



# COVID-19 Management

**290 Prof. Henrique Martins:**  
Digital Healthcare System - Now More than Ever

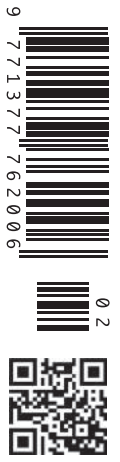
**302 Prof. Arch. Simona Agger Ganassi:**  
Towards Post-COVID-19: Lessons and Challenges for Hospitals and Healthcare Infrastructures

**310 Prof. Laura Oleaga:**  
How is the Pandemic Affecting Radiology Practice?

**324 Juhan Lepassaar:**  
Healthcare Cybersecurity in the Time of COVID-19

**326 Prof. Geraldine McGinty:**  
U.S. Radiology Responds to the Pandemic and Looks Ahead

**328 Alanna Shaikh:** Healthcare Has No Excuse for Another Pandemic Like COVID-19



9 771377 762006

0 2

# Don't Compromise Your Breast Care.



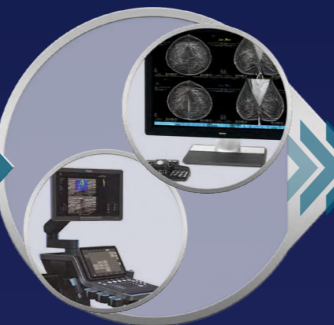
When you partner with Hologic, you are opting for the advantage of integrated solutions across the Breast Health Continuum of Care.

From screening to monitoring, our clinically proven breast and skeletal health innovations support you in delivering excellence in disease management along the patient pathway.

## RADIOLOGY



SCREENING



ANALYTICS, DETECTION & DIAGNOSIS



BIOPSY

## BREAST SURGERY



LOCALIZE



SENTINEL LYMPH NODE BIOPSY\*



REMOVAL, FILLING & MARKING\*\*

## PATHOLOGY



SPECIMEN EVALUATION

## MONITORING



BONE HEALTH AND BODY COMPOSITION

ARTIFICIAL INTELLIGENCE

**HOLOGIC** - Your Trusted Breast and Skeletal Health Partner.

3dimensionssystem.eu | info@hologic.com

\*TruNode<sup>®</sup>: Available in selected markets only  
\*\*BioZorb<sup>®</sup>: Not CE marked Not for sales, not for distribution

ADS-02949-EUR-EN Rev.001 / 2020©Hologic, Inc. All rights reserved. Hologic, The Science of Sure, TruNode, BioZorb, LOCALizer and associated logos are trademarks and/or registered trademarks of Hologic, Inc. and/or its subsidiaries in the US and/or international markets. All other trademarks, registered trademarks, and product names are the property of their respective owners. This information is intended for medical professionals and is not intended as a product solicitation or promotion where such activities are prohibited. Because Hologic materials are distributed through websites, eBroadcasts and tradeshows, it is not always possible to control where such materials appear. For specific information on what products are available for sale in a particular country, please contact your local Hologic representative or write to info@hologic.com



# Have your say!

Contribute now at:

[Interested@HealthManagement.org](mailto:Interested@HealthManagement.org)

2020  
COVER  
STORIES



Healthmanagement.org is a product by  
MindByte Communications Ltd



**Alexandre Lourenço**

Editor-in-Chief EXEC |  
[HealthManagement.org](http://HealthManagement.org)  
President Portuguese Association  
of Hospital Managers

Coimbra, Portugal  
[al@healthmanagement.org](mailto:al@healthmanagement.org)

## COVID-19 Management

As COVID-19 continues to wreak havoc across the globe, spreading to new regions and threatening with resurgence in those already affected, healthcare professionals are working tirelessly to develop and implement effective strategies for patient treatment, organisational management and public health measures. They are also looking beyond the pandemic to anticipate not only the 'new normal' but a redesigned and improved healthcare system.

In this issue, we talk about COVID-19 Management strategies and the impact of the pandemic on healthcare. We highlight the most urgent issues health workers are facing, and present crisis management best practices that are being implemented in different countries.

Prof. Laura Oleaga, Prof. Geraldine McGinty, Prof. Stephen Baker, María Candamio and Robert Lavayssière reflect on the pandemic's impact on radiology and the role radiologists have played and will continue to play during this battle.

Prof. Simona Ganassi looks into the challenges hospitals and healthcare infrastructures will be facing in the near future. Alanna Shaikh stresses that healthcare cannot afford such a pandemic again. Donna Prosser explains the three critical components for safe patient care highlighted by the crisis, while Keith Alverson outlines how COVID-19 is changing hospital waste management.

Juhan Lepassaar explains how the pandemic has made the need for effective cyber hygiene even more urgent. Diane Whitehouse and Tino Marti define a digital-first approach that adds value. Prof. Henrique Martins outlines a new, digital way of looking at healthcare while Wendy Dearing presents the previously obscure field of health informatics brought to the forefront by COVID-19. Sam Baker discusses how healthcare in the UK can maintain the digitalisation drive accelerated by the pandemic and Josep Picas offers insights into telemedicine as a volunteer for a COVID-19 telephone support service.

Professors Vedran Stefanovic and Asim Kurjak assess the impact of COVID-19 on women's health and pregnancy care. JJ Coughlan and Cormac Mullins discuss some of the potential opportunities in delivering acute cardiac care during a pandemic, while Emma Sutcliffe reflects on the impact of pharma's response to COVID-19.

During these troubling times, we hope this journal will give you guidance and greater insight into COVID-19 management across the globe. As always, we welcome your news and views and encourage you to share your COVID-19 stories with us.

Happy Reading!

A handwritten signature in blue ink, appearing to read 'Alexandre Lourenço', written in a cursive style.



## Providing multi-modality imaging decision support

The AI-Rad Companion<sup>1</sup>, our family of AI-powered, cloud-based augmented workflow solutions, helps you to reduce the burden of basic repetitive tasks and may increase your diagnostic precision when interpreting medical images. The AI-Rad Companion solutions provide automatic post-processing of imaging datasets through our AI-powered algorithms.

The automation of routine, repetitive tasks aids you in managing high case volumes to ease your daily workflow – so that you can focus on more critical issues.

Are you looking for intelligent support in your daily work? Visit our webpage to get more information on your future Companion!

[siemens-healthineers.com/ai-rad](https://www.siemens-healthineers.com/ai-rad)

<sup>1</sup>Not all extensions available for all modalities.

# Contributors



**Keith Alverson, Japan**  
Specialising in resource efficiency, environment and intergovernmental cooperation,

Keith has been working for the UN (in France, Kenya and currently Japan) for over a decade. He has 150+ publications and has served on a number of high-level scientific panels.

**332** How COVID-19 Pandemic is Changing Waste Management



**JJ Coughlan, Ireland**  
JJ Coughlan is a medical doctor, specialising in cardiology. He currently works at St James's Hospital, Dublin, Ireland.

**335** Delivering Acute Cardiac Care During a Pandemic: Seeds of Opportunity Within a Crisis



**Robert Lavayssière, France**  
Robert Lavayssière studied Medicine and Radiology in Paris and has

worked in private practice since the early 80's. Main interests include technology/informatics and economics. He is general manager of the VIDI group, the first French private radiology practice network.

**330** COVID-19 in Private Practice: How to Cope With It?



**Sam Baker, UK**  
Sam Baker is a healthcare expert at PA Consulting, a global innovation and transformation consultancy.

He specialises in operational and process improvement to support sustainable transformation and cost reduction across healthcare.

**347** Providing Alternative Outpatient Delivery Channels



**Wendy Dearing, UK**  
Coming from a nursing background, Wendy is now Head of Workforce and

Organisational Development at the NWIS. She is Chair of BCS Wales Health and Vice Chair for Professionalism. Her passion is developing professionalism across healthcare informatics.

**294** Health Informatics – 'Lost Tribe' No More



**Juhán Lepassaar, Greece**  
Executive Director of ENISA since 2019, Juhán Lepassaar has

over 15 years of experience in working with and within the EU. Prior to joining ENISA, he worked for six years in the European Commission and led and coordinated the preparations of the EU Cybersecurity Act.

**324** Healthcare Cybersecurity in a Time of COVID19



**Prof. Stephen Baker, USA**  
Stephen Baker is a member of the HealthManagement.org Imaging Editorial board

and Professor and Former Chair of the Department of Radiology, Rutgers New Jersey Medical School.

**338** COVID-19: Present and Future Effect on Radiologist Training



**Prof. Arch. Simona Agger Ganassi, Italy**  
Prof. Ganassi has over 12 years of experience as member of the

Ministry of Health Evaluation of Health Investments Team. Other areas of expertise include strategic planning, hospitals and energy, health urbanism and public procurement of innovation for the health sector.

**302** Towards Post-COVID19: Lessons and Challenges for Hospitals and Healthcare Infrastructures



**Alexandre Lourenço, Portugal**  
Hospital Administrator at Coimbra University and Hospital

Centre and a consultant for WHO, Alexandre is President of the Portuguese Association of Hospital Managers and holds various positions in EAHM, EHMA and a number of healthcare organisations around the world.

**280** Editorial: COVID-19 Management



**María Jesús Díaz Candamio, Spain**  
María Jesús Díaz Candamio is a Doctor of Medicine and a Radiodiagnosis

specialist at Hospital Universitario A Coruña, Spain.

**319** Diagnostic Imaging in the Age of COVID-19



**Prof. Asim Kurjak, Croatia**  
President of International Academy of Perinatal Medicine and honor-

ary member of 15 international societies, Prof. Kurjak has been awarded doctor honoris causa from 13 universities and received numerous awards. He is head/member of editorial boards of several journals.

**340** The Impact of COVID-19 Pandemic on Women's Health and Pregnancy Care



**Tino Marti, Spain**  
Tino is eHealth Project Officer at EHTEL with experience in eHealth and integrated health services

delivery (Catalonia, WHWO). He has participated in EU-funded projects and was Technical Officer at the WHO European Centre for Primary Health Care in Kazakhstan (2016-2019).

**313** COVID-19: Defining a Digital-First Approach that Adds Value



**Prof. Henrique Martins, Portugal**  
An Internist MD and Management PhD, Prof. Martins headed SPMS (Portugal) leading numer-

ous nation-wide eHealth projects and co-chaired the EU eHealth Network. He consults and teaches on Digital Health, health transformation, management and leadership.

**290 Digital Healthcare Systems, Now More than Ever**



**Josep M. Picas, Spain**  
A health adviser at Catalan Health Service in Spain, over the years Dr Picas held various

managerial posts at a number of public and private organisations. His current focus is on Health Care & Social Care information Systems and personal citizen data ownership.

**349 COVID-19 from the Perspective of Telemedicine**



**Emma Sutcliffe, UK**  
Emma is Head of Patient Engagement at NexGen Healthcare. She has been a leader in Patient Engagement

practices and policies since 1996 and is a Steering Committee Member for several pharma-academic research collaborations.

**344 COVID-19: No Return to Normal**



**Prof. Geraldine McGinty, USA**  
Prof. McGinty is a radiologist who specialises in the detection and diag-

nosis of breast cancer. She is a passionate advocate for quality imaging and its vital role in the delivery of healthcare.

**326 U.S. Radiology Responds to the Pandemic and Looks Ahead**



**Donna Prosser, USA**  
Having been in the healthcare industry for 30+ years, Dr Prosser is currently Chief Clinical

Officer at PSMF. Prior to joining PSMF, she worked as a healthcare consultant, and held administrative, education and clinical positions with several health systems.

**288 The Impact of the COVID-19 Pandemic on the Future of Healthcare Leadership**



**Diane Whitehouse, Belgium**  
Diane is a Principal eHealth Policy Analyst at EHTEL. In recent years,

her focus has been on the societal, organisational, ethical and innovation aspects of eHealth. Her background includes work in the European Commission's DG CNECT on ageing, disability and health.

**313 COVID-19: Defining a Digital-First Approach that Adds Value**



**Cormac Mullins, Ireland**  
Cormac Mullins is a final year special-ist registrar in anaesthesiol-ogy at St. James's

Hospital Dublin. He has a Master's qualification in Health Services Management from Trinity College Dublin and has expertise in change management, strategy and leadership within the healthcare setting.

**335 Delivering Acute Cardiac Care During a Pandemic: Seeds of Opportunity Within a Crisis**



**Alanna Shaikh, USA**  
Alanna Shaikh holds an MPH in inter-national health from Boston University and

has twenty years of program design, management, and assessment experience spanning the humanitarian relief and development sectors.

**328 Public Health's Response to COVID-19**



**Georges Espada, Belgium**

With over 20 years of experience in healthcare industry and a background in finance, Georges joined Agfa Healthcare in 2018 as Head of the Global Business Unit Conventional & Digital Radiography.

**308 #CountOnUs: Creating New Paths and Partnerships to Solve Extraordinary Challenges**



**Prof. Laura Oleaga, Spain**  
Prof. Oleaga is the Chair of the Radiology Department of the Hospital Clinic

in Barcelona. She is an active member of many scientific societies and is the Scientific Director of the European Diploma in Radiology since 2018.

**310 How is the Pandemic Affecting Radiology Practice?**



**Prof. Vedran Stefanovic, Finland**  
Senior consultant in Obstetrics, Gynecology and Fetal Medicine

at Helsinki University Hospital and Head of Perinatal Medicine Curriculum at Helsinki University, Prof. Stefanovic has published extensively and is actively involved in IS-AIP, NNFM and IAPM.

**340 The Impact of COVID-19 Pandemic on Women's Health and Pregnancy Care**



**Jutta Odarjuk, Germany**

Jutta Odarjuk has a PhD in biochemistry. Having worked in various research positions and with more than 25 years in diverse marketing positions in pharmaceutical and diagnostics industry, Jutta has been dealing with PCT and its clinical utility as a bacterial infection marker and aid in antibiotic stewardship.

**298 BRAHMS PCT: A Valuable Tool for Bacterial Coinfection Risk**

# Contents



## Editorial

- 280 COVID-19 Management  
*Alexandre Lourenço, Portugal*



## Management Matters

- 288 The Impact of the COVID-19 Pandemic on the Future of Healthcare Leadership  
*Donna M. Prosser, USA*
- 290 Digital Healthcare System - Now More than Ever  
*Prof. Henrique Martins, Portugal*
- 294 Health Informatics – ‘Lost Tribe’ No More  
*Wendy Dearing, Wales*

- 298 B·R·A·H·M·S PCT: A Valuable Tool for Bacterial Coinfection Risk Assessment  
*Jutta Odarjuk, ThermoFischer*



## Cover Story: COVID-19 Management

- 302 Towards Post-COVID-19: Lessons and Challenges for Hospitals and Healthcare Infrastructures  
*Prof. Arch. Simona Agger Ganassi, Italy*

- 308 #CountOnUs: Creating New Paths and Partnerships to Solve Extraordinary Challenges  
*Georges Espada, Agfa*

- 310 How is the Pandemic Affecting Radiology Practice?  
*Prof. Laura Oleaga, Spain*

- 313 COVID-19: Defining a Digital First Approach that Adds Value  
*Diane Whitehouse, Belgium*  
*Tino Marti, Belgium*

- 316 Think Inside The Box: This Parisian Hospital Has a Dedicated CT Cabin for its COVID-19 Patients  
*GE Healthcare*

- 319 Diagnostic Imaging in the age of COVID-19  
*María Jesús Díaz Candamio, Spain*

- 324 Healthcare Cybersecurity in the Time of COVID-19  
*Juhan Lepassaar, Greece*

- 326 U.S. Radiology Responds to the Pandemic and Looks Ahead  
*Prof. Geraldine McGinty, USA*

- 328 Healthcare Has No Excuse for Another Pandemic Like COVID-19  
*Alanna Shaikh, USA*

- 330 COVID-19 in Private Practice: How to Cope With It?  
*Robert Lavayssière, France*

### DISCLOSURE OF CONFLICT OF INTEREST:

Point-of-View articles are the sole opinion of the author(s) and they are part of the HealthManagement.org Corporate Engagement or Educational Community Programme.

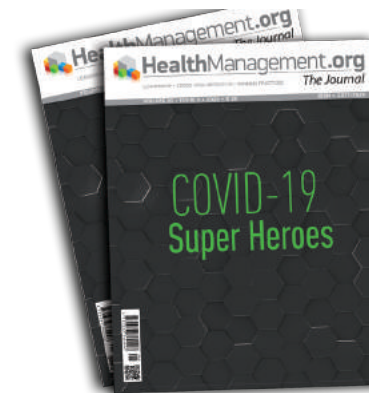


# Contents

- 332** How COVID-19 Pandemic is Changing Waste Management  
**Keith Alverson, Japan**
- 335** Delivering Acute Cardiac Care During a Pandemic: Seeds of Opportunity Within a Crisis  
**JJ Coughlan, Ireland**  
**Cormac Mullins, Ireland**
- 338** COVID-19 - Present and Future Effect on Radiologist Training?  
**Prof. Stephen R. Baker, USA**
- 340** The Impact of COVID-19 Pandemic on Women's Health and Pregnancy Care  
**Prof. Vedran Stefanovic, Finland**  
**Prof. Asim Kurjak, Bosnia and Herzegovina**
- 344** COVID-19: No Return to Normal  
**Emma Sutcliffe, UK**
- 347** Providing Alternative Outpatient Delivery Channels  
**Sam Baker, UK**
- 349** COVID-19 from the Perspective of Telemedicine  
**Josep Manuel Picas, Spain**

## Upcoming Issue

- 350** COVID-19 Superheroes Edition



### DISCLOSURE OF CONFLICT OF INTEREST:

Point-of-View articles are the sole opinion of the author(s) and they are part of the HealthManagement.org Corporate Engagement or Educational Community Programme.

