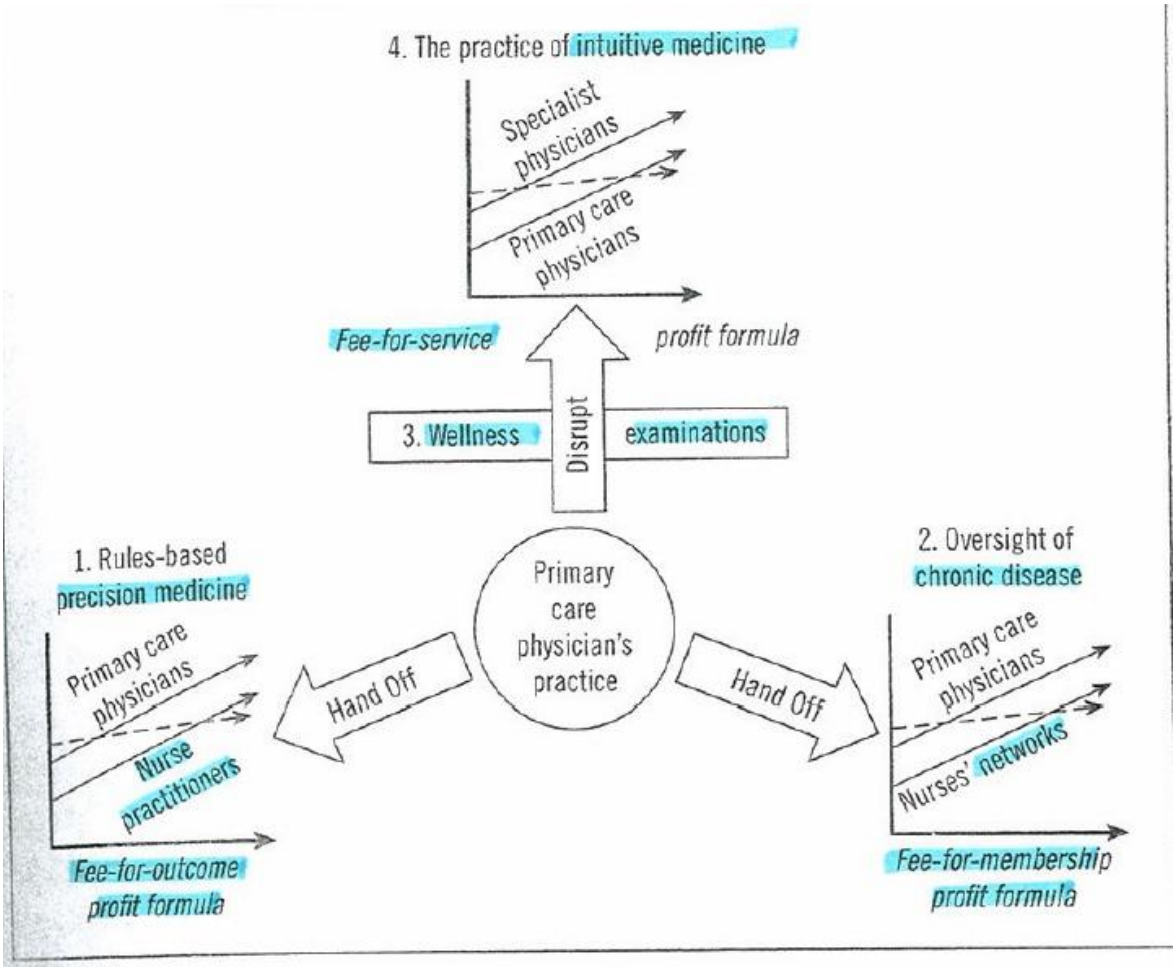

Figure 2 Disruption in physician's practice (M.Christensen, 2008)

The typical primary care physician's business practice consists of four different categories of healthcare delivery:

1. The straightforward diagnosis and treatment of disorders in the realm of precision medicine[11]
2. The ongoing oversight of patients with chronic diseases, e.g. diabetes, tobacco addiction
3. Ongoing wellness examinations and disease prevention, *which in turn leads to*
4. The preliminary identification of disorders in the realm of intuitive medicine[12], partly handled by primary care physician, mostly referred to specialists

[11] Precision medicine is the application of panoramic analysis and systems biology to analyze the cause of an individual patient's disease at the molecular level and then utilize targeted treatments to address the individual patient's disease process.

As indicated in Figure 2 the nurse practitioners should disrupt the precision medicine. The job to be done in this case is to confirm quickly and conveniently whether there is a health problem or not and to prescribe a remedy. In the case of behavior-intensive diseases, the oversight of the patient should be handed in to network facilitators. Such facilitators can be nurses, other professionals who assist in disease management like *Healthways Inc.* based in Nashville,TN and partly networks of patients and their families like *PatientLikeMe.com*. The third sphere, namely wellness examinations, remains in the realm of primary care. Nevertheless, the primary care physicians are expected to disrupt the specialists' 'solution shops'. The reason for this lays on the advancement in technology that enables economical on-site testing and imaging and online diagnostic roadmaps that integrate large bodies of research to bring even more diagnostic capabilities to primary care physicians.

There are three technological innovations that will propel primary care physicians and by extension the '*médecin référent*' in their move up-market. These are the decentralization of testing and imaging, the online diagnostic support tools along with the expert system software and telemedicine. In the first case, a notable example would be that of blood, urine and other tissue samples exams. The increasingly complex and capital-intensive multichannel blood analysis equipment drove doctors to outsource these services. The result was a pervasive decentralization of blood and tissue analysis that relies on third-party providers of laboratory analysis. Another interesting example, relative to telemedicine, is that of University of New Mexico's Project ECHO. The latter is using telecommunication technologies to deliver specialized care to patients with Hepatitis C and HIV.

The traditional physician's practice is structured to make money from sickness. What the current changes in the healthcare arena suggest is that doctors will still be in business but now they will make money from wellness (as chronic diseases become more prevalent). In this paradigm shift from curative to preventive care, the role of the doctor and particularly that of the '*médecin référent*' is crucial. Allowing for patients to engage themselves in their health management, paradigm shifts where doctor is becoming a coach and a knowledge broker for the patients are the way forward (Gawande, 2012). At the same time, this shift encompasses a disruption in traditional physician's practice, redefining the role of the doctor and hence the one of the '*médecin référent*' in the changing healthcare system of Luxembourg. This progressive shift is marked by an input of great value for public health research, allowing for a superabundance of data and IT.

[12] The use of intuition or clairvoyance for medical information and subsequent diagnosis.

3. Information and communication technologies (ICT) in health

In 2006, the government has adopted the action plan '*eSanté*' for Luxembourg. This plan came as a result of the European Commission's demand for each member state to set up a plan for introducing new technologies in information and communication technology in health. The Minister of Health has gathered together a working group that was working on setting up *eSanté*. This working group has defined the scope of this plan to be a better communication of healthcare data, to get rid of the excessive body checks and laboratory exams, to enhance transparency of the services costs and to ensure the interoperability of the system of Luxembourg with those of other countries (CNS, 2012).

For the operationalization of the *eSanté* plan, *Agence eSanté* was created on December 17 2010.The goal of this agency is to establish a national platform for exchange of healthcare data, primarily facilitating the establishment of the DSP. The latter is a file that gathers all healthcare data and important information which are relevant to the health status of the patient, such as laboratory exams, prescriptions and medical imaging. The patient can also update his/her DSP. The access to this file is reserved to the '*médecin referent*', the treating doctor and other healthcare professionals that are involved in the treatment of the patient. It should be noted that the patient has the right to access his/her file and to be informed on who has accessed it too. He/ She can refuse access at any time to someone. The ultimate aim of DSP and *Agence eSanté* is to progressively facilitate preventive medicine, ameliorate diagnostics and treatment as well as patients' follow-up, ensuring security, continuity and coordination of healthcare services.

