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Chained Globalisation

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Editorial

Chained Globalisation

Eric de Roodenbeke
CEO
International Hospital Federation

We have been reading for decades that we live in a global village and that the virtual world has put down all boundaries. However, the reality in healthcare does not really reflect this description.

Technological advancement has benefitted healthcare at the global scale although at a different pace. There is, no doubt, a global appetite for adoption of new technology. In any professional healthcare meeting, technical innovation always attracts interest, and healthcare leaders are willing to be early adopters, especially in competitive healthcare markets.

However, the way technology is used, the outcomes it provides and the efficiency of its usage vary dramatically across different countries and even within countries. Technology has more or less adapted itself to local practices rather than participating to a global standardisation of practices. It would be wrong not to recognise the interplay between technology and processes but except for technologies triggering a disruptive change, its adoption is primarily dependent on the purpose of the organisation and the processes that are in place to produce their services.

When looking at practices and models of care, globalisation is far from becoming a reality because of a local mindset driving the paradigm of those involved in health service delivery. This is understandable because health services are embedded not only in the local culture, but also in the socio-economic model of the community they serve. It is not always logical to copy and paste good practices from one place to another.

However, even if solutions cannot be replicated, there are two major drivers participating to **Chained Globalisation**. The concerns and priorities that are behind health services are quite universal: patient safety, quality of care, efficiency of resource mobilisation, patient centredness, value, accessibility, etc. The tools and methods supporting the processes are also quite universal: quality improvement methods, governance practices, effective leadership, management competencies and processes, etc. Behind these drivers there are numerous factors giving each organisation a certain level of specificity when considering their own time frame and level of priorities.

In this issue, our contributors outline the current challenges and opportunities in high value care, and talk about digital health diplomacy and how it can facilitate the creation of a global digital healthcare system. They explore corporate social responsibility policies and how they should drive COVID-19 vaccine development and distribution, and discuss communication flows within the global healthcare sector. They also explore regulatory restrictions on healthcare workers, limited imaging choices in low-income regions, the application of machine learning and radiomics, the threats to imaging and radiology, and the application of GeoAI for chronic disease management.

We hope you enjoy this issue. As always, your feedback is always welcome.

Happy Reading!

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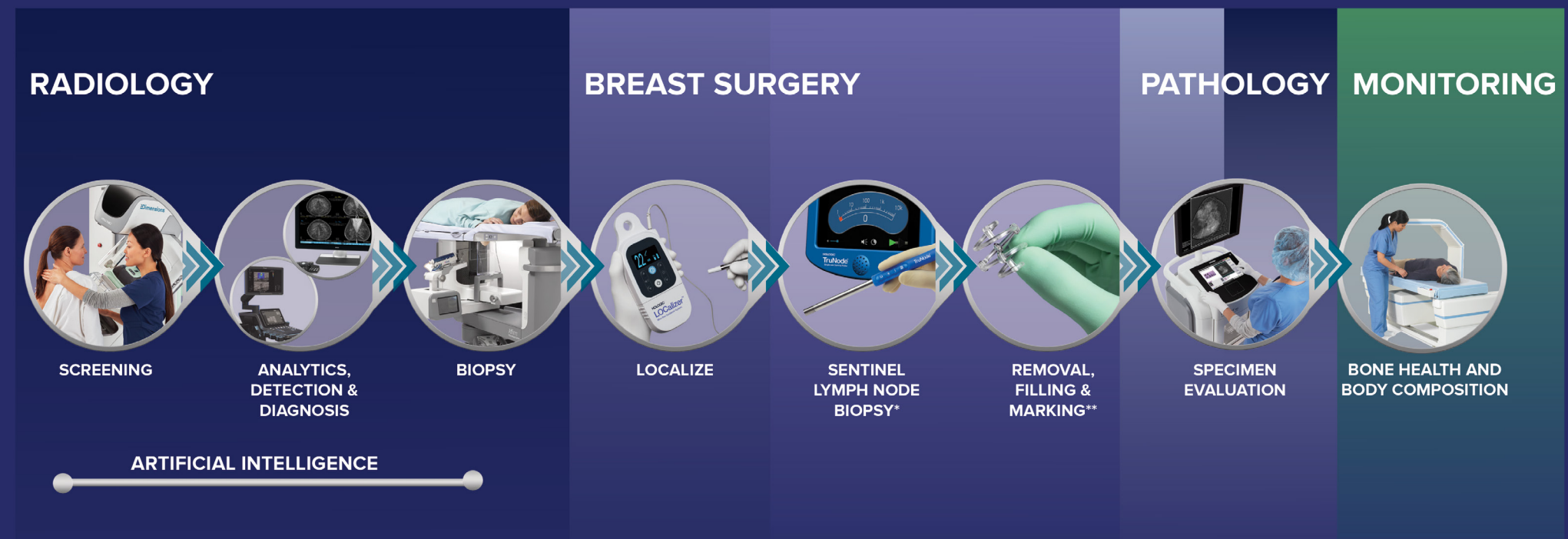
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Globalisation promotes healthcare innovation on a worldwide scale through the exchange of ideas and technologies. Despite all efforts to promote best practices, why doesn't this international approach always work as well as it should? What are the cultural differences or regional specialities that need to be bridged? How can we improve the implementation, transfer and application of healthcare services and knowledge across different borders and specialties? How can we ensure equity in healthcare across the globe? This and much more in this issue.

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On the Threats to Imaging....Should We Be Worried?

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☑ **Key Points**

- Imaging has been at the forefront of innumerable technical developments over the last two decades.

- Radiology was the lead in developing CT and MR, and led the charge into the transition to digital in the '00s.

- However, in recent years, imaging changed from being a profit centre to a cost centre, inpatient care was deemed too expensive, and outpatient care was the way to go. This has affected imaging in many ways.

- When the prevailing thought is that imaging is slow and cumbersome and expertise is not always easily and readily available ('not at the table'), the idea that "we can do it better ourselves" threatens to take hold. This creates threats for imaging.

The older one gets, the more reflective one becomes. Especially upon retiring, taking stock is not unusual I feel. One might thus ask themselves, what contributions have been made, what insights have been gained, and which of my experiences might be of some use to the next generation of imagers?

There is no doubt imaging has been at the forefront of innumerable technical developments over my 40 years of practice. Since the early '80s, the diagnostic armamentarium has expanded exponentially, leading to an unprecedented ability to be the central cog in the diagnostic process.

One might think this will continue, with personalised medicine and more insured patients likely leading to more imaging tests. But as with all things, there are some downsides, maybe even threats, to these developments in the field of imaging.

How We Got Here

Let's begin with a fact: there is rarely a diagnosis made or rejected in the hospital without input and support from imaging, with the possible exception (research is ongoing) of psychiatry and dermatology.

Almost 50% of all inpatients interact with radiology at least once during their hospital stay - and the number of imaging interactions is much higher when outpatients are considered. And in more than 50% of patients presenting for medical care, the imaging results decide the further course of medical/surgical action. This is partly what makes - and has made - imaging such an attractive career.

We also have the neatest tools, but they are also (at least perceived as) the most expensive ones. Radiology was the lead in developing CT and MR, and led the charge of the medical realm's transition from analogue to digital data acquisition, storage and distribution in the '00s.

In the '70s and '80s, we were all familiar with bins of film jackets, often left overnight to be looked at the next day. Reports were attached to these film jackets a few days later, infrequently if seldom read. If a clinician wanted to have a result before this trajectory was completed, he or she would have to come to the reading room to discuss the case. Concurrently the development of the digital patient record (Electronic Patient Record, EPR) allowed the diagnostic process to speed up even more.

Indeed, this was a wonderful development. Imaging was proud to be leading in these developments until the early 00's. Not so much now though, IT departments having taken over. It may turn out that we have been so far in the front that we have forgotten to look

back at those we were leading.

Over the last two decades or so, the world has also changed in a few very distinctive ways. First, social change and media have fostered a prevailing attitude of 'I want it now, or earlier.' From news, to opinions, to results of anything at all, speed of delivery and sound bites seem to prevail over contemplative, careful thought and analysis. The younger generation types quickly and error-free, is connected all the time, and wants their lives to be fast paced, ready for the next thing that comes along. And yes, this plays out in imaging as well.

Secondly, during this time, we can no longer ignore the sobering fact that in the U.S. we spend $1 out of $5 on health care, as opposed to an average of $1 in $8 to $10 in the European Union (EU). Along with the troubling statistic that millions of people in the U.S. have no access to healthcare at all has led to slow steps toward a form of national health care solution,

so decades. Attempts at reigning in healthcare costs through bundled payments as well as capitation, as ongoing alternatives for the traditional fee-for-service model, have further eaten away at how imaging gets paid for. Particularly in Europe, capitation has developed apace, leading to a form of 'rationing' of care. Some form of that will evolve in the U.S.

Thus, transforming the imaging department from a profit centre to a cost centre for hospitals was the inevitable result, not in the least aided by the decreasing technical component for imaging reimbursement to hospitals. This makes imaging, imaging (and its machines) perceived to be "expensive," and thus thought of by non-medical 'managers' as expensive. All of this may further the notion that imaging is 'just a com-modity' to be traded for a cheaper or more efficient model. As a former CEO once told me: 'if your radiology department makes us money, we will not bother you.'

overcrowded. Add to that, in this malpractice environment especially, that we cannot afford to send a patient home with a wrong diagnosis and it is more expensive to do imaging in the ED.

This leads, most distressingly, to frustration and adversarial situations between the imaging department and referring clinicians where there used to be collegiality. Of course imaging attempted to remedy this. To try and improve the dialogue as to what imaging is best in what clinical situation, as well as to bridge the literature-based evidence between specialties, imaging initiated best practices, also known as the appropriateness criteria. These developed out of multi-specialty committees that addressed which imaging modality is best for what clinical indication. Unfortunately, in many cases, this has proven to be another bone of contention - often specialties are not even aware these criteria exist, and many have not readily accepted them. It's a classic case of too many cooks....

Almost 50% of all inpatients interact with radiology at least once during their hospital stay - and the number of imaging interactions is much higher when outpatients are considered.

step two of that process being the ACA.

The result? Imaging, perceived as expensive, evolved from being a profit centre to a cost centre. Cost cutting became prevalent, inpatient care was deemed too expensive, and outpatient care was the way to go. This has affected the practice of imaging in many ways.

Less Imaging (or More Indicated Imaging)?

To 'lower' the imaging bill, several strategies took hold:

The insurance companies simply started paying less for the service. In the last two decades, the professional reimbursement of all we do plummeted—for a chest radiograph, roughly 90% during the last two or

The other cost-cutting method has been to require preauthorisation of the more advanced, thus more expensive, imaging studies such as CT and MR. This is now a common occurrence if the study is not ordered by the emergency department (ED). And so we have the following scenario: Imaging departments cannot proceed with scheduled studies without approval by the payor leading to extra work on all sides, inefficiency and increased labour costs.

At the same time, referring clinicians increasingly send patients to the ED so imaging can be done more speedily, without preauthorisation. This is why we image so much in the ED, yet we are surprised that ED's are

Who Does the Imaging?

A common perception in imaging is that it is used as a stethoscope and, as an extension, fosters the loss of the "art" of medicine.

All too often, imaging is done first, before anyone has examined, let alone taken more than a token history of, the patient. Scenarios abound: barely trained physician extenders ask walk-in patients where it hurts and fill out the imaging requistion form; ambulance/helicopter staff decide, often in the field, what needs to be done once the patient arrives at the ED; shift hospitalists order imaging studies not knowing (or bothering to look up) whether previous studies were done or what

the report of previous studies said. Meanwhile, the volume of imaging grows unabated.

This is compounded by the fact that ordering imaging studies in the EPR can be cumbersome, thus perceived as slow. A final report can take "a while" (not further specified, but really expected right away). And reaching someone in imaging can be quite a challenge, as well as the reverse.

When the prevailing thought is that imaging is slow and cumbersome and expertise is not always easily and readily available, the idea that "we can do it better ourselves" takes hold.

This plays out in at least two distinct threats:
1. On the radiation side, radiologists traditionally have to become licensed in order to perform the imaging itself. But slowly other image-interested

2. On the 'non-radiation' front, ultrasound (US) and magnetic resonance (MR): for the former one needs to look only at the modern ED staff, doing their own (FAST) imaging and gradually being allowed to bill for it by hospital administrators. This development is aided by reams of emergency room imaging papers being published in non-traditional (and not always peer-reviewed) imaging journals.

Much of what is happening in CT is valid for MR as well. MR centres run by non-imagers are more and more common, opening the door for non-imaging trained specialists to muscle in on imaging territory.
3. The day cannot be far away, I fear, that the clinician will simply ask the imager for the raw data of the study and do their own post-processing, reconstructions and pre-op planning.

For some imaging departments, an answer is to decentralise the reading room, putting neuroradiology on/near the neuro floors and the chest imagers near the ICUs.

This stress on the imaging personnel cannot be understated. It is well documented that overnight shifts are physically hard, disruptive to family life and lonely. In imaging, two to three years is the typical "lifespan" of these night workers, and almost all will want to revert to regular work hours. Where do we find replenishment for these professionals in a market where "part-time" is embraced in the majority of young graduates from medical school? Where the new generations prize their 'away from work' time much more than decades ago?

Ever higher volumes of imaging studies also do not lead to increasing revenues. Radiologists who have to

In the U.S. we spend $1 out of $5 on health care, as opposed to an average of $1 in $8 to $10 in the European Union (EU).

specialties are encroaching: for instance, orthopaedics can now install their own CTs and hire a radiologist to oversee the imaging, bill for it and finalise a report. The same is true for cardiologists/cardiac surgeons, where we tenuously hold on to a 'cooperative' management of the studies and reporting of these studies together, also neurology specialists, who are even more involved in the neuro-interventional realm and, in some institutions, totally in control of the imaging/IR rooms. Neurosurgeons have a real need for post-processing of CTs and MRs, to define the opera-tive path. Some centres have developed post-processing labs for this reason, to lessen the burden on the reporting radiologist and serve the image-avid specialties like cardiology, neurosurgery and orthopaedics.

Today's Reality
During the last decade-plus, imaging commendably confronted its "image problem." Radiologists understood their profession needed to be more visible to referring clinicians and patients themselves. After all, oft-quoted, when you are not at the table, you are apt to become the main course!

The solution was sought in 24/7 availability, in person, through teleradiology or a hybrid form. This, however, puts a tremendous strain on the imaging department, both on personnel (night shifts, reviewing teleradiology reports the next day) and on productivity, with risk for interpretative mistakes occurring when radiologists work too fast or with less attention. After all, other specialty faculty rightly insist on imaging faculty during 'off-hours'!

report these studies simply cannot keep up, in both the volume and their energies - which leads to the inevitable, growing complaints from clinicians. Is the next step radiographers interpreting and final reporting cranial CTs, as is happening in the UK? Or nurses doing the same for skeletal trauma, like in Scandinavia?

No wonder burnout among imagers is at roughly 40% and rising fast. Anecdotally, it's just no fun anymore, leading ever more imagers to even retire from the profession.

Question of Quality
There also simply are no reproducible quality measures for imaging, especially in a society where numbers rule. Yes, we measure how fast a study can be scheduled, performed and dictated, but there is no standard turnaround time

generally accepted, thus usable, as a quality measure.

Even more vexing: what constitutes a good imaging report? Is it accuracy? If so, how do we measure this? Is it speed? (Is a 30-minute turnaround time good or bad?) How about legibility? Can the referring colleague read it and comprehend it? Should it be structured or free text? And what about the lay-person reading their own reports - should we tailor the report accordingly?

Then: wrong sidedness. In the old days, a patient might come to radiology with a requisition that reads "right hand," except that the bandage is on the left, and the pain is also, according to the patient. The technologist would cross out "right" and insert "left" and do the imaging. Try that today! Trying to reach the requesting person is time consuming (for both parties) and prone to irritation. However, the statistics on this "wrong-sidedness" are kept as a quality measure.

Even more difficult to talk about is the quality of training for our trainees as a result of all these threats. Do they get the chance to develop? Practice our craft under adequate supervision? Formulate their own thoughts in preliminary reports, or is there no time for that these days?

Is Artificial Intelligence a Threat?

In no other field of healthcare are the inroads of big data (sets) more evident, and Artificial Intelligence (AI) strikes at the heart of imaging practice.

Have you noticed the ads that pop up on your phone or computer relating to a site you just visited? In imaging, it will grow into a major threat: imagers do spatial recognition yet AI does it just as well. (I recommend you watch 'the Social Dilemma' on Netflix. Disturbing!). Algorithm (deep) learning will allow for machines to ever improve in the detection and interpretation of data. Many routine imaging tests can thus likely be done as well, if not better than, the trained imager. Will it be just the routine imaging that is at risk, or even the complex imaging we do?

Future Shock

Clairvoyance is needed. I am an optimist at heart, love my (paediatric) specialty, but I have a hard time seeing anything but mammography, interventional (IR) imaging and paediatric radiology surviving these threats long term.

Why these three? As to mammography - no breast surgeon or oncologist wants to do screening, and thus are quite happy with the mammography expertise, as well as the pre-op localising skills of mammographers. IR is not likely to take that aspect over. AI on the other hand does need the human input (on-site presence) in this field, at least for now. Thus my confidence that mammography will be around for a while yet.

IR, and mammography also, will have to address the increasingly importance of the liquid biopsy, where a simple blood test will screen for oncologic diagnoses. Non-surgical tasks performed in the imaging department will likely remain cheaper than the operating theatre based interventions, thus likely securing this 'partially clinical' part of imaging a longer lifespan.

I know I am subjective, but paediatric imaging is unique. It takes special people to deal with kids, and the respect still generally enjoyed by paediatric imagers will likely guarantee long-term cooperation and survival of this sub-specialty.

Yes, I am worried. I hope I am (mostly) wrong. Unfortunately, the adage that your achievement of today is your baseline of tomorrow may not hold for imaging, as a whole, going forward.

Conflict of Interest

None. ■

Restoring Healthcare to Its Purpose

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Healthcare leaders around the world and in Europe in particular are increasingly interested in high value care, or value-based healthcare, with many aiming to implement, or already implementing the model in their work. Dr Christina Åkerman is part to many prominent organisations and initiatives in this field. In 2020, she has been keynote speaker at the [VBHC Prize](#) in the Netherlands and the ongoing [EIT Health Summit Series](#). HealthManagement.org talked to Dr Åkerman about the current challenges and opportunities in high value care in Europe.

High Value Care

What are some of the key challenges in the field of high value care (HVC) and how will these be addressed at the Summit?

An OECD report from 2017 suggests that at least one-fifth of health spending could be channelled towards better use. The numbers show that many patients are unnecessarily harmed at the point of care. It also points at the fact that many patients receive unnecessary care that makes no difference to their health outcomes. The problems in health care delivery have common root causes in the failure to measure health outcomes that matter most to patients. We do not know what matters most to patients and we are not able to compare the health outcomes easily between organisations to share best practices and learn from each other. The HVC Summit session will discuss the importance of health outcomes, the need to reward these outcomes, and ways of working together in a more integrated and solutions-oriented manner.

For the Summit participants, what would you like to see as a desirable takeaway?

I wish the participants to leave the session with a sense of urgency for the need to take existing waste out of the health system and transition to high value care. We do not need more care but better health!

Today, how do you see HVC in Europe compared to five years ago?

Over the years I have noted a growing awareness of the central importance of health outcomes to achieve high value care, augmented in 2020 by the ongoing pandemic.

What impact has the COVID-19 pandemic had on HVC? What will be the long-term consequences of this crisis?

The COVID-19 pandemic has put a sharp light on the challenges of equity, of demography, of making sure care is of high value for the resilience of health systems, and on the importance of staying in good health. All are pointing at the importance of identifying the health outcomes that matter most to patients, and making sure these outcomes are central to all health care being delivered.