### Subscription Rates (6 Issues/Year)

One year: Euro 106 + 5% VAT, if applicable  
Two years: Euro 184 + 5% VAT, if applicable

### Production & Printing

Total circulation 47,000  
ISSN = 1377-7629a

© HealthManagement.org is published six times per year. The Publisher is to be notified of any cancellations six weeks before the end of the subscription. The reproduction of (parts of) articles is prohibited without the consent of the Publisher. The Publisher does not accept any liability for unsolicited material. The Publisher retains the right to republish all contributions and submitted materials via the internet and other media.

### Legal Disclaimer

The Publishers, Editor-in-Chief, Editorial Board, Ambassadors and Editors make every effort to ensure that no inaccurate or misleading data, opinion or statement appears in this publication. All data and opinions appearing in the articles and advertisements herein are the sole responsibility of the contributor or advertiser concerned. Therefore the Publishers, Editors-in-Chief, Editorial Board, Industry and Regional Ambassadors, Editors and their respective employees accept no liability whatsoever for the consequences of any such inaccurate or misleading data, opinion or statements.

### Verified Circulation

According to the standards of International Business Press Audits.

### HealthManagement.org

is independently audited by TopPro Audit



# Editorial Board



**Alexandre Lourenço**  
**Editor-in-Chief EXEC**  
Centro Hospitalar e Universitário de Coimbra,  
Portugal  
al@healthmanagement.org



**Prof. Lluís Donoso Bach**  
**Editor-in-Chief Imaging**  
Hospital Clinic – University of  
Barcelona, Spain  
ld@healthmanagement.org



**Prof. Tienush Rassaf**  
**Editor-in-Chief Cardiology**  
Westgerman Heart- and Vascular Center,  
University of Essen, Germany  
tr@healthmanagement.org

## Board Members

**Dr. Gilbert Bejjani**

Hospital Group, Brussels, Belgium

**Philippe Blua**

Hospital Center of Troyes, France

**Juraj Gemes**

F.D. Roosevelt University Hospital, Slovakia

**Prof. Sir Muir Gray**

Better Value Healthcare, Oxford, UK

**Sjaak Haakman**

Reinaert Kliniek, The Netherlands

**Marc Hastert**

Federation of Luxembourg Hospitals, Luxembourg

**Prof. Karl Kob**

General Hospital Bolzano, Italy

**Heinz Kölking**

Lilienthal Clinic, Germany

**Nikolaus Koller**

President EAHM Editorial Board, Austria

**Dr. Manu Malbrain**

University Hospital Brussels, Belgium

**Chris McCahan**

International Finance Corporation (IFC)  
World Bank Group, USA

**Louise McMahon**

Health and Social Care Board, Northern Ireland

**Prof. Iris Meyenburg-Altswarg**

Nursing Medical University, Hannover Medical School  
(MHH), Germany

**Dr. Taner Özcan**

MLPCare, Turkey

**Prof. Denitsa Sacheva**

Council of Ministers, Bulgaria

**Jean-Pierre Thierry**

Synsana, France

**Hans-Peter Wyss**

Management & Recht, Switzerland

**Prof. Stephen Baker**

Rutgers New Jersey Medical School, USA

**Prof. Hans Blickman**

University of Rochester Medical Center, USA

**Prof. Edward I. Bluth**

Ochsner Healthcare, USA

**Prof. Georg Bongartz**

University of Basel, Switzerland

**Prof. Frank Boudghene**

Tenon Hospital, France

**Prof. Davide Caramella**

University of Pisa, Italy

**Prof. Alberto Cuocolo**

University of Naples Federico II, Italy

**Prof. Johan de Mey**

Free University of Brussels, Belgium

**Prof. Nevra Elmas**

Ege University, Turkey

**Dr. Mansoor Fatehi**

Medical Imaging Informatics Research Center, Iran

**Prof. Guy Frija**

Georges-Pompidou European Hospital, France

**Assoc. Prof. Frederik L. Giesel**

University Hospital Heidelberg, Germany

**Prof. Wolfram Knapp**

Hannover Medical School, Germany

**Prof. David Koff**

Hamilton Health Sciences; McMaster University, Canada

**Prof. Elmar Kotter**

University Hospital Freiburg, Germany

**Prof. Heinz U. Lemke**

International Foundation for Computer Assisted  
Radiology and Surgery; University of Leipzig, Germany

**Prof. Lars Lönn**

National Hospital, Denmark

**Prof. Elisabeth Schouman-Claeys**

APHP Medical Organisation Directorate; University of  
Paris 7, France

**Prof. Valentin Sinitsyn**

Federal Center of Medicine and Rehabilitation, Russia

**Dr. Nicola H. Strickland**

Imperial College Healthcare NHS Trust, UK

**Prof. Henrik S. Thomsen**

University Hospital of Copenhagen, Denmark

**Prof. Vlastimil Valek**

Masaryk University, Czech Republic

**Prof. Berthold Wein**

Group Practice, Aachen, Germany

**Prof. Gunter Breithardt**

University of Munster, Germany

**Prof. Hugo Ector**

University Hospital Leuven, Belgium

**Prof. Michael Glikson**

Shaare Zedek Medical Center, Israel

**Priv.-Doz. Philipp Kahlert**

Universitätsklinikum Essen, Germany

**Prof. Peter Kearney**

Cork University Hospital, Ireland

**Prof. Alexandras Laucevicius**

Vilnius University Hospital, Lithuania

**Prof. Fausto J. Pinto**

Lisbon University, Portugal

**Prof. Piotr Ponikowski**

Clinical Military Hospital, Poland

**Prof. Silvia G. Priori**

University of Pavia, Italy

**Prof. Amiran Revishvili**

Scientific Center for Cardiovascular Surgery, Russia

**Prof. Massimo Santini**

San Filippo Neri Hospital, Italy

**Prof. Ernst R. Schwarz**

Cedars Sinai Medical Center, USA

**Eugene Fidelis Soh**

Tan Tock Seng Hospital and Central Health, Singapore

**Prof. Dan Tzivoni**

Israel Heart Society, Israel

**Prof. Alex Vahanian**

Bichat Hospital, France

**João Bocas**

Digital Saludem, UK

**Miguel Cabrer**

TopDoctors CIO and Founder of Idonia Medical  
Image Exchange Palma de Mallorca, Spain

**Richard Corbridge**

Boots, UK

**Dr. Marc Cuggia**

Pontchaillou Hospital, France

**Dr. Peter Gocke**

Charité, Germany

**Prof. Jacob Hofdijk**

European Federation for Medical Informatics,  
The Netherlands

**Prof. Werner Leodolter**

University of Graz, Austria

**Prof. Eric Lepage**

Agence Régionale de Santé Ile-de-France, France



**Prof. Christian Lovis**  
**Editor-in-Chief IT**  
 University Hospitals of Geneva  
 cl@healthmanagement.org



**Christian Marolt**  
**Executive Director**  
 HealthManagement.org, Cyprus  
 cm@healthmanagement.org

**Prof. Josep M. Picas**  
 WAdaptive HS, Spain

**Prof. Eric Poiseau**  
 IHE Europe, France

**Prof. Karl Stroetmann**  
 Empirica Communication & Technology  
 Research, Germany

**Diane Whitehouse**  
 EHTEL, Belgium

**Ing. Martin Zeman**  
 CESNET, Czech Republic

## Industry Ambassadors

**Dan Conley**  
 Beacon Communications, USA

**Marc De Fré**  
 Agfa, Belgium

**Prof. Okan Ekinci**  
 Roche, USA

**Prof. Mathias Goyen**  
 GE Healthcare, UK

**Dr. Rowland Illing**  
 Affidea, UK

**Jurgen Jacobs**  
 Qaelum, Belgium

**Ljubisav Matejevic**  
 Ascom, Germany

**Christina Roosen**  
 AHIMA International, Spain

**Gregory Roumeliotis**

Breakthrough Genomics, USA  
**Dr. Jan Schillebeeckx**  
 Meerkant, Belgium

## Regional Ambassadors

**Joan Marques Faner**  
 Son Dureta University Hospital, Spain

**Dr. Thomas Kaier**  
 King's College London, UK

**Dr. Mahboob ali Khan**  
 Imam Abdul Rahman Bin Faisal University,  
 KSA

**Dr. Sergej Nazarenko**  
 Estonian Nuclear Medicine Society, Estonia

**Dr. Nadya Pyatigorskaya**  
 Pitié Salpêtrière Hospital, France

**Andreas Sofroniou**  
 Limassol General Hospital, Cyprus

**Dr. András Vargha**  
 National Centre for Patients' Rights,  
 Hungary

**Anton Vladzmyrskyy**  
 Virtual Hospital m-Health, Russia

## Team

**Christian Marolt**  
 Executive Director cm@healthmanagement.org

**Iphigenia Papaioanou**  
 Project Director ip@healthmanagement.org

**Barbora Terešková**  
 Vice President Client Management bt@mindbyte.eu

**Anastazia Anastasiou**  
 Creative Director art1@mindbyte.eu

**Samna Ghani**  
 Senior Editor sg@healthmanagement.org

**Maria Maglyovanna**  
 Staff Editor mm@healthmanagement.org

**Marianna Keen**  
 Staff Editor mk@healthmanagement.org

**Dran Coronado**  
 Staff Editor dc@healthmanagement.org

**Katya Mitreva**  
 Communications Director km@healthmanagement.org

**Anna Malekkidou**  
 Communications am@healthmanagement.org

**Sabahat Shamsuddin**  
 Communications office@healthmanagement.org

**Sandip Limbachiya**  
 Head of IT

**Sergey Chygrynets**  
 Front-end Developer



is a product by MindByte Communications Ltd

**Brussels Office:**  
 Rue Villain XIV 53-55, B-1000 Brussels, Belgium  
 Tel: +32 2 2868500, Fax: +32 2 2868508  
[brussels@mindbyte.eu](mailto:brussels@mindbyte.eu)

**Limassol Office:**  
 166 Agias Filaxeos, CY-3083 Limassol, Cyprus  
 Tel: +357 25 822 133, Fax: +32 2 2868508  
[office@mindbyte.eu](mailto:office@mindbyte.eu)

**Headquarters:**  
 9, Vassili Michaelides, CY-3026, Limassol, Cyprus [hq@mindbyte.eu](mailto:hq@mindbyte.eu)

- [@Healthmanagement.org](https://www.facebook.com/HealthManagement.org)
- [@ehealthmgmt](https://twitter.com/ehealthmgmt)
- [HealthManagement.org](https://www.linkedin.com/company/HealthManagement.org)
- [healthmanagement.org](https://www.youtube.com/channel/UC...)

## Have your say. Engage!

As COVID-19 continues to wreak havoc across the globe, healthcare workers are busy managing patient flow and improving patient outcomes. In this issue, we explore crisis management practices in different countries and the efforts of the healthcare community as they battle this disease.

To contribute, contact us on  
**[Interested@HealthManagement.org](mailto:Interested@HealthManagement.org)**

# The Impact of the COVID-19 Pandemic on the Future of Healthcare Leadership

## Three Critical Components for Safe Patient Care

Creating and nurturing a culture of safety that is aligned with a holistic, continuous improvement process and sustained through effective communication and education is no longer a choice; it is now a requirement of all healthcare leaders, from the boardroom to the bedside.



We are well aware of the impact that the COVID-19 pandemic has had on frontline healthcare workers. They have been challenged with an ongoing lack of supplies and staff while trying to manage tremendous surges in patient volume for months. Many have been ‘repurposed’ and asked to work in roles and departments previously unfamiliar to them. We hear about these stories on the news daily, but healthcare leaders have also been quite

challenged during this time. There is little talk on the news about the tremendous impact this pandemic has had, and will continue to have, on leadership moving forward.

We have an opportunity to make the next 20 years in healthcare quality and safety different than before. For the past two decades, since the publication of the IHI’s *To Err is Human*, healthcare leaders, clinicians and patient advocates across the globe have worked diligently to uncover

the root causes of harm in healthcare and improve them. Unfortunately, medical error remains the third leading cause of death in the U.S. and the 14th globally. Although healthcare *has* improved tremendously over the past 20 years, we still have a very long way to go.

This pandemic has highlighted the gaps in safety that still exist in hospitals. Patient falls, pressure ulcers and communication errors have increased significantly over the

past several months. Though the demographics may be different, social disparity and health inequity exist in every country, and are evident in the COVID-19 death toll. This is happening because, in most organisations, the processes implemented to improve those outcomes were never truly hardwired, and so they break down easily during a crisis. This indicates that a change in behaviour didn't occur, which is the most difficult component of improvement.

Over the next 20 years, leaders must learn how to change the hearts and minds of the people who do the work. This requires a shift in organisational thinking that begins with the governing body and executive leadership. There must be alignment across the organisation, and agreement at all levels of leadership, that harm from preventable medical error is unacceptable.

There are three critical components to transforming safety in such a way. Organisations, which are committed to eliminating harm from medical error, have alignment across:

1. A culture of safety
2. A holistic, continuous improvement process
3. A development approach that results in effective sustainment.

Most organisations do not have such alignment, and the COVID-19 pandemic has highlighted how a crisis can quickly disable an organisation without a foundation of safety. The Patient Safety Movement Foundation provides resources that can assist you in your journey to transforming safety. Our Actionable Patient Safety Solutions (APSS) provide an evidence-based summary of 18 of the leading safety challenges, including establishing a [culture of safety](#), and are available free of charge on our website. Refer to these APSS to help your organisation align the three critical components of transforming safety.

### Culture of Safety

Achieving a culture of safety requires transformational change, a data-rich environment, and a focus on respect and transparency. It is critical to create trust, establish

accountability, and make it easy for people to identify unsafe conditions. Leaders must ensure that everyone in the organisation feels safe reporting issues and near misses and establish a blame-free culture that focuses on strengthening the system rather than blaming the individual. Organisations, which are successful at minimising harm because they have created such a culture, are said to be a high reliability organisation (HRO). This has been optional in the past and is a status that only a few healthcare systems have had the resources and the capacity to do well, but the COVID-19 pandemic has clearly shown us that all healthcare organisations should be HROs.

### Holistic, Continuous Improvement

Every hospital has a quality department that oversees improvement of identified issues, but often the work of these departments is not aligned with all of the improvement projects that are occurring across a hospital or a system. This creates waste and inefficiency. It is critical that the improvement system is approached in a holistic manner, and that leaders assess the risks and actual problems in an organisation as a whole, so that priorities can be established and improvement can be allowed to progress unimpeded. Healthcare administrators have a responsibility to lead improvement efforts by ensuring that the right team is established, that their work is supported and that barriers are removed.

### Sustainability

Every healthcare organisation struggles with sustaining hard-won change. A structured, organisational development approach that aligns with the holistic improvement process and culture of safety is the third critical component of transformation. This includes creating a simple process for communication and education. Healthcare workers are inundated with constant changes in policies, procedures, protocols, pathways and many other documents that are supposed to guide their practice. Leaders must ensure that it is easy for the frontline to know what

to do, and that managers are well equipped to effectively facilitate change by understanding and applying the principles of human factors.

### Conclusion

COVID-19 is reshaping the narrative about healthcare safety and has shifted the responsibilities of future healthcare leaders. Creating and nurturing a culture of safety that is aligned with a holistic, continuous improvement process and sustained through effective communication and education is no longer a choice; it is now a requirement of all healthcare leaders, from the boardroom to the bedside. We have seen the gaps shown to us by this pandemic, and as leaders, we cannot just turn away. We have the responsibility, as well as the opportunity, to truly make patient care safer in the future. Let's embrace it. ■

#### Author: Donna M. Prosser

Chief Clinical Officer | Patient Safety Movement Foundation | Irvine (CA) | USA  
[Donna.prosser@patientsafetymovement.org](mailto:Donna.prosser@patientsafetymovement.org) | [@dmprosser](https://twitter.com/dmprosser)

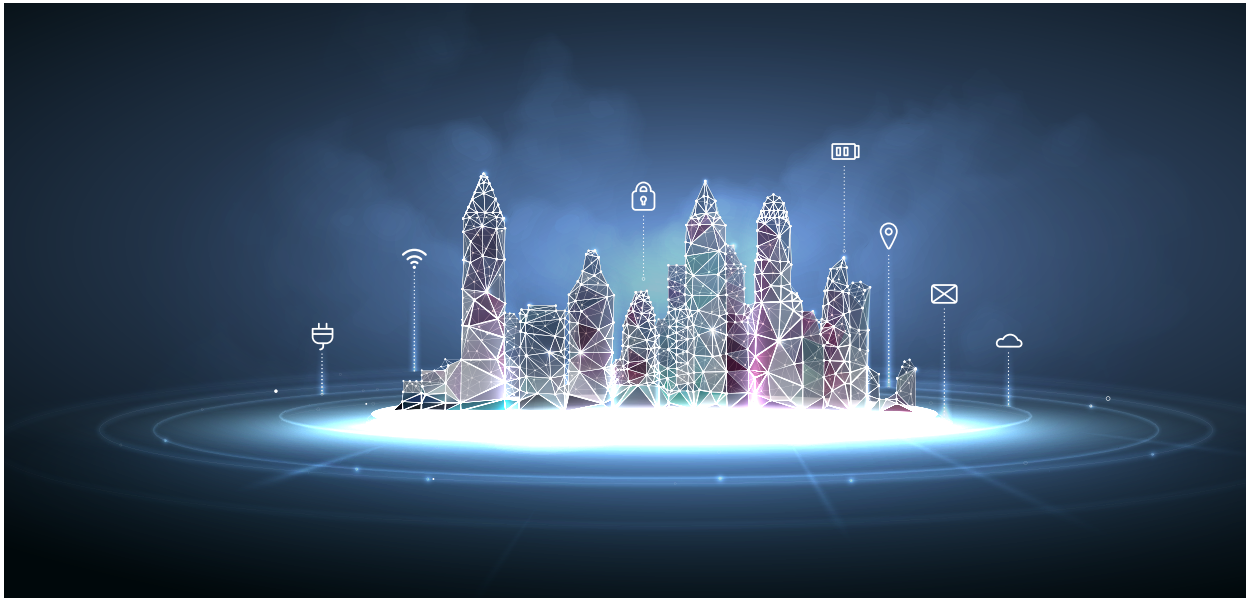
### Key Points

- The COVID-19 pandemic has highlighted the gaps in safety that still exist in hospitals.
- These gaps exist because leaders have not yet become proficient at changing behaviour.
- The three critical components required to transform safety include aligning a culture of safety with a holistic, continuous improvement process and a development approach that results in effective sustainment.
- The Patient Safety Movement Foundation provides free resources to assist healthcare leaders in transforming patient safety.