However, the need for an electronic platform that will allow the different players to interact has been acknowledged already from 1990. At that time, the CRP Henri Tudor has developed the HealthNet which in 2005 became the GIE HealthNet. The Agence eSanté has come in 2010 to replace the GIE HealthNet adopting a new governance model by integrating all relevant actors. Those partners consist of the state via the Ministry of Health and the Ministry of Social Security, the CNS, the Association of Medical doctors and dentists (AMMD), the federation of hospitals of Luxembourg (FHL), the Federation of Laboratories of Medical Analyses (FLLAM), the Confederation of '*prestataires d'aides et de soins*' (COPAS), the syndicate of pharmacists of Luxembourg and last but not least the Patients Association (Patiente Vertriedung asbl) (CNS, 2012).

The structural re-organisation and the gradual shift in governance in GIE HealthNet giving its place to *Agence eSanté* has been the centre of activity for 2011 and 2012. This shows that time is an important factor that should not be underestimated. To set-up the proper

governance structure, to recruit the right people and to elaborate on a strategic plan for the years 2013 till 2015, focusing on the launch of DSP and e-prescription, is a task that needs thorough research and thus time. The latter (DSP) is launched in 2014 progressively with the collaboration of the National centre of data protection (CNPD). However, the Agency's activities do not stop in launching the DSP. There is a necessity to integrate this initiative within the services provided by CNS, leading towards an eCNS. Moreover the offer of electronic services to the insured via a portal of mysecu.lu is part of the future plans of the agency. The electronic communication of the prescriptions and medical bills along with access to detailed reimbursement information are in this direction.

Challenges

As it has already been mentioned (section 'Hospital planning and budgeting'), nowadays there is a shift in accountability from the general practitioner's practice and the general hospital to nurse practitioners in retail clinics. Facilitated networks help us deal with our behaviour-dependent chronic ailments. In addition we have coherent solution shops and VAP clinics that diagnose and treat respectively. And then the question rises, when we receive care more and more from so many independent, focused providers, won't the already existing problem of coordination be exacerbated? The current progress in ICT through personal electronic health records (EHR) is a valid reason for this not to happen!

EHR, if implemented properly, can be the connective tissue that draws and holds together the independent elements of healthcare.

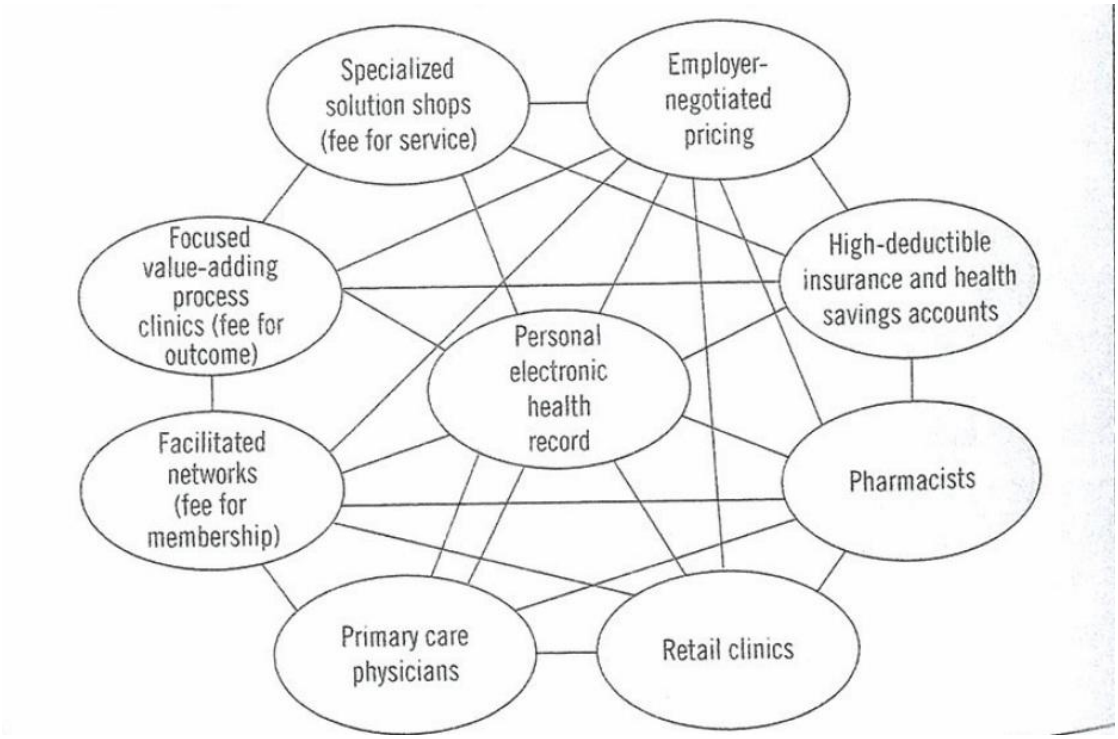

Figure 3 Role of personal electronic health records (M.Christensen, 2008)

Millions of units of airtime in legislative hearings and healthcare conferences have been attributed to the discussion of the need for EHR. Abundant resources have been allocated in order to develop and deploy various types of EHR systems. It is undisputable that we need EHR to address the problems in quality of care and the cost of administration in the current system. Nevertheless, there has not been yet a standardized format of medical record technology, making EHR seem a distant dream. But why are EHRs not as widespread in practice as they are expected to? The answer lies in the job EHRs are asked to do!

The job that EHR is designed to do is a systematic job, enabling providers in different locations. The problem is that usually the physicians are bearing the cost of implementing an EHR system (by cost meaning their time which is highly priced!), when most of the benefits – e.g. improved patient safety, data security, disease prevention- accrue primarily to patients, insurers and payers. There is a lack of motivation for the doctors to engage in such a system as they do not experience the direct effects of it. In order to counteract this problem, it is fundamental for EHR to help organize and store data that can be easily retrieved, protect physicians legally by recording their actions and most importantly do not impede their normal interactions with the patient and their work flow!

It is crucial to establish a standard record format that all hospitals and practices will adhere to. That is also the aim of Agence eSanté to establish a national healthcare platform. This task

is facilitated by Luxembourg's small size compared to the US, where there are competing proprietary systems. However, it is important to virtualize the proprietary systems of the different hospitals in Luxembourg and to move towards compatible formats. Somehow, personal healthcare records (PHRs) are gaining grounds in this direction. The fundamental principle of this initiative is that data always travel - at least in a virtual sense - with the patient. As is the case of DSP, PHRs keep the information in an open format, allowing access *only* to those entities the patient chooses to share the information with.

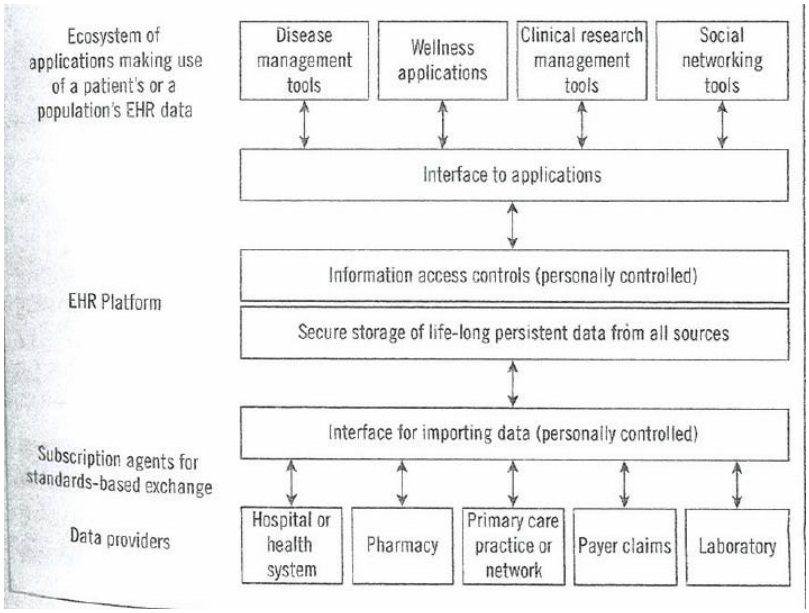

Figure 4 Structure of a personal electronic health record system (M.Christensen, 2008)

The whole concept is akin to the organizing paradigm of social networking websites. There is an ecosystem of entities that sit atop of the system and create proprietary applications for the data of the PHR. The patient chooses whether to make its PHR's data available. All in all, EHC and by extension PHR/DSP promises to yield remarkable benefits not merely for patient safety but also in clinical research in Luxembourg and globally. It makes data open, modular, conformable, so that the applications using these data can be optimized. Establishing a standard format of EHR in Luxembourg is essential, in an era where data becomes commoditized, leading in turn the applications that use them to become de-commoditized – and this is where the money will be made (M.Christensen, 2008).