Exponential growth in digital health solutions has been one of this year's trends. How can technology help in the HVC implementation?

Informatics interoperability is central to help improve health outcomes via sharing of best practices and learning from each other. Of course, COVID-19 accelerates the use of digital therapeutic solutions as healthcare systems are shifting towards remote care. There are seemingly endless possibilities for new digital health solutions. But given the myriad opportunities, patient involvement, early and often, is paramount to thoughtfully selecting what is most important. Without patient-focussed measurement, stakeholders risk consolidating digital versions of poor traditional assessments and proliferating low-value care.

In the Strategy Review for HVC Projects, one of the EIT Health's priorities is: "Move away from projects focussing on research and/or technology development." Could you explain the thinking behind this?

My interpretation would be that EIT Health with this priority intends to underline the importance of influencing innovation and research with patient and citizen engagement, making sure that developments within the health sector actively involve the people they are intended to serve. This is a cornerstone in achieving high value care and health – keeping the health outcomes that matter most to patients at the centre.

How can HVC activities be supported, in terms of policies and regulations, at the European level?

To me one of the most important areas where the European level can contribute is via embracing emerging standards, such as the HL7-FHIR or the EHDEN, an EU initiative to create a fully interoperable informatics network for European biomedical research. A successful support in this field will open up much-needed opportunities to benchmark and reduce the existing wasteful spending on health.

International organisations, such as EIT Health, work extensively on promoting outcomes-based care. How can this work help at a local/organisational level?

EIT Health is a community with all stakeholders needed to build the ecosystems necessary to transform to HVC and restore healthcare to its purpose: health. The recent launch of the HVC Forum, with the ambition to educate, co-create and share best practices, is to me one of the most exciting news in the field. With this Forum EIT Health has a unique opportunity at local/organisational level to make real world impact towards high value care!

What will be the major challenges for HVC in Europe in 2021?

To make sure we do not return to the situation before the pandemic and forget the challenges of equity, of demography, of making sure care is of high value for the resilience of health systems, and the importance of staying in good health that COVID-19 is currently teaching us, but instead use the insights to continue and increase the speed of transformation towards high value care.

What would be your most important message to health leaders already involved in HVC? To those still sceptical about it?

I hear individuals say "this is old wine in new bottles". If so, how come we still have at least one-fifth of health spending that could be channelled towards better use, that many patients are still unnecessarily harmed at the point of care or that many patients still receive unnecessary care that makes no difference to their health outcomes? How come we still pay for the services provided and not the results achieved? Involved or sceptical, we need to know the health outcomes that matter most to the people being served and how well these outcomes are achieved!

Conflict of Interest

None. ◼

Utilising the Workflow Engine of Enterprise Imaging at King Faisal Specialist Hospital

Author: **Mustafa Hamdy** | **Regional Manager** | **Middle East** | Agfa HealthCare

On 14 August 2020, King Faisal Specialist Hospital - Jeddah, in the Kingdom of Saudi Arabia went live with the Agfa HealthCare Enterprise Imaging for Radiology platform. HealthManagament.org spoke to Mustafa Hamdy, Regional Manager, Middle East region for Agfa HealthCare to learn more about the deployment and their future outlook in this region.

✓ Key Points

- King Faisal Specialist Hospital – Jeddah is one of three hospitals that make up the King Faisal Specialist Hospital & Research Centre (KFSHRC).

- They were the first hospital in the Middle East to achieve HIMSS EMRAM Level 7.

- In August 2020, Agfa HealthCare and the King Faisal Specialist Hospital, Jeddah, went live with the Enterprise Imaging for Radiology platform.

- Agfa HealthCare and the King Faisal Specialist Hospital & Research Centre will work together as strategic partners to implement the Artificial Intelligence capabilities utilising the powerful workflow engine of Enterprise Imaging platform.

- Enterprise Imaging features that meet the hospital's specific needs include remote reporting, peer learning, web deployment and accessibility, and an integrated viewer that enables patients to view their images and reports on a mobile device.

Can you give us a short overview of the healthcare sector in the Kingdom of Saudi Arabia? Any key points that you would like to highlight about healthcare in this region?

Health care in Saudi Arabia is a national health care system in which the government provides free health care services through a number of government agencies like MOH hospitals, National Guard hospitals, Ministry of Defense, Ministry of interior hospitals and group of specialist hospitals

like King Faisal Specialist Hospitals. There is also a growing role and increased participation from the private sector in the provision of health care services. Saudi Arabia has been ranked among the 26 best countries in providing high quality healthcare.

Healthcare is one of the main focus areas of the ambitious Saudi Vision 2030 and National Transformation Program 2020 (NTP) that seek to improve the quality of healthcare services and facilities across the Kingdom of Saudi Arabia.

Agfa HealthCare has recently deployed Enterprise Imaging at the King Faisal Specialist Hospital in Jeddah. Can you tell us something about this healthcare facility?

King Faisal Specialist Hospital – Jeddah is one of three hospitals that make up the King Faisal Specialist Hospital & Research Centre (KFSHRC). This tertiary referral hospital offers primary and highly specialised inpatient and outpatient medical care and participates in many clinical and research

studies. The 500-bed facility in Jeddah has a top-notch radiology department that also provides training in diagnostic and interventional imaging to radiology, medical, paramedical, nursing, and medical students.

On Friday, 14 August 2020, Agfa HealthCare and the King Faisal Specialist Hospital – Jeddah, in the Kingdom of Saudi Arabia, went live with the Enterprise Imaging for Radiology platform. Despite the challenges of carrying out the entire project during the COVID-19 containment efforts, the go-live was

projects and that was also a reason for KFSH to align with STC and Agfa to deploy that important project on the premises of King Faisal Specialist Hospital in Jeddah.

What challenges was the King Faisal Specialist Hospital facing, and why did they decide to move to Enterprise Imaging?
Enterprise Imaging offers a single, unified imaging platform, with embedded clinical tools and a

April. While the installation of the hardware had to be done on-site, all other work, including configuration and initial training, was done remotely.

Following the end of the curfew, the on-site engineer was able to take his place at the facility, and the Agfa HealthCare application specialists could complete the training of the hospital staff in person.

Despite the challenges in the face of the pandemic, the go-live went very smoothly, thanks in large part to the excellent collaboration and

The large-scale Enterprise Imaging implementation at King Faisal Specialist Hospital – Jeddah is expected to handle 120,000 studies yearly

smooth and successful. The large-scale Enterprise Imaging implementation at King Faisal Specialist Hospital – Jeddah is expected to handle 120,000 studies yearly.

Before Agfa HealthCare introduced EI within this healthcare facility, what kind of system did they have in place?
In 2010, the hospital became a customer of Agfa HealthCare with the IMPAX PACS, but by 2019, it was time to move to a next-generation image management solution. After a competitive tender, the hospital chose to stay with Agfa HealthCare, and implement Enterprise Imaging.

Agfa HealthCare and STC (Saudi Telecom) decided to partner together since 2016 mainly to address the cloud solutions and started offering that service and actively implemented quite some important installations for Ministry of Health which went live also this year using STC cloud technology. STC is also a partner to KFSH in the connectivity

powerful workflow engine, for maximised productivity. Features that meet the hospital's specific needs include remote reporting, web deployment and accessibility, and an integrated viewer that enables patients to view their images and reports on a mobile device.

Agfa HealthCare and the King Faisal Specialist Hospital & Research Centre will work together as strategic partners to implement the Artificial Intelligence capabilities utilising the powerful workflow engine of Enterprise Imaging platform.

What challenges did Agfa HealthCare face when deploying Enterprise Imaging at this hospital in terms of resources, acceptance, transition etc.?
The implementation project faced serious challenges due to the global COVID-19 pandemic. The Kingdom of Saudi Arabia instituted a 3-month curfew starting in March. The hardware for the Enterprise Imaging deployment was delivered in

hard work of the hospital and Agfa Health-Care teams, and the project coordination by the Hospital and Agfa HealthCare project managers.

Is this the first hospital in Saudi Arabia to deploy Agfa HealthCare's EI platform, or are there other successful implementations already in place in this region?
We have deployed already Agfa HealthCare Enterprise Imaging platform in several other healthcare organisations in Saudi Arabia. However, King Faisal deployment was unique because of their size, specialisation, clinical demand and very well structured infrastructure.

Their ambition towards digitisation is endless. They are a pioneer in different HealthCare IT aspects, and were the first hospital in Middle East to achieve HIMSS EMRAM level 7. They are very serious in their approach to Artificial Intelligence (AI).

• Ongoing deployment of Enterprise Imaging for the new hospital in Madinah, expected to be fully deployed in 2021.
• Further collaboration with AgfaHealthCare to validate some of the Artificial Intelligence algorithms in Enterprise Imaging platform. ■

At Agfa HealthCare, we support healthcare professionals across the globe to transform the delivery of care. Our focus is 100% on providing best-of-suite Imaging IT software solutions that enable secure, effective and sustainable imaging data management. From product development to implementation, our unified Enterprise Imaging Platform is purpose-built to reduce complexity, improve productivity and deliver clinical value. We use our proven track record as an innovator, our in-depth medical knowledge and our strategic guidance to help healthcare providers achieve their clinical, operational and business strategies

What have been the major outcomes? Has the deployment been successful, and what benefits has the hospital already seen since EI was implemented?
Enterprise Imaging offers a new generation of image management, creating a secure ecosystem of medical images with advanced image processing, tools to facilitate collaboration and peer learning, and platform performance and stability.

The platform provides the King Faisal Specialist Hospital, Jeddah with a number of key features that fit its specific needs, including remote reporting, advanced clinical applications, and an integrated viewer that enables the patients to view their own images via the mobile application.

What future collaboration is planned with King Faisal Specialist Hospital?
The modern, up-to-date platform meets the imaging IT vision of the KFSHRC's pioneering IT department. Currently we are working with King Faisal Specialist Hospital management team as strategic partners in several initiatives. Some of these include:

Enterprise
Imaging
Community
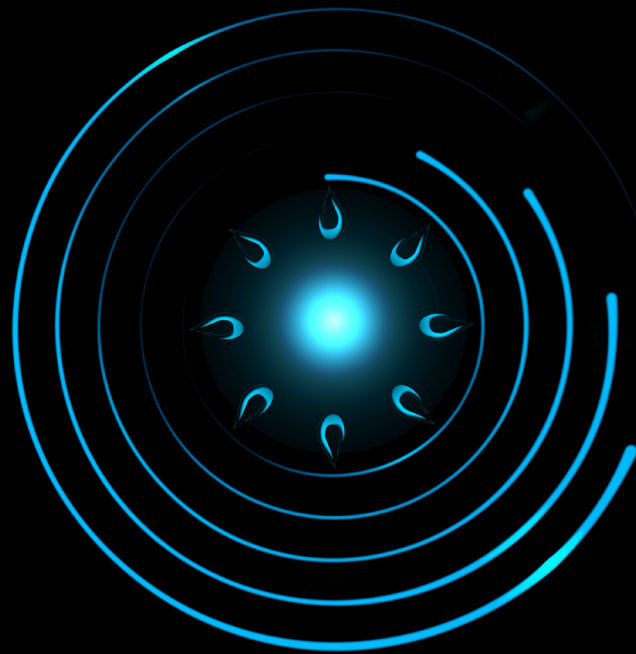
COVER STORIES

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Digital Health Diplomacy in Chained Globalised Health Context

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There cannot be a global approach to diseases and health promotion without a tremendous effort to create links. Interoperability of people, processes and information systems is crucial for this purpose. I advance a concept of Digital Health Diplomacy as concentrated international efforts towards supranational interoperability in eHealth/Digital Health. Such could lead to better policy and technical collaboration and the implementation of common projects, which are urgently needed. I argue that to build a Global Digital Healthcare System, we will require a new set of skills, tools and forums, and this must be the purpose of Digital Health Diplomacy.

✓ Key Points

- A global approach to healthcare is only possible through creating interoperability between people, processes and technologies.

- Digital Health Diplomacy is the basis for real cross-border health data exchange between all healthcare actors. It is key to global health cybersecurity and the use of digital health for universal health coverage and integrated care systems.

- Establishing a worldwide interoperable health ecosystem requires policy and technical collaboration as well as common projects realisation.

- A global electronic health record (G-EHR) is achievable with focus, concrete steps, value creation and determination to explore certain elements.

- Information security and health cybersecurity is much more than the absence of cyber incidents.

- A LOST-IIS approach to digital health is needed at various levels, from national to global.

- Building a global digital healthcare system is possible with Digital Health Diplomacy.

Need for Digital Health Diplomacy

The 'health of nations', to paraphrase Adam Smith's famous 'wealth of nations', has never been so at risk. At the same time, 5G technology, satellite internet and Artificial Intelligence (AI) are linking us and exploring data about us (European Commission 2019). As air travel and globalisation processes have risen, so has the risk of cross-border health threats (Alemanno 2020). Today we know a deadly biological virus spreads around the world within hours, leaving a trail of death. Likewise, in 2017, the harmful WannaCry cyber virus crippled, within minutes, many sectors of activity including healthcare. Paradoxically, a digital way to send across continents a person's list of diagnoses, medical conditions or allergies in a standard, universally accepted terminology and an interoperable format is not available, although it is technically possible, and lures as a hard-to-reach target.

If we accept the progressive nature of Digital Healthcare Systems (Martins 2020), chained globalisation in health will mean one thing: *Global Digital Health.*

There cannot be a global approach to diseases and health promotion without a tremendous effort to create links. Interoperability of people, processes and information systems is crucial for this purpose. Only through those means can orchestrated strategies emerge from common perspectives on regional and
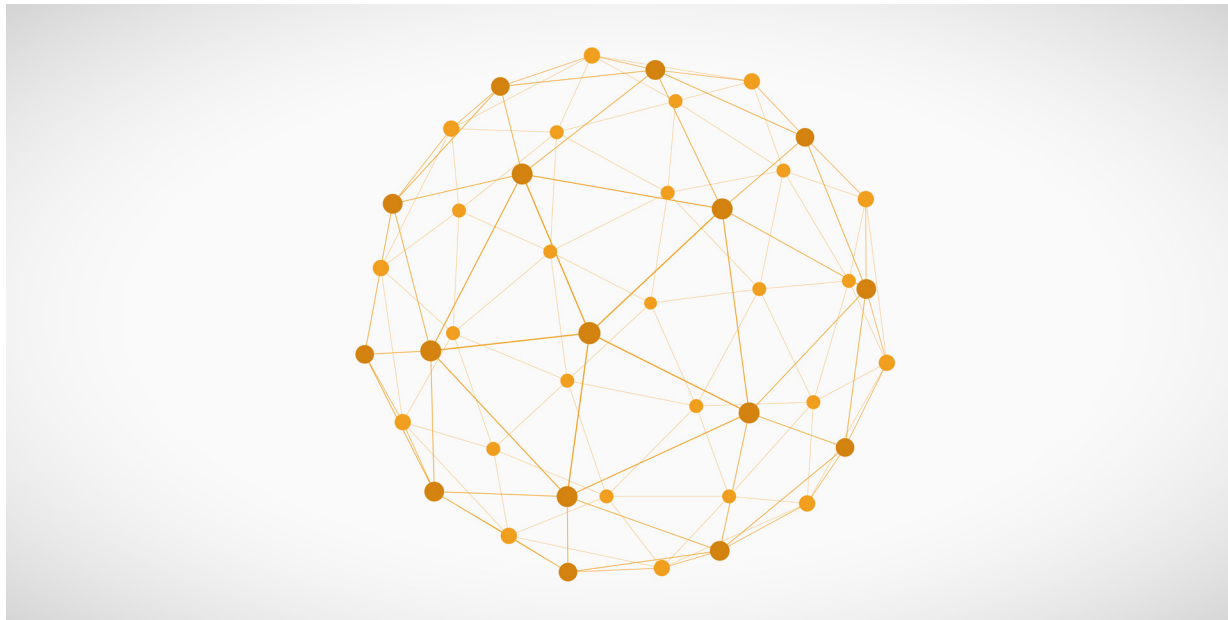
world health and disease. By no means this is a task only for the World Health Organization (WHO) (WHO 2020), nor should it be left alone, like any other, on the global scene. Likewise, high-level responsible health agents, such as ministries or public health authorities, need to understand that, on the international and global scale, multinationals, and other private or third-sector agents, are key to global development. This is no different in digital health.

There are relevant global actors doing quite extensive work of connecting efforts from different countries. These include: i) Standard Developing Organizations (SDOs) like International Organization for Standardization (ISO), Health Level 7 (HL7) or Integrating the Healthcare Enterprise (IHE); ii) clinical terminology-focussed organisations like SNOMED International or LOINC terminology; iii) promoters of digitalisation efforts such as Health Information and Management Systems Society (HIMSS) or International Data Corporation (IDC) and, increasingly, the

informatics community, for example the International Medical Informatics Association (IMIA), the American Medical Informatics Association (AMIA), its European counterpart, the European Federation of Medical Informatics (EFMI), and even national noteworthy examples like the Korean Society for Medical Informatics (KOSMI).

To reach a truly global digital healthcare system, however, we need to work much more profoundly and more decisively on real worldwide cross-border eHealth services, like a global ePrescription system or sharing of minimum sets of data (e.g. the ISO International Patient Summary) and progressively bigger components, such as a vaccination passport, summary or e-cards. For example, medical devices (e.g. insulin infusion pumps, or non-invasive home ventilators) are increasingly globally produced and standardised, yet, the information that they require and generate seems to get 'chained' to local, regional or national health systems, in turn, chaining

citizens down to their institutions, often their homes. People fear to travel to a remote location where access to their device or health data is not possible. They know healthcare may not be equally safe, which makes them feel unsafe to travel and 'chained'.

As an integrationist, system thinker and a change agent, I have learnt to be an intercultural broker, fostering attention to strategy but also to real implementation when talking to end users and IT programmers alike. I know both worlds. Having been active in policy advice and law-making, I know appropriate legal frameworks are highly needed for truly global digital health maturation. Patient access rights, AI, digital ethics and privacy-as-a-platform are moving targets. These topics will be critical in the future. To create this global digital health network and explore the value of this international ecosystem, we need to mature Digital Health Diplomacy, which could be defined as follows:

Digital Health Diplomacy refers to the concentrated international efforts towards supranational interoperability in eHealth/Digital Health. These may include international agreements for mutual health data transmission, recognition of information systems or common approaches to the use of international standards. It is the basis for real cross-border health data exchange projects, pilots and infrastructure creation, connecting all healthcare actors worldwide through data. It is key to global health cybersecurity risk alert and response, and to the use of digital health to contribute decisively to global health threats.

Digital health diplomacy is not just a matter of commercial interest or the facilitation of interoperability amongst Electronic Health Records (EHRs). It is equally a matter of healthcare provision, increased and improved cross-border care, and, so important these days, fighting cross-border health threats.

World strategies, memorandums and declarations about telehealth, eHealth and now digital health are not in short supply from many international and global organisations (World Health Organization Regional Office for Europe 2016). Real working sandboxes and green fields await. Policy collaboration, technical collaboration and concrete common projects realisation are key to establishing a **worldwide interoperable health ecosystem**, which is urgently needed. Digital health policy is an issue of growing interest in the world health policy. Like many other international efforts, this one equally requires targets and a common mission. That of global Digital Health Diplomacy should be threefold:
1) To reach full digital health interoperability
2) To uphold health information cybersecurity
3) To guard from digital threats to human health and dignity.

b. Global rules for the detailed reporting and information exchange in cross-border health threats
c. Decisions on the implementation and governance of concrete digital health services.