# Digital Healthcare Systems

## Now More than Ever

Digital Healthcare Systems are needed in all contexts. Portugal's recent eHealth upscaling used a crisis to leverage change. An expert who led the country on this way shares this experience and outlines the bases of a new way of looking at healthcare.



There is a global need for a new healthcare system organisation. The will for transformation was dormant, and the need has become prominent with COVID-19 crisis. Digital solutions are shaping eHealth (von der Leyen 2019) adding value to obsolete 20th century-born healthcare systems. Portugal's eHealth developments are a vivid example of how change is possible during and after a crisis. Digital healthcare, however, is something new and needed. Its shape and form are to be outlined, its citizen core to be energised. Courageous leadership will be able to exit COVID-19 crisis and step into that new era.

### Portugal eHealth Developments in Brief

Portugal is a medium-sized country but now a reference point and an influencer in the digital health policy in Europe. Faced with a financial crisis, the 2011 government had to restore the National Health Service (NHS) sustainability, fighting fraud and waste while maintaining healthcare provision. We had an unstructured and mostly outdated eHealth infrastructure. Like in many other countries, even today, there was no official strategy and a plethora of homegrown and off-the-shelf solutions maintained by curious in-house programmers and bought from

companies in an *ad hoc* manner. There were many vendor 'lock-in' situations and little documentation, system architecture or interoperability standards.

All countries have their strengths upon which to build eHealth. Ours were some generalised old legacy systems developed by the Ministry of Health, and few Information Systems (IS) technicians remaining from a period and a practice of national digital health solutions creation by public entities.

In 2012, a decision was made to revitalise eHealth. At the Ministry of Health, I outlined a plan under the new Commission for Clinical Informatisation. A dedicated eHealth agency would emerge from the restructuring of the Shared Services of the Ministry of Health (SPMS), inherent people and old information systems from other institutions.

Existing health-related systems were reorganised in new formats providing quick-win integration solutions. The prime example was the new Health Data Platform, which in less than nine months linked all public hospitals and primary care, allowing doctors and nurses to see health records nationally.

Secondly, IS were aggressively implemented in the areas of fraud in prescription and dematerialisation of all processes, such as issuance of sick leaves and death certification (Marques 2015), among others.

A citizen-centred digital health stream of initiatives was started. The first patient portal, launched in April 2012, enhanced e-booking for online appointments, but from a more strategic perspective citizens could document

their health data, now accessible by the NHS staff pending their explicit consent. A citizen had become a source of data in the care process. Half a million enrolees benefitted immediately; now they are over 2.5 million. Co-created with the national data protection authority, the platform was already GDPR-compliant. It was continuously enhanced and later rebaptised under the new 2015 Government as 'Registo de Saúde Eletrónico' (Electronic Health Record).

This was a rare, but fundamental form of eHealth strategy continuum. Four evolutions of the portal came about over the years with design, usability, increased services, sophisticated self-management of consent, EU compatible cross-border services (ePrescription and Patient Summary), access to national ePrescriptions, and a myriad of other services.

I presided over SPMS, as it set itself to revolutionise

wallet). It carries fragments of their electronic health record, such as their full vaccination data; gives further access to their data online; or allows to self-check their symptoms online for flu and other diseases, even before this dreadful COVID-19.

We developed our own national, publicly available telehealth platform in 2015. Through a working group, and later the new National Telehealth Centre, in 2017 institutions were given a new dynamic, which led to increased use. Financing mechanisms and clinical guidelines for telehealth were created, as was the framework for tele-dermatology, culminating with the approval of one of the first national strategies for telehealth globally in 2019 (Hashiguchi 2020). These are key examples that created grounds for 'digital thinking' in health, not to *show off*, but to *show how and why* it is possible to embark on similar journeys where needed.

later adjusted and contributed to the creation of [SPMS Academy](#).

Portugal enjoyed the benefits of EU co-operation under different projects, and led some of them in eHealth, like EXPAND or [eHAction](#). I served as representative and later Member-State chair of the [EU eHealth Network](#) – the eHealth policy forum. Many criticised such external activities. Digital health, however, only makes sense in the broader context as interoperable advances in each country need to align internationally. Citizens travel, and responses need to be European, if not global, as, unfortunately, COVID-19 crisis is showing.

Similarly, because of organisational and technical interoperability, systems need to be cybersafe. We set in place robust governance for health cybersecurity, kick-started two European Health Cybersecurity collaborations (SPMS 2020) and collaborated under the newly formed Global

## Portugal is now in the forefront of eHealth in Europe. The new NHS portal is a potential game changer for access to services information

World Health Organization, Review of the Portuguese National System Report 2018

digital health, and oversaw the IS directorates from 2013 to 2020. We went fast and in-depth. Digital health needs interoperability standards, enterprise architecture, service management, high-scale operation capacity, international cooperation, cybersecurity strategy, data usage road-mapping and ethical surveillance.

In September 2015, we launched ePrescription, which reached 98% coverage by October 2016. Now more than 10,000 doctors use the new mPrescription (mobile prescription with eSignature and paperless transfer to citizens), and, starting April 1, 2020, paper prescriptions have been banned by law. Our ePrescription includes not just medicines, but home respiratory care, or prevention interventions, such as prescription of physical activity (Mendes et al. 2020). Many other projects synergised to provide Portuguese population with a mobile app (MySNS

Drawing on robust national systems such as patient index, prescription database, datawarehousing of all primary care data or digital mortality certification, Big Data projects were launched. For example, online open data, primary care public dashboards, or citizen centric dashboards on the NHS website ([Ministério da Saúde](#)) made various data available to scientists, journalists and citizens in general in early 2016. Artificial Intelligence projects with a focus on public health and health management issues always twinned with academia. More could have been done, namely faster infrastructural improvement and legacy system update, in which resources were the limitation. More remains to be done. We also did some things wrong, eg there was little direct clinical engagement in the beginning, as we trusted IT departments in organisations with this. Such pitfalls were

Digital Health Partnership ([GDHP](#)). International relationships in a national agency are the door to innovation, standard promotion and broader thinking in digital health – a long-term investment.

Vision, strategy and political support; technical capacity, enthusiasm and emotions; willingness to try and acceptance of failure – these were the ingredients for Portugal's eHealth path. The first published strategy, for 2017-2019, benefitted from one year of reflection, WHO Europe contribution, lessons learnt from others, and consultancy input. Nine years of continuous political support through four ministerial teams, including an additional boost through the change from the right-wing to left-wing government, was another factor. Public sector technical capacity developed through intensive reskilling of staff and new hiring. Enthusiasm and motivation came from

meetings and events, which attracted health organisations, professionals and multiple associations. The willingness to try and accept failure had to be developed in SPMS and the ministry – it did not come naturally. I believe, however, in a ‘fail-fast’ methodology, or, as I called it, ‘à Gil’ approach (in reference to the well-known agile IT methodology but adapted to my leadership style: ‘à-something’ means ‘the way of’ in Portuguese, and Gil is my middle name), emotional leadership and fun are key to digital health.

### Digital Healthcare System

Developing and deploying eHealth services that fit into and optimise existing healthcare systems is crucial to improve their performance, accessibility, comfort and efficiency, but it is not the same as the digital-first healthcare.

A digital-based healthcare system is much more than using sophisticated information systems wisely (Ribeiro 2019) or undergoing digitalisation of healthcare (von Eiff and von Eiff 2020). It goes further than just achieving a stage where citizens have full access to their health data and better access to more effective and comfortable care, or improving system efficiency and sustainability through digital support. A new Digital Healthcare System (DHS) is more than that, and in the context of a country, a region or even a healthcare organisation, it can be conceived and should be implemented.

What are the bases for a digital-based healthcare system?

First, *healthcare transformation* – of processes, professionals and patients, or, alternatively, of the care philosophy, interprofessional collaboration and health-aware citizens.

Second, *significant investment in rethinking any need for physical interaction* – even before COVID-19 crisis we knew that we should protect frail citizens from nosocomial infections, unnecessary travel, cost and suffering

– and here telehealth is the new health.

Third, *security of data, privacy and interoperability* – the basis of trust necessary for the new social contract. This is required for using advanced population-based digital tools or for robotics professionals to step in where humans are at risk or insufficient, or where human-robot hybrids outperform both.

Fourth, *motivation* – rethinking healthcare systems worldwide was already needed. 2020 gave us extra motivation, especially if we now better understand why a digital-based healthcare system is desperately needed.

How will it look like?

Preventive, paperless, empowering, personalised and accountable. Digital healthcare strengths lie not in technology but rather in the fact that digital technology will be present in processes, professionals and people, *in ways such that everyone can be a healthcare creator*. They can be a prevention specialist; care for themselves and their family with the best scientific support; access digital therapeutics by default. Moving to any form of needed physical care, drug therapy, surgery, hospital admission, or ventilation support should be a last resort. *When humans know enough to care not in a domestic, amateur, unprofessional way, but are empowered with digital tools designed, oriented and monitored by scientists and professionals, we will have less shortage of resources to focus on highly specialised care that may still be needed*. In a digital-oriented healthcare system, professional associations, patient advocates, governments and industry will have to redefine their functions and relationships, and new leaderships will be needed (Martins 2019).

Why could it be better?

A new healthcare system that is based on a full digital landscape can provide value to citizens in multiple ways. There are several studies showing the value of digital tools in surveillance, screening programmes, awareness

campaigns, social media-based interventions on behavioural diseases, or the value of digital health literacy. There is no shortage of scientific evidence that people can benefit from digital tools in healthcare. However, most uses have focused on restoring health, and too few on prevention, or eradication of certain risk factors. In a DHS, digital tools are used to reduce the need for healthcare. Societal design of education, workplace and play can be improved. Through the integration of knowledge about medicine and human behaviour with architecture, engineering and law, digital-born solutions can create the grounds for a healthier society. While the focus of eHealth use in *existing healthcare systems* is better access, comfort and efficiency, the *hallmark of a Digital Healthcare System is not better care, but less need for care. Less is the new better*.

How do we achieve it?

Countries or regions wishing to make use of digital tools for better health will need to invest more time, money and political attention in a solid yet rapid deployment of technology in healthcare processes. The desired outcomes for eHealth have been redundantly covered in reports and recommendations, such as from the World Health Organization (2019) or the [eHealth Network](#). Practical guidance on how to get to an interoperable ecosystem, create systematic involvement onto a change momentum, or glue up disperse systems in a meaningful way, is still missing. Being an international eHealth expert and a policymaker for over eight years, I have been arguing that creating strong eHealth agencies, increasing their capacity and having a ‘fast-drive’ eHealth national strategy designed with inputs from outside experience, are critical success factors.

This journey, fundamental if a minimum eHealth maturity has not yet been reached, only leads to a healthcare system ‘augmented’ by eHealth. Healthcare where eHealth is extensively used is not the same as digital healthcare. Telecare should be provided by default, like



e-banking. Digital engagement and surveillance tools, virtual reality, AI technologies, which are readily available or can be accelerated in less eHealth-mature contexts, need to be considered in a revision of the eHealth strategy, and then followed with strong leadership into healthcare transformation.

Profound deconstruction of existing physical and traditional models is needed to get to the latter. It is not only about redesigning policies for fostering prevention, home care, integrated services, financial sustainability, or multiprofessionalism, which are needed; but rather about revisiting the social contact between society, individuals, governments and the so-called 'social state.' *The pillars of new Digital Healthcare Systems are digitally enabled citizens.* Managers, doctors, nurses, allied health professionals, informaticians, IT specialists and all others, should be enablers and actors, to trigger, respond to and guide the *informed health-aware citizen*. Such citizens will be the new propelling force, and both new and existing professionals need to learn new sets of skills (Martins 2010). Access to good digital tools would help to wake up this force, give it its form and purpose. Open data about healthcare facilities' performance create urgency for questioning old ineffective ways. Simple online digital literacy materials coupled with digital inclusion programmes and a paper-free philosophy, creates the new generation of patients and healthcare staff.

Why is COVID-19 crisis a non-return point in

transition to DHS?

Mitigation of the negative spillover of health system temporary reorganisation as well as advances in diseased surveillance and patient follow-up systems are needed to improve the existing healthcare. However, as exhausted healthcare systems and organisations exit the crisis, there may be a temptation to 'go back' to finishing unattended 'business-as-usual.' *Alert leadership should use this momentum and avoid doing only that*, because a new telesociety will be emerging. Online shopping, teleeducation, telework, telehealth will be used more extensively, or improvised to offer quick services to quarantined households. People are unlikely to go 'back to normal,' such as unnecessary travel to care facilities or exposure to nosocomial infections and other risks. They are the missing fuel cell to defeat the initial inertia of the much-needed healthcare transformation.

### Conclusion

'Digital' is available. People leaving their houses and isolation pods will want to see it going into healthcare more extensively. Portugal's eHealth journey shows it is possible to leapfrog. We should use the current crisis to push for the needed healthcare transformation. While finishing the basis of solid eHealth ecosystem, countries, regions and health organisations need to rethink healthcare.

All citizens have a right to digital healthcare. It is better, more sustainable and empowering. A new daily routine is desirable and will be desired. More crises will come,

and we will want to be much better prepared. This means not only intense use of digital tools in today's healthcare, but, most importantly, creating new Digital Healthcare Systems and healthcare organisations. ■

### Author: Prof. Henrique Martins

Associate Professor, ISCTE – University Institute of Lisbon | Lisbon | Portugal  
[henrique@henriquemartins.eu](mailto:henrique@henriquemartins.eu) | [Henrique.manuel.martins@iscte-iul.pt](mailto:Henrique.manuel.martins@iscte-iul.pt) | [iscte-iul.pt](http://iscte-iul.pt) | [www.henriquemartins.eu](http://www.henriquemartins.eu)

### Key Points

- It is possible to speed up eHealth adoption with a strong eHealth agency and national strategy based on international input.
- New Digital Healthcare Systems are needed. The concept and its benefits are presented, and details briefly outlined.
- Reaching Digital Healthcare Systems is not a matter of digital and healthcare transformation, but of a fundamental revision of the role of professionals and organisations and the new role of digital citizens in health.
- The COVID-19 crisis may be the leverage that many countries, regions and health organisations needed for embracing digital healthcare.

### REFERENCES

- Hashiguchi TC (2020) Bringing health care to the patient: An overview of the use of telemedicine in OECD countries. OECD Health Working Papers, No. 116. Paris, France: OECD Publishing
- Marques C et al. (2015) Mobile SICO – Mobile E-Death Certification. *Procedia Computer Science*, 64:911-916
- Martins H (2010) Why management and leadership education for internists? *European Journal of Internal Medicine*, 21(5):374-376
- Martins H (2019) Digital Transformation and Digital Leadership. *Health Inform Res*, 25(4):350-351
- Mendes R et al. (2020) Physical Activity Promotion Tools in the Portuguese Primary Health Care: An Implementation Research. *International Journal of Environmental Research and Public Health*, 17(3):815
- Ribeiro JM (2019) Saúde Digital: Um sistema de saúde para o Século XXI. Lisbon, Portugal: Fundação Francisco Manuel dos Santos
- SPMS (2020) Portugal lidera Grupo Europeu de Cibersegurança para a Saúde. 30 January. Available from [iii.hm/12pf](http://iii.hm/12pf)
- von der Leyen U (2019) Mission Letter. Stella Kyriakides. European Commission. Available from [iii.hm/12pg](http://iii.hm/12pg)
- von Eiff M and von Eiff W (2020) The Digitalisation of Healthcare. *HealthManagement.org The Journal*, 20(2):182-187
- World Health Organization (2019) Draft Global Strategy on Digital Health 2020-2024. Available from [iii.hm/12ph](http://iii.hm/12ph)

# Health Informatics – ‘Lost Tribe’ No More

An unexpected but positive development the COVID-19 crisis has brought into healthcare, is the rise of technology and inevitably, the recognition of the previously obscure field of health informatics. An expert at the NHS Wales Informatics Service talked to HealthManagement.org about the long journey of the profession from ‘the lost tribe’ to the backbone of the NHS.



What has been keeping you busy since the beginning of the COVID-19 pandemic?

In Wales, we've been deploying new projects or accelerating the existing ones, such as our clinical portal where clinicians can see test results across the whole of Wales and which now includes areas of primary care. Our

information teams have been collecting data, working with Public Health Wales and supporting the combination of all the dashboards with all the required data. For those who have switched to remote work things like Office 365 have gone explosive. Not that it wasn't there before, but now teams are being well-used to video

conferencing and GPs can do remote consultations.

Do you think all this will stay after the current crisis is over?

As we see, technology has just been speeded up by COVID-19, expediated through necessity. Hopefully, when

we get through this crisis, technology will be here to stay. People are now seeing the benefit of it, and we can embed it further in.