In addition, ICT advances in healthcare are important for a low-cost, high quality healthcare system. In particular, e-Health mobile apps and digital medical gadgets consist a growing market. Big smartphone companies and venture capitalists are starting to be really interested as they see the enormous business possibilities in the global personal health sector (Ahlen, 2014). Incubators are built to catalyse the flood of start-ups across the broad spectrum of e-health services (Ahlen, 2014). Digital Health Days conference's topics - held annually in Stockholm - sum it all; Big to big value, insight to action and focus on patient. Every day, we use various digital trails and we leave a significant amount of data behind us. Companies like Google and Apple are analysing this data aiming at offering us services based on how we behave. The question is how real value is created from user, research and healthcare generated data. In terms of putting insight into action, a very relevant point for Luxembourg; it is of great importance to find ways for disruptive innovations to be accepted in healthcare and for policy makers, healthcare providers and the business sector to enable and nurture innovation. As for enabling patient-centric (digital) care, one can't help but wonder what does this mean really for individuals and society? And furthermore where does society's responsibility for the individual's health begin and end? (DigitalHealthDays2014, 2014)

E-Health is here to stay and that is not an exaggeration. Stockholm aims becoming a hub for e-health development, given the highly digitized healthcare system, the vibrant internet start-up community and the smartphone–hugging population (Ahlen, 2014). What they and the global business community realize is that technological advances have enable a very positive new force, that of a proactive and empowered citizen and patient. The latter is becoming more and more in control of his/her health supported by the current trends in e-health. The enabling smartphone, self-tracking and wearables, self-screening tests online[13] and lab-tests online[14] are a reality and are gaining grounds.

All that personal data that derive from our apps, lab tests, body sensors and medical gadgets will need a secure and convenient place to be stored. This is what Christensen (2008) was referring to when stating that 'this is where the money will be made'. Apple launched in September 2014 an extensive development platform called HealthKit with the new iOS 8, which translates into 800+ million iPhone users who will start using this app as soon as it is out there! For this initiative, Apple is partnering with big health players in the US, like Mayo Clinic and other healthcare providers. Alongside, Apple has integrated HealthKit with Epic, the Medical Health Record system used for more than 50% of Americans. Google Fit is the

[13] An example from NHS (National Health Services of the UK): https://www.nhs.uk/symptomcheckers

[14] Example from Sweden: http://www.werlabs.se.

platform for Android smartphones. Companies such as Nike and Adidas are involved in Google's initiative right from the start. In addition, Samsung has created Simband with the collaboration of University of California, San Francisco (UCSF) and IMEC[15]. The challenge in these prominent steps forward is how these platforms will secure the data and whether they will exchange data with each other.

Agence e-Santé is definitely moving in the right direction, showing the way forward, but where is Luxembourg situated within the health disruptive innovations continuum? Can Luxembourg be a hub for e-health development? Initiatives like Connectathlon planned for 2015 show it can be the case. In April 2015, Luxembourg will be the capital of e-health. Medetel, one of the major events this year, will denote the beginning of the collaboration between the Agence e-Santé and the International society for telemedicine & e-health (Isfteh). It seems that Luxembourg is going to play an important role in the digitalized health world. The latter is strongly supported by top notch biomedical research and is a sector that should not be neglected if someone wants to excel in the e-health frontier.

4. Diffusion of biomedical technologies

One can argue that advances in medicine can both reduce and increase spending. On the one hand, preventive medical care helps avoiding costly hospitalizations for acute care. On the other hand, other advances have provided the medical community with treatments for conditions that could not be treated before. In turn, this would lead to more patients surviving, live longer and therefore use services for more years.

In its proclamation the government of 2013 calls for a modern healthcare system that allows access to healthcare services of high quality. It also underscores the need for balancing between universal access, quality, medical progress and budget constraints. In their 2010 report, UEL proclaims that '*Le progrès technique médical, ainsi que la hausse généralisée du niveau de vie et de revenus, est lié à une augmentation substantielle de la part des dépenses de santé dans le PIB*' (UEL, 2010).

Biomedicine is a powerful tool of Luxembourg's healthcare system, consisting a vital part of prevention, screening, treatment and patient follow-up (FLLAM, 2010). During the last few years, biomedicine has witnessed a revolutionary development globally (Abdul R Shaikh,

[15] Samsung Electronics and UCSF joined their efforts to create the Digital Health Innovation Lab, which will be a vibrant new accelerator space at the UCSF Mission Bay Campus in San Francisco. Samsung's Simband platform is an open reference design for sensor modules. The first module of its kind has been developed in partnership with IMEC, a world leading bio-sensing institute (http://www.samsung.com/us/globalinnovation/innovation_areas).

Collaborative Biomedicine in the Age of Big Data: The Case of Cancer , 2014). From 2004 onwards, biotechnology and health sciences have been a key element of the governmental strategy of Luxembourg, aiming at diversifying the economy. Towards this direction, Luxinnovation launched the BioHealth Cluster, a cluster that regroups the know-how of the different stakeholders in the biotechnology sector. Ultimately, its goal is to help its members attain scientific excellence in molecular diagnostics, which in turn would allow Luxembourg to become an attractive destination for research, development, innovation, becoming a pioneer in the biomedical market.

But what is the state of the art in medical research in Luxembourg today? The *Centre de Recherche Public de la santé* (CRP santé), *Centre de Recherche Public Henri Tudor* (CRP Henri Tudor) and *Centre de Recherche Public Gabriel Lippmann* (CRP Gabriel Lippmann) are among the pioneers in biomedical research of the public sector in Luxembourg. CRP santé comprises departments in Translational Cardiovascular Research, Immunology, Oncology, Public health, Infection and Immunity. CRP Tudor among other focuses on healthcare technologies and CRP Gabriel Lippmann specializes also in biotechnologies, in particular nutrition and toxicology.

But is there any direct link of the research in those institutions and clinical practice? In other words, do patients in Luxembourg – resident and non-residents- have access to the latest advances of biomedicine? The answer is not so straightforward. It has been noted that Luxembourg's lack of a University Hospital could be a reason for low uptake of biomedical breakthroughs. Nevertheless, it is a common belief among healthcare professionals in Luxembourg –but also a global trend- that research should be regarded as a quality boosting activity. In that respect, research output can set quality standards quite high. There is already a link with hospitals (e.g. clinical trials) but the issue was and still is that of a lack of critical mass.

However, there has been a series of efforts facilitated also by BioHealth Cluster, leading to an extended network of collaborations with institutions abroad (e.g. CRP santé with University of Vienna and Arthur & Sonia Labatt Brain Tumor Research Centre in Toronto), counteracting in a way the problem of critical mass (CRPsanté, 2014). Apart from CRP santé there are a number of other public actors in Luxembourg's biomedical frontier, namely Luxembourg's Centre for systems biomedicine (LCSB), the Integrated Bio Bank of Luxembourg (IBBL), the Resource Centre of Healthcare Technologies (SANTEC), life sciences research unit of University of Luxembourg and the *Laboratoire National de Santé* (LNS). In addition to the public players, the BioHealth Cluster brings together private (Advanced Biological Labs, Cellon etc.) and decision-making players (Ministry of Health,

Ministry of Economy, Ministry of Higher Education and Research and the National Research Fund), realizing the importance of engaging all relevant stakeholders. It is worth saying that Luxembourg is part via the BioHealth Cluster of the Council of European Bioregions (CEBR).