Finally, as a profound believer in *Incremental-but-real-Interoperability* (IBRI), I advance the following worldwide cross-border eHealth services as initial steps:
1) Global ePrescription system
2) Global sharing of minimum sets of data (for example, the ISO International Patient Summary) and, progressively, bigger components, such as vaccination passports/summary/e-cards
3) Internationally approved minimum information sets for advanced data-rich medical devices
4) Internationally approved and maintained digital information leaflets for prescribed drugs.

ii) industry, from medical device and equipment manufacturers to software development companies
iii) research and higher education institutions
iv) standards setting organisations
3) Enlarging the number of involved countries and working under the auspices of larger, well-established international bodies like NATO, OECD or WHO.

In Europe, it means eventually using the Eastern Partnership (EaP) and/or Central European Initiative (CEI) to enlarge the debate and capacity building outside immediate EU influence. Likewise, other regional organisations like the Asia-Pacific Economic Cooperation (APEC), the Association of Southeast Asian Nations (ASEAN), or the African Union (AU) should be more engaged with international health policies, and at the intersection of economic and well-being concerns ensure the security of their increasingly digital national health systems. At the global level, following this direc-

We need to make sure that digital health comes with solid defence. Otherwise, it may bring more risks than benefits

Global Electronic Health Record

A global electronic health record (G-EHR) is not something utopic. It requires focus, concrete steps, value creation and determination to explore the following elements.
1) Creating a worldwide voluntary patient and health professionals' registries
2) Setting up a global regime/governance forum for the advancement of agreements and common creations
3) Enacting legally binding agreements grounded in international treaties of voluntary participation, on three dimensions:
   a. Global rules for telehealth

Cybersecurity for Digital Health Is Global Task

Current efforts in international cooperation in health cybersecurity, as those happening under the Global Digital Health Partnership (GDHP), should continue. They can be expanded, and this is likely to be of benefit to healthcare systems and societies in multiple countries. Such expansion can happen by:
1) Making existing cooperation in health cybersecurity more sustainable and structured
2) Expanding stakeholders' engagement to involve, in particular:
   i) patient associations and professional scientific societies

tion means ensuring such collaboration with regard to cybersecurity in general could eventually be hosted, in a sustainable manner under the UN umbrella, or at WHO.

As we see the global discourse on the increased speed in the digitalisation of healthcare and the increased need for international collaboration, we need to make sure that digital health comes with solid defence. Otherwise, we think digital is good for health, but it may bring more risks than benefits. Countries should implement national digital health strategies and be willing to support and contribute to international efforts and agencies where sharing of that implementation can help them and boost these much-needed efforts. Inspired by the WHO definition of

[health](#), we should see **information security and health cybersecurity as a total state of integrity, availability and privacy, and not just the absence of cyber incidents.** In a digital health environment, cybersecurity concerns are critical as the essence of the health system functioning depends on the 'health' of the information systems that support it.

"First, Do No (Digital) Harm"

Most doctors will follow the "first, do no harm" rule as they have voluntarily been *chained* to their Hippocratic Oath. If the absence of digital solutions has been associated with lower patient safety, it is also true that digital threats to human health and dignity can come from misuse or abuse of digital health technologies. Such trade-offs are often the case with any impactful human invention. An increasing number of scientific reports point out to the dangers of digital technology and its damaging effects on health. Literacy, digital and health literacy are powerful *digital vaccines* to fight this menace.

These digital vaccines and some digital therapeutic interventions face distribution problems, their scope is often limited, the incentives and political visibility is often surpassed by more glamorous and eye-catchy technologies. This is the case with blockchain-EHRs or robotic physiotherapist care in highly matured digital health settings. A focus on literacy is essential, but it is possible to promote both. This has been shown in examples of mHealth use in low-resource rural areas to help healthcare provision and foster literacy, while capturing valuable data for further sophisticated secondary data uses.

Human dignity is at risk in privacy matters, in cybersecurity breaches, in robotised clinical decisions. It is also at risk when two years of waiting time for a visit to a dermatologist could be cut

down to two months with the use of simple tele-dermatology screening. Reflection, pondering and, sometimes, waiting and awaiting – these are old remedies to some of these challenges, although not the panacea.

Conclusion

We are LOST, if we do not work to develop Legal, Organisational, Semantic and Technical (LOST) interoperability global alliances. Efforts, such as HL7 collaboration with HIMSS or SNOMED International, operate at the Semantic and Technical levels. We have the GDHP and some regional efforts by WHO Regional Offices trying to create bridges at the Organisational level, but we have no common Legal grounds. **An international treaty on digital health is urgently needed** for two reasons:
1) Pandemics, present and future, and the increasingly important role of digital health in their deterrence
2) Telehealth as a world and globalised phenomenon, where medical liability and privacy issues need to be minimally regulated if we are to harvest the great benefits that can come from such technological advancements into healthcare prevention, promotion and provision.

Finally, I argue that the famous LOST interoperability framework should be enhanced with two final 'I's and an 'S', which would stand for:
a) International – or, ideally, global interoperability
b) Intelligent – advancing AI global standards for its better use in health
c) Security – health information cybersecurity that presents particular challenges and requires global positioning and response.

A LOST-IIS approach to digital health is needed at each nation's level, but also in the EU, or other regions, and globally for all citizens alike. Through a holistic, global and sustained approach to digital health worldwide, I believe we will see digital

health as the only way forward for Universal Health Coverage, for fair and balanced healthcare transformation, and for fighting the emergence and prevalence of many diseases and health-threatening conditions, including new digital-born and old and present serious cross-border threats to health.

We need to lead (Martins 2019) into what I profoundly believe is needed in the European region and worldwide – new Digital-First Healthcare Systems. Yet, as Cassese (Cassese and D´Alterio 2016, p. 3) notes, "in the global space, several global regulatory regimes act without subjection to one hierarchically superior regulatory system. This is the empire of the 'adhocracy', because there is no uniformity and no common pattern." Therefore, building this global digital healthcare system will require new set of skills and forums to face a chained globalised world. This is the space of Digital Health Diplomacy.

Conflict of Interest

No conflict of interest declared. ■

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From Globalisation to a Health Supportive Global Planet

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We are still in the middle of a dramatic experience. Will the pandemic's impact on health and health systems help us comprehend the value of health and how little health-friendly is the present globalisation? Can it, consequently, help in the creation of a multidimensional, health supportive new global planet?

Key Points

- Globalisation - the growing interdependence of the world's economies, cultures, and populations, brought about by cross-border trade, technology, and flows of investment, people, and information.

- Health - as defined by the Constitution of WHO, is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

- Pandemic - an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people.

- COVID-19 - an infectious disease caused by a newly discovered coronavirus, a group of related RNA viruses that cause diseases in mammals and birds.

- Distal and proximal determinants of health- indirect or direct factors influencing health.

- Enlightenment - cultural movement born in eighteenth-century Europe, aimed at renewing the intellectual and moral sensitivity of the time and at reforming the traditional political and religious institutions of society, fully relying on the critical and rational abilities of man.

- Complexity - the quality or condition of being difficult to understand or of lacking simplicity.

Introduction

Globalisation is certainly per se a difficult subject to approach, considering its complexity, its many facets, and its many interpretations. It becomes harder, but in the meantime more challenging, having to write about it in the middle of the so called new pandemic wave, which has hit all the countries and areas of the world. The different dramatic seriousness of the impact should teach us a lot. A new awareness and consequent actions, however, will take place only if scientists, specialists of all disciplines, health operators of all kind of persons directly involved in the battle, together with politicians and policy makers, will have a holistic approach, and humility and honesty to meet, even remotely, and virtually exchange analyses of the events and share ideas, coordinate action for local and global solutions.

I will get back to this vision to reflect upon the question: is it a choice or an obligation, a mild necessity or an impellent urgency to work for a new concept of global? The best possible point of departure in the present historic moment appears to be to focus on **health**. One of the most relevant results of the pandemic, in fact, is that it has made us more aware that **health and wellbeing are** the most important value for all and any of us, no matter the colour of our skin or where we were born or live on this planet. We have seen at work one of the most devastating aspects of globalisation that is the speed in the diffusion of the pandemic. We should consequently reflect about globalisation, starting with the pre-COVID 19 outbreak. Why did we not understand the health implications of the ongoing crisis under our global eyes? What should we not repeat and what should we change to avoid the replication of another pandemic at a global scale?
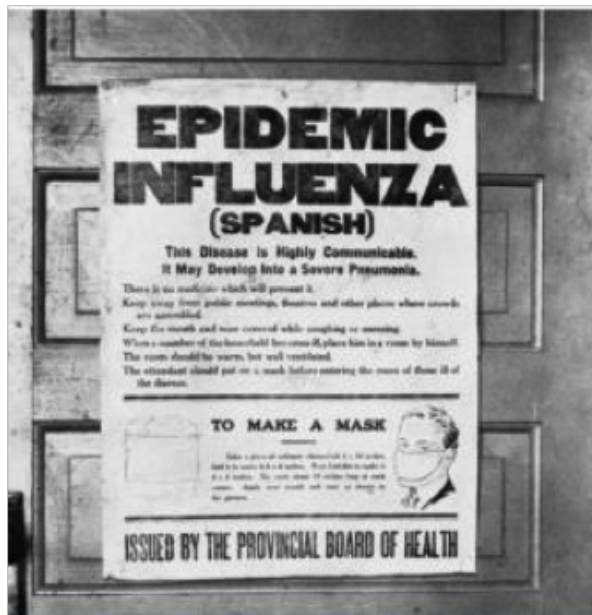
Image Credit: Wikipedia Spanish flu poster of Alberta (Canada)

Coromandel Hospital Board (New Zealand) advice to influenza sufferers (1918)

In September 1918, the Red Cross recommended two-layer gauze masks to halt the spread of "plague".[100]

Image Credit: Wikipedia

The Process of Globalisation and Pandemics Before COVID-19

Globalisation has been under the scrutiny of scholars of many disciplines for quite some time. Without digging into its history and speaking of the very early phases of exchanges among people living in different part of the world, we can agree that the early forms of globalisation that can be of our interest were determined initially by the process of industrialisation and the parallel development of transports.

Historically it is recognised, in fact, that globalisation during the 19th century was shaped by the industrial revolution, when in parallel the rapid population growth sustained the demand of the new standardised product. The transportation revolution is considered another crucial factor in enlarging continental and intercontinental trade, with an increasing drive for also expanding new forms of political domination, subsequently defined colonialism. Especially with regards to Africa and Asia, many scholars of different disciplines have concluded in an even stronger way that globalisation in the 19th century was shaped by imperialism.

Towards the end of the century and in early 20th century, progressive changes in the economic structures, created by the rapid diffusion on neo-capitalism and neo-liberal ideologies produced a rapid growth of economic relations, of different forms of communication, and cultural exchanges, even if the latter had less relevant impact and diffusion.

In such a period, the need for cooperation in the fastest growing areas produced the first international organisations, of which examples are the International Telegraph Union founded in 1865, and the Universal Postal Union established in 1874. The necessity of some control and governance produced the Permanent Court of Arbitration, which was implemented in 1902. These were, in effect, dealing in specific matters. Only after World War I, international holistic institutions started to appear. In 1919 the League of Nations was created, the predecessor of the United Nations,

when the International Labour Organisation was put in place as an affiliated agency of the league. Specifically concerning health, our focus, it needs to be reported that a widespread pandemic, called the Spanish Flu, exploded in February 1918, in the final year of World War I and lasted until April 1920. It infected 500 million people - about a third of the world's population at the time - in four successive waves. "The death toll is typically estimated to have been somewhere between 17 million and 50 million, and possibly as high as 100 million, making it one of the deadliest pandemics in human history" (Spreeuwenberg et al. 2018).

The forgotten images of that period constitute a reminder of how history can repeat itself, without us having learned the lessons and being astonished in discovering the similarities.

The devastation of communities and the impact on economies were felt all over the world; nonetheless it took until after the Second World War, in 1948, to arrive at the creation of a world organisation focused on health - the World Health Organization (WHO). It was the beginning of the official recognition that the world was becoming connected, that this was an important factor for the attacks to health spreading fast and that they were involving all areas of the planet, beyond natural and anthropic boundaries.

We will only mention two other outbreaks of influenza of the XX century, with some characteristics of a pandemic: the Asian and Hong Kong of 1957 and 1968 respectively. The epidemics frequently mentioned in the XXI century are SARS, that mainly hit China, from where it originated and in 2009, the inappropriately called Swine Flu.

No epidemic of the XXI century had the serious planet impact of the Spanish Flu of the preceding century, but scientists were alerting of the possible risk. Michael Osterhom, at that time Director of the Center for Research and Management for Infectious Diseases of the U.S. State Department, wrote: "A series of scientific studies have shown that a pandemic is expected
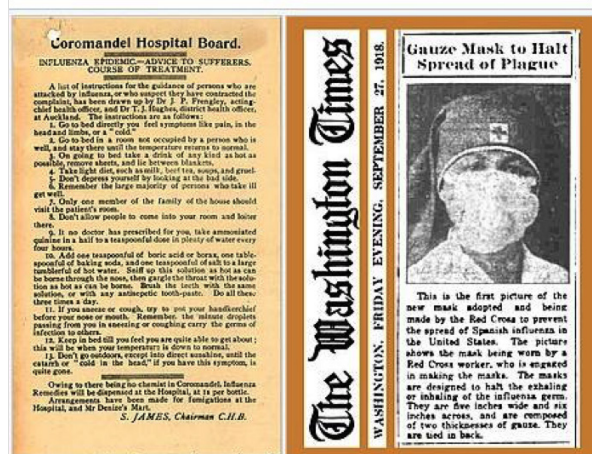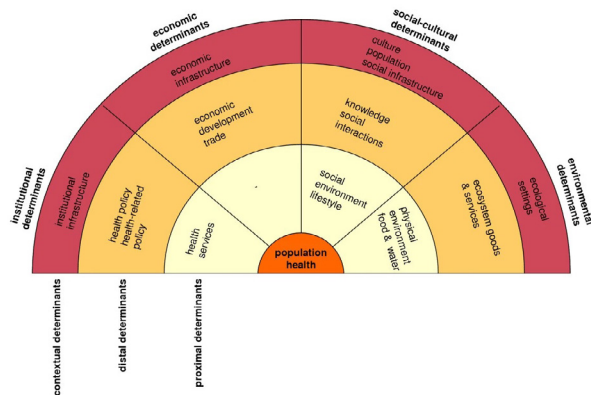
Figure 1. Multi-nature and multi-level framework for population health. Source: Huynen 2005

Figure 2. Conceptual framework for globalisation and population health. Source: Huynen 2005

in the short term ......the effects cannot be predicted, but preparing for this event is indispensable and a lot of work on the part of the institutions is needed" (Osterhom 2005). Obviously this call for attention did not produce great effect and got progressively lost in the mist of many other economic and social problems in most nations of the world.

But now, in the present time, COVID-19 has unequivocally made us aware that the warning was real. In addition, we have to recognise that we are in a world that is hyper-connected and that no country is in a position to manage their health problems independently, especially during a pandemic. "Viruses travel with us, cross borders without needing a passport; and then suddenly we are in the middle of a pandemic, a global epidemic (Missoni 2020).

In addition to the movement of people and merchandise, we are becoming aware now that climate change, pollution, social inequalities, lifestyles and other factors play a fundamental role in determining the vulnerability that we are witnessing and suffering from at the present time.

The fact that climate change affects the health of the entire planet cannot be denied any more, as well as
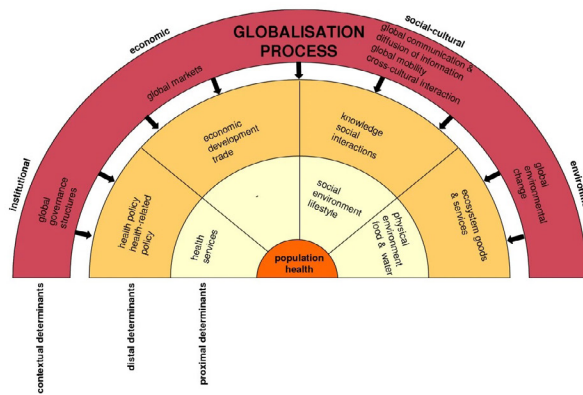
the fact that we are in a world of increasing complexity, which requires greater understanding and new approaches that are different from traditional disciplines, as well as greater more connection and integration. The hyper-connected world in which we live obeys laws different from those typical of mechanistic thinking, governed by a linear approach, which must now be accompanied by a new systemic and holistic way of thinking.

To avoid getting lost in this complexity, it is important to leave aside the specific pandemic that is scourging us and that is claiming lives in the four corners of the world. We cannot objectively think that we can go back to a non-globalised world, so in preparing for a post-pandemic world, we have to think about a different globalisation, and we need to start exploring, more closely, **the health impact of globalisation**.

The Health Impact of Globalisation

The economic impacts of globalisation in their multifaceted aspects have already produced relevant studies relatively a long time ago, because globalisation has been seen for some time, mostly an economic process.

The examination of the relationship between globalisation and health started relatively in recent times. In 2001 in a bulletin of the World Health Organization a group of scholars (Woodward et al. 2001) published an interesting article "Globalisation and Health: a framework for analysis and action." The article was mostly focused on economic aspects related to globalisation and how they were having negative effects on health. The study that followed by Labonte and Torgeson (2002), also connected with WHO, enlarged the analysis to the links between economic globalisation, international governance and health.

It has become slowly evident that the health effects of the globalisation needed a more holistic approach. In fact in 2005, a group of Dutch scholars published an article focused on producing a conceptual framework "rooted in a broad conception of both population health and globalisation" (Huynen et al. 2005).

The article presented an analytical evaluation of the determinants of the population health and in parallel, the levels and the areas of influence of the globalisation process. We consider that this work has fulfilled its goal of constituting a "conceptual framework, a well-structured think-model or concept map" as the authors called it, because "an interdisciplinary approach towards globalisation and health is required, which draws upon the knowledge from relevant fields such as, for example, medicine, epidemiology, sociology, political sciences, (health) education, environmental sciences and economics" (ibidem).

We will therefore build on what this methodology has achieved, naturally trying to introduce what additional knowledge has been given to us. A clear contribution is given with two schemes: the "multi-nature and multi-level framework for population health" followed by the "conceptual framework for globalisation and population health."

The determinants of health are distinguished by nature: institutional /economic/socio-cultural/

environmental, but the scheme intends to indicate that "the chain of events leading to a certain health outcome includes both proximal and distal causes; proximal factors act directly to cause disease or health gains, and distal determinants are further back in the causal chain and act via (a number of) intermediary causes. In addition, we also distinguish contextual determinants. These can be seen as the macro-level conditions shaping the distal and proximal health determinants; they form the context in which the distal and proximal factors operate and develop."

By studying the determinants of health of a population, it appears clear that globalisation can have an impact on all the determinants that indirectly influence health. The most relevant are economic development. Some optimistic studies consider globalisation having had a positive role in decreasing inequalities among countries and improving conditions inside countries. Even in scarcity of complete data such a statement appears not to have ground.

On the other hand, on other **distal determinants** influencing health, the increase of interactions and exchanges, and more occasions for high level education, constitute the most positive aspect relate to globalisation and global communication. This however, is partly counteracted by the possibility of the increase in conflicts stimulated among others by changes of values and taking place of norms marked by individualism and self-interest, materialistic goals.

From the determinants directly connected with health, health services are among the most relevant. Health services privately delivered have always existed in the so-called western world, even where there were national services with relatively good performance. Globalisation has confirmed the perception that health is no more a right, as the constitution of WHO and of many countries state, creating space for an increase of privatisation in health services. Charities, at best, can provide minimum support for groups deprived even of the most basic medical services, having lost the

possibility to access and use naturalistic remedies.

Directly acting on health and deriving from the movements of people, information of media etc... lifestyles have been imported in many countries of the world, characterised by unhealthy diet, smoking, drugs, the latter moving illegally facilitated by legal commerce. Naturally, positive lifestyles also travel, get absorbed and can have a positive impact, but, as studies show, they seem to have less impact.