Our organisation, luckily being what you might call 'techy,' has been able to shift to remote work in about 12 hours. From Sunday night to Monday morning, we had over 98% of our workforce working remotely. We'd been saying to people the week before – take monitors home, take your chairs home, because it's going to come. And when it did come, we were ready. Even people like myself and others who are the 'back office' and not technical experts, have been able to do more than our fair share of work remotely.

has multiplied quickly enabling deployment or adoption. We talk about disruptive innovation here, and to me that comes down to human behaviour – forced behaviour - change.

It's a real, real shame that we needed a crisis of this scale to come to that. But on the positive side, that also highlights how important people working in health informatics (HI) are, how our tech colleagues across the UK have really risen to the challenge. We've had staff, both technicians and people at the front line, working all hours way beyond the call of duty to get some of this technology out there or to collect the data – and everything else in between. That's a real testament of the profes-

in the technical field can do.

But I've also seen that it's never been as widely known that you could be offered or have a career in HI. It's still a fairly young profession with a small 'p.' Until very recently we were 'the lost tribe,' nobody knew about us. Then we became a backbone – again invisible, but if a system went down people were starting to realise they couldn't do without that system. And now I see us as part of a centre stage with our other colleagues in the health and care system – whether it's working in software development, information, or even modelling the future healthcare requirements. We've got people who work with our clinicians on the front line to show them

## Technology has just been speeded up by COVID-19, expediated through necessity. Hopefully, when we get through this crisis, technology will be here to stay

Same is true for healthcare staff working on the front-line, as our colleagues across Wales have shown, with GPs working remotely and having video consultations. Our patients, our citizens, also have to adopt these new ways of interacting with health systems. In Wales, there is still some digital isolation, but organisations like Digital Community Alliance work to ensure those isolated people can get an iPad donated to them, so that they can do video consultations with their GP, or keep in touch with their family. The frontline workers have also been supporting that with the use of technology, such as Facetime and other similar platforms.

If you could go 2-3 months in the past, what would you change?

I think we've all acted very quickly from the technology point of view. Because all these technologies had already been put in place, whether it's about the data or the systems, they just weren't used that much. This crisis

sionalism of our staff.

Not many people know about HI as a career. So, there's something in there for me around how we market and brand all these new developments to show the opportunities for a great career within HI. I wouldn't want to only use COVID-19 as a sort of means here, but for most people the NHS equals to the frontline workers. I am not saying that this is wrong, but that there are many others involved, and it's not just HI, but all the support services that are needed to provide care to the patient, as and when that patient, that citizen needs it.

What obstacles do you see to the development of HI?

There has been a real change over the last few years. I've come from a nursing background into learning and development, into Sussex Health Informatics Service. So I've seen where technology can play a part in the health and care system and what amazing things the people working

the best of the systems and to help them. So, whichever part of the HI family it is, I think we've started to come into our own – even if the general public is not yet aware of us.

What are the main areas of your work?

To start with, it's working with young people. We've joined up with organisations like Technocamps and the Lego Challenge, which have a remit of working with youths in STEM. Now we go out to schools and participate where we can to influence the curriculum and get that message across – that you can be working in STEM, in tech, in the healthcare system.

In terms of our medical and nursing students of the future, we'd like to see that HI or the use of technology in general is embedded into their curriculum. Because all of this is about the change of behaviour, isn't it? And we know that's happening. In Wales, the 10-year workforce strategy has what I would call 'golden digital threads'

throughout it, not just in HI but in any use of technology for process automation.

Another issue is how we can show those people who are doing computer science courses at their universities the opportunities for them in the health and care sector. This is how a colleague and I started up with the Wales Institute of Digital Information (WIDI) a few years ago. At the time, Professor Ian Wells was the Head of Computer Science School at the University of Wales Trinity St David. I was in my role as Head of Workforce for the NHS Wales Informatics Service. We talked about

a week and have four days a week in the workplace – a proper apprentice-type qualification and role. Back in the beginning we put out four cybersecurity apprentice posts and had 177 applications. The following year we put out three posts and had 275 applications.

What has been your personal journey from a nurse to your current position, from ‘analogue’ to ‘digital?’

When I first moved into tech in 2004, my kids just laughed at me. Until I started in Sussex Health Infor-

and it would become a much more localised field. That’s when I got the job in Wales, and my work since then has been in what I call my ‘three buckets.’ And all of them are about the people.

What are those ‘buckets?’

The first one is our patients, our ‘citizens’ as I call them, who need to be digitally literate. Here in Wales there is still about 11% of those who are digitally excluded. Together with Digital Community Alliance we’ve been trying to reduce that number.

---

## All these technologies have already been put in place, whether it’s about the data or the systems, they just weren’t used that much

---

how he had computer science students, and how I had an organisation – and two years down the line we ended up forming a strategic partnership.

WIDI has been absolutely brilliant in terms of mutual benefits to both organisations but, more importantly, to staff and people. Out of that strategic partnership has come what you would see normal for industry and employers, ie students coming over and getting work experience with us and looking for their placements or topics for dissertation. This might be mainstream in some other areas, but not in HI.

We’ve now gone one step further. We’ve looked at the computer science degree and thought if our existing staff or other professionals could come into HI as, say, a second career. And we did that prior to the Welsh government announcing they would fund some degree apprenticeships. We were able to apply to the university that could offer those. There were three pathways: cybersecurity and networking; data analytics; and software development. Currently, over 140 people are following those pathways. They go to the university once

matics Service (HIS), my journey had been a nurse working in vocational development. I then became a clinical teacher and later headed up a vocational unit looking at National Vocational Qualifications (NVQs) in health and social care. The benefits of the apprenticeship underpinned by theory have always been clear to me. I developed a course in Brighton where we put health-care assistants who’d got their Level 3 NVQ in health and social care through a secondment opportunity, to then get their diploma in Nursing.

In Sussex HIS, I led their ‘non-tech’ direction (education and staff support) and ended up as their director of corporate services. Back then there weren’t as many opportunities for career pathways and career progression as in some of the other fields within the healthcare sector. This ‘unequal playing field’ was where my passion started. I also helped with Staffordshire University in those days and a couple of other HISs, and around 2010 we created a work-based degree. With all the changes going on in England at the time, we knew the HISs and the national programme for IT would probably disappear

Then, my second bucket is all those clinicians who use the technology and are digitally literate, but may wish to transfer into HI – how can we help them?

The HI professionals is my third bucket. How do we support them to have a rewarding career?

There are some commonalities in those three areas. I’ve obviously focussed on the last one, the development of the HI professionals. There’s no one entry route here, unlike, say, in nursing where they can go to any university and come out with the same qualification. HI is too broad a church for this – it could be a clinician, or a software developer, or someone working in the educational space of HI. The routes into HI are plenty, but they’re all there to support digital and technology enhancing, transforming the health and care sector. And we’ve seen that in action recently, haven’t we?

What is your take on professional registration of health informaticians?

Across the UK, there are around 60,000 people working in HI, but from what we see this workforce is not fully

supported in terms of opportunities for their career pathways, their continuous professional development (CPD).

With the developments of technology such as AI, there's a growing need, not only in the UK but globally, to ensure the high standards of our profession and safe provision of services alongside our clinical colleagues. For me it's crit-

an assessor for them, and I've done eight assessments over the last couple of weeks, so that seems to be quietly growing now.

There are four levels at the moment, namely practitioner, senior, leading and advanced practitioner, and we're looking at associate practitioner for those who are

on YouTube" sort of thing. That's why we're looking at how we build up people's learning portfolio. If they're interested in this given subject and they're doing that in depth, how can they build up their portfolio and then get accredited? There are many routes into this, and many ways of learning.

## Health informatics is still a fairly young profession with a small 'p.' Until very recently we were 'the lost tribe'

ical, for the safety and the sustainability, that we have a recognised profession of informaticians. Another area just as important is to make HI a really good and appealing profession, to support people with their progression so that they get into a CPD mentality and ethos.

All of the main professions in health and care are already regulated. Going forward, we know that the critical nature of this work is going to increasingly depend on the informatics. So, it's not about me saying next week it's got to be mandatory to join a register. It's about individuals and organisations joining a professional body, and then individuals, through that professional body, applying to go on to the register.

In the UK, the players in the arena for the professional body are the British Computer Society ([BCS](#)); Association of Professional Healthcare Analysts ([AphA](#)); Institute of Health Records and Information Management ([IHRIM](#)); Society for Innovation, Technology and Modernisation ([Socitm](#)); and Chartered Institute of Library and Information Professionals ([CILIP](#)). They came together to create a common register as the Federation for Informatics Professionals ([FEDIP](#)), where people go through their professional bodies and can then join on a voluntary basis. Organisations have seen this as a recruitment or retention initiative. People are increasingly aware that membership of these organisations is valued. Currently, there are about 100 professionals on the register. I'm

new into the healthcare sector.

How do you make place for HI education when resources are limited, such as now?

Indeed, with the COVID-19 pandemic the demand for all sorts of technology has risen, but there is no time, energy or money in the system to invest in education and training. Still, there are opportunities. One can look at the apprenticeships that are funded by the government in Wales or through the apprenticeship levy in England as an example. This option can be used with existing staff for upskilling or as a recruitment initiative for new staff coming in.

I've created apprenticeships at Level 4 in Wales, and we're looking to see how we can trailblaze that into England. This is distance learning, so it takes 12-18 months to complete it, but I still think that's really beneficial.

If you ask our techy people, they would want bite-size learning, through YouTube, for example. This is what we've been discussing with our university colleagues – how we respond to this 'on demand' type of learning. We know, especially with our tech colleagues, some of them want the formal qualifications of their degree, such as master's level. I've got four staff doing PhDs now, so we have the longitudinal qualification knowledge gain. But for many of them, it's more of "What can I not find

Wales is a small country, and here we have the opportunity to work with the University of Wales Trinity St David's. There's a FE (Further Education) college as well, through which we've been able to offer Levels 2, 3 and 4 in HI by means of distance learning. Then there are the degree apprenticeships, the formal PhDs. We've taken the advantage and created those opportunities and now lots of people are doing various levels of that.

Do you think HI will soon become that appealing a profession you want it to be?

I know that our colleagues in England are building a Digital Ready Workforce workstream, and there are pockets of learning across the UK. So the recognition is there, although many people may still not know HI exists. And even though there are many ways to get into this sector, ultimately people want to work with the values of the NHS. I think for many of them an important part is that we are not 'the lost tribe' any more, but very much part of the NHS. In this crisis, people have seen what technology can do, so let's hope it continues to have a real meaningful place in the healthcare system. ■

### Interviewee: Wendy Dearing

Leading Practitioner, FEDIP | Head of Workforce and Organisational Development, NHS Wales Informatics Service | Cardiff | Wales  
[Wendy.Dearing@wales.nhs.uk](mailto:Wendy.Dearing@wales.nhs.uk) | [nwis.nhs.wales](https://www.nwis.nhs.wales)  
[@wbntinter](https://www.linkedin.com/company/wbntinter) | [fb@wendy-dearing-14514538](https://www.facebook.com/wendy-dearing-14514538)

# B·R·A·H·M·S PCT: A Valuable Tool for Bacterial Coinfection Risk Assessment

## Procalcitonin – A Critical Biomarker

Procalcitonin (PCT) is a member of the calcitonin family and known as a critical biomarker for bacterial infections. To be effective a biomarker must have high diagnostic accuracy and allow early and rapid diagnosis. PCT fulfills these requirements and has already demonstrated superior diagnostic accuracy compared to other conventional biomarkers (Müller B. et al., 2000; Meisner M., 2010)

PCT is widely used for the differential diagnosis of bacterial infection and risk assessment for progression to severe sepsis and septic shock. In addition, change in PCT over time is used to assess the response to therapy and determines the mortality risk in patients with bacterial sepsis. Moreover, PCT is also a critical tool to facilitate decisions regarding antibiotic therapy in patients with suspected or confirmed lower respiratory tract infections (LRTI), including community acquired pneumonia (CAP), acute bronchitis and acute exacerbations of COPD (AECOPD) (Schuetz P. et al., 2018).

As a marker reflecting the systemic response to a bacterial infection, procalcitonin is usually low in viral infection (Meisner M., 2000). This has been proven also during viral epidemics like H1N1 influenza (Ingram P.R. et al., 2010; Cuquemelle E. et al., 2011, Rodriguez A.H. et al, 2016), SARS (Chua A. & Lee K.H., 2004) or MERS (Rhee J.Y. et al, 2016). In case of bacterial coinfection, though, PCT was found to be a valuable tool to differentiate pure viral disease from bacterial (co)infection where elevated PCT levels were observed and higher severity of disease was reported (Guan W. et al., 2020; Karhu J. et al., 2019; Pavia A.T. et al., 2013). A PCT below 0.5µg/L was shown to have a high negative predictive value to exclude presence of bacterial coinfection (Rodriguez et al., 2016)

## Procalcitonin and COVID-19 Patients

Coronavirus disease 2019 (COVID-19) is a new respiratory and systemic viral disease that has already infected millions of people globally. Although most of the infected patients experience a mild form of the disease, a smaller percentage progresses to very severe disease state requiring intensive care and invasive ventilation (Chen N. et al., 2020; Chen R. et al, 2020; Guan W. et al, 2020; Zhou F. et al 2020;). An early identification of these patients at elevated risk or evolving disease

would be critical to improve patient management and outcome.

Unfortunately, on admission neither radiological findings and clinical symptoms nor white blood count (WBC) or C-reactive protein (CRP) seem to be predictive for severity and outcome risk, as these parameters were elevated also in a majority of patients with mild disease and non-adverse outcome (Guan W. et al., 2020). On the other hand, the descriptive studies revealed that procalcitonin on admission was usually low in patients with mild disease and non-adverse outcome, with only less than 4% of those patients having elevated PCT value (Guan W. et al., 2020). Also other available study data indicate that procalcitonin could be a valuable tool in the current COVID-19 pandemic for early identification of patients at risk for bacterial coinfection and adverse outcome (Huang et al. 2020; Guan et al. 2020; Zhou

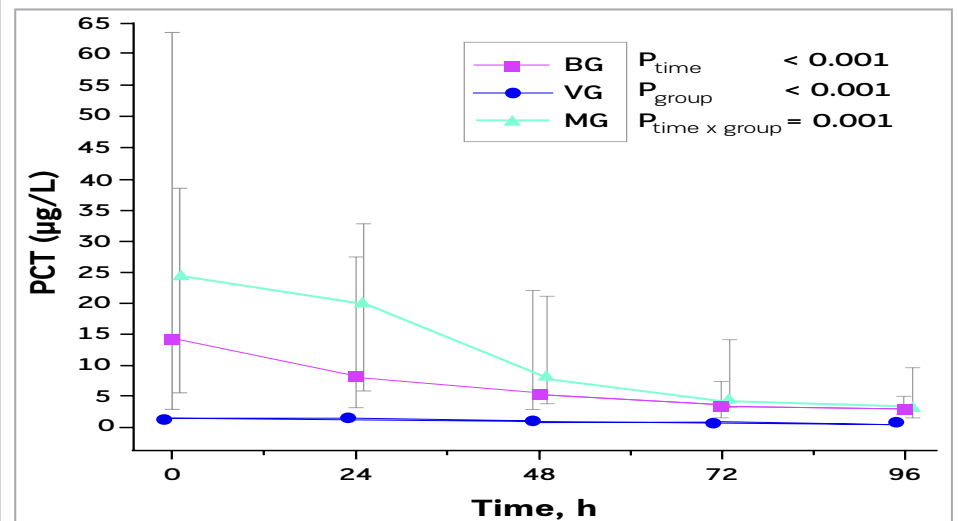


Fig.1: Procalcitonin (PCT) concentrations over time for patients with pure viral infection (VG), bacterial infection (BG) or mixed [viral with bacterial coinfection MG] during an H1N1 influenza epidemic; adapted from Karhu J. et al., Cytokine 2019, 113:272-27

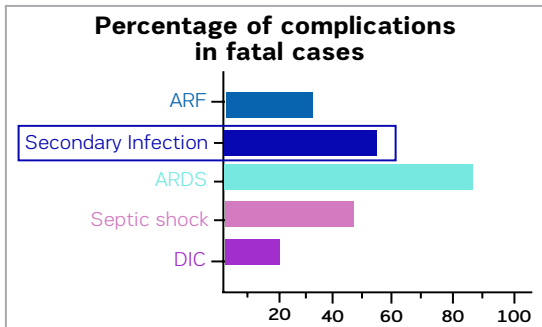


Fig.2 Percentage of complications in fatal cases out of 1590 hospitalized patients across China (adapted from Chen R. et al., 2020) ARF: Acute Renal Failure; ARDS: Acute Respiratory Distress Syndrome; DIC: Disseminated Intravascular Coagulation

et al. 2020; Chen N. et al. 2020; Xiao-Wei et al. 2020, AACC 2020).

Accordingly, in a meta-analysis of 4 studies, elevated PCT was found to indicate a nearly fivefold higher risk for severe disease (Lippi and Plebani, 2020; AACC 2020). The authors linked this to the potential contribution of secondary (bacterial) infection and concluded that a serial testing of PCT could be helpful to identify deteriorating patients timely.

This is further supported by the analysis of 1590 patient cases from whole China (Chen R. et al. (2020) which found that in those patients with fatal outcome, besides ARDS, the most frequent complications were secondary infections and septic shock (Fig.1) and that procalcitonin >0.5µg/L was the strongest outcome predictor with a hazard ratio of 8.72 (see table 1).

Based on the available evidence on PCT and COVID-19, procalcitonin is included in a variety

of COVID-19 related guidelines and recommendations like, e.g. by IFCC or CDC to assess likelihood of bacterial coinfection which would be associated with a higher outcome risk (IFCC 2020; CDC 2020).