The mission of the BioHealth Cluster does not only include creating a successful ecosystem through networking, it also underscores the importance of boosting innovation and economic performance. On 2014 ESIC's[16] report on Luxembourg regarding service innovation, it has been highlighted that "it is vital for the successful implementation of a disruptive technology, guaranteeing its economic benefits, to create the right 'environment' for it to proliferate/flourish. The act of imitating without understanding the underlying concept or motivation may lead to failure of implementing the innovation. Thus missing the benefits it entails" (European Service Innovation Center, 2014). The work of ESIC is undertaken in the six model demonstrator regions. Luxembourg is one of them, the rest being Canary Islands, Emilia- Romagna, Upper Austria, Northern Ireland and Limburg.

In a series of peer review sessions that led to ESIC's report, Luxinnovation has underscored that the rationale behind the Large-Scale Demonstrator (LSD) approach is coming from the dilemma of sustainability. It is also highlighted that despite the sustainability issue, healthcare in Luxembourg functions quite well. Thereby, it is considered better to promote pilot actions and small amendments, rather than drastic changes. ESIC has tried to frame the conditions of service innovation in Luxembourg compared to the rest demonstrator regions (see Table 1). Within this assessment, ESIC has stressed the need for Luxembourg to focus on the users instead of the product (more on the service). Furthermore, they have identified the challenges related to implementation of the proposed LSD strategy in five levels, namely the patient, the physician, the hospital, the government and the system level.

[16] European Service Innovation Center (ESIC) aims to capture and demonstrate the dynamics and impact of service innovation, as well as to assess how service innovation can contribute to Europe's competitiveness, to the shaping of new industrial structures and regional development. In close collaboration with the European Cluster Observatory, ESIC will identify sectoral and cross-sectoral industrial development patterns driven by service innovation. The new, or better, business and innovation support tools identified will be further transferred to relevant stakeholders such as the European Business & Innovation Centre Network to stimulate a wider roll-out. In addition, ESIC will develop close links with the Smart Specialisation Initiative of the European Commission's Directorate General for Regional Development. Awareness will also be raised about the opportunities offered by the European Structural Funds to foster favourable conditions for eco-systems that can promote regional regeneration, including using service innovation as a driver for change (Commission, 2014).

Function of the innovation system	Strengths/assets	Weaknesses/challenges
Entrepreneurial activities	Stability Location/port to Europe for non-European companies	Weak R&D efforts by SMEs Lack of suitable facilities Low number of spin-offs from public research organisations
Knowledge development and transfer	Rapid quantitative and qualitative growth of scientific activities Development of the Cité des Sciences	Relative youth of the science base Lack of highly-skilled individuals
Innovation and business model generation	Mutating service sector	Lack of targeted funding for service innovation
Financing innovation and growth	New support instruments implemented since 2009	Access to VC funding Decline of non-R&D innovation expenses
Collaboration and networking	Relatively small number of key players who know each other	Access to data

Table 1 Strengths and weaknesses of Luxembourg innovation system (European Service Innovation Center, 2014)

ESIC's sessions regarding Luxembourg call upon a policy mix approach. Something that Agence e-Santé has already accounted for in its governance with the aim to improve interoperability amongst different actors in the healthcare scene. The report concludes by stressing also the need for the MDs to engage in research programs, the need for a paradigm shift – from 'getting the patient back' to 'curing patients and helping them to stay healthy'- and the need for promotion of public-private partnerships.

That peer review was performed during the set-up of the program ACTIVATE: My lifestyle, My health. This program target diabetes type 2 patients and initially will be performed in collaboration with Zitha Clinic. Prevention is better than cure, it is a well-known quote in every sphere of the life and especially in healthcare. Preventive forethought is also the core of the ACTIVATE initiative. Patients will provide information on a voluntary basis on risk factors for diabetes in an online platform. This information will serve as a roadmap which will then show the path each of these individuals should follow. Once again personalized medicine is the centre of interest. The individual is the target, so that the lifestyle and / or treatment regime is tailored to him/her, a factor that can prove to be cost effective for the system. At the same time, the initiative serves as crash test for establishing similar programs within the national policy for managing chronic diseases (Antzorn, 2014). The scientific excellence in biomedical research and in particular in molecular diagnostics is the

cornerstone of personalized medicine. The ultimate goal is for the healthcare system to be able to provide the right treatment, at the right time and at the right cost in case it is needed.

As ESIC underlines that 'in the future, the healthcare system should move away from the screening of diseases towards the monitoring of risk factors'. Once the risks are identified, then the person needs to be empowered to go through a sustainable health behavioural change, supported by multidisciplinary and personalized interventions (European Service Innovation Center, 2014). ACTIVATE is leading the way and the results remain to be seen in the future. Nevertheless, the necessity for such a shift is depicted already in the parliamentary debate regarding the mammography program. Recently, the question over the importance of the mammography program triggered once more a number on discussions relating to the sustainability of such an initiative. Every year, this program calls 22000 women between 50 to 69 years old to have a mammography every two years. This examination costs 45 Euros and is covered entirely by CNS. The answer to this debate could be given by the move towards monitoring of risk factors, i.e. target directly women with high risk of suffering from breast cancer, instead of just shifting the age thresholds up or down so that the budget impact won't be as elevated as it is now and at the same time problematic situations would be identified at an earlier stage.

This aim for precision in provision of healthcare services is depicted in the four 'P's of medicine. The era of 'P4' medicine stands for predictive, personalized, pre-emptive and participative medicine. In comparison to traditional medical practice, 'P4' medicine is looking for leveraging potentially innovative and disruptive technologies to accelerate discovery and reorient clinical practice towards patient-centred care. It can be seen in conjunction with the Institute of Medicine's (US) concept of rapid learning health system. In such a system, basic translational, comparative-effectiveness and health services research is synchronized with optimal delivery of precision care. Moreover, research and practice in this system are based on advanced digital health infrastructure that can take advantage of data liquidity. If we add on these four Ps the element of complexity, then a 'P5 medicine' arises with the 5th P denoting the population perspective needed to realize the full potential of P4 medicine (Abdul R Shaikh, Collaborative Biomedicine in the Age of Big Data: The case of Cancer, 2014).

The international trends on the biomedical field show that the economic development of the biomedical sector can be an alternative economic pillar for Luxembourg such as the traditional markets of finance, iron and steel. Already in 2010, the '*Fédération Luxembourgoise des Laboratoires d'Analyses Medicales*' (FLLAM) underscored the great potential that the biomedical sector constitutes for Luxembourg's economy. Notably, the

potential of cross-border cooperation favours the emergence of poles of competence enhancing the rational use of the Luxembourg's infrastructure. Last but not least, its biomedical expertise renders Luxembourg a competitive and reliable partner in the European biomedical arena.

Nevertheless, according to the Global competitiveness report of 2014/15[17], though Luxembourg has climbed up 3 places in ranking (19th place among 144 countries), it seems to stagnate with respect to health. Luxembourg seems to do quite well in terms of innovation and technological readiness but health and education still need a boost (Schwab, 2014). It is pivotal to link current biotechnological progress with clinical practice and at the same time account for patient right. The latter should not be seen remotely as free choice of provider but also as the patient engagement of decisions regarding his/her health and access to his/her medical information.

[17] World Economic Forum (WEF) : World competitiveness report

5. Cross border health

The European Health Policy Forum[18] has outlined the policy action frame for Health 2020. One of the aims of this policy is to establish health systems in the European region that are universal, equitable and sustainable, with high quality standards and focus on the individual (i.e. personalized medicine) (WHO, Health 2020, 2011). The Directive 2011/24/EU[19] goes further than each member state's borderlines, proclaiming the patients' rights in cross-border healthcare. However, the transposition of the Directive into Luxembourg's national law has been delayed due to the anticipated elections of 2013. The law of 1st July 2014 that modified the Social Security Code in accordance to the directive has entered into force on the 1st August 2014 and enacted by CNS from 1st September 2014.