The Framework to Build a New Global: Health and Climate - The Twin Goals

The preceding synthetic analysis doesn't assume to have identified all the possible effects of the globalisation process on human health. We consider that we are still lacking data, of intellectual and scientific instruments to fully understand the complexity of our global system.

Keeping in mind this, we have tried to clarify some relevant inadequacies of the characteristics of the present process of globalisation. We are rationally conscious that we cannot go back, we cannot avoid globalisation, but we do realise that this is not the globalisation that can improve the major determinants of health and consequently improve the wellbeing of the world population. Furthermore, the tragic events of the present pandemic situation and the likely possibility of other pandemics coming, according to many scientists, impose that we cannot passively accept this situation.

As a contribution to the framework of a "new global," we will start to point out the changes that could help in building these "new ways to go global." One of these changes, certainly the most difficult, but also the most important is a **progressive change of values of our global society**. I was surprised to hear in an interview of the Foreign Affairs Minister of a European country, where she concluded her answers by saying that what we need now is "**the humanisation of globalisation**." Are these just empty words or an indicator of a need for new paradigms that also touch the policymakers?

The hope of change could become a reality if these circumstances get realised. The first: health of people of the world shall become the priority of the new paradigms, enhancing the concern for the environment and its health and, the other side of the coin, of human health.

The second: the community in social terms and its physical environment from the village to the city, will re-conquest their value and role, defeating the de-territorialisation produced by the actual globalisation process.

The ground for these two goals to be reached lie in the situation that the world is living. The COVID-19 viral infection has become a pandemic producing a dramatic and fast hit globally. Scientists repeat that there is the possibility of a next one, similar or worse than this, sooner or later. A sense of insecurity in and around almost all cultures in the world is growing and with it the growing awareness of the fragility of human health.

The planet's disastrous ecologic conditions extend this sense to the ecologic surrounding. As the framework, even the foundations of our knowledge are shaking. After more than 300 years, our interpretation of the world, based on this enlightenment, is no more sufficient. Globalisation is the quintessence of complexity and complexity requires the introduction of new systems of understanding.

It is clear that the first goal cannot be reached if the highest level of policymakers of every sector don't embrace this cause. The "top down" does help change, but it is not easy to make it start, nor to keep it moving in the right direction. The second goal therefore is essential. The change that starts "bottom-up" is not simple either, but in the present circumstances, possibly easier to attain.

To reach some success and make the examples become viral, to use a word of the most common media, is the first milestone of a bottom-up path.

As I had occasion to write in another article, communities working to get liveable cities, with clean air and environment, good health services, social justice, eradication of poverty, would become the "viral" seed that

keep policymakers going and defending the environment against the most un-human and ecologically devastating enterprises.

One somewhat influential figure, Pope Francis, has given two complementary examples: the Encyclicals "Laudato si, mi Signore" (Be Praised, my Lord) in 2015 and recently the second "Fratelli tutti" (All Brothers). The first is concerned with environmental matters, the latter calls for more human fraternity and solidarity, and is a plea to reject wars. These are policy/political in the highest sense of the word, not religious documents and it seems to me that they should and hopefully will produce action to save the planet's environment and to stimulate humanism in a profoundly changing scale.

They both require great mobilisation and acceptance of the share of responsibility from all and each of us. I figure that environment and human health should and have to constitute the content of a positive "Trojan Horse" that breaches the thick wall of self-interest, greediness, search for conflicts and wars, **bringing a new global**. Is it day dreaming? Utopia? My honest answer is that it is simply a necessity for us in order to give a future to our children and subsequent generations.

Conflict of Interest
None. ■

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What Is Big *Intelligently Efficient* Opportunity that is Key to Unlock Better Outcomes and Experience of Care?

Author: **Chiara Cavallo** | **Chief Strategy & Marketing Officer** | GE Healthcare EMEA

The coronavirus pandemic has shone a light on the dedication of our global health systems. It has also helped inspire new thinking on how to address the key challenges that have been facing healthcare for many years. Empowering a new climate of quality care that is guided by insight to benefit both providers and patients, will create a system as healthy as those it cares for. A renewed focus on global collaboration and the exchange of ideas and technologies will bring about further healthcare efficiency reform. For this to happen, every institution and market has a voice and a part to play – are you ready to drive the change?

Intelligent Efficiency is Improving Every Component of the Care System

The biggest conversation today to enable healthcare institutions to thrive tomorrow is 'intelligent efficiency'. This new narrative has been ignited by decades of efficiency and productivity discussion that is approached from a linear, calculated standpoint. It had traditionally taken a value-in/value-out perspective and a focus on how each element contributed to a specific definition of worth.

Now, healthcare leaders are being encouraged to view efficiency as a process that improves every component of the care system and uplifts every individual who interacts with that system. This is efficiency for all, where a universal concept is creatively integrated into the DNA of an operation and underpinned by data and analytics. The overall result is that time is gained across the healthcare spectrum to add value not only to the obvious metrics but also behind the scenes.

For some institutions 'intelligent efficiency' is becoming a reality as they strive for a state in which quality care flows seamlessly and efficiently for providers and patients, guided by relevant insights.

The lessons it can teach us all will be incredibly valuable for the progression of all healthcare collaboration across national and international geographic borders and across radiology, cardiology or oncology specialities where we are all delicately chained together in a global healthcare industry.

Integration of Technology, Data and the Human

The first core principle of intelligent efficiency is when technology, data and operations work together seamlessly to create a self-reinforcing cycle that improves the lives of everyone that touches it. This ethos prizes the smart integration of all elements that sees technologies rolled out as part of an efficiency mosaic where benefits cascade throughout the hospital or clinic.

An example of this can be found at Nuremberg Hospital in Germany when it was experiencing increasing pressure from payors to speed up reporting times for cardiology diagnostic procedures. To resolve the issue, it conducted a full workflow analysis and connected all diagnostic modalities to a single cardiology information system that could generate a report to be made available to all relevant care providers. It involved integration of a new technology solution plus extensive training and education for hospital teams.

The results delivered positive returns on the efforts of a combined tech, data and human approach. Time to complete cardiology cath lab reports decreased by 60% and quality control compliance increased to 100%. The improved efficiency structure speaks to every element of the healthcare organisation and delivered not only time savings but also greater profitability.

Being Consumer- and Provider-Centric in Efficiency

The next key element vital to intelligent efficiency is recognising that every endeavour must simultaneously consider the needs of both patients and providers. This is being consumer-centric and provider-centric.

To thrive in the new normal of global healthcare means embracing the changing expectations of patients to create a seamless experience. A move towards the consumerisation of medicine and instant access to web or mobile app-based information means that patients now demand the same type of service and convenience they gain in other aspects of their lives. Indeed, data suggests that in 2019 patient satisfaction in the UK National Health Service (NHS) fell to its lowest level in a decade.

automate the cath lab and echo workflow. It eliminated the need for manual entry of some patient information, worksheets and transcription, which reduced the turnaround times for anxious patients. But even more importantly, it was able to virtually eliminate error-prone manual processes. This illustrated an improvement in system and process for the patient at the same time as lifting the spirits of the team working in the department daily.

Holistic Efficiency in Contrast to Ad Hoc, Quick Wins

The third principle of intelligent efficiency is about taking a comprehensive approach to tackling the major issues facing healthcare by involving all relevant stakeholders at the same time. The theory behind this is that an ad hoc approach often solves

patients in multiple Intensive Care Units (ICUs).

The system at OHSU improved all efficiencies in care delivery by allowing critical care experts to remotely oversee patients' vital clinical data and best practice standards in near real time. It allowed for better visibility into ICU bed access for those in need of intensive care, better data collection and monitoring for individual patients. This, in turn, delivered greater satisfaction for providers who found it easier to fulfil the delivery of high-quality patient care, and a more efficient distribution of hospital beds across the system.

Shared Global Health Experience

Whilst there may be many different health systems around the world with differing structures, cultures and at different stages of technological evolution, the one thing they have all

Healthcare leaders are being encouraged to view efficiency as a process that improves every component of the care system and uplifts every individual involved

On the provider side, 2019 studies showing physician burnout at over 40% should now be amplified following two waves of coronavirus pandemic shattering workforces throughout 2020. So, the application of efficiency-led innovation should also take into account the needs of the physician, nurse or technologist they serve. Healthcare workforce morale and satisfaction will be encouraged by improved patient satisfaction and their physical resourcing assisted by a helping technological hand.

A great example of this is at the century-old American Hospital in Istanbul, Turkey. The cardiology department revamped its IT systems to

one problem but can create others. In other words, avoid dipping your toes in the water of innovation in an attempt to ripple the waters of efficiency, but do jump in with a splash.

An example is the USA's Oregon Health and Science University (OHSU) adoption of a real-time care system to paint a comprehensive picture of patient status and prioritise attention on the most critical cases. This addressed major issues of multiple stakeholders, in contrast to a haphazard or staged ad hoc approach. In the face of the COVID-19 pandemic it helped the hospital operate more efficiently by enabling specialists in a central location to provide clinical support to bedside teams caring for

had in common this year is a shared infectious disease emergency. The pandemic is still delivering millions of tragic outcomes; however, it has also opened the door to new thinking and a willingness to be intelligently guided by data, experience and clinical best practices that together will pave the efficient path to a future of outcome-driven patient care.

Our intertwined experience this year has cast new light on the big conversations about efficiency. It will continue to fuel dialogue on the benefits of sharing all experience bringing intelligently efficient solutions to unlock better outcomes and experience of care. ∎

Coronavirus, Tensegrity and CSR: Year of Living Dangerously

🔶 Author: **Prof. Florencio Travieso** | **Co-director of the MSc in Health Management & Data Intelligence, Law Professor | emlyon business school | Lyon |** France

The COVID-19 vaccine development is currently central news globally. With recently reported successes, however, the focus is shifting from the very availability of a vaccine to manufacturing and distribution aspects. It is the pharmaceutical sector that will be playing the key role in freeing the world from the disease. A business expert argues that companies should embrace the corporate social responsibility ethos to subside their corporate interests for the greater benefit of the humanity.

✓ Key Points

- The race for a coronavirus vaccine is coming closer to the finishing line.

- Pharmaceutical companies are aware of the role they will play in jumpstarting the next chapter of our world.

- CSR might function as a way to attenuate the commercial drive of the companies into a social interest to promote general prosperity.

Factor for Globalised Acceleration

COVID-19 has contributed, since early 2020, to global business acceleration. The spread of this virus has reminded us of the globalised nature of our existence, and just how interrelated countries and continents are. And how vulnerable they have become.

We can borrow Scott Galloway's concept that the coronavirus acts as an accelerator of change, forcing the technology to speed up its cycle of innovation (Galloway 2020). What was going to happen in two or three years, is happening right now. If certain sectors were losing momentum, or stalling, it is clear that the pandemic has pushed for a need to wake up, shake up and innovate. With no choice.

The economy in general and certain sectors in particular have suffered enormous losses. The pharmaceutical and life sciences sectors have, on their own, benefitted from a fair growth spurt even if in the past they had fallen victim to scandals and been seen as villains, unethical and ruthless players in the market. Now, many companies in the sectors are enjoying their place in the sun.

An unusual American architect and an accidental inventor, Buckminster Fuller coined, around the 1960s, the term 'tensegrity': a contraction of 'tensional integrity', a notion of stable self-balance structures, based on the fact that while being in constant tension, they achieve mechanical stability and compression without disassembling. We can picture the current coronavirus vaccine race as a tensegrity moment, where multiple forces are creating tension, and while all of the forces are constantly pulling, a certain stability is achieved.

This article aims to give an overview of how COVID-19 and the vaccine developments will be influenced by corporate social responsibility (CSR) and how the future months will require a constant exercise of 'tensegrity'.

Solution Remains the Same

The cornerstone of the COVID-19 solution has always been, since the appearance of the virus, the discovery of a vaccine. Measures such as lockdowns or forms of social distancing have been applied, but they all seem too unnatural for the population: people believe the only real alternative will be the traditional vaccine.

In these last months, we have witnessed how medical innovation around the production of vaccines and clinical trials has, luckily, been influenced by technology, such as AI-empowered drug repurposing (Mohanty et al. 2020).

Traditionally, vaccines take many years to develop, and in this case the goal is to manufacture (and distribute) one in less than 18 months. In the hopes of speeding things up, funding, in many cases, has been provided by the companies themselves but also by governments and other related entities (the Pfizer and BioNTech initiative has been operating without government help).

This is why the use of new technologies (such as AI) is essential in the fast production of the new vaccines, as they will speed up the process (Kaushik and Raj 2020). At the same time, companies have understood that the pandemic conditions them to act innovatively.

COVID-19: Game Changer Not Without Risk

The rules of secrecy between pharmaceutical companies might have to be put on hold, so as to allow constant and balanced developments in R&D from all competing firms. More intense government regulation will probably appear in the months to come, in order to prevent abuses from producers and other companies in the supply chain.

Some companies (Roche, Sanofi and Johnson & Johnson), in the context of the complexities of the first clinical trials, were able to produce statements engaging themselves to share resources and clinical trial data in order to increase testing capacity and develop treatments.

Gilead Sciences has recently obtained an emergency use authorisation for Veklury (remdesivir), which allowed them to raise up to €736 million ($873 million) in revenue, becoming the second best-selling drug in the third quarter (behind its HIV drug). There have also been discussions on the pricing strategy that some argue has been a price hike (up to €2,615/$3,100), as well as the obtention of the priority review voucher, obtained without a clear efficacy in reducing deaths, which has been the source of criticism for the price strategy as well. Finally, on 20 November, WHO recommended against the use of remdisivir given its unconfirmed therapeutic effect in randomised controlled trials (WHO 2020; Hsu 2020).

Recent information of promising vaccine developments from Pfizer and Moderna has triggered a statement from Doctors Without Borders (2020), serving as a reminder of the importance of not enforcing patents and of sharing all intellectual property information in order to fast-track the scaling-up of production, while making sure that the price can remain fair and affordable. This criticism is mainly based on the fact that the R&D and manufacturing of the vaccine has been partially offset by public institutions, with at least €2.11 billion ($2.5 billion) from the U.S. government.

Time for Redemption?

Even if the recent vaccine developments as of late November 2020 are very encouraging (Johnson 2020), the concrete effectiveness and actual challenge will be to give access to the vaccine to as many people as possible and at the highest speed (Thomas 2020).

The pharmaceutical sector sees a chance now, an open avenue to potentially become the messiah of salvation in the near future, the carrier of the promised healing potion, and the key to bringing everything back to how it was before.

The sector faces the chance to redeem itself and be part of jumpstarting the planet, economically, politically and emotionally.

In this context of a perfect storm, many companies might try to recalibrate and reassess their CSR policies, not only in view of the current COVID-19 situation, but also in light of the upcoming day after (Kramer 2020).

Invisible Hand of CSR

As we unfold world events from these past months, we have a clearer understanding of how CSR can (and should) affect the pharmaceutical sector, especially in view of the magnitude, with which the pandemic has struck in most countries.

The eventual vaccine development and deployment will certainly imply the hope of a cure but also equally trigger the effects of a globalised world where suffering is echoed immediately and solutions only impact a happy few. The upcoming vaccine will accentuate the disparities, inequalities and the factual power prerogatives from certain states, something that is already happening in how future vaccine licensing contracts are being allotted (The Economist 2020).

CSR can help a company become socially accountable to itself, its stakeholders and the public; businesses have a moral responsibility to the society in which they operate (Godfrey et al. 2020). In theory, companies should be motivated to promote a general prosperity, beyond profit and shareholder financial performance. CSR promotes direct benefits not only for the company but also for the industry competitors, and finally a drive to do the right thing, as a basic moral imperative.

In connection to these ideas, the Organisation for Economic Co-operation and Development (OECD) has put together a note describing the responsible business conduct in relation to the COVID-19 crisis (OECD 2020), laying out "the expectation that businesses contribute to sustainable development, while avoiding and addressing adverse impacts of their activities, including throughout their supply chains". This attention allows companies to identify, mitigate and address potential adverse impacts.

This pandemic has triggered a global reaction, similar to reacting to a natural disaster – everyone wants to help. Companies should use the COVID-19 situation as a trampoline to showcase solutions

("proactive steps" in the OECD language) to protect employees, secure supply chains, build long-term value and resilience, which will ultimately translate into long-term positive repercussions when recovery arrives.

The generalised effect of the pandemic on companies is reflected in the fact that many employees are working from home, something that can imply an imbalance between their personal and professional life. Privacy issues, data protection and general cybersecurity must be reconsidered from a company and employee perspective. The eagerness in the creation of alternative processes in view of the pandemic could lead to pressed decisions with lack of, or not enough, due diligence or risk assessments. Companies might therefore neglect protection and workers' well-being in exchange for faster processes.

In the note on COVID-19 and responsible business conducts, the OECD has set concrete steps to include responsible business conducts in the emergency response to the crisis. They include: connecting with procurement and sustainability teams; understanding vulnerabilities in link with continuity planning; dealing with critical supply chain disruptions creating a rapid response supplier due diligence; dealing with demand-side disruptions; assessing the impacts of cancellations or suspensions.

Virtuous Collaboration

There are new approaches, like Digital Transformation Institute, the public-private consortium started by C3.ai gathering Princeton, Carnegie Mellon, MIT, University of Illinois at Urbana-Champaign, University of California, Berkeley and the University of Chicago, as well as Microsoft (Darzi 2020). It has brought together academia, technology and supercomputers in a research entity dedicated to the acceleration of the application of artificial intelligence to coronavirus vaccines.

An additional factor must be noted: the use of artificial intelligence in the development of vaccines is key, thanks to technology and the large quantities of data that can be analysed rapidly. The sharing of the genome of SARS-CoV-2 virus showed a collective and positive approach in this sense (Kames et al. 2020).

Facing the complexities of international pricing, allocation and mass production of the future vaccine and therapeutics, a part of the pharmaceutical industry will have to rely on self-regulation, avoiding fierce competition, as well as collaboration and the sharing of information. Pharmaceutical companies should team up at the supply chain in the near future to jointly manufacture at higher speeds in order to meet global demand, something that will certainly become a reality in the years to come.

Many companies have understood the current stakes and the way, in which a CSR approach could make a difference. AstraZeneca has donated over nine million face masks to different countries dealing with the virus. Eli Lilly decided to accompany diabetic patients by reaching out to them with newspaper ads to create awareness on available support during the unstable economic times, to guarantee the supply of insulin. The laboratory has also donated 300,000 vials of the antibody Bamlanivimab, with no out-of-pocket costs for patients, as well as shared data with Incyte on the use of Baricitinib in combination with Remdesivir and the effect of reduced recovery time and improved clinical outcomes for patients with COVID-19. Janssen Pharmaceutica of Johnson & Johnson has launched a joint large-scale, multi-country vaccine development, with the commitment of holding the pledge to "high ethical scientific principles", granting complete access to the details of the totality of the study's protocol.

And as a global initiative, the Coalition for Epidemic Preparedness Innovations (CEPI) has announced partnerships with five clinical sample testing laboratories to create a centralised global network to assess and compare the immunological responses generated by COVID-19 vaccine candidates.

New Hope

We have probably realised, perhaps the hard way, that governments have painstakingly tried to contain and control the pandemic, which would shift the attention to entities like hospitals, universities and pharmaceutical companies.

The pharmaceutical companies have understood that, in the current crisis, it is they who play a key role in our global society, realising their positions in becoming the artifices of the solution and the way out of this crisis, with the insight needed for future pandemics.