Procalcitonin could be helpful in limiting overuse of antibiotics in patients with COVID-19 related pneumonia.

Although the bacterial coinfection rate in the overall population is very low, which is also reflected by low PCT values in the majority of patients, more than 70% of patients got antibiotics for 3-17 days (Huang C. et al., 2020; Chen W. et al., 2020).

Based on the available evidence for PCT as an effective and safe aid in antibiotic stewardship of lower respiratory tract infections (Schuetz P. et al., 2011) and

Variable	Level	Hazard Ratio (HR)	95% CI
Age, years	65-74 vs <65	3.43	1.24 - 9.5
Age, years	>75 vs <65	7.86	2.44 - 25.35
Coronary Heart Disease (CHD)	Yes vs No	4.28	1.14 - 16.13
Cerebro-Vascular Disease (CVD)	Yes vs No	3.1	1.07 - 8.94
Dyspnea	Yes vs No	3.96	1.42 - 11.0
Procalcitonin (PCT); µg/L	>0.5 vs <0.5	8.72	3.42 - 22.28
Aspartate Amino-Transferase (AST); U/L	>40 vs <40	2.2	1.1 - 6.73

Table 1: Independent outcome predictors per multivariate Cox regression (adapted from Chen R. et al., CHEST 2020)

the association of low PCT levels and mild COVID-19 disease course, it was recommended that in case of repeatedly low PCT antibiotic treatment should be stopped in COVID-19 patients.

For example, [J.P. Metlay and G.W. Waterer](#), the co-chairs of the ATS and IDSA CAP guidelines, provide their interpretation for the use in COVID-19 patients and point out that they "...endorse the use of a low procalcitonin value early in the course of confirmed COVID-19 illness to guide the withholding or early stopping of antibiotics, especially among patients with less severe disease..."

Similarly, UK specialists in a knowledge-sharing session on ICU management of

**Procalcitonin (PCT) for Risk Assessment and Rule-out of Bacterial Coinfection**

PCT on admission	PCT during hospital stay
Test PCT as an aid for <b>early</b> risk assessment and prioritization of <b>high</b> risk patients	Monitor PCT to detect:
<0.50µg/L* low risk for bacterial coinfection and adverse outcome	secondary bacterial infections
≥0.50 µg/L high risk patients, bacterial coinfection likely	progression of disease

\*Majority of patients with mild disease had PCT values <0.25 µg/L or even <0.1µg/L. <sup>ref.1-4</sup>  
Likelihood of bacterial infection and recommendation to start antibiotics in patients with LRTI at PCT 0.25 µg/L. <sup>ref.7</sup>

COVID-19 patients concluded to use PCT as a “stop signal” to guide when to stop antibiotics use and to monitor patients for bacterial infection and restart antibiotics when required (NIHR, UCL partners & ICS, 2020). Accordingly PCT-based algorithms were introduced into hospital protocols (Brighton and Sussex University Hospitals, NHS, UK, 2020) (see Fig. 3).

### Guidelines on the use of Procalcitonin in COVID-19

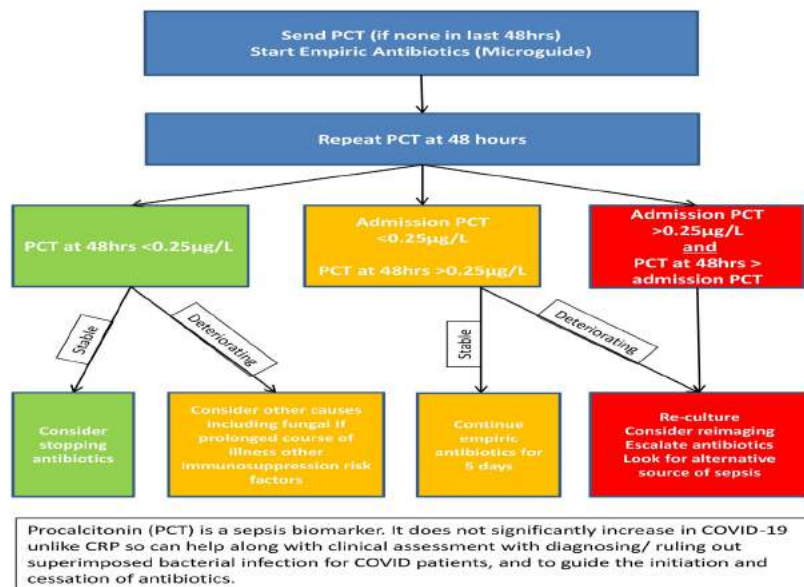


Figure. 3: PCT algorithm for use in COVID-19 patients as part of the hospital guideline of Brighton and Sussex University hospitals, NHS, UK. Source: [bsuh.nhs.uk/library/wp-content/uploads/sites/8/2020/04/Covid107.1\\_Guidelines-on-the-use-of-Procalcitonin-in-COVID-19-REDO-9.4.pdf](https://www.bsu.hospital.nhs.uk/library/wp-content/uploads/sites/8/2020/04/Covid107.1_Guidelines-on-the-use-of-Procalcitonin-in-COVID-19-REDO-9.4.pdf)

### Key Points

- PCT testing is an important tool to differentiate bacterial infection from other causes of inflammation and to aid in antibiotic stewardship. Current evidence shows that PCT may also be an effective aid in COVID-19 patients
- Low PCT can be helpful to early identify patients with low likelihood of bacterial coinfection and severe disease, and aid in stopping antibiotic treatment
- PCT monitoring should be done routinely also in COVID-19 patients to detect and treat superinfection timely
- PCT can aid in targeted antibiotic treatment and monitoring of treatment response

#### B·R·A·H·M·S PCT

B·R·A·H·M·S PCT provides information on the presence and severity of bacterial infection, helping clinicians in the intensive care unit, emergency department, and other hospital wards decide whether to initiate antibiotic therapy in patients with suspected or confirmed lower respiratory tract infections (LRTI) and when to safely discontinue antibiotics in patients with LRTI and sepsis. In conjunction with other laboratory findings and clinical assessments, B·R·A·H·M·S PCT provides valuable information on the severity of a bacterial infection – both on presentation and during the course of treatment of the septic patient. Clinicians in health systems worldwide rely on B·R·A·H·M·S PCT since 1996 to make patient care decisions with confidence. More than 5,500 publications have demonstrated the clinical utility of PCT, defined clinical cut-offs, and treatment algorithms based on the B·R·A·H·M·S PCT assay performance.

### REFERENCES

Müller B. et al, 2000; Crit Care Med;28 (4),Apr: 977-83.

Meisner M; 2010; UNI-MED Science, ISBN 978-1-84815-163-5

Schuetz P. et al., Exp. Rev Anti-infect. Ther., 2018, 16:7, 555-564, DOI: 10.1080/14787210.2018.1496331

Ingram P.R. et al., Intensive Care Med 2010;36 (3),Jan 13: 528-32

Cuquemelle E. et al., Intensive Care Med 2011, 37(5):796-800

Rodriguez A.H. et al., J. Infect 2016, 72:143-152

Chua, A. P., and K. H. Lee. 2004, J. Infect. 48:303-306

Ji-Young Rhee et al., Jpn. J. Infect. Dis., 2016, 69:361-366

Karhu J. et al., Cytokine 2019, 113:272-276

Zhou et al., Lancet , March 9, 2020 :[https://doi.org/10.1016/S0140-6736\(20\)30566-3](https://doi.org/10.1016/S0140-6736(20)30566-3)

Guan W. et al., NEJM 28 Feb 2020, <https://www.nejm.org/doi/pdf/10.1056/NEJMoa2002032>

Chen N. et al., Lancet 2020; 395: 507-13, [https://doi.org/10.1016/S0140-6736\(20\)30211-7](https://doi.org/10.1016/S0140-6736(20)30211-7)

Chen R. et al., Chest April 15, 2020; <https://doi.org/10.1016/j.chest.2020.04.010>

Xiao-Wei Xu. et al., BMJ (Online); London 2020, 368 (Feb 19, 2020), <https://www.bmj.com/content/bmj/368/bmj.m606.full.pdf>

Huang C et al; Lancet 2020; 395: 497-506, <https://www.thelancet.com/action/showPdf?pii=S0140-6736%2820%2930183-5>

Huang Y et al., medRxiv preprint 2020, doi: <https://doi.org/10.1101/2020.02.27.20029009>

Pavia A.T. , Infect Dis Clin North Am. 2013 March ; 27(1): 157-175. doi:10.1016/j.idc.2012.11.007.

For full references, please email [edito@healthmanagement.org](mailto:edito@healthmanagement.org) or visit <https://iii.hm/13kg>



**NOMINATE YOUR COVID-19**  
**SUPER HERO**

*- in memory of Li Wenliang -*

Let us thank our most admired soldier(s) in this battle against COVID-19, having proven that no matter how dire the situation, they will not back away from protecting their patients.  
Nominate them to give them the attention they deserve



# Towards Post-COVID-19: Lessons and Challenges for Hospitals and Healthcare Infrastructures

There is evidence of viral assaults possible repetitiveness in the foreseeable future. Prevention and preparedness are essential, especially for the health sector. Learning from the dramatic experience of Italy with COVID-19, this article addresses the major aspects of the role of the health technicians who, in parallel with the managerial and medical staff have responded to the continuously changing needs, providing appropriate care environments for the infected and protection for other patients and operators.

## Framework

It is largely known that Italy has been the first, and for some time, the most affected country in the Western World by COVID-19, a new coronavirus strain that has never previously been identified in humans, before being reported in Wuhan, China, in December 2019.

Why Italy, why so intensively, why concentrated at first only in the Northern part, largely in the plain of the River Po (Pianura Padana)? What is the genesis of the specific virus, its evolution and effects? These and others questions will be the matter of long studies and intense discussions among specialists, politicians and media of all kinds.

This article, without under evaluating the importance and centrality of disciplines like virology, epidemiology, infectious diseases, intends to focus mostly on the field of knowledge and experience of the writer, that is Healthcare Built Environment and Governance of the complexity, such as any healthcare system, made more complex by a furious pandemic, as the one in which we are still immersed.

This pandemic explosion has, in fact, highlighted the importance of the health facilities systems and hospitals in the first place, and their constant management, as relevant part of the whole governance of this dramatic and complex moment. We are reporting in detail the experience of one of the authors, directly working in the battlefield of a major hospital in the North of Italy.

## Preparedness for a Mass Crisis Situation Such as a Pandemic

The preparedness of the healthcare built environment in Italy, with its similarities to other countries in Europe, is the point of departure and the appropriate answer can only come by analysing the recent epidemiological history.

In the past century, the so-called “short century,” when World War I was still going on, precisely starting in January 1918, a deadly pandemic influenza, identified for the first time in Kansas, exploded, lasting 36 months, that is, till December 1920. It infected over 500 million people – around one third of the world’s population at the time. The death toll has had, and still has, a rough estimate: at least 25 million people, but possibly even up to 50 or more.

It is now scientifically proven that this pandemic, that put the entire world on the verge of collapse, was due to an avian virus, AH1N1.

Italy, already hit by the large number of war casualties, suffered a number of deaths - between 350 and 600,000 - produced by the pandemic. The overlapping with the war and then the post-war socio-political situation, triggered a strict censure and the health impact of the so called Spanish flu scientists define as a lost occasion to learn and make scientific progress.

The second pandemic came after World War II, called the Asian flu, virus AH2N2, isolated in China, that was fortunately reduced in its impact by a vaccine, produced in record time.

In 1968 the Hong Kong flu, an avian flu similar to the Asian flu, produced a large number of deaths in the Asian area within two years, but extended in the US with about 34,000 victims.

At the end of 2002, SARS (Severe Acute Respiratory Syndrome) a coronavirus SARS-Cov. spread very fast, mostly in the Asian part of the world. Its presence seemed to be defeated rapidly.

In 2016, however, the European Centre for Disease Prevention and Control was warning that “SARS and related viruses need to be globally monitored and response capacities need to be maintained”([ecdc.europa.eu/en/publications-data/severe-acute-respiratory-syndrome-annual-epidemiological-report-2016-2014-data](https://ecdc.europa.eu/en/publications-data/severe-acute-respiratory-syndrome-annual-epidemiological-report-2016-2014-data)). This alert did not receive great attention in Italy and generally in Europe.

The Swine Flu Pandemic has been the last warning. The virus was identified as a new strain of AH1N1 (the second appearance after the Spanish Flu). It lasted about 20 months and provoked great panic, but it was dismissed, when it became clear that its lethality rate was lower than the normal flu.

The explosive effects on Italian hospitals of COVID-19 can be vividly appreciated reading this insert written by Eng. Daniela Pedrini from her direct experience while being responsible for the technical sector of a major hospital in the North of Italy

### THE MINUTE BY MINUTE FIGHT WITH THE VIRUS

*From the daily experience of Eng. Daniela Pedrini.*

With the impetuous spread of COVID-19, Italian hospital structures have found themselves in need of reorganising hospital networks and assistance activities to face the health emergency within a few days and sometimes a few hours. They have begun to transform many of their wards into intensive, sub-intensive and inpatient areas to accommodate the ever increasing number of patients. The rapid spread of the infection and the sudden influx of people at high infectious risk, made it necessary to immediately increase the number of beds, particularly intensive care units, localised in specifically equipped wards, with separate routes and dedicated teams.

The organisational and technical effort put in place to ensure a timely response can be fully understood considering that dedicated operators were hired and trained, when in parallel departments were closed, transformed and reopened in a few hours, renovations completed in a few days, beds made available, equipment installed, protection devices distributed, risk prevention and reduction measures adopted, lines of activity interrupted or suspended, citizens contacted for services rescheduling, managing personnel working in remote areas. Decisions to be taken, organisational solutions to be shared and realisation to be constantly monitored. All this, continuously and relentlessly.

Activating a department or a pavilion for the management of positive COVID-19 patients, within a hospital, means immediately moving entire departments, setting up multi-professional teams, guaranteeing the Personal Protective Equipment (PPE) provision, even a hundred times more than the usual number, training the dressing and undressing teams, identifying different dirty/clean materials' routes with adequate signals and informing all staff, do urgent work to upgrade the electrical system, oxygen system and room ventilation and obtain negative pressure, if necessary, install all the equipment, and in parallel separate the paths and find location for the other patients (transplants, oncology, etc) ensure the continuation of treatments that cannot be postponed, while protecting them from the risk of being infected.

In this context, everyone becomes fundamental and must work in harmony: main health managers, teams of professionals, directors and coordinators of the departments and services involved, nursing service, the technical services, clinical engineering, risk management, pharmacy, etc. The whole must be like an orchestra, realising a dynamic “system management” in action operating in the field.

With regard to the technical sector, some of the main activities to adapt the hospital network include:

- Activation of pre-triage in emergency areas, day-hospitals for cancer and access points with temporary structures (tents, prefabricated boxes) to create an obligatory and differentiated path for those who access normal care and those who are afflicted by respiratory symptoms, fever and cough and who can be suspected of having coronavirus.
- Creation of completely separate areas in the emergency rooms or external areas with Civil Protection tents equipped from an electrical point of view, medicinal gases, nurses' calls and remote controlled CCTVs connected with the Control Room and toilets to host suspected COVID-19 patients and avoid the possibility of contagion with patients present for other pathologies.
- Transformation of operating rooms and recovery rooms into intensive care units for COVID-19 patients.
- Realisation of passages and temporary boxes with dirty/clean filters to allow the dressing and undressing of the staff.
- Reversal of air flows in departments equipped with forced ventilation, construction of dedicated systems or use of extractors positioned on windows to create negative pressure environments.
- Application of the guidelines published by WHO (WHO Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected, Interim Guidance, 25 January 2020), specifying the environmental characteristics

to prevent airborne contagion in environments:

- where aerosol therapy is practiced: perform procedures in an adequately ventilated room, with natural ventilation with air flow of at least 160 L/s per patient to be obtained by opening doors and windows or in negative pressure rooms with at least 12 air changes per hour and controlled direction of air flow when using mechanical ventilation;
  - where aerosol therapy is not practiced: single hospital rooms, with natural ventilation with air flow of at least 160 L/s per patient to be obtained by opening doors and windows.
- Enhancement of the storage capacity of oxygen tanks and supplementary racks for cylinders, implementation of power lines and reduction panels to allow simultaneous operation of CPAP breathing systems and non-invasive ventilation (NIV).
  - Adjustments of electrical systems to current regulations for resuscitation, implementation of electrical outlets for each bed, integration of special systems for patient management (nurse call, network points, video surveillance for remote monitoring).
  - Creation of areas for dialysis dedicated to COVID-19 patients.
  - Implementation of cold rooms for the storage of corpses in mortuary chambers.
  - Adaptation of laboratories for specific tests for COVID-19.
  - Identification and implementation of areas for the storage and distribution of PPE for staff.
  - Identification and implementation of areas for storage and collection of waste.
  - Identification of lifts to be dedicated exclusively to COVID-19 patient paths.
  - Separation of COVID-19 and non-COVID-19 areas and related paths with many different solutions
  - Identification of dining rooms and dedicated areas for dressing, undressing equipped with screens and mirrors on wheels for specific staff training.
  - Installation of plexiglass panels for all front offices, information points, acceptance points, drug distribution, etc.
  - Sketching of clear explanatory plans of the location and of the routes relating to the various COVID-19 areas, continuously updated, available to healthcare personnel on the company intranet.
  - Installation of sanitary equipment for new intensive, sub-intensive and inpatient therapies, IT equipment, computers, furniture (armchairs, trolleys, etc), phones, two-way radios, tablets, smartphones.
  - Development of management software and specific dashboards for bed control in monitoring.