The Directive constitutes a lengthy document as most European legal acts do, which comes as a supplement to the Regulation (EC) n°883/2004[20], clarifying and adding on the provisions of the latter. But what are the patients' rights in cross-border care? How do they apply in Luxembourg? In its newsletter/socionews the Chambre des Salariés du Luxembourg (CSL) had a very straightforward way of touching upon cross-border healthcare patients' rights (CSL, 2014). Starting with what is actually covered by CNS, going to how are cross-border healthcare services defined and followed by two possible scenarios. Firstly, the case of being treated in another European state, Switzerland or a country of the European Economic Area (EEA) and secondly the case of being treated in a country other than the above. Finally, a point that is highlighted in the Directive is the establishment of a national contact point (NCP)(cf. Box 6).

The transposition of a Directive in the national law of a country as such is a fiddly task and requires a good understanding of the content and most importantly the link with the actual situation in the country of interest. In the case of Luxembourg, one would think this should not be the case as it is a country with a long standing tradition of cross-border workers and by extent of cross-border patients. Nevertheless, the existence of cross-border workers has great implications in terms of social security, as to who is covered for what and by whom.

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[18] The European Health Policy Forum is helping to ensure the EU's health strategy is open, transparent and responds to public concerns. It brings together 52 umbrella organizations representing European stakeholders in the fields of public health and healthcare (http://ec.europa.eu/health/interest_groups/eu_health_forum/policy_forum/index_en.htm)

[19] Directive 2011/24/EU of the European parliament and of the council 9 march 2011 on the application of patients'rights in cross-borader healthcare.

[20] Regulation (EC) N°883/2004 of the European Parliament and of the Council fo 29 April 2004 on the coordination of social security systems.

But what is the real aim of the Directive? Its primer goal is to ensure equal access to healthcare, allowing all patients - and not only the best informed or richest - to enjoy a series of healthcare rights which have been recognized by the European institutions. So ultimately any EU citizen would be able to receive all non-hospital healthcare (without pre-authorization) and all hospital care (with pre-authorization) to which they are entitled to in any of the Member states and get reimbursed based on the rules applying to their own healthcare system. To this direction, it would allow for the patient waiting list to be sidestepped legitimately and would be in line with medical progress and the lead to globalization of healthcare provision.

Medical travel is supported by the new patient mobility directive. In turn, this mobility can accelerate the demand for transparency. Luxembourg has for long-time allowed its citizens to seek care in neighbouring countries following a generous healthcare provision regime. It is a prosperous country with a great potential to establish a comprehensive healthcare system. The working group for cross-border health of the CESGR[21] has a particular interest in cross-border care and the project Santransfor points to this direction. Santransfor is a project for the cooperation in matters of health within the Greater Region between 2013-2015. Its objective is to provide key healthcare players of the Greater Region with the necessary tools to develop their cooperation and thus improving the access to healthcare for those areas.

The operationalization of the initiative Santransfor shows the multiple steps that are needed for the coordination of the different partner areas. Initially, a pilot training program (*projet de formation*) bringing together the different partners is essential. This pilot project is followed by the development of the regulatory, legislative and jurisprudence tools that are required to ensure the operationalization of such an initiative. Concrete measures have to be taken also in terms of how to expand the cooperation, for instance when tackling with issues such as patient transportation. A key step for Santransfor to succeed is the exchange of best practices, aiming at better quality of care. Last but not least, the communication of the project proceedings as well as the communication within and between the partner-areas is a fundamental step for establishing a quality healthcare network.

Nonetheless, why is Santransfor needed? Particularly after the new Directive (2011/24/UE) has been enacted in Luxembourg from 1st of august 2014. In a recent meeting of the working

[21] The CESGR (Conseil économique et social de la Grande Région) is a socio-economic advisory body of the summit of the Greater Region. Its mission is to advise and to draft resolutions regarding the problems related to the economic social and cultural development of the Greater Region. One of the working groups deals with the issues of cross-border healthcare provision in the Greater Region.

group for cross-border health of the CESGR in February 2014, one of the major topics of discussion concerned the project Santransfor in the context of the Interreg programs[22] and ZOAST[23]. The ultimate question concerned the transferability of the organisational model of the ZOAST in the Santransfor initiative. The ZOAST approach supports bilateral framework agreements, thus it supports complementarities of health services provided from both sides of the border. It has been underscored that for this model to work, the insurance providers of the participating countries should be engaged into the initiative. In addition, it is fundamental to guarantee mutual respect of the national legislation of both sides, in order to establish the mode of financial regulation for the operationalization of Santransfor.

At the same meeting of the working group for cross-border health of CESGR, another topic was brought up, concerning Emergency Medical Services (EMS). It has been acknowledged by the working group that EMS is an integral part of the cross-border cooperation. EMS is already part of the conventions between France and Belgium and it is aimed that such conventions will be a reality for the broader Benelux area, namely between Belgium, Luxembourg and Netherlands. CESGR interest in EMS integration in the cross-border plan is in line with the global trends in healthcare that promote ambulatory care. As IHI[24] Senior Vice President Kedar Mate has stated only recently 'in an emergency, what happens before a patient comes through the hospital door can positively affect downstream outcomes and costs of care'. EMS become more and more integrated in healthcare systems and paramedics receive training and equipment that allows them to initiate even more lifesaving and beneficial treatments in the field. The terms 'pre-hospital' reflects exactly this strategies and capabilities that respond more effectively to what the patient needs. Thus, enhancing cooperation in pre-hospital emergency care in the Greater Region is leading the way forward in healthcare.

[22] Interreg is an initiative that aims to stimulate cooperation between regions in the European Union. It has started in 1989 and has been financed under the European Regional Development Fund (ERDF). Interreg IVC, which covers the period 2007-2013 and for 2014-2020 the Interregional cooperation will continue under the name INTERREG EUROPE (http://www.interreg4c.eu/).

[23] Zone Organisées d'Accès aux Soins Transfrontaliers. ZOASTs were launched in order to provide simplified administrative and financial tools, facilitating the access to healthcare services abroad. Thus, the continuum of healthcare services will be guaranteed for patients between Belgium and France (Source documents de CRSGR).

[24] The Institute for Healthcare Improvement (IHI) is an independent not-for-profit organization based in Cambridge, Massachusetts. It is a leading innovator, convener, partner, and driver of results in health and healthcare improvement worldwide (http://www.ihi.org/about/Pages/default.aspx).

Box 6: Cross-border care: is there another way?

Netherlands

As mentioned earlier, it comes as no surprise that Luxembourg is scoring green in the European Health Consumer Index (EHIC) of 2013 as far as the indicator for 'cross-border care seeking freely allowed' is concerned. It has been allowing for cross-border healthcare provision for long time. Netherlands holds the same status as Luxembourg in cross-border care but it differentiates in some respects from it. For Netherlands there is a single National Contact Point, the National Health Institute (NCP), who is providing information on both treatments in the Netherlands and in another country. The information comes with a useful and easy web interface, along with information on legislation and NCP itself (http://www.cbhc.nl/en). Each section is 'unfolding' itself depending on the depth of information the user is seeking.

In addition, Netherlands is a country with a long tradition in trade, which renders it a country that values international relations. NHTV Breda University of Applied Sciences has a distinct department in International Tourism with a Center of Cross-cultural Understanding (CCCU). Not surprisingly, one of its areas of expertise is Medical Tourism and International Health. It is highlighted that in medical tourism -perceived as within the EU or internationally - it is not only a question of provision of medical healthcare but also how to cope with cross-cultures as a patient and as a medical manager. What is considered of great importance is that cross-border care should be acquainted with concepts of sustainability and can be an economic boost. Furthermore, it is highlighted that cross-border care calls for professionalization, expertise building through quality management such as in the Hamburg Eppendorf University Hospital, which can be seen as a good practice. In sum, cross border care and medical tourism at large can be seen as an economic sustainable driving force, operating as multi-cluster of services, actors and patients (Magazine, 2009).

Challenges

An important feature that is to play a role in cross-border care is the aspect of quality when it comes to the choice for one hospital to another, one country to another. In every tier of every market at any given point in time, there is a basis for competition[25], which is interlinked with the prevailing notion of 'quality'. Quality can be defined as performance and reliability when the best products in the market aren't good enough. After these two elements have become more than adequate then quality can be defined as convenience, speed and responsiveness. In particular in the health market, when we refer to the specialists practice, quality is about performance and reliability, as the best available care is not good enough yet. In the realm of precision medicine, there is more than adequate care provided so quality becomes an issue of convenience, speed and responsiveness.