Conflict of Interest

The author certifies that he has no affiliations or involvement with any entity mentioned in the subject matter discussed in this document. ■

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Women's Health Community

Elevating Cancer Care to Global Level

🔶 Interviewee: <u>Dr Susan Henshall</u> | CEO | City Cancer Challenge (C/Can) | Geneva | Switzerland

With cancer being the second leading cause of death globally, it is necessary to include cancer care into the global health agenda. An initiative known as City Cancer Challenge (C/Can) aims to do this through work with stakeholders at a local level and dialogue on cancer care between cities and partners across the world. Its CEO talked to HealthManagement.org about the challenges cities face on their path to better care and what results they can achieve with global support.

Please give us some background information about C/Can.

C/Can was launched in 2017 at the World Economic Forum annual meeting in Davos by the Union of International Cancer Control (UICC), which is an organisation representing over 1,100 members from more than 170 countries. Obviously, there were clear commitments and resolutions to support advances in cancer including the 2017 World Health Organization Cancer Resolution, commitments embedded within the Sustainable Development Goals, and the resolutions of the World Health Assembly on palliative care and access to essential medicines. However, it was very difficult for those to be translated to local action. There was still a lack of guidance and limited platforms, no interaction on the ground, and patients were not seeing the benefits of those global commitments. UICC decided to take action and form a group of people, including myself, to create a programme called City Cancer Challenge. This was the first time that anyone had tried to build a bottom-up, community-led approach whereby not the organisation itself, but the cities were the lead, the main driver. It was very much a new approach, a new way of thinking and quite an ambitious step into a very different space for UICC at the time.

In 2019, given the early successes that we'd seen in engaging people and cities, City Cancer Challenge became a standalone foundation, and our mission is to support cities as they work to improve quality equitable cancer care. It means to support cities through a journey that takes them from assessing what is available in their city in terms of treatment and care to identifying the gaps, as well as the opportunities to strengthen care and the priority areas that we could help them build upon. We like to talk about strengthening existing action. Cities have clear ways of working, they have unique healthcare ecosystems that frame the way they deliver cancer care, so it is really about understanding that whole ecosystem across the health system and supporting them to adopt a holistic approach that takes into account the unique and changing needs of their populations.

Fundamentally, it's this bottom-up, community-led approach that distinguishes us from other organisations in the way we work.

A <u>new call</u> for the City of Tomorrow initiative was launched in October. Considering the pandemic context, why now? What are your expectations from this call?

The City of Tomorrow is an aspirational campaign to bring this way of working to cities around the world.

We want to share the most impactful and inspiring learnings from our cities. We want to create a movement of cities that are able to support and learn from each other and to take best practice and help each other move cancer care forward in this holistic way.

You might think that now is indeed a difficult time, but in fact it's building on the momentum that cities have created through the pandemic as frontrunners in health. They have been on the frontline, and they've shined especially this year. The city level is where things are implemented, where the action happens, and where the connection to local stakeholders is really possible.

We've seen this before coronavirus, emerging increasingly in other areas, e.g. in climate action, but I think there's been a reluctance to really elevate the role of cities in health. That's changed considerably in 2020. We saw a few weeks ago the first meeting of cities under the UN umbrella. We've seen cities take very clear steps towards resilience through this pandemic. I believe that cities will emerge even stronger than they are today, that's what history tells us: strength inevitably comes through a crisis. So we are hopeful that this campaign will actually consolidate and leverage much of the work that cities have led this year and take it into a new sphere.

From your experience, what are the most common challenges a city might face when attempting to elevate its level of cancer care?
There are indeed some common threads. We work with cities on more than 70 projects. One of the most prominent is around guidelines and protocols. It doesn't sound very exciting, but the foundation of quality cancer care comes from understanding the protocols and guidelines that can inform that care. These are processes and ways of working that really have been proven, time and time again, to support quality care and quality outcomes for patients and their families. For example, we talk about multidisciplinary team care and not everyone knows what that is. Essentially, it's about bringing different health profes-

On this way, what are the major obstacles for C/Can?
It's about investing time and resources into bringing stakeholders together. What we see time and time again in cities is that people are busy. They have incredibly heavy workloads, they are engaged 120% in delivering care, and particularly in an environment like we have today where cancer health professionals are also managing emergency situations and the pandemic. It's really about getting people in a room, facilitating a discussion and the exchange. That's a challenge because you need to bring people together, build trust between stakeholders and create an open and transparent space for dialogue. Because ultimately, as I said in the beginning, change comes from the community and from the local stakeholders. For

Furthermore, you want to make sure that these lessons that we learn, this type of work is also elevated and made visible to the global community, and that's where the city-to-city exchange is essential. We need to get cities talking to each other, and then cities, of course, are talking to other stakeholders, to other forums, so it's really about expanding the dialogue. It's ensuring that at every stage this consultation is inclusive, that it's not isolated – and that's where C/Can comes in. The advantage and the benefits we have as a global organisation is connecting the dots, joining the conversations. Over 60 partners are supporting C/Can right now, and they are part of our ecosystem. If we're having a dialogue, such as we've just had on using digital solutions to leapfrog solutions in

There's been a reluctance to really elevate the role of cities in health. That's changed considerably in 2020

sionals, different specialities together around the care of a person, very much putting the person at the centre of that discussion and understanding what the best course of treatment for that individual is. It takes different perspectives, it brings in pathologists, a surgeon, a treating oncologist as well as allied health professionals, such as speech therapists or physiotherapists. It's a more holistic way of working, and we know that it leads to better outcomes, there is evidence to support that. This is an area where we're partnering with organisations like the American Society of Clinical Oncology (ASCO) to really work across cities, to provide guidelines and protocols about multidisciplinary care and support the adoption of that way of working at the city level.

that to happen, you need to take the time to bring people together and to get them talking. Once again, it sounds very simplistic, but very often dialogue, conversation, consultation is really the start of any change that we see.

How do you facilitate international interaction and collaboration between the participants under the C/Can umbrella?
When we talk about city level, it is important to understand that 'city' doesn't mean not facilitating regional, national and then global dialogue. In any city ecosystem you want to bring in the regional government, the national cancer institute or the national cancer registry. You also need alignment with national cancer control plans.

cities, then we have the capacity to bring together the global stakeholders and partners and connect them with local stakeholders. Once again, it's about bringing the people together and elevating the conversation.

During the pandemic any kind of conversation is a challenge. How do you manage?
Well, like everybody else. We were able, very fortunately, to switch online quickly in as early as March remembering that we're a global and predominantly virtual team, this is embedded in the way we work. We have a city manager, a person who's working on the ground, in every city, but of course during this time they're also often working virtually. Sometimes, when we might've

had an in-person meeting with 25 people in the room, we've run five smaller virtual meetings to ensure that the dialogue is rich and the information is shared.

I really believe that we're going to come out of this in 2021 much more connected to our stakeholders because 90% of the time we've got very close contact across video, we've all been reminded that we're only a click away from each other.

Is the lack of digital skills in people on the ground sometimes a problem?
Of course, and one of the lessons that we are really trying to share with the global community is that digital is transforming, that virtual is a facilitator and an enabler in many aspects. Connectivity is essential, and there needs to be investment in meaningful connectivity. In many countries that we work in, there are challenges involved in simply being part of virtual meetings.

Digital literacy is also what we'd like to really promote and see more consideration of. If you're expecting health professionals and patients to shift so quickly the way they work, you need to be ready to invest in the whole package. Countries have, on the most part, been very quick to change their policy environment. We've seen changes that perhaps have lagged, but sometimes local leaders have pushed through to ensure that telemedicine, for example, is available and that there are ways of embedding this into the national health system. However, that also needs investment in health professional training, in digital literacy for patients and communities, and particularly for vulnerable populations including women. It's really important to ensure that people are equipped with the skills, the infrastructure, and the actual technologies themselves, so that they can engage and not be isolated through this process even further.

The majority of the cities participating in C/Can is in the global south. Are you expecting C/Can to expand its scope soon?
That's part of the global call for cities. Our global call is exactly that, a global call. We want cities from all over the world to join this movement. We have worked predominantly in middle-income countries to date, and a part of C/Can is about engaging communities and cities who might be completely different from each other. It's also very important to understand the diversity in health systems, from cities that have, currently, very limited access to national health insurance to cities with full population universal health coverage that face other challenges like fragmentation of care or coordination of the patient journey. It's not so much as to focus overall on this country or this region, but to understand the very clear challenges that cities around the world face, such as guidelines and protocols, insurance and coverage, or access and financial protection. There is also the maturity of the health system or the place of the investment and elevation of cancer on the political agenda, and that can be very different.

Could you give some examples of the participating cities' best practices?
I'd like to give a couple of very different examples. One of them relates to regulation and the ability to embed cancer care into national policy. In Asuncion, in Paraguay, there had been a push for some time, before C/Can existed, to elevate cancer into the political agenda through a national cancer law. It had not been successful. As we started to work in Paraguay, the group of local stakeholders had come together as a City Executive Committee. Their work was successful, the cancer law was passed through the Senate, and for the first time Paraguay has a national cancer law. That has really snowballed, and the discussion about cancer law and what it means to have cancer embedded into national legislation is really starting to become much more prominent in the global health dialogue.

When you're looking at the plethora of changes that have happened across the health system in the last three years, you really need to think about how cities connect and change together. For example, it was considered a major priority to look at the quality of pathology in Cali in Colombia, and particularly access to diagnostic support at a specific type of laboratory that a public hospital didn't have available. The local stakeholders, with support from one of our partners, the American Society of Clinical Pathology (ASCP), worked with Cali to look at quality assurance, protocols, processes and guidelines; to support training programmes for pathology technicians from a more holistic health workforce perspective. That, in turn, led the city to the development of a new pathology laboratory that is really supporting more accurate and timely diagnosis of cancer patients. Through the needs assessment we'd also seen that there was complete absence of training for oncology nurses. This resulted in a conversation about building a curriculum locally for oncology nursing training, which is being done and has already started – it's really about building the capacity of the local workforce.

Once again going back to this need for protocols and guidelines – in Yangon in Myanmar, we've just seen guidelines for pain management and for quality assurance for radiotherapy adopted by the national government and the national ministry of health. This is the first time that such guidelines exist. They will really change and transform the way care is delivered in Yangon. We're expecting those guidelines to be adopted nationally, which is going to change the care for many millions of people.

What will be the pandemic-caused long-term consequences for cancer care? What steps should be taken to ensure cancer care receives due attention?
Cancer patients have been challenged considerably through this period. Globally there's been a

significant reduction in cancer surgeries. We know from our own cities there are huge reductions in consultations, e.g. mammography appointments. There are other immediate issues around consultations. We talked about this switch to telehealth without facilitated training and infrastructure, which has really challenged many of our cities. There's also been reallocation of resources. Through the first phase of the pandemic we saw that in many cases the oncology workforce was being reallocated to managing COVID-19. Now that we're in the second wave, we expect that will happen again. Policymakers are obviously focussed very much on pandemic response and are being diverted from other areas, so there will be an enormous impact over time for cancer patients.

On the other hand, what we've also seen is the recognition of issues that have never really gone away, for example the lack of investment in the health workforce, which we knew about. If you pick up any global health publication on workforce pre-2020, it would've talked about the stresses and strains that are put on any health system if there's not resilience built into the system, and one of the aspects of resilience is investing in a skilled health workforce. That was always there. I'm hopeful once again that we're going to see a recognition of this coming through 2021 and an investment in health workforce and the people that serve the health system.

We need to think about the things that have really stretched the capacity and the resilience of the system through this period, and seek to address those quite

proactively. Health workforce is obviously one of them, investment in infrastructure is another, and particularly we've talked about going into a new era of digital health and expansion of services that are around digital technologies. We need to be much more prepared than we have been. We've

started this conversation with cities being stronger tomorrow than they are today, and I think this is the most important message to give.

How does C/Can see itself in 2021?
We're very excited about 2021. We have seven out of nine cities who have reached the stage of implementing projects and moving through to delivering on the targets, priorities and objectives that they'd set in the last couple of years. Of course, there is a challenge in making sure that cities, the local stakeholders have the support they need.

Speaking of any specific challenges, it is to push, as hard as we can, on a message that nothing can happen in isolation. Commitment is needed to multi-sectoral action in health platforms and sectors working at different levels of government, embracing inclusivity in terms of multilateralism but also across partner profiles, which includes the public and private sectors. Otherwise we won't be able to support what people really want to do on the ground. It's just imperative. One of my greatest frustrations is to still go to a meeting where someone poses the question, 'Should we be partnering in this?' I really want that question to go away and be replaced with 'How can we accelerate partnerships in the right way? How can we work more effectively with more partners? How can we ensure that technology companies are at the table with people talking about health system change? How can we ensure that the financial community is engaged in conversations with health professionals around financing for cancer and SDGs? How do we build this ecosystem of partners and platforms that are interconnected and reflect truly the ethos of the SDGs, which is cooperation and collaboration?' That's where we started the conversation long before 2015, it's embedded in those commitments. I don't think we've seen full embracing or engagement in that ethos, and the major challenge for C/Can and for all work like this is to foster this different way of working.

Is there anything else you would like to add?
In every conversation we highlight the people. The people are the centre of this conversation, not C/Can itself, not the global health community. It really has to be about the patients. It's so important to just take a moment and think why you're doing this. I've certainly had personal experiences with cancer and good and bad experiences of the health system that supported that person. But if we keep that front of mind, if we continue to talk about the person at the centre, then many of our challenges will be made easier. I really believe that there is sometimes a disconnect between what the real challenges are, faced by a person navigating what is a really complex system, and understanding that even changes that make that journey easier, improve that person's life. We have to continue to talk and to think about it in that way to really embrace what we're trying to do.

Conflict of Interest
None. ◾

Playing Our Part – How Clinical Laboratories Can Build a Cleaner, More Sustainable Future

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An overview of the impact the healthcare industry has on the environment and how the adoption of an Environmental Management System according to ISO standards can provide a framework for a more sustainable operating model for clinical laboratories.

As the healthcare industry continues to grow, so does its effect on the environment. As a sector which exists to promote longer, healthier lives, the subject of environmental impact, and its related health consequences, carries extra significance. Whilst there are many sectors which are more closely associated with the acceleration of climate change, such as energy, agriculture and fashion, healthcare currently accounts for 4.4% (Karliner et al. 2019) of worldwide net carbon emissions. It is therefore the responsibility of all stakeholders within the sector to consider how to embrace more environmentally responsible practices while maintaining standards of care quality and safety.

The healthcare sector has already taken steps to better define how such improvements can be realised. The voluntary adoption of an Environmental Management System (EMS) according to the International Standards ISO 14001 or EMAS (Eco Management and Audit Scheme), provide a framework for a more sustainable operating model. Adopting such measures can help to ensure regulatory compliance and enhance a hospital's reputation as a progressive and forward-looking organisation. EMS adoption also offers potential commercial advantages by reducing the risk of government-imposed fines, lowering energy consumption, improving resource efficiency, and optimising waste management processes. The cumulative effects of these measures can therefore deliver substantial overall competitive advantages.

However the implementation of effective and permanent operational change in any large organisation cannot succeed without a unified and committed senior management team. It is beholden on the organisation's leaders to fund and facilitate the necessary training and development to adopt new practices, and foster a culture in which new thinking can be embraced, feedback can be openly expressed, and communication is clear and effective (Waxin et al. 2019). It is also vital that staff are regularly made aware of the cumulative positive effects of their efforts.

First Steps

Implementing an EMS is a similar undertaking to introducing any other quality system, albeit with a consistent emphasis on environmental factors. A laboratory may choose to seek certification under the ISO 14000 standard for environmental management. There is also a need to assess and understand both national and local statutory requirements, and legislation pertinent to a specific product or service. These can include the disposal of dangerous goods, licensing to discharge waste into sewers, and compliance with building regulations.

A recommended first step for laboratories is to set clear and achievable environmental targets. These may include a reduction in energy and water consumption, a reduction in consumables, and a reduction in waste products. Where possible, recycling guidelines should also be published and enforced. A typical and highly effective means to promote such changes is a Plan-Do-Check-Act approach. A final, but potentially highly impactful step in the process is the engagement of partners and other stakeholders to adopt similar policies and commitments.

Environmental improvement should be based on the concept to reduce, reuse and recycle. A green purchasing policy for equipment, laboratory furniture, reagents, and management of packaging wastes may be introduced for instance.

A green purchasing policy for equipment, laboratory furniture, reagents, management of packaging wastes may also considerably reduce a lab's overall environmental impact. This involves the selection and acquisition of products and services which reduce environmental impacts over their life-cycle of manufacturing, transportation, packaging, ordering patterns, use and recycling or disposal. It is essentially a commitment on the part of the laboratory to buying recyclable, recycled, more efficient, less toxic, and locally produced products whenever it is feasible.

Enhance Environmental Practices

In pursuit of such a strategy, the adoption of analysers with a reduced or even zero water requirement should be considered. The supply and treatment of water represents a significant proportion of the environmental impact of a laboratory. Equipment selection should therefore take into account the potentially contaminated wastewater from analysers, as well as expensive and wasteful deionised water. Switching to a lean and efficient automated laboratory system may present a further opportunity to enhance environmental practices, since it may lead to a reduction of testing material and waste.

Whilst each of these initiatives may seem relatively small, the transition to a more sustainable operating model must be thought of as an aggregation of marginal gains, leading to a substantial overall impact. This can only be achieved if each member of the organisation is aligned with the goal, and committed to it. In reducing the impact of laboratory waste, the key principle is that no activity should begin until a robust plan for the disposal of both hazardous and non-hazardous waste has been determined. This will ensure that all of the applicable regional and national requirements covering the handling of waste have been met, and any unplanned issues and related charges are minimised. This could include the generation of a form of waste, such as chemical or biological, which the institution is not equipped to deal with.

An example of such difficulty laboratories can encounter when dealing with management of wastewater discharge to the sewage is given by the recent implementation of REACH Regulation 1907/2006 (ECHA) on placement of OPE (commonly used detergent in laboratories; commercially known as Triton X-100) and NPE (commonly used detergents in laboratories) substances on the Authorization List. Formal decisions regarding the ECHA authorisation process and allowances of IVDs containing Triton-type detergents will be taken in the coming weeks; however, the Draft Opinions prepared by the Risk Assessment Committee (RAC) & Socioeconomic Assessment Committee (SEAC) in regard to the majority of the applications by a number of IVD companies state that "all solid and liquid waste shall be collected for adequate treatment. The treatment shall minimise releases to environmental compartments as far as technically and practically possible. Release into the sewer system or to surface waters is not adequate treatment". As there is currently no known treatment technology proven to effectively remove dilute concentrations of OPE and NPE from the wastewater generated from reagents used upon IVD instrument platforms, this implies that EU healthcare systems and diagnostic laboratories should collect and incinerate all their wastewater (reference: Information sheet issued by European Federation of Clinical Chemistry and Laboratory Medicine sent on September 3, 2020 to all EFLM Academy members).

Environmental Footprint

Today, very few clinical laboratories have made the important step to ISO 14001 certification. Despite the growing global focus on building a cleaner and more sustainable future, most laboratories have yet to formulate plans to reduce their impact on the environment. What is certain is that, as with all other sectors, the healthcare industry will eventually be held to account for its environmental footprint, both by Governments and regulators, and by the media and the public. It is imperative that leadership teams in hospitals and labs consider this not only as a critical matter of corporate social responsibility, but also as an opportunity for long-term cost savings (Lopez and Badrick 2012).

A huge amount is at stake. Healthcare represents 10% of the global economy, so the potential to transform it into a cleaner, more sustainable and lower carbon industry is critical to global targets. When combined with the healthcare industry's world-wide political influence, there is a real opportunity to provide powerful leadership towards a low-carbon, climate-smart, more equitable, and healthier future (noharm-global.org).