This is only a short list of the continuous and constant activities that have involved and still involve hospital technicians to assure that the whole

environment of the hospital is suitable for hosting COVID-19 patients and safe for medical and non medical staff and all the other hospital patients.

To summarise, we can say that in the war with the coronavirus, there are two advanced lines that fight side by side day and night: those who are in the trenches fronting the enemy and those who prepare safe trenches for them, meticulously, but quickly and respond as much as possible to the continuously changing needs.

Box 1: Insert written by Eng. Daniela Pedrini, Dipartimento Tecnico Direzione Progettazione, Sviluppo e Investimenti Azienda Ospedaliero-Universitaria di Bologna, Policlinico S. Orsola - Malpighi; President of the "Società Italiana dell'Architettura e dell'Ingegneria per la Sanità" (SAIS).

(Box 1).

Moving in another part of the Italian Health sector, in 1988 the Italian Government, considering the conditions of its post-war hospitals, decided to make a relevant allocation of public funds to finance a plan for modernising the structural and technological health care infrastructure of the National Health Service, to respond with increasingly appropriate, modern and safe structures and technologies, to the health needs of the community and to the expectations of operators and community assisted by the national health service, created in 1978.

There were two phases up to 1998 and then till about 2010, during which several hospitals were built, others rehabilitated in several regions. Then, almost coinciding with the end of the second financing of the above programme, the health sector started to be considered too expensive and in the last decade, precisely starting in 2010 the National Health Service (Sistema Sanitario Nazionale) was one of the victims of a new austerity, called "spending review," that produced, among others, a big loss in human and technical resources. Furthermore, in this period there was also a very relevant expansion of privatisation, facilitated also by the public support. The end result has been that in Italy, and probably for similar reasons also in other European countries, the improvement of hospitals was stopped. Some good examples of new buildings and plants were realised, but according to standard models for standard needs. To adapt even recent structures to the new needs of a pandemic can be called non-preparedness and certainly will be the first lesson for post COVID-19, also because scientists keep stressing that pandemics like the present and the preceding ones, mostly put aside in our memories, will occur again in a time span maybe not too long.

We should now be aware that we need to elaborate new models of hospitals and of management of health systems. Awareness and preparedness are the goals of

the post-pandemic society. In the final part we will get back to the lessons we are learning for rethinking the health care built environment.

### The Chain of Command in the Health System and the COVID Challenge

Another issue is taking space in the public debate, probably not only in Italy, of taking advantage of what the pandemic is teaching us as occasion for an objective evaluation regarding the health systems governance.

Italy has had, since 2001 with the reform of the Constitution, a decentralised health system. Issues have arisen during these nearly 20 years with regard to the decentralisation, that can be called more properly classified as “regionalisation” of the health system. Among others one of the major goals that was supposed to be achieved with such important measures was the reduction, if not disappearance, of the differences between the quality of care in the North and in the South regions, which appear to have increased, not decreased in the last period.

The pandemic fortunately has not hit very hard, up to now, the Southern Regions and especially the two major islands Sicily and Sardinia. The circumstances of such a positive situation are still not clear and a matter of debate.



Figure 1: Urgent construction of tents for pre-triage of persons suspected of being infected by COVID-19



Figure 2: Health operators in their protected garments



Figure 3: The empty square of the Milan Cathedral after the lockdown measures



Figure 4: San Pieter Square in Rome.

What is clear is that the present decentralisation has been the source of some problems in the fight against COVID-19, but there is also the possibility that restarting a country is an even bigger challenge, considering that Italy suffers and will suffer from the massive hit of the pandemic. Focusing our analysis again on the health system, there is no doubt that the cut in funds for the health system in the past ten years and the consequent reduction of medical and non-medical personnel, the impoverishment of the territorial health services, including GPs, have influenced the heavy consequences of the pandemic. The discussion will necessarily go on, as it has to be in a democracy, but it is fundamentally important that the lessons of the dramatic period will be learned. In the conclusion, we will give our synthetic view.

### Atmospheric Pollution and Coronavirus

Another aspect that has raised and still raises questions, is the strikingly uneven distribution of the spread of infection. The plain of the River Po encompasses the regions with the first and highest number of people infected, of patients needing intensive care, and also the highest number of deaths. The research of a scientific explanation of such distribution is going on, producing a scientific and frequently non-scientific debate.

The pandemic is slowly reducing its impact. This is why it can be considered the right moment to start a deep evaluation of factors which may have been at the base of the way the situation evolved.

The Regions Lombardy, Veneto, Emilia-Romagna and Piedmont, that is the major part of the Northern area, are the most industrialised parts of Italy. Lombardy, especially the city of Milan, are the centre of international trade and commerce, therefore they have been the first and most exposed to the coronavirus infection. Officially in China the “epidemic” was acknowledged in February, but probably from December, as we now know, it was going around and probably not only in China.

But, for too long a time, we, the Europeans at least, were looking to the far away province of Hubei and its major city Wuhan, as if they were another world.

It was only the first seriously infected patient on February 28, that started to produce the alarm, with the first diagnosis of coronavirus infection. The contagious virus has rapidly spread in the Northern regions of Italy as we know, creating disruption in most hospitals in the above mentioned regions. Many scientists are relating this fast and localised spread with the environmental situation of this area that has affected and debilitated the inhabitants, making it more easy to be attacked by the virus.

We must also take into account that Northern Italy is one of the most polluted areas of Europe because of the sum of different factors: climatic and geographic conditions, industrial development, traffic from urban, to international. The aerial photography of the usual atmospheric pollution level and the situation after more than one month of restriction on all kinds of traffic can show the impact of the later factor on the situation



Figure 5: The Colosseum

of the area.

Even the most prudent of scientists underline that “a subject living in an area with high levels of pollutant is more prone to develop chronic respiratory conditions and susceptible to any infective agent” (Conticini et al. 2020) and conclude that studies are urgently needed to evaluate the role of atmospheric pollution in certain populations.

## Conclusions

Examining some of the lessons that Italy, and maybe other countries, should learn from the way COVID-19 has impacted Italy, we have started with the situation of the healthcare built environment, namely hospitals, to expand the urgently needed reorganisation of the public healthcare system of Italy and trying to understand in a more systemic approach the whole complexity of the situation. We have also touched an issue regarding the need to change the way we live in our planet. Far before COVID-19, it was known that pollution was causing not only in the Northern part of Italy, but in many other parts of the world illnesses and death.

Hence, we put together all our conclusions: the first lesson is that this dramatic period we are going through requires the courage to change: those who work in the

health sector have to re-think the architectural models. The technicians have made miracles in adapting the present hospitals to dramatically meet new needs, and in future have to be encompassed in the planning and design processes. Governance of the health systems has to take into account the need of less fragmentation, strong national and European coordination and the realisation that any spending review forms for the health sector should be devised and envisaged in restarting the economy. We have to take into account that this time we have to move in a sustainable way, with prevention and preparedness as goals in addition to an economic development focused on respecting people, community and environment. This way, we should respect the saying of Machiavelli and take advantage of a dramatic crisis. ■

### Author: Prof. Arch. Simona Agger Ganassi

Member of the Council of Health Care Without Harm –Europe (HCWH –EU)

Member of the Board, European Health Property Network (EuHPN)

Member of the National Council of SIAIS | Italy

[simona.agger@gmail.com](mailto:simona.agger@gmail.com) | [www.euhpn.eu](http://www.euhpn.eu) | [www.noharm-europe.org](http://www.noharm-europe.org) | [www.siais.it](http://www.siais.it)

## Key Points

- COVID-19/Coronavirus is a very contagious virus of the AH1N1 strain.
- Pandemic is an infectious disease widespread over a whole country or the world.
- Healthcare infrastructures refer to the complex system of healthcare assets, including hospitals.
- Health technicians include architects, engineers, professionals with technical knowledge working in health.
- Governance in health systems refers to rule-making related functions carried out by decisions makers.
- Atmospheric pollution refers to pollutants present in the air in high quantity and influencing health.

## REFERENCES

Conticini E, Frediani B, Caro D (2020) Can atmospheric pollution be considered a co-factor in extremely high level of SARS-CoV-2 lethality in Northern Italy? *Environmental Pollution*, 261. [doi.org/10.1016/j.envpol.2020.114465](https://doi.org/10.1016/j.envpol.2020.114465)

# #CountOnUs: Creating New Paths and Partnerships to Solve Extraordinary Challenges



The COVID-19 crisis has placed extraordinary pressure on healthcare providers and clinical professionals alike. And yet, within this difficult and demanding context, we have seen incredible responses: in a sense of unity, in new ways of working, in the creation of virtual connections and more.

Agfa Radiology has stepped up as well, to help the healthcare sector meet the added challenges. #CountOnUs is our initiative to co-create and enable practical responses to the COVID-19 crisis, hand-in-hand with clinical partners. #CountOnUs is more than just a hashtag, it is a committed response, born out of solidarity, which has transformed into a holistic approach to finding simple, practical solutions to exceptional problems.

## Meeting Volume Demand Through More Capacity, Productivity and Uptime

“CountOnUs” began as a message to our customers: that we would stand with them and support them in any way possible. As the pandemic ramped up, specific needs became clearer. In particular, the acute lung distress of patients created demand for an unprecedented volume of images.

Busy healthcare professionals fighting COVID-19 in ICUs, ERs and treatment

rooms, dressed in bulky PPE, needed to make large volumes of bedside images offering excellent image quality, while keeping imaging units properly disinfected and working. Managing this new reality called for new solutions and support.

Within Agfa Radiology, the questions arose: How can we make our machines faster and more reliable? How do we ensure optimal utilization with the increased usage? How do we enable our customers to get more scans with the same equipment? How can we offer solutions that increase healthcare providers’ productivity? And how can we achieve these goals without long implementation times?

We saw that we needed to approach the problem from three directions:

- **Increase capacity:** especially for bedside imaging, whether DR, CR, analog or Retrofit. This requires to step up our manufacturing capacity bringing creativity, and partnering with other vendors.
- **Increase productivity:** finding ways for existing equipment to do more, both technologically and in terms of workflow.
- **Secure uptime:** people and equipment are being pushed to their limits. Overwhelmed staff don’t have time to worry about their equipment: whether damage due to dropping, or increased hygiene requirements.





### A Holistic Platform for Problem-Specific Solutions

#CountOnUs became our platform to figure out how to work under the new conditions; to share successes and learnings, in order to find problem-specific solutions that could be implemented quickly and simply. It lets us get information, suggestions, best practices and customer stories to more people, more rapidly.

Under the #CountOnUs umbrella, we have created **campaigns** based on concrete actions. For example, in a campaign named Fight against Time, we are offering our Chest+ software free of charge for nine months, to Agfa customers and non-Agfa customers alike. Chest imaging is a key part of triaging and monitoring patients. Chest+, for gridless bedside imaging, can help increase speed and productivity by up to 30%, as no grid positioning or disinfection is needed.

We are **communicating insights** such as the advantages of CR for the ICU workflow. Fast, flexible imaging, a robust solution and lower total cost of ownership (TCO) make it a sustainable addition to the COVID-19 imaging environment. Then there are the benefits of the mobile DR Retrofit, which is helping healthcare teams deal with the overwhelming pressure on diagnostic and treatment resources. The Retrofit can upgrade mobile imaging units to DR productivity 'in an instant', with just a laptop and detector.

We are also spreading **best practices** from healthcare providers, so we can partner with companies to translate and replicate the successes to other systems. In hard-hit Brazil, for example, Agfa with its partner and a local manufacturer teamed up to create a mobile solution powered by Agfa Musica SW to offer, within weeks, state of the art imaging to a field hospital in Sao Paulo,



### Transformative Experience, Practical Responses

The trends we are seeing emerge during this pandemic will reshape the way radiology is practiced, and Agfa will continue to be a partner to healthcare as we all learn and evolve together. #CountOnUs is creating a transformative foundation of solidarity with, and value for, patients, clinical professionals and healthcare providers. It represents and enables a collaborative problem-solving mindset that connects us to our customers and to other vendors, so we can quickly identify and implement relevant and practical solutions. And it encourages teams to share their stories, so they can support and motivate each other in a purposeful way. ■

#### Author: Georges Espada

Head of the Global Business Unit Conventional & Digital Radiography | Agfa  
[georges.espada@agfa.com](mailto:georges.espada@agfa.com)

Agfa NV is one of the world's leading companies in imaging technology. Agfa develops, manufactures and markets analogue and digital systems for the printing industry, for the healthcare sector, and for specific industrial applications. The group has more than 150 years of imaging experience.

The Digital Radiography Solutions division delivers diagnostic imaging solutions that set standards in productivity, safety, clinical value and cost effectiveness.

Agfa is headquartered in Mortsels, Belgium. The company is present in 40 countries and has agents in another 100 countries around the globe.

# How is the Pandemic Affecting Radiology Practice?

An overview of how the Radiology Department at Hospital Clínic in Barcelona handled the COVID-19 pandemic and how this disease will change the way radiology is practiced.

The COVID-19 pandemic has led to major changes in clinical activity at our radiology department. The radiology department at Hospital Clínic in Barcelona carries out more than 350,000 imaging examinations per year. When COVID-19 appeared, we cancelled 70%-80% of clinical and all research imaging examinations. We drew up radiology guidelines for the safe imaging of patients, with contingency staffing planning to reduce the risk of nosocomial spread.

We had to adapt our daily activities to take care of both COVID-19 and non-COVID 19 patients whilst implementing safety measures. Activity was maintained for oncologic patients, non-delayable interventional procedures and emergency patients.

We adapted our priorities and instructed all staff to work from home wherever possible. As we had already set up tele-work resources (a VPN–virtual private network) for all staff, this did not present any major problems in the department. During the course of the pandemic we increased the number of staff working from home.

We have had more than 900 hospitalised COVID-19 patients, 195 of whom were in the intensive care unit at the height of the pandemic (Figure 1). Radiology plays a key role in the diagnosis of COVID-19 patients (Rubin et al. 2020). During the pandemic, the number of chest x-rays (Figure 2) and chest CTs (Figure 3) in COVID patients increased considerably, which led to an increase in workload for the chest radiology section (Revel et al. 2020). From March 16 to April 24, we performed more than 9000 chest x-rays and more than 600 chest CTs. We introduced a structured report template to provide guidance to radiologists reporting chest x-ray and CT findings (Simpson et al. 2020).

The fact that these patients will need exhaustive follow-up studies within established time limits, when added to existing activity, will entail an increased workload for the radiology department (Mossa-Basha et al. 2020).

## Research

The pandemic has slowed down most current research projects, while also opening up new lines of research that must take priority at the present time. We are still not fully aware of many aspects related to this pandemic. Rigorous data collection is of prime importance; both now and in the future, if we are to actively participate in research on this disease.

We are participating in COVID-19 data-sharing with other centres and imaging societies, developing projects in response to COVID-19-related requests for proposals and preparing educational lecture series on imaging for trainees and

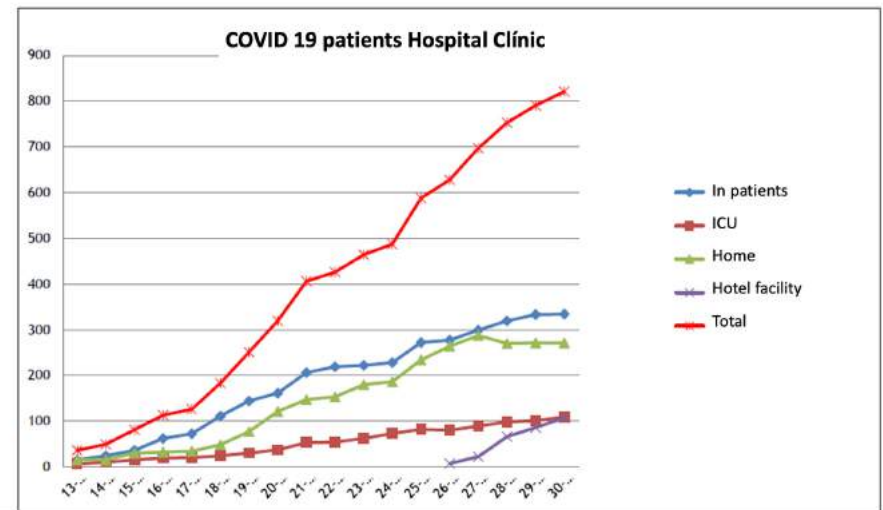


Figure 1: Increase of COVID-19 cases since the start of the pandemic in different areas of care

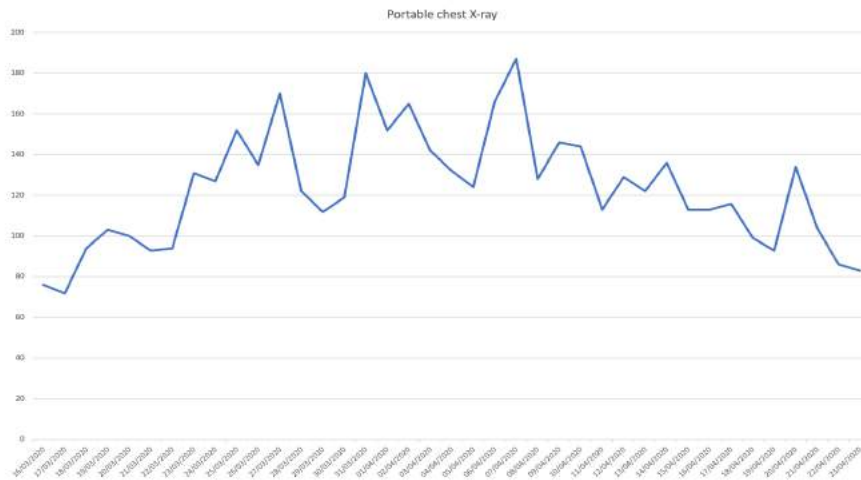


Figure 2: The evolution of the number of chest x-rays from the beginning of the pandemic to the present

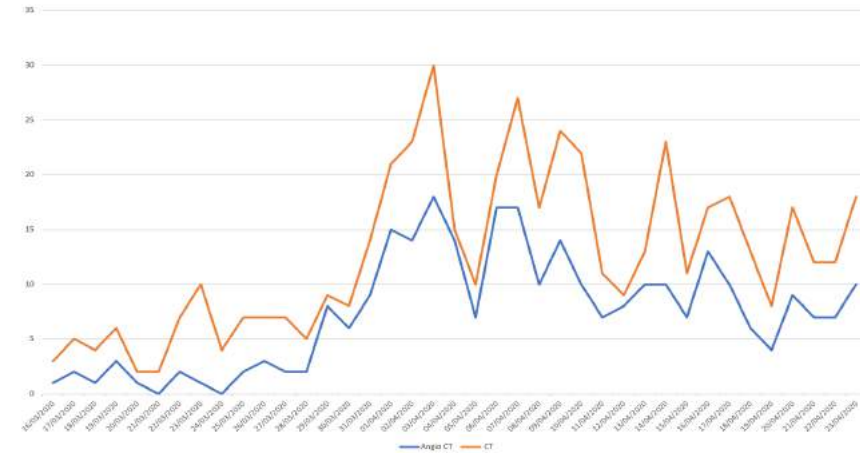


Figure 3: The evolution of the number of CT imaging studies from the beginning of the pandemic to the present

clinical staff.