For quality to be assessed and for patients to be adequately informed - allowing for smooth cross-border movements - there should be a systematic evaluation of the properties and effects of a health technology in place, addressing the direct and intended effects of this technology, as well as its indirect and unintended consequences. That is where health technology assessment comes in as an important tool for decision making in health technology (HTA).

6. Health Technology Assessment (HTA)

Already in 2010, UEL has noted the need for a surveillance committee as well as the need for an external control in the context of structural reforms of CNS. Unfortunately, little progress has been done in this direction. But what is the purpose of such a surveillance system, should it be there just to ensure that everything is in place?

In its annual activity report, CRP santé has outlined that 'excellence in biomedical research is a key driver for diagnostic and therapeutic innovations that will benefit the population of Luxembourg while strengthening the national economy'. For this to happen, it is essential for the researchers to transfer effectively their research outcomes to the market. Among the departments of CRP santé, there is a department dedicated to public health with a Centre of health studies and a subdivision on Systems analysis and health services. The overall scope of

[25] The basis of competition is defined as the type of improvement for which customers will pay a premium price as it diminishes the gap between what the customers' desire when buying the improved product or service and their actual experience.

the centre of health studies is to provide a research and a surveillance system that will inform decision makers on prevention, healthcare financing and will perform effectiveness evaluations.

However, while realizing the importance of health economics, CRP santé has moved a step further by setting-up a Health Economics Unit that would focus on evaluation of the economic value of research outcomes. Prof. Maarten IJzerman has been chosen as the project leader, responsible for establishing Luxembourg's Institute for Translational Health Economics (LITHE). This initiative is in line with the global trend of personalized medicine and health economics. It becomes apparent that there is a great impact of biomedical research and the advances in healthcare broadly on the health system and budget. Thereby it is pivotal to be able to assess all relevant aspects, to be able to make informed decisions.

That is exactly what Health Technology Assessment (HTA) stands for. It can be defined as a form of policy research that identifies policy issues, assesses the impact of alternative courses of action, and presents findings (D. Gallio, 2007). According to Cohen and Hanft (2004), medicine and technology 'proliferate at a staggering pace'; therefore it 'has never been more important to evaluate those innovations'. It is important to clarify that there is more in evaluating health technology than merely cost-effectiveness. An evidence-based approach can only give a partial, short-term solution to the burgeoning healthcare costs accompanying health technology.

In principle, HTA should encompass not only the clinical and economic consequences but also the ethical and social implications of the diffusion and the use of top-notch technologies on medical practice. The HTA audience is broad and diverse: from healthcare providers, government and administrative bodies to patients and public, not to forget pharmaceutical companies and the biomedical industry. The use of HTA is also diverse, from instrumental use to shape policies and conceptual use to confirm decision maker's own judgment to symbolic use to justify someone's position such as that of a public group (Lehoux, 2006).

Gartner is one of the world's leading information technology research and advisory company. Every year, it updates its famous 'Hype cycle for emerging technologies'. In a way, Gartner assesses the technological advances and it delivers a technology-related insight that is necessary for its clients (from CIOs and senior IT leaders in corporations and government agencies to business leaders in high-tech and telecom enterprises) to make informed decisions (Gartner, 2014). Particularly, the latest version of the 'Hype cycle for emerging technologies' encompasses a significant number of health technologies. In Figure 5, digital health subcategories are located along the spectrum of maturity and market readiness. As an

example, 'mobile health monitoring' is appearing to approach the bottom of the 'trough of disillusionment' and is expected to reach the 'plateau of productivity' and thus steady market adoption in 10 years from now. Realizing the great impact of patient preferences in digital health technologies, Gartner has released a specific analysis for trends in the patient-facing digital health market. Thus Gartner's approach underscores the multifaceted basis for decision making that HTA stands for.

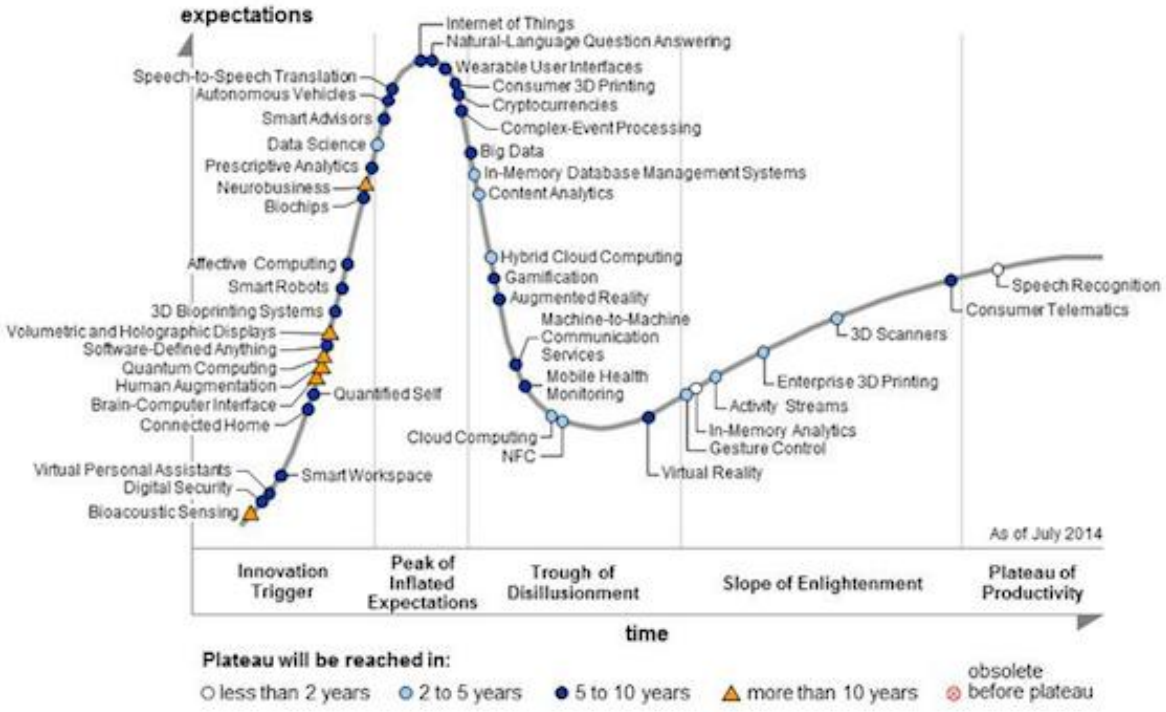

Figure 5 Hype Cycle for Emerging Technologies (Dolan, 2014)

In order to encompass all relevant information and make an informed decision, multi-criteria decision analysis (MCDA) is gaining grounds. As a decision support framework, MCDA is helping decision makers in healthcare - and not only - to make complex choices in a more comprehensive, structured and transparent way. A key element of MCDA is problem structuring. It is the first step of MCDA and it demands enough time for understanding in depth the problem that is to be addressed. In addition, numerical (not always necessary) and uncertainty modelling, along with a variety of weighting and scoring techniques are important elements of MCDA. It is of fundamental importance to be able to visualize adequately the outputs of the MCDA model for the decision makers to have confidence on the model. It becomes apparent that MCDA, already applied in healthcare since 1990's, is well suited to support a broad range of decisions in healthcare by carefully selecting the appropriate MCDA technique depending on the decision to be made.

All in all, policy in general -and healthcare policy by extension- does not consist in yes and no answers. It is rather a process of laying and shifting evidence, with HTA being part of that. It can be seen as objective and can be used from the decision makers to patients groups for stimulating debate and orient government policies. In sum, HTA is aiming at maintaining transparency and consistency of the decision making process that often has to trade-off between cost-effectiveness and other factors such as political pressure, budget constraints and patient opinion. Luxembourg can only gain by implementing HTA, in an effort to engage in a more transparent and consistent process of decision making within healthcare.