It has long been a central to the culture of Ortho Clinical Diagnostics to work in harmony with our environment, and to ensure that we incorporate effective sustainability practices into everything we do. This belief goes hand-in-hand with our purpose of improving and saving lives. We are committed to policies and practices that support the environmental health of the communities in which we operate and the sustainability of the planet and its finite resources. Throughout our operations we seek every opportunity to reduce our waste and lower our energy consumption, including the production of clean, renewable energy at a number of our global facilities. We also carefully plan and analyse our product manufacturing and packaging processes to ensure that the most efficient and environmentally friendly methods are incorporated. In addition, Ortho Clinical Diagnostics endeavours consistently to lower its environmental footprint by designing technology and systems with the highest operational efficiency and therefore the lowest impact on the earth and its resources

Time to Act is Now

It is no secret that the world is at a critical inflection point. We must confront and change the habits that have brought the planet's delicate environmental balance to the brink. Our sector undoubtedly has a crucial role to play, and whilst we have made a start, there is much to do. Throughout history, innovation and discovery have been central to advances in medical care. It is now time to apply these talents to re-thinking how our industry operates, and where it can improve. There simply is no 'do nothing' option. It is time to act. ■

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Radiology Resources in Timor-Leste: Limited Imaging Choices in a Small Yet Poor Country

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An evaluation of the imaging profile of Timor-Leste's territory consisting of the eastern half of the Southeast Asian Island of Timor, Atauro, Dili, Oecusse, bordered by West Timor and an assessment of the region's imaging resources, radiology capabilities and barriers to the provision of imaging care.

✓ Key Points

- Timor-Leste has a population of 1,318,445 people.

- 90% of its population is rural and most of them are subsistence farmers.

- 75% of all healthcare expenses in this region are borne by the goverment while prviate support is available in the capital city of Dili.

- Government funding in healthcare is paltry compared to other Southeast Asian countries.

- It is a lower-level middle income country with minimum investment in healthcare and even poorer resources in imaging and radiology.

In most assessments of a nation's radiology capabilities, both the country to be examined and the members of the investigative team share socioeconomic similarities. Typically, the presumption is that there are sufficient financial resources to enable purchase of all up-to-date, clinically established imaging modalities. Hence, critical evaluations tend to focus on isolating equipment deficiencies, specific means of deployment or assignment of payment. However, when attention is turned to analyses of conditions in countries of limited means, the presumption should be that the full panoply of imaging technologies is unavailable to patients at present. Rather, a realistic standard of assessment should be how well the roster of in-place radiological devices has diffused across the country and how well the means

of access to them accords with the other needs of the healthcare system. This evaluation of Timor-Leste's imaging profile attempts to follow this guide.

Timor-Leste's territory consists of the eastern half of the Southeast Asian island of Timor, a nearby small island, Atauro, situated to the north of the capital, Dili, and a coastal exclave, Oecusse, bordered landward by the Indonesian province of West Timor. In the prolonged contest between European colonial powers, the Dutch established overlordship of Indonesia, displacing the Portuguese who were able to hold on to eastern Timor, for which it functioned as an entrepôt for them but otherwise remained largely undeveloped. In 1975 the Portuguese withdrew from its far-flung empire and the Indonesian army invaded East Timor. A protracted

rebellion ensued with much hardship. In fact, it has been labeled a genocidal campaign of suppression by the Indonesian military. The U.N. along with the Portuguese sought to convince the Indonesian government to allow an independence referendum. Despite persistent violence and with the presence of the U.N. peacekeeping force an affirmative decision by the voters led the way for a declaration of independence and the establishment of a government in 2002. This process engendered great loss of life and severe property destruction. For example, about seventy percent of its existing health infrastructure was destroyed in the struggle for autonomy. Moreover, in 2005 – 2006 civil discord led to further casualties and dislocations. And yet, these dislocations have not prevented the nation's

founders from instituting a system of free healthcare for all, characterised by no payment at the site of care.

Timor-Leste's area is 5,794 square miles. Its population is 1,318,445. It has one major city, its capital Dili, which has 137,959 inhabitants. Most of the population (90%) is rural and most of them are subsistence farmers. Its main agricultural export crops are coffee, cinnamon and cocoa but the country's wealth is derived almost exclusively from oil and gas deposits located just offshore. The country contains many ethnic groups. One native language, Tetum, is spoken by 60% and Portuguese by 75%. English is understood by 31% yet only 60% of adults can read, with a wide discrepancy in literacy between city-dwellers and country folk. Life expectancy has increased by ten years since independence and is now 67 years for men and 70 years for women. The median age is 20.8; respecting that youthfulness, less than 6% of the population is over 65 years of age. Average completed fertility is 4.5 children per female. The neonatal mortality rate is 27%, but the under-five mortality rate is 60% reflecting the prevalence of pneumonia and diarrhea in young children. In fact, a study from 2013 revealed that 50% of those under five were stunted, placing Timor-Leste at 110 out of 117 in the 2019 Global Health Index. And an undernourishment percentage of 36 applies to adults, especially those residing in rural areas which are subject to recurrent food shortages. One further glaring statistic is a maternal mortality rate of 215 per 100,000 which is actually an improvement from 928 per 100,000 fifteen years ago.

While improvement has occurred since the period of internal conflict in 2006, these health statistics are still dire. The array and dispersal of radiological devices reflects a relative lack of investment but, nonetheless, focuses on basic devices disseminated widely. There is one tertiary care center in the capital, the Guido Valadares National Hospital, which has two fixed multipurpose 150kvp radiography units and three mobile units. It has the one MR machine in the country, a recently installed 0.5T unit. Since at least 2014, the hospital has had one CT unit, a 64 slice machine, also the only one in the country. It has two 4D ultrasound devices. But, there is no nuclear medicine facility in Timor-Leste. There are four radiologists, all located in Dili, up from two, seven years ago - two native to Timor-Leste and one each from China and Cuba. All are general radiologists and presumably do not have subspecialty expertise in interventional radiology.

In Dili, as well, there are six private clinics each with functional radiography and ultrasonography. There are five regional hospitals well-placed in various sites in the country each has both radiography and ultrasonography equipment. All-told, there are 87 radiographers utilising these pieces of equipment.

In addition to this seeming meager array of devices, there are other profound barriers to the provision of imaging care that stand out starkly. Seventy-five percent of all healthcare expenses are borne by the government with most private support expended in the capital city. Yet, compared with other Southeast Asian countries, government funding at approximately $100 per capita is paltry. This funding is secured by contributions from the Sovereign Wealth Fund generated by oil revenues, whose prospects are encouraging yet subject to uncertainty. Oil and gas production expansion depends on the completion of an undersea line which must cross a 3,300ft trench.

Social factors are a relative impediment to optimal care. Recent studies have pointed out the insensitivity to patient needs by health staff at clinics related to differing ethnic groups and wide levels of educational attainment between professionals and patients, in as much as the rural population remains largely illiterate. But, probably most important, are infrastructural deficiencies. There is no postal service for many non-urban areas; electricity is not available in many locations. Roads are poor leading to the decision by the Health Minister to procure motorbikes for doctors to be able to do rounds rather than purchasing ambulances to bring patients to clinical facilities. Moreover, three-fourths of births occur at home which accords with the significantly high infant mortality rate in the countryside (over 50 per 1,000) compared with Dili (31 per 1,000).

Until Timor-Leste improves in each of these areas the further dissemination and implementation of enhanced radiological services, especially in the countryside, may now not be a worthwhile initiative. For example, portable ultrasonography deployed at the bedside at home will be subject to frequent breakdowns because of the poor roads the machines must travel. Likely as well the need for improved service oversight would be hindered because of insufficient personnel. The relatively low percentage of elderly in the population suggests that expensive imaging equipment germane to their needs may now not be high on the government's spending list.

Timor-Leste's GNP per capita of over $5,000 according to one index suggests that it is now a lower-level middle income country. But the wealth engendered by petroleum production has not been widely distributed. Infrastructure needs must be addressed before Timor-Leste should seek to become a "fully-fledged radiology country".

But one, perhaps ironic, affirmative fact. Timor-Leste has aggressively isolated itself and also follows internal lockdown regulations so that by the end of July 2020 there has not been one death due to COVID-19 infection in the country.

Conflict of Interest
None. ■

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Think Global, Act Local in Healthcare Communications

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The pharmaceutical and medical device sectors strive to deliver global communications strategies relating to their innovative products and how they can benefit patients, their carers and health systems. However, as COVID-19 has once again demonstrated, although we are global citizens, at a country level there is still very much a nationalistic approach. Global communications need to account for this in their delivery if they are to succeed in their goals.

✓ Key Points

- In delivering global communications we need to 'Think Global and Act Local.'

- With the internet, there are no borders to the flow of information, but how well the communication resonates at a country level depends on how it is tailored to that healthcare system.

- Approaching diverse audiences with a 'one-size-fits-all' approach at best can restrict success but has the potential to alienate those you are trying to communicate with.

- Vehicles for communication also vary by geography and communication format may need to flex to accommodate different platforms.

- In the pandemic, health communications related to COVID-19 are impacting not just patient health but also the economy, which itself can have an even greater impact on global health.

The COVID-19 pandemic has taught us many things and, in terms of globalisation of communication, has surely reminded us that the adage 'Think Global, Act Local' still remains an insightful statement on many levels. The pandemic has seen a degree of global information sharing and unique partnerships that would perhaps have not been thought possible at the end of 2019. 'Probably the best' example must be a pharmaceutical company partnering with a drinks manufacturer to produce hand sanitiser for their home market. And yet, in implementing a global response we have seen every country manage the pandemic in their own unique ways. Borders have

closed, nationalism has grown. Even within countries the response has been tailored again at a regional or local level. What we have seen during COVID-19 highlights the perennial challenge for the globalisation of communications in healthcare. Although globalised communication is a valid and achievable strategy, in the local delivery a global, 'one-size-fits-all' approach will at best restrict success and in the worst case actually damage the overall aims. Effective healthcare communications need to resonate with the audience they target and that is impacted by everything, from diverse cultures to variations in local clinical pathways.

Need for Message Consistency and Harmonisation

For pharmaceutical and medical device manufacturers the benefits of a global communication strategy lie within the need for consistent messaging around their brands evidence and clinical benefits, as well as the company's corporate values and commitment. The spread of this information is unrestricted by geographical or political borders, so to maintain consistency organisations need to ensure wherever in the world the brand is discussed, the facts and intent communicated are the same. That's achievable for the 'what it is', but when it

comes to the 'when', 'where' and 'how' a specific medical innovation is used, local factors start to come into play. Although there is often the desire for uniformity, failing to recognise and adapt communications so they remain relevant and appropriate to the local market can have a significant impact on how they are received by the target audiences and their ultimate success.

Global harmonisation for clinical research and drug registration remains a desirable goal for the pharmaceutical and health devices sector and regulators, with organisations like the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) bringing together stakeholders to generate guidelines on the scientific and technical aspects of drug registration. ISO quality standards also help achieve this goal. Regions

of already harmonised regulatory approval, such as has existed in Europe with the European Medicines Agency and the CE (Conformité Européenne) mark, might initially seem a haven for globalised communication and to achieve product regulatory approval that is true. However, we live in a world where the approval of a medicinal product or device is only the first step in the pathway to it ultimately reaching and benefiting patients. In most markets, access or reimbursement remains a local decision and each country tends to assess and make decisions in their own way. In Europe some of the smaller countries are starting to work together on their health technology assessments, such as the Valletta Declaration, Beneluxa Initiative and Visegrad Group, but local variation in healthcare pathways still exists. Communications around these processes that ignore the

local reimbursement environment or health provision pathways are destined for failure and also have the potential to alienate the very audiences they are trying to communicate with.

All innovative treatments need to demonstrate the data to support their use. Global trial programmes therefore need to set out to show efficacy and safety across a wide range of patient demographics and ethnicities, so when their results are communicated, they are applicable across markets. Again, the ICH and their guideline E5 help harmonise this approach. China, Japan and India are examples of markets where there are unique regulatory requirements around demonstrating that data have been collected specifically looking at the influence of ethnicity on drug pharmacokinetics. This type of data is also valuable for multicultural markets like the UK to support clinicians in treating culturally diverse populations. COVID-19 has again highlighted that different populations may see different clinical outcomes to disease as well as with treatments. Understanding and incorporating these differences in communications is not a dilution of global strategy, rather an essential tailoring of its delivery.

Power of Local

The use of external experts again emphasises the need for local, alongside global. Technology allows us to communicate the views of clinicians, carers and patients from one country across the world. What it does not do is determine whether that person's view is valued or can be related to by the target audience, that is something that needs good local knowledge and insight. The most powerful voices to support the health benefits and use of any medical innovation may in fact be local, not global. Another challenge for the globalisation of health communications is the same as experienced for any global brand communication; the vehicles for communication vary by market and, although English remains

the common language of scientific research, local language communication is needed to truly engage with audiences. The internet and digital communication has paved the way to rapidly achieve global dissemination of messages but, even here, the platforms that are most popular in markets like the U.S. and Europe are very different from those favoured in a major market such as China. Again, a global digital communication strategy therefore needs to accommodate adaptation of content for different platforms depending on country or region. Social media users, in particular, do not respond well to communications force-fitted rather than developed specifically for the platform.

example, variations in measles vaccination levels have seen increasing numbers of associated hospitalisations. Ensuring healthcare professionals and patients are able to rapidly obtain and recognise credible sources of information is surely the most important goal for all global healthcare communications. However, in the globally connected world in which we live, our desire to provide universally available and rapid access to health data still needs to be balanced with the importance of ensuring robust review. In the early stages of COVID-19 the *New England Journal* of Medicine and *The Lancet*, both globally renowned medical journals, published two studies which arguably influenced clinicians' treat-

medical advances. The pharmaceutical sector, in particular, has historically struggled to achieve and maintain the levels of trust across global society that they would like and undoubtedly deserve, considering the positive impact medical innovation has had on life expectancy and quality of life over the last 100 years. With COVID-19 the world has looked to this sector as potential saviours and, as a result, surveys such as the internationally recognised Edelman Barometer, are showing the sector has seen an unprecedented leap in trust from the general public. However, that comes with high and possibly unrealistic expectations, so how the sector maintains its reputation will rely on a truly global communica-

In the local delivery a global, 'one-size-fits-all' approach will at best restrict success and in the worst case actually damage the overall aims

In global healthcare communications we therefore need to consider so much more than just transcreation. Maintaining intent is certainly a key element, but understanding how to adapt our global messages so they are applicable and resonate locally is essential for them to be effective.

Fake News, Trust and Reputation
As we have become more globally linked through digital media, we have also opened up the door to the abuse of such connectivity through fake news. In terms of global communication, this is probably one of the most dangerous challenges the healthcare sector faces. Conspiracy theories during COVID-19 have been prolific but, long before the pandemic, the anti-vaccine fake news proliferating globally had already had a measurable detrimental impact on public health. In Europe, for

ment of the disease, and even saw the World Health Organization temporarily halt clinical trials. These were subsequently retracted in response to concerns raised by scientists about the provenance of patient records the studies were based upon. It provided another stark reminder that no publication is better than bad science. In our fight against fake news, if we start to undermine the confidence in those sources we all hold up as beacons of robustness and repute, we are in danger of destroying the foundations of our defence. So, global health communicators need to ensure they stay present and vigilant on the same platforms that disseminate fake news in order to debunk the perpetrators and provide the real evidence using credible stakeholders.

Trust and reputation amongst healthcare commissioners, providers and users remains key for these organisations developing and delivering innovative

tions effort alongside the genuine globally accessible delivery of whatever treatments or vaccines the sector can develop. This global communication is now impacting not just the accessibility to innovative new treatments for patients but also the global economy, which itself can have an even greater impact on global health.

As we strive to act as a global society in bringing healthcare innovation to the world's population, we must also recognise that for our communications to be successful, they need a global strategy but also a locally cognisant delivery.

Conflict of Interest
None. ■

Why Workflows are the Core of Radiology

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Radiology departments are facing several challenges – increased volume of examinations, cross-site collaboration, rising costs, and data protection. How can the highest possible efficiency be achieved in this specialty and how can workflow and IT systems be optimised for maximum productivity?

☑ Key Points

- Radiology departments can benefit from cost and time-efficient radiology management.

- The key to increased efficiency lies in the workflow and in IT systems that manage these workflows effectively.

- The goal should always be to digitise and streamline the entire patient workflow from start to finish.

- Radiology IT systems produce a multitude of data. With intelligent software solutions, this data can be processed to valid facts that serve as a basis for day-to-day management decisions.

Radiology typically is the medical specialty with the highest investments. At the same time, it offers the highest potential for optimisation and thus savings. The volume of examinations is rising steadily, new legal requirements (e.g. patient data protection) coming up frequently, and structures are becoming more and more complex. Cross-site work, working from home, teleradiology, closer cooperation with referring physicians and other medical departments are constantly presenting radiology with new challenges.

Therefore, not only the radiology department itself but the entire hospital or entity benefits from a cost and time efficient radiology management. More patients can be examined, diagnoses are available faster, treatments can begin earlier. The result is a better healthcare for the patients plus investments pay off more quickly.

But how to achieve the highest possible efficiency? The key to this lies in the workflow and in IT systems that manage these workflows effectively. While radiology processes differ significantly from those in other medical departments, radiology has many processes that always run in the same manner. Solutions specifically designed for radiology that are consistently geared to the workflow offer enormous potential for optimising speed, efficiency, and cost-effectiveness.

Modern IT systems dedicated to workflow management consider and streamline workflow aspects in every process step, trigger mechanisms to start the next process step (e.g. report release or preliminary release or second opinion) and also provide answers for handling workflow interruptions efficiently that occur in daily business.

From Radiology Workflow to Patient Workflow

Workflow optimisation neither starts nor ends in the radiology department. The real workflow starts with a patient and a physician who decides that imaging diagnostics is needed for this patient. The examination might occur in one place, but the reporting might be done somewhere else. The patient workflow does not end when the examination has been carried out and the report is released, but rather when report (and studies if needed) are made available to the referring physician, the patient and other physicians involved in the treatment.

As a result, the goal should always be to digitise and streamline the entire patient workflow from start to finish. Best practice here are integrated, one-stop software solutions: They optimise each workflow step individually but at the same time avoid process interruptions between systems that may lead to delays, dual data storage or missing or false information in the next process step.

End-to-End Digital Workflows

Offering patients and physicians the option of making appointments online noticeably reduces the

workload on registration staff - especially if online booking is integrated directly into the appointment calendar of the radiology information system, thus avoiding work and sensitive data storage in parallel systems. Cross-site resource planning and standby lists for inpatients are additional factors that ensure high modality utilisation without idle times. In the next step, systems that automatically remind patients via e-mail or text message of upcoming appoints further help to reduce the no-show rate significantly.

When the patient arrives at the radiology, waiting and turnaround times should be kept to a minimum. One key factor here is a paperless workflow which

Text modules can be easily inserted with speech commands, lab or dose values are automatically retrieved from connected systems and inserted into the report.

A short space of time from examination to reporting is important but, coming back to the idea of a fully digital patient workflow, needs to be followed by a speedy transmission of findings without media breaks. Only then is the data immediately available for further treatment - whether in the connected HIS or a web portal with notifications and access for physicians and patients alike. To ensure a smooth process, automated workflows must exist for different scenarios, which the radiologist can start at the push of a button, such as:

solutions, this data can be processed to valid facts that serve as a basis for day-to-day management decisions that the profitability and success of a radiological institution depend upon. Via statistical analysis and real-time dashboards, problems and workflow insufficiencies can be identified, trends can be recognised, and management measures can be derived in a timely manner. Cross-site room utilisation, resources and reporting worklists can be directly influenced and managed whenever needed to achieve the best results.