### Restoring Activity

#### 1. Protection

We are currently facing the complexity of imaging COVID-19 and non-COVID patients in the radiology department. Waiting rooms will have to be adapted respecting the appropriate distance to prevent cross-transmission. The depart-

in order to sustain hygiene measures and provide the time to sanitise imaging rooms between patients, in order to guarantee patient and staff safety.

A detailed operational plan has been prepared to increase the activity in the radiology department over a period of four weeks, but scheduling patients to a specific timetable so as to avoid an excess number of patients in the waiting room at any one time. Furthermore, we have established a plan for the progressive incorporation of staff members to avoid an excess number of people in the

## During the pandemic, the number of chest x-rays and chest CTs in COVID patients increased considerably, which led to an increase in workload for the chest radiology section

ment should adhere strictly to infection control measures, including adequate hand hygiene, equipment hygiene and proper PPE supplies (Politi et al. 2020). We have developed radiology-specific guidelines for safe imaging.

#### 2. Workload

Cancellation of programmed imaging studies has led to a substantial increase in the waiting list. The return to regular activity will not be easy and must be progressive. The overall capacity of the radiology department will be reduced

common areas, with strict infection control procedures.

We have established new priority filters based on clinical criteria, in agreement with the referral physicians to define the re-schedule time for pending imaging studies.

#### 3. Working approaches

We will probably see changes in how we practice as radiologists. In the future, working from home will come to be seen as standard in the radiology

department. Telephonic consultations with patients prior to interventional procedures and as part of follow-up will become more common. This new challenge is also an opportunity for the radiologists to get closer to the patient. Increased communication and visibility to patients can only have a positive impact on our future practice.

With board and expert meetings being held online, radiologists must lead the coordination and promotion of these innovative solutions to maintain their involvement in all decision-making meetings. This will also require a more flexible working day and close collaboration with the IT team to provide these tools, whilst also considering all aspects related to data protection and confidentiality.

Artificial intelligence, using deep learning technology, has seen great success in the field of medical imaging. Right now, these approaches are being developed to identify COVID-19 pneumonias. We will see a great development in artificial intelligence tools that will affect the organisation and management of radiology departments of the future.


### Conclusions

Radiology departments must adapt to the new situation created by the pandemic, learn from it and reorganise working procedures to be prepared for new outbreak clusters in the future.

What we have learned from the pandemic is the importance of following strict safety guidelines and the need for close collaboration between radiologists, radiographers, nurses, transporters and clinicians to provide a united front against the virus during such a critical time as the one we are now facing.

We all need to rise to this challenge, making choices that will actively enhance

the value of radiology in patient care. By carefully setting our priorities, being aware of the difficulties and our limitations, our contribution can be part of that solution. ■

 **Author: Prof. Laura Oleaga**

Radiology Department | Hospital Clínic, Barcelona, Spain

[loleaga@clinic.cat](mailto:loleaga@clinic.cat)

### Key Points

- The radiology department at Hospital Clínic in Barcelona carries out more than 350,000 imaging examinations per year.
- During COVID-19, the department cancelled 70-80% of clinical and research imaging examinations.
- More than 9000 chest x-rays and more than 600 chest CTs have been performed between March and April.
- Rigorous data collection is of prime importance; both now and in the future, if we are to actively participate in research on this disease.
- Radiology departments must adapt to the new situation created by the pandemic, learn from it and reorganise working procedures to be prepared for new outbreak clusters in the future.

### REFERENCES

Mossa-Basha M, Meltzer CC, Kim DC et al. [2020] Department preparedness for Covid-19: radiology scientific expert panel. *Radiology*. [doi.org/10.1148/radiol.2020200988](https://doi.org/10.1148/radiol.2020200988)

Politi LS, Balzarini L [2020] The Radiology Department during the COVID-19 pandemic: a challenging, radical change. *European Radiology*. [doi.org/10.1007/s00330-020-06871-0](https://doi.org/10.1007/s00330-020-06871-0)

Revel MP, Parkar AP, Prosch H et al. European Society of Radiology (ESR) and the European Society of Thoracic Imaging (ESTI) [2020] COVID-19 patients and the radiology department - advice from the European Society of Radiology (ESR) and the European Society of

Thoracic Imaging (ESTI). *Eur Radiol*. [doi.org/10.1007/s00330-020-06865-y](https://doi.org/10.1007/s00330-020-06865-y)

Rubin GD, Christopher J et al. [2020] The Role of Chest Imaging in Patient Management during the COVID-19 Pandemic: A Multinational Consensus Statement from the Fleischner Society. *Radiology*. [doi.org/10.1148/radiol.2020201365](https://doi.org/10.1148/radiol.2020201365)

Simpson S, Kay FU, Abbara S et al. [2020] Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19. Endorsed by the Society of Thoracic Radiology, the American College of Radiology, and RSNA. *Radiology*. [doi.org/10.1148/ryct.2020200152](https://doi.org/10.1148/ryct.2020200152)

# COVID-19: Defining a Digital-First Approach that Adds Value

Crises pose opportunities as well as threats. The COVID-19 outbreak is a key example. As a result, digital health use is expanding. Dramatic changes to models of patient care are occurring with new technologies, digital solutions and organisational approaches. Mobile apps are coming to the fore. The use of virtual care is likely to be consolidated. A digital-first approach can work, and the European Health Telematics Association (EHTEL) and its members are keen to support these advances.

## Crises Pose Opportunities and Threats

Today, European health systems are struggling to cope with the most challenging public health threat they have experienced in recent times – the COVID-19 outbreak. Yet, at the very same time, a revolution in digital health is occurring. The current pandemic shows just how digital health can assist in providing effective treatments, offering safety measures and sharing humanity.

Not only Europe, but the entire global community, is responding urgently to this crisis. Everyone has been mobilised to ensure that the world's health services have sufficient capacity to cope with these challenging circumstances. Confinement has been keeping people in lockdown, but it is also curbing the infection and reducing the burden on hospitals and care homes.

Everyone is being brought on board. Through the World Health Organization (WHO)'s declaration of March 11, 2020, WHO Director-General, Dr Tedros Adhanom Ghebreyesus announced that COVID-19 was now a global pandemic (WHO 2020). In his sobering opening speech, he alerted his audience to the fact that the crisis would hit every socioeconomic sector. As a result, a wide diversity of stakeholders were encouraged to act together. In his own words, "This is not just a public health crisis, it is a crisis that will touch every sector – so every sector and every individual must be involved in the fight."

Like many other organisations and associations, the European Health Telematics Association (EHTEL) has heeded this call. Indeed, from late February 2020 onwards, the association had already started to work on a positive response to the crisis.

EHTEL's role as a pan-European multi-stakeholder forum means that it concentrates on what is happening in digital health on the European continent, but also takes a more global view. It quickly produced a short briefing paper on the digital challenges underpinning the outbreak (EHTEL 2020). It followed this up by an appeal to its members to make known any helpful digital applications of which they are aware. These solutions have come chiefly in the health and care sectors, and from many countries, including Israel and the U.S.

## Dramatic Changes to Models of Patient Care

Change has been sudden. Radical technological and organisational changes are taking place in the field of health and care. Virtual care – which comprises a wide range of applied digital health solutions – is being welcomed. Examples of use include electronic and video consultations, telemedicine services and mobile health applications.

Since the first COVID-19 cases were detected in Italy, European health systems have responded by making a huge leap towards the virtual delivery of patient care.

Through the lead taken by health and care professionals, health centres have adapted rapidly to this unprecedented and challenging situation. They are adopting digital health solutions that enable virtual care to protect health professionals, patients and people at large. Today, these solutions are seen in use in institutions for infection control as well as in hospitals, clinics and homes. When people have to self-isolate at home, patients can communicate easily through these digital platforms with their health and care professionals, and individuals can keep in contact too with their wider communities.

What follows are some example developments, to which EHTEL's members have alerted us. In some cases, EHTEL members have been closely involved with these developments.

### Digital Solutions are Certainly Helping

Throughout the European Union, examples abound of new uses of digital solutions. They operate at all sorts of levels, from those of health systems and authorities to

The European Union is gathering much useful work together. The health and care authorities are very much on the ball. As from mid-April 2020, Europe's member states, supported by the European Commission, are working on the creation of a European toolbox. The toolbox will use mobile applications for efficient (COVID-19) contact tracing. Its aim is to support a gradual lifting of COVID-19 confinement measures, as set out in the Commission's April 2020 Recommendation – a policy document (European Commission 2020).

Technical building blocks are at the foundation of many new and interesting developments. An EHTEL member in Italy has been involved in the development of a system, based on an application programming interface (an API), that is now in active use by the Italian authorities (CEF Digital. Connecting Europe 2020).

Indeed, particularly at population or community levels, digital solutions are undertaking real-time patient tracking, contagion maps and predictive analyses.

Telemedicine offers many benefits in today's crisis situation. In the context of a public health emergency, such as COVID-19, telemedicine solutions bring many

## This is not just a public health crisis, it is a crisis that will touch every sector – so every sector and every individual must be involved in the fight

individuals.

Most of these digital services were available before the COVID-19 crisis hit, but their use was often somewhat marginal. Even in those health and care systems that have an advanced eHealth infrastructure that enables data sharing among a range of health and care providers, care was often delivered face-to-face.

Take Catalonia in Spain as an example: 70% of health and care encounters that were previously provided conventionally are now being conducted virtually.

In Germany, there has been a dramatic increase in teleconsultations. Telemedicine platform operators report growth rates in their use of more than 1,000% over the past weeks. German reimbursement models for care have been modified. Online appointments are now reimbursed, just like face-to-face meetings, by the German National Association of Statutory Health Insurance Physicians (KBV).

In France, health authorities and health insurers are encouraging expanded telemedicine use. They are offering providers and patients incentives to use this delivery model.

In Belgium, the Belgian National Institute for Health and Disability Insurance (INAMI/RIZIV) has fixed the medical teleconsultation fee at €20.

pluses. They reduce the risk of infection for individual patients and for hospital or clinic staff. They also free up hospital resources for the patients who really need a hospital bed. Practical digital solutions, together with the financial incentives being provided to providers and patients in an increasing number of European countries, are decisive for a massive uptake of digital health.

### What Comes Next?

What will come after the current peak of COVID-19 infection has been reduced is today unclear. More waves of contagion may arise.

The COVID-19 crisis is, nevertheless, showing that models of patient care based exclusively on face-to-face meetings were perhaps not always needed and probably rarely desirable. Paradoxically, digital technologies that were previously criticised as de-humanising care have, in today's crisis situation, kept people communicating and joining together in solidarity. They are playing a particularly essential role in connecting patients and families. In terms of communication, more at-a-distance connectivity may grow in the future.

Virtual care will likely provide a more major complement to conventional care than

it did before. It seems highly probable that the use of virtual care will be strengthened, unless the benefits being reaped currently alter significantly in a detrimental way.

Historically, digital solutions have been insufficient to guarantee total quality continuity of care. Interaction between health and care professionals needs a big upgrade – including the digital tools that can support this, and the ways, in which they are integrated into health and care systems.

Consolidation of virtual care depends on its effective integration in three areas: in healthcare professionals' diaries, in the provision of care pathways, and in patients' electronic health records.

This shift from physical care to virtual care comes with new challenges that will need additional financial and organisational resources. The arrangements underpinning health system governance – to ensure telemedicine as a more usual way of delivering care – will need to be improved.

As was first said long ago, crisis also means dangerous opportunity. This crisis was decidedly unwanted. Yet its positive side-effects are the massive organisational and behavioural disruptions being catalysed by digital health. They offer us the opportunity to rethink entirely, and in the long term, just how health services can be provided in the digital age.

Two years ago, in April 2018, Europe launched its policy on the Digital Transformation of Health and Care (European Commission 2018). The focus was on both health and care in a digital single market. Today, Europeans really are seeing that the third priority of this transformation – empowering patients and healthcare providers through the use of virtual care – is being fulfilled exceptionally fast ([Digital Health Europe 2020](#); [EIP on AHA 2020](#)).

To conclude, a digital-first approach can work. Historical blockages to extensive uptake of digital solutions may well now be overcome. The evidence gathered through this large-scale, real-time, natural experiment will serve to define a digital-first approach that can deliver value.

**EHTEL and its members are keen to support digital health advances. For more information on the work that EHTEL has been conducting, in this time of opportunity and challenge, visit our dedicated digital health and COVID-19 [webpage](#).** ■

**Author: Diane Whitehouse**

Principal eHealth Policy Analyst | European Health Telematics Association (EHTEL) | Brussels | **Belgium**  
[diane.whitehouse@ehtel.eu](mailto:diane.whitehouse@ehtel.eu) | [@ehtel\\_ehealth](https://twitter.com/ehtel_ehealth)

**Author: Tino Marti**

eHealth Project Officer | European Health Telematics Association (EHTEL) | Brussels | **Belgium**  
[tino.marti@ehtel.eu](mailto:tino.marti@ehtel.eu) | [@ehtel\\_ehealth](https://twitter.com/ehtel_ehealth)

## Key Points

- Digital solutions are now seen as a must to deliver care during the outbreak. They are helping to protect and assist both patients and health professionals.
- Examples of beneficial digital solutions can be seen in European countries like Belgium, France, Germany, Italy and Spain.
- More changes are to be expected in healthcare professionals' diaries, provision of care pathways, and in patients' electronic health records.
- Digital-first can work. Today's experiences provide a large-scale, real-time, natural experiment that will serve to define a digital-first approach that can deliver value.
- EHTEL is focussing on digital health solutions. It has produced a briefing paper and a first list of possible solutions. It continues to collect and collate digital solutions to help control further spread of COVID-19.

## REFERENCES

- CEF Digital. Connecting Europe (2020) CEF Context Broker helps turn data into action plans to fight COVID-19. Available from [iii.hm/13f1](#)
- Digital Health Europe (2020) Digital Health Solutions for Health Care and Management in Times of Coronavirus. Available from [iii.hm/13hr](#)
- EHTEL (2020) Observations from the ongoing coronavirus (COVID-19) disease outbreak. Available from [iii.hm/13f3](#)
- EIP on AHA (2020) May edition of the EIP on AHA newsletter. European Innovation Partnership on Active and Healthy Ageing (EIP on AHA). Available from [iii.hm/13f5](#)
- European Commission (2020) Coronavirus: Commission adopts Recommendation to support exit strategies through mobile data and apps. Available from [iii.hm/13f2](#)
- European Commission (2018) Digital Transformation of Health and Care in the Digital Single Market is gaining more support. Available from [iii.hm/13f4](#)
- WHO (2020). WHO Director-General's opening remarks at the media briefing on COVID-19. Available from [iii.hm/13f6](#)

# Think Inside The Box: This Parisian Hospital Has a Dedicated CT Cabin for its COVID-19 Patients

A prefabricated cabin has sprung up just outside the entrance of the giant Henri-Mondor hospital in Créteil, a commune in the southeastern suburbs of Paris. The unassuming module might look like a trailer home or the temporary office for a construction project, but it's actually a vital outpost in the hospital's battle against COVID-19.



Image: Courtesy of GE Healthcare

Top: François Meignan, a project manager at GE Healthcare, designed the "CT in a box" (above) for Paris-area hospital Henri-Mondor. When the facility urgently needed more imaging capacity for COVID-19 patients, Meignan's team brought the on-demand solution from concept to completion in just two weeks.

Nestled inside the specially designed 36-square-meter module is a brand-new computed tomography (CT) scanner, a tubular machine that combines X-rays with computer processing to build a precise picture of the inside of a human body. The whole setup, which bolsters the hospital's imaging arsenal without occupying any of its precious indoor floor space, has been dubbed "CT in a box"<sup>1</sup> by the GE Healthcare engineers who invented it.

The extra machine will aid Hospital Henri-Mondor in assessing disease progression and complications in COVID-19 patients while also smoothing patient flow across the facility. That's because the module is entirely dedicated to COVID-19 patients, says François Meignan, a project manager at GE Healthcare who designed the project. "It's not just about patient numbers — it creates a specific flow for them."