Box 7: Health Technology assessment of companion diagnostics

National Institute for Health and Care Excellence (NICE), UK

Companion diagnostics have been developed to preselect patients according to their own biologic profile towards personalized medicine. In this way, it is possible to identify patients who are most likely to respond to treatment and thus facilitate the clinical decision to be made. At the same time, the use of companion diagnostics becomes more and more common, especially with new pharmaceutical that require for their use to identify the appropriate treatment subgroup. This is the case in some pharmaceutical products targeting cancers among other diseases. Companion diagnostics promote as a result tailor-made treatment according to individual needs. Nevertheless, the use of companion diagnostics could be a substantial burden for healthcare system resources, considering the increasing volume of testing. In order to tackle with this issue, policy makers and HTA bodies are reviewing the policies and methods of reimbursement regulations regarding pharmaceuticals that require companion diagnostics. NICE, the UK HTA body, has developed a policy for considering companion diagnostics using its Technology Appraisal and Diagnostics Assessment Programs. UK is a country with a long tradition in HTA in comparison to Luxembourg. However, according to PwC's Luxembourg new biennial review of the IVD sector, 'investor interest in global in-vitro diagnostic (IVD)[26] market is expected to grow […], increasing companion diagnostics partnerships'. In Luxembourg interest in diagnostics and personalized medicine is growing[27]. However, creating the right environment for sustaining such innovations demands rapid action - through assessment - in pricing, regulatory pathways, clinical trial design and drug-diagnostic value-sharing (Sarah Byron, 2014) (PwCLuxembourg, 2012).

[26] [1] In vitro diagnostic (IVD) tests are medical devices to be used in vitro for the examination of specimens, including blood, urine, and tissue donations, derived from the human body, to detect diseases, conditions, or infections.

[27] In fact, Luxembourg is hosting the EPEMED International Personalised Medicine Conference this year (*http://www.crp-sante.lu/en/Health-Economics-Symposium*).

Box 8: Public and Patient Engagement in Health Technology Assessment in Ontario

Canada

According to McMaster Health Forum 1, HTA agencies have difficulties to achieve public and patient engagement. In order to reinforce public and patient engagement, McMaster suggests a comprehensive approach. This approach resides on 3 elements. Firstly, create a comprehensive and flexible framework to engage the public and the patients. Secondly, build capacity within HTA agencies by promoting and embedding innovations within those organizations. And thirdly, build capacity among public and patients, by providing orientation and training and supporting coalitions with patient associations actively involved in HTA. What is underscored in the case of Ontario - but applies as well elsewhere - is that there are potential barriers that need to be kept in mind when implementing the aforementioned considerations. Those barriers refer to lack of awareness about HTA processes, difficulties in developing a common vision (when making recommendations), possible lack of champions or agents to adopt and sustain such innovations. Last but not least, the fear of policy makers that engagement of the public and the patients might undermine the efficiency of the current HTA processes. However, one should at the same time be attentive to potential windows of opportunity. More specifically, Health Quality Ontario is currently developing a corporate public and patient engagement strategy. In addition, the Health Technology Advisory Committee has established a Public Engagement Subcommittee to develop a public engagement framework. Finally the Health Technology Assessment International's Interest Subgroup on Patient and Citizen Involvement in HTA is involved in various initiatives that strengthen public and patient engagement. All in all, it becomes apparent for the case of Ontario that HTA is fundamental in order to ensure transparency, accountability and legitimacy of decisions taken in the policy level but needs to account for all relevant parties (Gauvin, Abelson, & Lavis, 2014).

7. Give voice to the patients

Are we there yet?

Patient rights, voice to the patients, patient associations always find a way to be part of the news. Healthcare is a highly complicated and emotionally charged field. Thereby patients' opinion can highly impact on healthcare policies (Cordasev, 2010). One would think that is hardly the case, considering the budget cuts in healthcare as a result of the economic crisis. Well that is not entirely true.

The economic crisis along with the technological progress has led to a shift from a 'grateful generation' of Europeans, taking doctor's word for granted, to a 'demanding generation' of active patients turning into health consumers who start 'shopping' for better deals (Levin-Scherz, 2014). That turning point from passive patient to health consumer is a crucial aspect of the healthcare setting. Especially in times of economic crisis, as it is the case nowadays, payers (conceptualized as the CNS, government, employer and beneficiary in the Luxembourg setting) are gradually moving into paying healthcare providers according to services delivered, where the quality of performance starts affecting the payment. In this respect, 'naming and shaming' proves to be a powerful tool, rewarding the best and criticizing poor performance. For a healthcare provider to lose his/her reputation can severely affect its income, as patients become more volatile and reimbursement more and more restricted. In the long run losing a patient might mean losing money rather than avoiding costs (Cordasev, 2010).

Moreover, patient empowerment and self-service are becoming more and more prevalent features of the healthcare setting of today and will potentially dominate healthcare provision of the future. Preventive care and risk reduction are downshifted to the patient him/herself that in turns limits the role of the healthcare system as it is. Diagnostics are increasingly offered directly to the patients. We have evolved greatly from home pregnancy tests to the possibility for patients to do their own home HIV test and to purchase a lab machine to check on their Coumadin[28] dose on e-commerce websites. Gartner - known for his 'Hype Cycle for Emerging Technologies' - has created for the summer of 2014, a more specific analysis of the technologies and trends in the patient digital health market. Some of the newer trends include your own wellness and patient decision aids, thus demarcating the importance of

[28] Coumadin is an anticoagulaiton drug used in the prevention of the formation of blood clots in the blood vessels and their migration elsewhere in the body.

accounting for patients' choices when assessing health technology development (Dolan, 2014).

The most successful healthcare systems around Europe start implementing consumer information and guidance system as a strategic element. In the Netherlands, a frontrunner healthcare system, active consumer choice is an essential mechanism of the healthcare market. Hospital information portals are a characteristic example that aims at increasing involvement of citizens and patients and to engage their knowledge to improve prevention and treatment. It is simple, if you would invest in a new house, you would not do that without investigating the qualities, obligations and of course the price. The same applies for other commodities and health is actually the one no one is willing to gamble. Governments foresee that and as the past has shown they usually succumb to patient pressure groups. Wouldn't it be more efficient –not to say cost-efficient – to account for patients preferences *à propos*?

Quality of care information (QCI) is a driver of healthcare quality and is pivotal for patients as consumers to make informed decisions. In turn, consumer's perception of what is relevant and useful for making choice decisions that is a crucial factor in effectiveness of information. Processability is a critical variable in building effective consumer information environments. Still, how patients' process information depends on consumer's knowledge and sophistication. Due to the ease of access to information, due to the new technologies and highly technological literacy, consumer's knowledge and sophistication are quite high. However, the traditional healthcare system tends to underestimate the patient's level of knowledge about technical medical matters. Consumer assertiveness in medicine is inconsistent with traditional authority relationships between physicians and patient. This inconsistency can raise a barrier to effective use of information and affect performance rankings (Cordasev, 2010).

As it has been the case with the Dutch organisation 'Kind en Ziekenhuis', hospital policies have been forced to change because of the ranking of patient organisations. The organisation has published the names of hospitals that allowed parents to be with their child while receiving narcosis. Not only parents have been taking this information into account more and more, but also more and more hospitals were allowing parents to be present on their child's narcosis procedure. Maybe in Luxembourg, where there are a small number of hospitals this is not the case. Patients would just conform to what the medical doctor would tell them to do. It would hardly be the case though, considering the latest reforms in the European treaty law, capitalizing patients' rights on cross-border care (Cordasev, 2010). So if not satisfied within Luxembourg, they can more easily now than before look for healthcare services abroad that better fit their desires.

However, what is the role of Patients Associations in Luxembourg's healthcare setting? Patiente Vertriedung (PV), the patient association of Luxembourg, is actively taking a stand on the healthcare frontier. Most recently in PV's press conference the 1st of April 2014, they have touched upon government's recent reforms, namely the DSP, 'médecin référent' and introduction of generics. According to PV, DSP is a rather fiddly task. Generics appear as a solution towards cost containment, generating at the same time some accountability issues. In terms of 'médecin référent', doctors constitute a very strong lobby questioning the role of 'médecin référent' as gatekeeper[29] of the healthcare system.