Stability, Interoperability and Security
Like in all IT infrastructures, workflow management systems can only play to their strengths if they come

Solutions specifically designed for radiology that are consistently geared to the workflow offer enormous potential for optimising speed, efficiency, and cost-effectiveness

at the same time increases quality and thus patient safety. Paper-based work is slow and error-prone, files can get lost or are not available where they are needed.

When it comes to reporting, a deep integration of speech recognition into the reporting workflow – without having to switch back and forth between systems or windows - can boost efficiency to a large extent. Another important factor for increasing speed, comfort and quality is data availability. Radiologists can fully concentrate on their task when, after one single click on the examination to be reported, the corresponding studies show up in the PACS and the correct findings template, patient file, preliminary findings and case information are available on the screen at a glance. In digitised workflow systems, all data recorded at previous workflow steps is filled into the report fully automatically.

How can second opinions on the findings be obtained? When and to whom are preliminary findings transmitted? How to ensure that critical findings reach the referring physician as soon as possible and can easily be recognised as such?

Finally, a highly automated billing process can help to minimise billing losses. Effective approaches include pre-defined workflows for all types of insurance models; examination-specific query assistants registering materials used early on during the examination; automatic import of material and billing catalogues; automatic checks of billing rules enable a largely automated billing and digital transmission of services and billing data to HIS or other billing systems.

Workflow-Based Business Management
Through its workflows, radiology IT systems produce a multitude of data. With intelligent software

along with high stability, reliability, and system availability. Standardised interfaces to PACS, HIS and further systems guarantee speed and interoperability even in complex landscapes.

In addition, healthcare IT Systems require the highest standards of data security and privacy. This is especially important since more and more web applications have become a substantial part of healthcare workflows. One of the central tools are the security guidelines of the Open Web Application Security Project (OWASP), which assess the most common threats and provide effective measures for protection against these threats. Additional security is provided by solutions with certified third-party penetration tests and ISO 27001 information security management certification. ∎

German Nurse in UK: Should I Stay or Should I Go?

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One of the pillars globalisation stands upon is free movement of workforce across borders. In healthcare, it is especially relevant to nursing, with its notorious global workforce deficit. At the same time, while 'cross-border employment opportunities' may sound good in politics, for a particular nurse to move abroad for work may be one of the greatest challenges in their life. But it's still worth it, says a nurse who knows first-hand how difficult but at the same time exciting working in another country is.

Key Points

- One usually needs a life-changing experience to decide to work abroad.

- In a new country, many new various skills need to be acquired and supported through life-long learning, as in the UK.

- Communication in nursing is very important, so one needs to invest heavily in developing their language skills.

- In nursing, curbing opportunities for foreign employment benefits no one, Brexit being one example here.

- The experience of working abroad and learning something new there is a win-win for any health professional.

- Nursing is an amazing profession, which allows one to work and be appreciated by people anywhere in the world.

I am a 47-year-old registered nurse (RN) originally from Germany. I have been living and working in Bristol, a city that I love, in the southwest of England, for the last 17 years. Having first qualified as a nurse in 1997 in Bremen, Germany, I worked as a staff nurse at the Red Cross Hospital there for six years before making the decision to live abroad.

Why did I become an overseas nurse? One does not decide to go abroad without a good reason. When people become overseas nurses, it is generally because they have had an experience, which

changed the way they see the world. In my case, this happened in Sydney, a city 16,000km from my home town.

I studied international nursing management at University of Applied Sciences in 1999-2003. In our fourth semester, we had the opportunity to study abroad, so I decided to travel to the University of Sydney. During my time there, I had an amazing insight into the Australian healthcare system. The nursing culture was so unlike my own professional experience in Germany. I saw how nursing

in Australia is treated as being on a much higher level; it was a profession. I was so impressed to see my Australian colleagues working so independently.

While I was being 'brain-washed' (in a good way, of course!) by all these amazing nursing experiences, I met my partner in Sydney. She is English and a healthcare professional too. After we returned to Europe, we decided to begin our life together in the UK, so I finished my studies in 2003 and moved to Bristol.

Nursing in UK

Before that, I had had two years to get to know the British nursing culture. Since it is a Commonwealth country, Australia's nursing culture is actually very similar to the UK's in the way the two countries approach nursing.

So, what does it mean to be RN in the UK? The short answer is 'a lot'! As with many other countries, nursing in the UK is a profession. First, there is The Nursing and Midwifery Council (NMC) and you must be registered with it before you can practice as a nurse. Second, we have our own union, the Royal College of Nurses (RCN), which represents and fights for our interests at a high level. Third, our nursing education consists of a 100% academic pathway, which means that we have undergraduate

• Changing a suprapubic catheter
• Having full accountability by giving the first IV antibiotics dose
• Starting an IV programme after a PICC line has been inserted by a colleague (a nurse) and they have checked the x-ray for the procedure and then given me the go-ahead
• Working with senior nurses called advance nurse practitioners (ANP) who nurse on an even higher level than I do
• And many, many other skills!

The phrase 'I can't do it, because I don't know how to do it' does not exist in British nursing. A culture of lifelong learning is part of the profession and the reason why nurses are so highly skilled in the UK. To maintain our registration with the NMC, we all have

ensure patient safety to a high level. I have learnt that nurses in the UK stand eye-to-eye with other healthcare professionals.

Language Skills Are a Must!

Obviously, starting a new life in the UK was almost like walking into a completely different space for me. It took me a good year to get my head around everything, like how the National Health Service (NHS) is run and who's who, and see the need to continue improving my clinical and colloquial English. When I decided to move to the UK, I said to myself: "I want to laugh when the Brits are laughing, I want to cry when the Brits are crying." This thought has helped me throughout my life here in Bristol.

Learning English and becoming bilingual is a tough

In the UK, I had to learn new nursing skills, many of which are still carried out by doctors in Germany

and postgraduate study courses. In Germany these three core elements have not yet been fully implemented. However, it's getting there, and I can see the changes happening.

When you work as RN in the UK, you are fully accountable for your actions and have to follow the code of conduct set by the NMC. In the UK, I had to learn new nursing skills, many of which are still carried out by doctors in Germany. Here are some examples of the new skills I had to acquire:
• Taking blood
• Inserting a cannula
• Giving blood units and doing the monitoring
• Doing a bladder scan
• Changing a tracheal cannula and giving full care of the tracheostoma

to do annual continuing professional development (CPD) to demonstrate that we are up-to-date with our knowledge and clinical skills. These are just some examples of how highly skilled the U.K. nurses are.

I owe so much of my nursing career to the ANPs I have worked with. They are the nurses who run clinics, do endoscopic procedures, run wards, prescribe medication, and even run community hospitals at a consultant level without any medical staff. After 17 years, I still feel blessed to be part of this culture and community.

The UK has also taught me how to organise my workspace in the right way and how to take on full accountability as a nurse. I have had to overwrite medical discharges and speak for my patients as a primary nurse. I have had to (and will continue to)

path, but it's worth it. The more my English improved, the more confident I felt as a nurse on the wards. In time, I was able to joke with my patients, lead meetings and run shifts. English language skills are a must!

As a nurse, you need to be able to communicate effectively with your colleagues, patients, of course, and their families. This is critical for being able to perform your role effectively and safely.

If you can't communicate on a professional level, you can't nurse. Communication is one of the most important skills you need as a nurse, whether you are working in your home country or abroad.

Restrictions Are No Good

During my 17 years in the UK, I have met many other overseas nurses and doctors. We all agree that

anything is possible and that if your will is strong enough, it will help you achieve your goals.

Brexit, however, is an enormous burden for the NHS and the private health sector in the UK as well as for foreign healthcare staff. As a European citizen, I have never thought that one day I would need a visa to be able to live and work abroad. Even when one gets all the paperwork done (in my case, the EU settlement, which allows me to stay and work in the UK as a nurse), the mental stress is tremendous.

Certainly no country in the world can afford a ban on healthcare professionals. Anybody who supports this new system doesn't understand that health-care workers (nurses, midwives, paramedics, carers, medics, etc.) are in short supply globally. We, health-care professionals and especially nurses, are gold nuggets in the labour market, so there is a strong argument for us to have the right to work anywhere in the world.

Knowing that governments are willing to put us under restrictions makes your heart quite heavy. Times for Empire thinking are over. The UK would not be the country I love so much without the many different cultural influences that complement the British culture. I will always be a foreigner in the UK, and I don't need a reminder with paperwork that I have this special status. My home is where my heart is, that is in the UK, but due to Brexit my love relationship with the country has a dark mark now. Whether I can live with this mark, I'll know in the next few years.

Benefits and Opportunities

I always support the idea of working abroad for a while, this is why I have been involved in the Erasmus project for German student nurses for eight years already. To get an insight into another work culture and to see how healthcare systems function in different countries is a

win-win situation for every healthcare professional. One can take the new knowledge, skills and views and apply them in their home healthcare system. Overseas experiences broaden each person's horizon on both sides – it is as beneficial for German nurses to learn from their British colleagues, as for British nurses to meet student nurses from Germany.

Exchanging views, knowledge and skills is fundamental in healthcare, whether you learn something new or start appreciating your own culture. If you never step out of your framework, which is a kind of a safe place, you will never have the great opportunity to work interculturally. You will never face any challenges that help your personality grow even more, e.g. mastering a new language, getting to know colleagues from other cultural backgrounds, learning different standards, etc.

So, should you try and work abroad? If you are happy to try new life paths, then do it. If you have the courage to jump in to new waters, then do it. Even if you are shy and self-conscious, do it anyway. You will not regret it. Even if after two days you realise this new chapter might not be a chapter of your amazing life, you can always say, "At least I tried!" As I have learnt from the British culture, when one door closes, another one opens. There is no failure here.

In conclusion, I'd like to say a few things that are very important to me. I work in the most progressive nursing culture in Europe and I am very proud of it. If I were 18 again, I would have chosen to become a nurse. Being a nurse has opened up my world and my life, and has shown me how wonderful nursing is. I think nursing profession is unique in all the possibilities it gives us.

As nurses, we can work all over the world. We can work with people and become a part of their life stories, which personally for me is such a gift. People place their trust in us and believe in our skills and knowledge. It can all feel quite overwhelming.

Conflict of Interest

None. ■

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Radiomics in the Imaging of Brain Gliomas: Current Role and Future Perspectives

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Machine learning and radiomics may lead to personalised management and treatment of glioma patients, hopefully improving quality of life and survival.

✓ Key Points

- In the past few years, multiple radiomics-based tools have been introduced in the field of neuro-oncology and in particular for imaging of brain gliomas.

- Radiogenomics may evaluate molecular expression of brain gliomas in the pre-surgical setting.

- Radiomics may predict the grading of brain gliomas without the need of invasive procedures.

- Prediction of prognosis of brain gliomas may be helped by radiomics in the near future.

Recently, there has been a growing interest in medicine for radiomics as it could have multiple applications in numerous fields (Cuocolo et al. 2019). Machine Learning (ML) is a subfield of radiomics which could be used to solve problems through the use of algorithms that dynamically learnfrom available data, without the need of prior explicit programming. It can be classified in three types based on the type of learning: supervised (if there is an available ground truth guiding the training process), unsupervised and reinforcement learning (when the algorithm learns from reinforcement given by a dynamic environment) (Choy et al. 2018). Deep Learning (DL) is a complex ML model consisting of multi-layered networks, each composed by a web of nodes. Therefore, it allows high-level abstraction of data and good performance (Cuocolo and Ugga 2018). Radiogenomics, also known as imaging genomics, is a field of radiomics which identifies relationships between tumour genomic characteristics and imaging phenotypes (Zhou et al. 2018). By far, radiology is the field of medicine with the most FDA-approved radiomics-based tools, in particular in the subfields of neuro-oncology (Cuocolo et al. 2020).

Gliomas represent the most common primary brain tumours, with an incidence ranging from 0.2-4.8 per 100,000 (depending on the specific subtype) and being more frequent in adults between 45 and 65 years (Kickingereder and Bisdas 2019). There are four
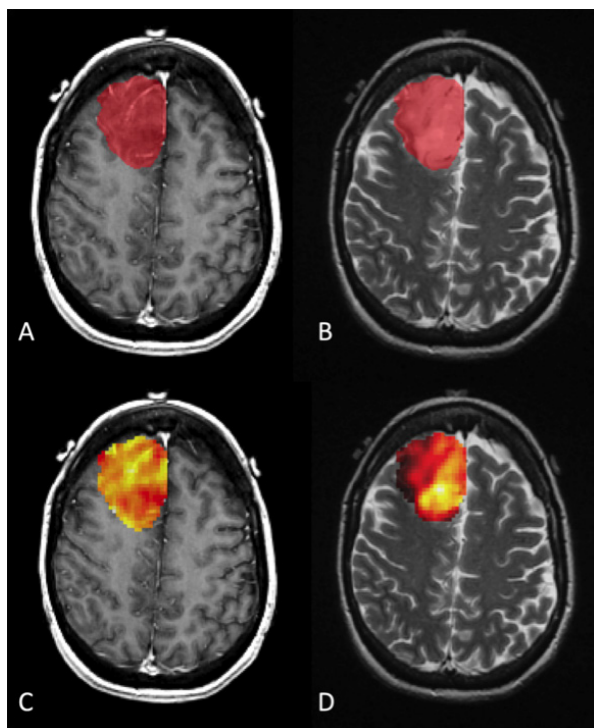
Figure 1.T1- (left column) and T2-weighted (right column) brain magnetic resonance images of a low-grade glioma patient, from the LGG-1p19qDeletion public dataset hosted on the Cancer Imaging Archive. A and B show manual lesion annotation while C and D the corresponding voxel-based extraction of a textural feature (i.e. Long Run High Grey Level Emphasis from the Grey level Run Length Matrix), highlighting the differences in qualitative imaging and quantitative textural characteristics of the lesion.

grades according to the World Health Organization (WHO) histopathological classification: grades I and II are low grade gliomas whereas grade III and IV are considered high grade. After the 2016 WHO classification of central nervous system tumours, they have also been classified based on molecular parameters, as they strongly influence survival. In particular,

the mutation status of Isocitrate dehydrogenase (IDH), the expression of ATRX, 1p/19q codeletion, K27 M mutations in thegene H3F3A and MGMT methylation status have been strongly associated with survival outcome (Louis et al. 2016).

Radiomics has proved to be useful in the imaging of brain gliomas, in particular in pre-operative and intra-operative planning, histo-pathologic diagnosis, post-treatment follow-up and outcome prediction (Sotoudeh et al. 2019). Hopefully, in the near future there will be ML-tools able to accurately evaluate tumoural gene expression, grading and survival prediction in the pre-surgical setting.

Radiogenomics and Tumoural Gene Expression

Prediction of molecular status of brain gliomas in the pre-surgical setting has become crucial to increase the efficacy of treatment. In this setting, radiogenomics may play a crucial role (Figure 1).

Buda et al. (2020) developed a DL tool able to predict genomic subtypes of lower-grade gliomas (WHO grade II and III) using magnetic resonance (MR) images. They collected 110 patients from five institutions and the DL model achieved area under the receiver operating characteristic curve (AUC) of 0.730 for the prediction of the tumour genomics (Buda et al. 2020).

In particular, the evaluation of IDH mutation status is extremely important for the characterisation of gliomas and treatment choice. V-Net is a tool based on convolutional neural network, a subtype of DL, that uses 3D-layers for the automatic segmentation of medical images. It has proved to be efficient in the evaluation and segmentation of Glioblastoma Multiforme (GBM) and peritumoural oedema on T2-weighted MR images and in the prediction of the mutation status of IDH1 (AUC=0.86) (Choi et al. 2020a).

Qian et al. (2018) created a radiomics signature based on T2-weighted MR images of low-grade gliomas which integrated radiomics and radiogenomics. It showed good correlation with hypoxia, angiogenesis, apoptosis and cell proliferation and could predict the presence of unfavourable gene expression (Qian et al. 2018). Furthermore, it showed good correlation with prognosis.

Finally, MR could help in the evaluation of MGMT methylation, an important biomarker for the prediction of response to alkylating chemotherapy. Li et al. created a radiomics model which could predict MGMT methylation status in GBM from multiregional and multiparametric MR images. The primary cohort was composed by 133 patients whereas the validation cohort was composed by 60 patients. The radiomics model reached an AUC of 0.88 (Li et al. 2018).

Prediction of Grading in the Pre-surgical Setting

Non-invasive tools for prediction of grading of brain gliomas could be extremely useful. Therefore, multiple radiomics-based tools have been developed, though they still require adequate validation for daily use in clinical practice.

For instance, Takahashi et al. created a ML algorithm based on MR images which can predict the grading of glioma with high accuracy. In particular, features extracted from apparent diffusion coefficient reached an AUC of 0.95.

On the other hand, Li et al. (2020) developed a radiomics tool based on T2 and FLAIR images for prediction of specific immunohistochemical biomarkers of gliomas. It was able to estimate the percentage of presence of Ki-67, d-100, vimentin and CD34, which are associated with tumour proliferation, malignancy, therapeutic effectiveness, invasion and angiogenesis. The AUC ranged from 0.713 to 0.923, depending on this specific biomarker (Li et al. 2020).

DL has proved to be useful in this setting. A DL-based classification trained on a cohort of 121 patients, showed high accuracy (AUC=0.987) in the estimation of glioma grading from brain MR (Çinarer, Emiroğlu, and Yurttakal 2020). Similarly, Chen et al. created a tool bases on convolutional neural network, a subtype of DL, for automatic segmentation and grading evaluation of gliomas. It used a training cohort of 220 high-grade gliomas an 54 low-grade gliomas, reaching an accuracy of 91.27% (Chen et al. 2018).

Prognosis and Survival Prediction
Radiomics has been used to predict overall survival of patients with gliomas. Baid et al. (2020) created a radiomics tool based on imaging features extracted from FLAIR and contrast enhanced T1 of gliomas to predict overall survival. It achieved high accuracy in the training, validation and test datasets (0.695, 0.571 and 0.558 respectively) (Baid et al. 2020). Similarly, Shboul et al. created a DL tool based on MR for automated

segmentation and classification of GBM and survival prediction with an accuracy of 0.73 for training datasets and 0.68 for validation cohort (Shboul et al. 2019).

Prediction of survival of ML tools increases when imaging features are combined with conventional clinical prognostic factors, such as sex, age, Karnofsky performance score (KPS), tumour location, tumour volume, MGMT promoter status and extent of surgery. For instance, radiomics based on multiparametric-MR showed high accuracy in prediction of overall survival and performance status in GBM when combined with conventional clinical and genetic prognostic models (Choi et al. 2020b). Park et al. developed a radiomics model combining multiparametric MR and clinical predictors for prediction of prognosis in newly diagnosed GBM. In particular, data from conventional, diffusion- and perfusion-weighted-MR taken from 216 patients were combined withclinical and genetic predictors and it outperformed models based on clinical predictors alone with a C-index of 0.74 (Park et al. 2020).

An important issue is to create radiomics tool that can be used in different institution with high accuracy and reproducibility. In particular, Suter et al. developed a ML tool for prediction of overall survival in GBM that showed robustness and accuracy when used to unseen multi-centre data (Suter et al. 2020).

Conclusion
ML showed promising results in the imaging of gliomas, thus there will probably be an increasing number of radiomics-based tools in this field, in particular for pre-surgical evaluation of tumoural gene expression, grading and prediction of prognosis. This will lead to a more personalised management and treatment of patients with gliomas, hopefully improving quality of life and survival.

Conflict of Interest
None. ■

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Chronic Disease Management Using GeoAI Applications: Severe Respiratory Illness in Spain

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An overview of a developmental model the authors have been working on for the past two years with a focus on chronic disease management and support for patients who are labile or highly reactive to changes in their environmental conditions.

✓ Key Points

- Global healthcare systems are struggling to manage the growth in chronic diseases.

- Several countries have identified that as many as half their populations may now be living with a long-term health condition for which there is no current cure.

- Respiratory conditions, such as COPD, have a significant impact on individuals including both their physical and psychological health status

- AI applications can play a role in supporting patients with chronic disease.

Introduction

Health systems globally are struggling to manage the growth in chronic diseases. Many low to middle income countries, in addition to wealthier countries, are now dealing with rising prevalence rates for heart, lung, cancers and metabolic disorders (Aikens et al. 2010; Bowry et al. 2015). Indeed, several countries have identified that as many as half of their populations may now be living with a long-term health condition for which there is no current cure. The impact of COVID-19 in 2020 also indicates that not only are such people at greater risk of death but also that COVID-19 survivors may experience long-term health impacts that complicate their lifetime health trajectories. This intersectional epidemiology indicates that health system responses will need to be highly adaptable in the coming decades if all of these complicated factors are to be managed appropriately and sustainably.

Recent developments have indicated that such flexibilities in healthcare are viable but the evidence base for longer term success remains limited. One of the emergent domains offering some evidence for sustainable response includes the growth in 'virtual' healthcare associated with expanded telehealth models for health monitoring and response in the community. The expansion in virtual health options has been greatly enhanced by the growth in digital technologies more generally (including the potential of 5G) and in digital health-specific technologies in particular. One of these domains is growth in the development and application of Artificial Intelligence (AI) options. This is a complicated area of practice with advances in some sectors, such as scanning analysis with Machine Learning (ML) moving faster than others. However, the indicators are that as AI options continue to prove their value in some specific clinical domains, that more general applications will be increasingly introduced to deal with emerging complexities and to enhance systemic capabilities.

In this piece we explore a developmental model the authors have been working on for the past two years with a focus on chronic disease management and support for patients who are labile or highly reactive to

Number | Percent | Rate | Years | Index score
Display Uncertainty? ☐ Start y-axis at 0? ☐

Prevalence, number

Legend
- Spain, Both sexes, All Ages, Respiratory infections and tuberculosis
- Spain, Both sexes, All Ages, Chronic respiratory diseases
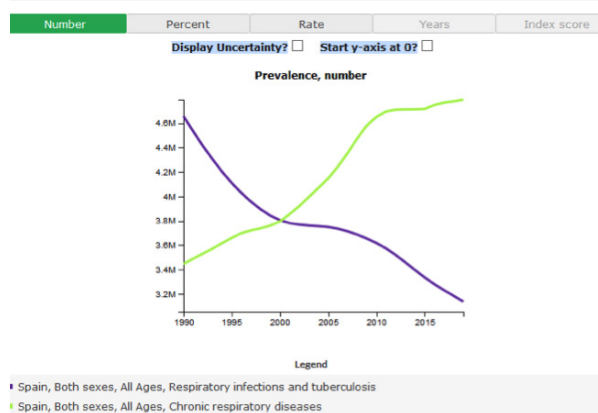
changes in their environmental conditions. The reason for this is that labile patients may deteriorate faster and require more immediate care and support than those whose conditions are stable and more manageable by conventional models of care. The role that various AI applications can potentially play in supporting these patients, and their associated health system touch points is the focus of this piece.

Chronic Diseases in Europe

The WHO has for some time now identified the growing problem presented by chronic diseases associated not only with factors like population ageing but also ambient and domestic air pollution and other urban-intensive health risks (Busse et al. 2010). This is an increasingly global concern but here we focus on the general European context and then on Spain in particular. This is because Europe's population, including Spain's, is ageing and infectious disease rates have been declining, with chronic conditions representing the major burden of disease.

Average Spanish Life Expectancy (LE) was recently ranked as number three in the world (WHO 2018). In addition, non-communicable diseases now represent the greatest burden of morbidity and mortality (Sorianao et al. 2016).

The sub-set of respiratory conditions including chronic obstructive pulmonary disease (COPD) and upper and lower respiratory tract infections are a significant contributor to the Spanish burden of disease.

The Global Burden of Disease (GBD) Study data indicates that respiratory disease remains a significant health issue in Spain. While respiratory infections have declined significantly since 1990, nonetheless more than 3 million in a population of 47 million (2020 estimate) are affected. In contrast, chronic respiratory diseases are continuing to climb over the same period with almost 4.8 million people estimated to be living with these conditions (GBD 2020).

The Concept

GeoAI refers to the intersection of conventional AI methods and the vast array of spatially enabled technologies available, including both software and hardware, such as geographic information systems (GIS), LIDAR, GPS, RFID, digital sensor systems and so on. The rise of digitisation has seen a growing integration of spatial technology with other forms of digital technologies such that most handheld devices can now generate and utilise spatial data including mobile phones, tablets, laptops and specialist devices.

When we consider the growth in personal health technologies (wearables) that monitor one or more physical and physiological factors (blood pressure etc.), then we can see how conventional AI and emerging spatial technologies have the capability of greatly improving care in the community and also care between specialist services and patients living in their own homes. This is because all digital data can be effectively spatialised and personalised to allow the geographic location of labile patients and the monitoring and reporting of environmental risk factors (e.g. pollution spikes, forest/bush fires, and even allergens such as grain shipments).

A next step in this integrated domain is the application of AI applications like chatbots which, as they become increasingly sophisticated, can help individuals

not only manage their own health but work collaboratively with health service providers and people with the same health condition to maximise their safety and wellbeing. The addition of chatbot data, which patients provide to healthcare providers and even each other as a form of mutual support, can be collected and integrated to model risk factors in real-time, inform systemic responses and support patients in situ. This data integration concept sits at the centre of this discussion because we believe this is where some key value lies in the AI equation, and especially so in a spatially enabled or GeoAI strategy.

The target audience for this concept is respiratory patients whose conditions are labile, or especially responsive to environmental changes rather than those with clinically stable conditions. This is important because there is evidence for natural events having a sudden and significant effects on community-dwelling patients which then lead to sudden demand spikes at hospitals and potential impacts on surge capabilities, workforce availability and even patient and community communication outcomes. The 2016 Melbourne, Australia thunderstorm asthma event created unprecedented havoc and associated communication failures which a subsequent inquiry showed could have been much better managed (Lee et al. 2017; Thien et al. 2018).

Contemporary research indicates that chatbots and associated techniques have substantial potential in, for example, self-management healthcare scenarios (Fernández-Avelino et al. 2021). A key issue here is that AI-based conversational technologies, such as chatbots, can be integrated with spatial technologies to provide an ongoing monitoring process that not only supports patients but also helps connect healthcare service providers likely to be impacted by changes in patient acuity and, therefore, service demand. This could include unplanned

calls to specialists, to general practitioners/family doctors, to pharmacists supplying their medications, allied health service providers and, ultimately, emergency services who might be called out to take acutely unwell patients to hospital. The better informed these various services are about the status of such labile patients, the greater their capacity to plan ahead and anticipate spikes in demand by patient type, location, condition and acuity.

The Aqurate Model

Our Aqurate model aims to apply these new conversational technologies, integrated into a GIS platform, as a potential source of patients' information to simulate what could happen from the development of an integrated AI-GIS-provider-patient platform and the potential impact it can have on patients living with respiratory diseases in urban agglomerations. This integration includes the analysis of natural language data collected via chatbot conversational technologies to build a responsive system that accommodates both conventional quantitative data measures (e.g. in-home sensors and monitors) and the subjective experiences of individual patients whose conditions are labile or highly reactive to changes in environmental conditions. In other words, the individual patient's self-assessment is readily integrated into the diagnostic and response scenario. This can be especially important for patients living with multiple chronic health conditions since, as we know, co-morbidity and multi-morbidity rates are rising globally (King et al. 2018; Singer et al. 2019).

The illustrations outline the basic concept we have developed. This includes the capacity for patients to self-report their situation, including changing symptoms experienced over time, and the integration of that data from remote sensing technologies (such as satellites monitoring weather or wildfires), environmental sensors (such as traffic related air pollution in urban areas), landscape data (altitude, vegetation cover etc.), and relevant infrastructure data including traffic monitoring and health service locations (hospitals, pharmacies, ambulance stations etc.).

The key issue here is that all of this data is fully digital and hence it can be automatically geocoded using the geographic information system (GIS) software and integrated with any associated analytics and visual dashboards. With patient approvals in place, individuals and their reported data could be either shown directly on the dashboard maps or key data anonymised but stamped with date, time and small area geography to illustrate

trends in factors affecting the clinical status of the patients. This would help to track the degree of localisation of a patient or patients' situation or identify trends across larger geographic areas.

Industry Applications

The synergies that could be generated between the academic, corporate and medical-scientific world, The University of Technology Sydney and the Clínica de Navarra will generate potentially positive feedback at all levels, from commercial and corporate, to research and CSR strategies.

In addition, another important aspect is the design, development and integration of the platform in a 5G network. Speed, capacity and flexibility of a 5G network will be especially important for the development of the tool.

Aspects such as the integration and optimisation of the tool in a 5G network will be a key factor for the project's development.

Therefore, the project will ultimately aim to create a tool optimised for a 5G network that synthesises, standardises and ultimately simplifies the analysis process in which they may be interested from corporate sectors linked to academia and research, the healthcare industry, and finally the public sector.

The applications derived from the development of the tool and in order to optimise its output to the market will focus on three different areas of development depending on their applications.

Hence, we are proposing our partners the development of an agreement focused on a longer-term strategy with financial benefits to come at a later date. A concern/goal would make sense at this initial stage.

The purpose would ultimately be to focus on an innovation that can be implemented in the medium-long term, with the necessary resources and always focused on developing a prototype in a flexible and collaborative framework by all parties in relation to patents and IPRs.

Applications

Healthcare sector:

• Hospitals and patient services.

Spatial distribution of pollutants and risk areas for patients.

• Warning information system for patients as well as for practitioners who want to be informed of the evolution and scope of any pollution event

• Study of distribution of patients by specialty.

Sports-Outdoors:

• Mapping Outdoor Sports Suitability:

Development of an alert system on the suitability of locations for performing outdoor sports (Running/ Cycling).

• As the topographic profile of the race, an information system based on isolines that inform the max recommended time of exposure to pollutants while running or cycling could be valuable in terms of practical information to the users.

Defence:

• Spatial distribution modelling of chemical-warfare agents from unconventional weapons.

• Perimeter protection system of chemical-warfare attacks in temporary mission military settlements.

Public Government:

Development of applications to support public health services in different areas from patient care through a system that allows access to relevant information e.g. pollution data, to information and control service for a hospital network. The objective is to facilitate the management of information for patients of public services as well as the connection with the network of hospital services.

• Transport:

• Infrastructure management in extreme climatic events and natural disasters (e.g. Volcanic Ash, Smoke Plumes, Mineral Dust).

• Harbours and Ports management (e.g. Soybean unloading and incidence of asthma cases).

• Public Healthcare system:

• Optimisation of public hospitals and patient services costs.

• Risk zone mapping for urban outdoor activities and sports.

• Aerosols: Particulate matter spatial distribution.

Conclusion

Respiratory conditions, such as COPD, have a significant impact on individuals including both their physical and psychological health status (e.g. Smith et al. 2014). There is evidence that they are also at higher risk of some other health conditions and, since the advent of the COVID-19 pandemic, these risks have only increased (Leung et al, 2020). Maintaining the health and safety of people with chronic disease is more important than never and this model identifies an approach with considerable potential in this space. Indeed, the upswing in telehealth and related virtual initiatives under COVID-19 only reinforces the basic concept presented here. An additional benefit may be the further customisation of services and support for particular patients (respiratory and others) becomes increasingly viable through the Aqurate modelling approach.

This article outlines a model for improving patient and health using an integrated set of digital technologies. The case study scenario of respiratory disease is illustrative of the complexities associated with chronic disease more generally and, more specifically, the growing problem of multimorbidity. The growing demand for patient self-monitoring and management relies on an expanded and better integrated use of digital technologies that link patients and providers more effectively. Lastly, patients and providers inhabit particular places where conditions may vary across space and over time. This model shows how both the general problems associated with rising chronic disease and the specific problems of distinct urban areas can be effectively managed within the one conceptual and technological framework. ■

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Pregnancy, COVID-19, and Hope for a New Vaccine

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✓ Key Points

- For the past 10 months, COVID-19 has spread rapidly, debilitating communities, plummeting economies, and killing 1.3 million people worldwide.

- According to the CDC, pregnant women are at higher risk for severe COVID-19 outcomes compared with non-pregnant women.

- Immunisations are especially important in pregnancy, to ensure the health of both mother and the developing baby.

- Given the myriad of physiologic changes a woman undergoes in pregnancy, it is important that health agencies and healthcare providers commit to lowering the burden of coronavirus disease in pregnant mothers.

Pregnant individuals go through many physical and mental transformations during those critical 40 weeks of gestation. Preconception health and healthcare has played a role in optimising women for such a high-risk period in their lives. The most common complications of pregnancy include high blood pressure, gestational diabetes, anaemia, mental health conditions, and infections to name a few - all of which can have long lasting effects on a woman's health throughout her life course.

For the past 10 months, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has spread, debilitating communities, plummeting economies, and killing 1.3 million people worldwide. The United States leads with 11.2 million cases and 247,437 deaths, while India, Brazil, France, and Russia are the other top five countries struggling to contain the virus. Since reporting its first case of COVID-19 on January 29, 2020, India's numbers have risen to 8,873,541 cases and 130,503 deaths. At the end of February, the first case of COVID-19 was reported in Brazil, since rising to 5,876,464 cases, and 166,014 deaths total.

The first case of COVID-19 in France was reported on January 23,2020, and the country has reported over 2,041,293 cases, and 45,122 deaths. Lastly, in Russia, since January the country has reported over 1,932,711 cases and 33,184 deaths. Out of these countries, only France and India's new coronavirus cases are trending downward (coronavirus.jhu.edu/data/new-cases). In the U.S., average daily cases are up 43% compared to the previous seven days, with 94% of U.S. jurisdictions seeing more cases.

A recent report by the Centers for Disease Control (CDC) found that pregnant women are at significantly higher risk for severe COVID-19 outcomes when compared with non-pregnant women (Zambrano et al. 2020). These outcomes included more frequent admits to the ICU, invasive ventilation, and ECMO – and the most worrying finding, a 70% increased risk for death. As coronavirus cases continue to surge, especially in the U.S. Midwest, the U.S. received its most promising update from any late-stage vaccine trial. On November 9, 2020 Pfizer and its partner, the German

company, BioNTech, announced preliminary results suggesting their latest coronavirus vaccine was more than 90% effective (note: the CDC typically presents flu vaccine effectiveness (VE) at 40% to 60%) (Zimmer and Thomas 2020). Then on November 16, Moderna announced that its coronavirus vaccine was 94.5% effective. Finally, on November 18, Pfizer revealed their vaccine was now 95% effective! The race is on for the Food and Drug Administration (FDA) approval, leaving the U.S. public, healthcare providers, and political leaders all hopeful for the coverage to come. Although the vaccine won't be developed in enough time to save the country during these next critical months, it is promising for the health of future pregnant mothers everywhere.

Immunisations are especially important in pregnancy, to ensure the health of both mother and the developing baby. Currently, the CDC routinely recommends (Tetanus DiptheriaPertussis) Tdap vaccination between 27 to 36 weeks' gestation, and inactivated influenza vaccine (IIV) during flu season for all

pregnant mothers (cdc.gov/vaccines/pregnancy/vacc-safety.html; Swamy and Heine 2015). When moms are vaccinated, we have seen increases in birth weight and decreases in both preterm birth and fetal death (Zaman et al. 2008). During 2019–20, 61.2% of pregnant women received influenza vaccination, 56.6% received Tdap during pregnancy, and 40.3% received both vaccines (cdc.gov/mmwr/volumes/69/wr/mm6939a2.htm?s_cid=mm6939a2_w).

Why is this so important? Considering what we know about inequalities in male/female disease outcomes in general, we must acknowledge sex differences in immunological response. Adult females typically mount stronger innate and adaptive immune responses than males, which can lead to greater vaccine efficacy and faster clearance of pathogens, but also contributes to women's increased susceptibility to inflammatory and autoimmune diseases (Klein and Flanagan 2016). Given the myriad of physiologic changes a woman undergoes in pregnancy (increased heart rate and oxygen consumption, decreased lung capacity, a shift away from cell-mediated immunity, and increased risk for thromboembolic disease) (Vlachodimitropoulou et al. 2020; Ramsey and Ramin 2001), it is even more important that the nation's health protections agencies and healthcare providers commit to lowering the burden of coronavirus disease in pregnant mothers.

Flu virus coverage can provide insight into how U.S. citizens view the severity of communicable diseases. More unique this year is the added burden of COVID-19 during these cold, dry winter months. The 2019-20 season flu vaccination coverage among adults ≥18 years was 48.4% (cdc.gov/flu/fluvaxview/coverage-1920estimates.htm). There can be many barriers to vaccination intention and behaviour: psychological, physical, contextual, and sociodemographic. The most common barriers include vaccine hesitancy, low perceived utility of vaccination, a negative attitude towards the influenza vaccine, and few previous influenza vaccinations (Schmid et al. 2017). An October

19, 2020 Gallup poll captured Americans' attitudes on COVID-19 finding that 49% of U.S. adults say they are either very worried (10%) or somewhat worried (39%) about contracting the coronavirus. This is the lowest level of concern recorded since mid-June, when 47% said they were very or somewhat worried about it. Half of Americans say they would agree to be vaccinated "right now" if an FDA-approved vaccine was available at no cost, down from 66% when Gallup first asked Americans about it in July (Reinhart 2020). And now large majorities of both political parties in the U.S., Republicans and Democrats, say the U.S. is more divided than before the coronavirus outbreak (Mordecai and Connaughton 2020).

Some of the biggest news to hit this year were the racial/ethnic disparities in COVID-19 deaths, citing multiple social determinants of health including racism. Unfortunately, if coronavirus vaccination coverage parallels that of flu vaccination, it is likely that racial/ethnic disparities will persist in the absence of targeted interventions. In the U.S., Black children typically have lower flu vaccination coverage than children in all other racial/ethnic groups. Hispanic adults and Black adults had lower flu vaccination coverage than white adults (cdc.gov/flu/fluvaxview/coverage-1920estimates.htm; www.cdc.gov/flu/vaccines-work/vaccineeffect.htm). And although Black women made up 14.1% of women included in the Women of Reproductive Age coronavirus study, they represented 36.6% deaths overall, 26.5% of deaths among pregnant women, and 37.4% of deaths among nonpregnant women (CDC.gov). This in addition to the poor health outcomes already noted in Black, Indigenous women of color (BIWOC).

Again, it's paramount that the U.S. health protection agencies and healthcare providers commit to lowering the burden of coronavirus in pregnant mothers in the coming months and years. With a nation divided and new vaccine hope on the horizon, there are so many pieces to manage. As companies race to the finish line of clinical development, regulatory review and approval,

manufacturing, and quality control, women's health physicians and other providers may start thinking of ways to better support their patients. Ob-Gyns were heavily involved in the extensive administration of H1N1 vaccine to pregnant women during the 2009 pandemic (Ramsey and Ramin 2001), and their continued efforts to increase maternal influenza vaccination resulted in coverage exceeding 50% coverage for the first time in 2012–13.Furthermore, vaccination coverage was highest among pregnant women who reported receiving a provider offer or referral for vaccination (influenza = 75.2%; Tdap = 72.7%) (Zaman et al. 2008). Facilitating culturally competent and humble conversations on pregnancy, communicable diseases, and racial ethnic disparities in vaccination can all contribute to lowering the burden of adverse coronavirus health outcomes in this high-risk population. As soon as the vaccine is safe for production, the Advisory Committee on Immunization Practices (ACIP) should make guidelines, including COVID-19 as a part of the vaccination schedule recommendations in pregnancy.

Conflict of Interest

None. ■

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