In particular, PV and e-Santé are working closely on the development and launch of DSP. A major issue with DSP initiative is who is going to have access to the patient's file. According to e-Santé, only the doctor will have a code with which he/she can access and modify the patient's medical file. But what about the administrative personnel in doctors' practice? Will they have access too or not? It is rather usual for the administrative personnel to fill in any changes on patients' medical files in addition or instead of the practitioner. Who is going to ensure data security then? PV has encompassed these confidentiality concerns and therefore suggests that administrative personnel as well receive a separate access code. The aim of this act would be in line with holding accountable all the people who some way or another interact with the patient and have access to sensitive personal data.

PV also takes a stand in terms of generics. It is highlighted that special attention should be given to not simply replace original medicines with generics based on economic criteria. It is rather the choice of generics in place of the original, only in case there is no better alternative. And then again, who is to decide which version of the drug the patient should receive? The doctor or the pharmacist? According to CNS, the doctor is free to prescribe either the original or the generic version. But the pharmacist is supposed to suggest to the patient the generic version. The final decision rests with the patient, but in case the patient decides to purchase the original - when there is an available generic - he/she will have to pay for the difference. Once again, who is to be held accountable? The doctor the pharmacist or the patient him/herself for choosing one medicine over the other? PV is occupied with these questions, realizing that these facts can have important implications as far as equal access in healthcare is concerned.

Furthermore, PV states that patients in Luxembourg prefer to have a healthcare centre in proximity, rather than having to travel to the closest city. This preference though leads to 'one

[29] A healthcare professional who is the patient's first contact with healthcare and who triages the patient's further access to the system.

size fits all' hospitals that try to please the patients by providing a broad range of services. Nevertheless, the quality of those services is questioned. PV calls for a more official and standardized way of assessing quality especially in hospitals. According to them, it is preferable to have fewer in number hospitals with more specialized areas of expertise (see Value Added Process hospitals (p.11) that provide high quality care. Once again the new Directive on cross-border health is underscoring the necessity for quality assessment. If the latter is not guaranteed, then the Directive is incentivizing patients from Luxembourg to look for healthcare provision somewhere else within EU with the same reimbursement levels as in Luxembourg.

Internationally, patient preferences are increasingly taken into consideration in healthcare service design strategies. And this makes sense, considering that patients are the end users of those services. Luxembourg is no exception, thus it is important to give voice to the patients through the patients' association. Engaging in a more active participation of the citizens, as health consumers, is fundamental for framing the healthcare system of tomorrow. PV provides various materials, both printed and online to raise awareness and promote informed decisions among patients. That is a first step. Initiatives like 2030.lu and open to general public blogs such as the one of Fondation IDEA can show the way for a more effective information flow. The latter is essential to guarantee a sustainable healthcare development according to the needs of Luxembourg.

Reflections

Box 9: Medical school in Luxembourg?

In order to disentangle the different notions related to the Luxembourgish healthcare system, it is of great importance to address the issue by readdressing the foundation of the Luxembourgish system, namely freedom of choice and liberal status of doctors. The first is a fundamental right, the second is rather a necessity to cover for medical needs. In this context, lots of discussion has been raised around the topic of funding a Medical school in Luxembourg. Could this be the Holy Grail for Luxembourg's healthcare system sustainability? It is an ambitious and without a doubt a reasonable thought. But then other questions emerge. Who is going to fund this School? How will these students be distributed and in which hospitals for their training? There are of course great potentials. An international country like Luxembourg, with doctors coming from different countries and subsequently different medical education systems, can be a starting point for an innovative medical school. A school with international orientation, gathering doctors from different countries and providing the best of what medical education systems have to offer, tailored to the needs of the Luxembourgish (first) and international health market. All aspects are going to be evaluated both externally and internally. So the possibility of this initiative is yet to be decided.

Iceland: Luxembourg's case vice versa

Lacking its own specialist qualification training for doctors, Iceland does probably benefit from a system which resembles the medieval rules for carpenters and masons: for a number of years after qualification, these craftsmen were forbidden to settle down, and forced to spend a number of years wandering around working for different builders. Naturally, they did learn a lot of different skills along the way. Young Icelandic doctors generally spend 8 to 10 years after graduation working in another country, and then frequently come back. Not only do they learn a lot – they also get good contacts useful for complicated cases: the Icelandic doctor faced with a case not possible to handle in Iceland, typically picks up the phone and calls his/her ex-boss, or a skilled colleague, at a well-respected hospital abroad and asks: Could you take this patient?, and frequently gets the reply: "Put him on a plane!" (Björnberg, 2013).

Conclusion

The government's health policy is based on six principles. Namely the guarantee of healthcare services quality, equal access to healthcare, preventive medicine, priority of primary care, patients and providers' accountability and rationing. Do these principles render sustainability of Luxembourg's healthcare system a herculean task? With this report, we aimed to show that this is not the case. These principles lay a rather good foundation for long term benefits. The question that we tried to answer is what would be the recommendations towards all relevant stakeholders, based on solid scientific research and comparative analysis.

The policy recommendations presented in this report are within the spheres of hospital planning and budgeting, the concept of 'médecin référent', ICT, the diffusion of biomedical technologies, cross-border health, health technology assessment (HTA) and accounting for the end-user, the patient. For each of these recommendations, we have presented what is the state of the art in Luxembourg, what is the way forward, challenges for Luxembourg's health (which in most cases are challenges for healthcare globally) and last but not least best practices and examples of how other countries have risen to the occasion.

In order to depict the current trends in healthcare, we introduced a number of best practices, including Netherlands, Switzerland, France, Canada and others. There are a lot of best practices to learn from but one should take some distance and reflect! It is pivotal to understand in depth the causes of system alert. As in the case of immunoresponses, we need to identify not only the players but also to map the pathway by identifying the stakeholders, which is the first step, followed by mapping of their interactions and the margins of improvement.

According to Tallin's Charter, healthcare systems must engage in a holistic approach of the services provided. This in turn necessitates the coordination between various providers and institutions, public or private, primary, acute and long term care (WHO, Tallinn Charter: "Health Systems for Health and Wealth", 2008). In our report, we aimed to adopt this holistic approach by identifying all relevant stakeholders, namely medical professionals, policy makers, representatives from the biomedical research field and the patient association. At the same time, we started exploring their interrelations as these is experienced in other countries, showing the path for Luxembourg in an effort to meet its sustainability goal in healthcare.

Deber (2003) states that preserving the sustainability and the public nature of healthcare systems and fostering solidarity among citizens and belief in the legitimacy of public policies might also be important in healthcare. The current trends in healthcare in Luxembourg and in the world reinforce this approach. Luxembourg believes in the public nature of healthcare, promoting solidarity but there is a need to address the sustainability concerns that emerge by strengthening the legitimacy of public health policies.

Luxembourg is a small country with a strong economy. Thomas Fuller once said that health is not valued until sickness comes. Nowadays, we do not wait until we fall sick. It is not cost-effective. Thus, we try to prevent illness. As the global trends show, healthcare provision moves towards preventive medicine focusing on individual patient level. And Luxembourg shows strong willingness to embrace these shifts and even participate in the shaping of tomorrow's healthcare setting. Realizing that healthcare is in addition a promising economic pillar and investing on it, can only benefit Luxembourg.

In sum, this report should be seen as a stepping stone for health economic research with the aim to better inform relevant stakeholders, in order for healthcare provision to be a substantial economic pillar of Luxembourg economy. At the same time, this report underscores that for the transformation of Luxembourg's healthcare, it is fundamental to undergo the so-called "disruptive" innovations, not only in technology but mainly in service provision. Towards this effort, other countries' activity in this direction can show the path.

Luxembourg's healthcare quo vadis? As highlighted from the beginning, the goal of this report is to give an insight on how Luxembourg can address the sustainability issue in the healthcare sector. In this respect, this report should be read as a roadmap on discussion about healthcare in Luxembourg, where medical professionals, biomedical researchers, patients and ultimately policy makers would sit around the table and discuss in a productive way, setting the health policy of tomorrow. A policy that will guarantee sustainability. It has happened already once, in a broader level, with 2030.lu, thus it can happen again. So let the discussion begin!

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