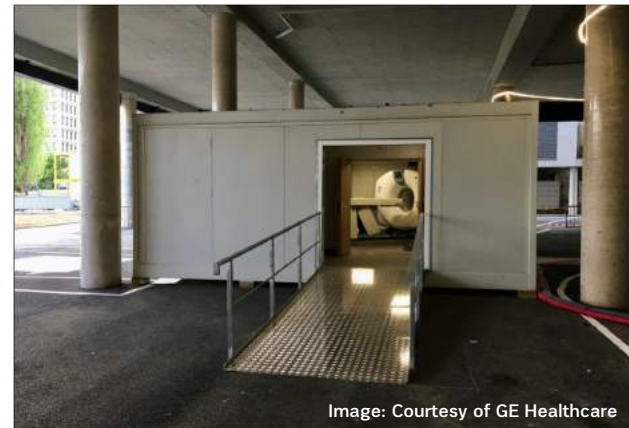


Image: Courtesy of GE Healthcare

GE first deployed the technology in China and the United Arab Emirates. "At the beginning of the outbreak, China's clinicians in remote or pop-up hospitals quickly called for the precise images CT scans provide to help them spot complications earlier," Kieran Murphy, GE Healthcare CEO, wrote in an opinion piece published in [Barron's](#). "To address this need, our

engineers quickly developed CT-in-a-box, an easy to install modular machine that captures the same robust imagery of traditionally installed CT scanners. Learning from our experience there, GE Healthcare teams in France developed a similar solution to address the urgent need for additional imaging capacity — and specifically adapted it to the needs of clinicians caring for COVID-19 patients."

The French hospital already had plans to beef up its intensive care bed capacity several months before the coronavirus pandemic, but the rapid spread of the infection accelerated its plans. In late March, hospital authorities decided to nearly double the facility's ICU capacity from 90 to 175 beds. "Our three CTs were already fully busy, [so we thought] how can we create a fourth one?" says Alain Luciani, radiologist and medical head of Academic & Medical Department FlixIT. "We turned to GE Healthcare and said 'OK, how can you help us?'"

Brainstorming began immediately; it had to. "The opening of the new building was already planned for 9 April, so we had to find a solution — concept and build — in



two weeks,” explains Meignan, a project manager who works at GE Healthcare in the north of France. “They [the hospital] wanted an easy-to-install solution, fast in concept, and fast in building, so we worked on drawings to find a solution,” says Meignan.

The team soon discovered that designing this CT in a box required some out-of-the-box thinking. The sticking point was not fitting the CT machine itself in a trailer, but replicating the safe, controlled and easily accessible environment of a hospital CT room. A quick primer: CT machines rely on [electrically produced radiation](#) to image anatomy. The donut-shaped gantry houses both the X-ray tube and detectors positioned on opposite sides of the ring. As the gantry rotates, it produces cross-sectional, or tomographic, images of the areas of the human body within the donut hole. “It takes pictures in slices, creating a 3D model to detect anomalies,” explains Meignan.

The small dose of radiation emitted by a CT scan may be low-risk to the patient, but imaging technicians repeat the procedure several times per day. That is why CTs always have lead-shielded walls and thick windows between the exam room and control room, where technicians and clinicians can observe the patient and perform the imaging process. It’s also why the exam room and control room each have their own doors.

CT scan rooms also use sophisticated heating, ventilation and air conditioning (HVAC) systems to maintain a constant temperature of around 72 degrees Fahrenheit. The exam room is prone to increasing temperatures because the gantry’s electronics expel plenty of heat.

Inspired by the CT-in-a-box solutions their GE Healthcare colleagues had developed for China’s remote and pop-up hospitals, Meignan and his team designed their own modules, drawing materials from local supply chains. Of course, they knew they’d need much more than a big trailer and a power supply. “We had to find a place outside to create an exam room with specificities like electrical supply, HVAC and shielding,” Meignan says.

They settled on a design consisting of two small, prefabricated cabins joined into a single, square module with a shielded partition wall between the exam and control rooms. While there would be no windows, technicians in the control room would monitor real-time webcam images of the exam room via TV screens. The module would have an HVAC unit to maintain its temperature, and there would be a door for



Image: Courtesy of GE Healthcare  
Jerome Duhamel, the healthcare project management leader for GE Healthcare in Europe, says 18 such modules will be sent to the U.K.’s National Health Service in coming weeks.



With the two-room housing in place, the CT scanner itself is forklifted into the module’s dedicated exam room.

each room, separated at opposite ends.

The next step was to determine whether all the materials were available in northern France: The whole country had begun a [strict lockdown](#) on March 17. But GE Healthcare partner Ramery Energies and its suppliers came through. “They worked day and night so we could finish the module as soon as possible,” says Meignan.



Image: Courtesy of GE Healthcare

"Onsite, you just put together the two boxes, plug in the cable and that's it," Meignan says. After a couple days of machine calibration, Créteil's CT in a box was ready to scan its first patients.



Image: Courtesy of GE Healthcare

Maxime Huet, a project manager of the installation.

Post-assembly, GE Healthcare's team ensured the box was battle-ready before it departed for Paris. "HVAC was checked, the shielding was finished, and the power distribution was already installed," says Meignan. A truck then hauled the module's two pieces to the hospital, where a small crane lowered them into place. A forklift then hoisted the two main parts of the CT machine — the hulking gantry and the long, flat table — into the module. Finally, workers laid a metal ramp up to the cabin, allowing patients to be wheeled out the hospital doors and directly up

alongside the CT scanner.

The whole setup looks similar to mobile blood banks that erected in parking garages or the medical cabins at rock festivals.

"Onsite, you just put together the two boxes, plug in the cable and that's it," Meignan says. After a couple days of machine calibration, Créteil's CT in a box was ready to scan its first patients.

Including the exam table, the GE Healthcare-manufactured machine, which is part of the [Optima CT family](#), tips the scale at 2.5 tons. "It's a big and heavy machine, so we needed reinforcement inside the module," says Meignan. But it is worth its weight in gold: The clinical consensus is that CT scans are an important imaging modality for assessing disease progression and complications in COVID-19 patients. "Patients are very fragile in terms of their respiratory condition, and they face different complications — and CT is there to detect those complications," explains Luciani, the Albert Chenevier-Henri-Mondor doctor.

While the scan itself be completed in a matter of minutes — or even seconds — technicians can accommodate around one patient per hour, due to the time needed to prep the patient and fully sanitize the exam room. But, as Meignan explains, the new module is not just about boosting the number of scans, but smoothing patient flow across the entire hospital. That is because the module will relieve pressure on the facility's three existing CT machines and because it is located near the hospital's ICUs, where it treats its COVID-19 patients.

It might just be the beginning for the CT-in-a-box concept in Europe. Jerome Duhamel, the healthcare project management leader for GE Healthcare in Europe, says 18 such modules will be sent to the U.K.'s National Health Service in coming weeks.

In the meantime, it's all systems go in Créteil. "We are ready to go, 10 days after [reaching out to GE Healthcare]" says Luciani. "It was an adventure for us, for GE Healthcare and for the workers who worked night and day to build those containers."

*Previously published on GE Reports*

<sup>1</sup>Availability is subject to local supply capacity and requirements that vary by country. Contact a GE Healthcare representative for more information

# Diagnostic Imaging in the Age of COVID-19

In a disease surrounded by unknowns, patients' imaging is shedding a light on the course of COVID-19.

## Radiology in the age of COVID-19

During this relative respite that the COVID-19 offers us after the purportedly first peak of the pandemic, we can reflect on how this tiny virus changed our lives. For the healthcare system, the adaptation to the pandemic is being particularly tough. Here we will focus on how COVID-19 is changing radiology teams' everyday life.

In just a few months scientists learned a lot about this disease whose clinical spectrum ranges from the absence of symptoms to death. Experts realised that SARS-cov-2 virus' deadly power is enhanced by the large percentage of asymptomatic and pre-symptomatic carriers of this high infective virus. We are still learning how to protect ourselves from the infection, and there are still many unknowns. Finding an effective treatment will take time, and vaccine candidates are still in their early stages of trials regarding effectiveness and safety. On the other hand, experts believe that the pandemic will remain for a couple of years, or perhaps forever, maybe SARS-cov-2 becoming one more seasonal virus. Many of us long for the hypothesis that the virus may lose aggressiveness over time.

From the diagnostic point of view, things have progressed very quickly, considering that the disease has been known for just six months. Thanks to the Chinese scientists, the molecular structure of SARS-Cov-2 was soon available, allowing the early design a reverse transcriptase polymerase chain reaction (RT-PCR) for the diagnosis of infection in nasopharyngeal swabs. But the sensitivity of these RT-PCR tests is reported as low as 60-70%, in part because their results depend on the moment on which the samples are taken at the progression of the disease. Subsequently, various serologic tests for anti-SARS-Cov-2 antibodies have been added to the market, but they are not especially useful as diagnosis tests at the beginning of the disease. In Wuhan, given the RT-PCR false negatives particularly early in disease time course, the scarcity of tests at the peak of the pandemic, and the frequent delay in obtaining the results, doctors soon considered the use of imaging as an adjunctive diagnostic tool for screening of COVID-19.

As COVID-19 manifests predominantly as a pneumonia-like respiratory process, the radiology techniques most involved in its diagnosis and follow-up are those of chest imaging, mainly chest X-rays and chest CT. The Emergency and Chest

divisions of the radiology departments are the most involved, but at the peak of the pandemic the COVID-19 cases outshone the rest, and almost every member of hospitals' Radiology teams participate sometimes not only in its radiological diagnosis but collaborating in other hospital areas.

Chest radiography (CXR) can be insensitive for detection of early or mild disease but is useful in triaging patients and monitoring care in those with radiographically detectable pneumonia (Wong 2020). We soon learned from Wuhan's experience: to decrease the likelihood of intrahospital infection, specific circuits for suspected or confirmed COVID-19 patients' requiring radiological studies must be perfectly differentiated at the hospitals. Radiographs must be carried out with portable equipment, which allows limiting the displacement of patients through the hospital. Radiology technicians are the ones who approach patients with their portable equipment wherever they are: in the emergency department, in the hospital ward or at the ICU. Safeguard of radiology workers with personal protective equipment (PPE) was seen to be essential: now, in addition to the lead apron, radiographers must wear a mask, a waterproof apron, face shields, etc.

CT findings in COVID-19 pneumonia demonstrate a temporal evolution typical of organising pneumonia as a response to acute lung injury. The hallmarks of COVID-19 infection on imaging at the beginning of the disease are bilateral and peripheral ground glass opacities with lower lobe predominance. Four to 14 days after symptom onset there is a greater lung involvement with consolidation, and "reverse halo sign" and "crazy paving" signs are useful findings because they are not usual in other viral pneumonias. Bilateral lung involvement was observed in 28% of early patients, 76% of intermediate patients, and 88% of late patients (Guan 2020). CT findings correlate with the severity of the disease (Yu 2020) and could help make treatment decisions for patients in the ICU (Gattinoni 2020). To facilitate communication with requesting physicians, a radiological reporting system (COVID-RADS) has been created (Salehi et al. 2020).

Chinese studies in February reported higher sensitivity of chest CT compared to RT-PCR (98% vs. 71%) for COVID-19 screening, but these results should be interpreted cautiously mainly due to pre-test probabilities: chest CT is more sensible as a

screening test at the peak of the COVID-19 pandemic (Fang 2020).

There are various caveats of CT as a screening tool for COVID-19. First, to prevent additional infections and deaths, reducing false negatives is particularly important, and chest CT can miss COVID-19 cases, because chest CT is normal in more than half of patients imaged 0-2 days after symptom onset (Bernheim 2020). We know that after the Diamond Princess Cruise passengers' experience: only two-fifths of PCR positive people had lung opacities at CT. Cases missed at CT screening could infect others (Inui 2020).

Second, there are also CT false positive diagnoses, since CT findings are not specific, mainly because they overlap with those of other viral pneumonias, including influenza. Nevertheless, the probability of misidentifying them as COVID-19 is much lower outside of flu season, and especially in the context of this pandemic, false positive are not very problematic: the recommendation is simply to self-isolate, this being useful also for flu patients.

Apart from sensitivity and specificity issues, there are also practical considerations regarding Sars-Cov-2 contamination risk from scanners to other patients. There is a need to disinfect the CT room after studying a COVID-19 patient. But CT scanning is safer for health care workers than obtaining samples with nasopharyngeal swabs, often triggering explosive coughing and virus spreading (Huang 2020).

The main advantage of CT is its ubiquity, but although there are many CT machines their usage for monitoring COVID-19 patients during and after their disease is already overloading CTs. There is a high incidence of subclinical CT findings in SARS-cov-2 infected cases, showing mainly ground-glass opacities. If the entire infected population were monitored by CT, radiology and pneumology departments would be overwhelmed. In the next months and years radiology teams will be involved also in the control of the pulmonary sequelae of COVID-19 patients, one of the more worrisome being lung fibrosis. Available equipment and staff will be not sufficient.

Considering all these factors most radiology societies led by the American College of radiology (ACR), [advise](#) against chest imaging for initial COVID-19 screening and diagnosis.

Of course, there is a role of chest CT in COVID-19 patients with complications, cases of diagnostic uncertainty, and critical illness. Most clinical guidelines recommend chest CT when alternate diagnosis is suspected or when COVID-19 testing is unavailable or highly restricted.

However, the Fleischner Society (Rubin et al. 2020) considers that there is a role for imaging in COVID-19 diagnosis, particularly at the peak of the pandemic. In some circumstances the ideal diagnostic approach would involve both swab PCR tests and a chest CT to ensure the highest sensitivity, to miss the fewest cases possible. For



COVID-19 screening complementary to RT-PCR, a sub millisievert low-dose with no intravenous contrast CT technique is enough (Dangis 2020).

According to the Fleischner Society statement "The Role of Imaging in Patient Management during the COVID-19 Pandemic," imaging is indicated in hospitalised patients with moderate to severe symptoms consistent with COVID-19 despite a negative COVID-19 test result if pre-test probability is high. Chest CT scans for screening or diagnosis of COVID-19 would not be beneficial in a low-prevalence region due to high

rate of false-positives (Kim et al. 2020).

As a chest CT can show COVID-19 changes even in asymptomatic people, depending on prevalence of the disease, we can expect incidental detection of COVID-19 pneumonia on any CT examination (Pozzessere et al. 2020). It is crucial to review chest images immediately after the CT images acquisition to quickly detect features suggestive of COVID-19 pneumonia, whatever the indication of the CT examination. Radiology departments must be prepared since COVID-19 pneumonia is associated with potential virus transmission.

### Artificial Intelligence (AI) and COVID-19 Imaging

Many teams worldwide are developing AI systems based on the imaging signature of COVID-19 (Kundu 2020). There are studies about deep learning-based triage of COVID-19 cases from chest CXR, but there is more interest in AI studies on chest CT, mainly to differentiate COVID-19 pneumonia from other causes of pneumonia.

There is an international common goal to build data repositories to fuel COVID-19 AI, such as those of the [RSNA](#) and the European [EUSOMII](#). Chest imaging with the help of AI could help not only in diagnosis but in risk stratification and in monitoring the response to treatment. In an ideal world, AI models could personalise drug choice along the course of COVID-19 and could be even useful to develop new COVID-19 drugs.

Automated segmentation and quantification of infection from chest CT regions give rise to quantitative scores (Belfiore 2020), such as a "corona score," which may provide new radiomic biomarkers with potential clinical utility to assess progression

over time in hospitalised patients.

Despite the high hopes placed on artificial intelligence, there is not still evidence for clinical utility of AI models for COVID-19 imaging. The Royal Australian and New Zealand College of Radiologists (RANZCR) has released a [position](#) statement urging caution with this unproven technology: “Given that CT is not always recommended for diagnosis of COVID-19, an untested and unvalidated radiology AI diagnostic assistance system is of questionable value.”

### COVID-19: Imaging of a Multisystemic Disease

COVID-19 is not a purely pulmonary process, but a multisystemic disease, probably through a prothrombotic mechanism. A variety of extrapulmonary manifestations have been reported, including in the gastrointestinal tract, brain, heart, kidneys or muscles. Imaging addresses the array of potential complications during COVID-19 recovery. The work-out of most of these pathologies need imaging, including abdominal CT, ultrasound (US) MRI and PET-CT (Manna 2020).

Abdominal pain is an atypical and nonspecific presenting symptom of COVID-19. Emergency radiologists need to be aware patients may present with abdominal complaints and look at the lung bases for findings of COVID-19 (Siegel 2020). Bowel abnormalities and cholestasis are common on abdominal imaging of inpatients with COVID-19 (Bhayana 2020)

COVID-19 has been reported in association with a variety of brain imaging findings such as ischaemic infarct, diffuse leukoencephalopathy and microhaemorrhages (Radmanesh 2020).

Recently, the pathophysiological substrate of two of the typical clinical symptoms associated with COVID-19, has been described thanks to MRI: myalgia, revealed as myositis signs at musculoskeletal MRI (Beydon 2020), and anosmia, seen as a MRI signal alteration at the posterior gyrus rectus at a brain MRI study (Politi 2020).

Ultrasound (US) plays an important role in the pandemic, especially at the ICU, where patients sometimes need abdominal US studies due to liver function changes. Upper and lower extremity vascular US is useful in patients with suspected deep vein thrombosis (DVT).

Point-of-care (POC) hand-held US devices are increasingly being used due to its low cost and high availability. POC chest US can have a role, but it is a very operator dependent for lung disease. It has been proposed to use it in emergency settings as a COVID-19 screening technique at the peak of the pandemic. POC echocardiography might have utility in haemodynamically unstable patients.

Imaging, including coronary CT, is crucial in the diagnosis and follow-up of COVID-19-associated Kawasaki-like disease in children and adolescents (Verdoni 2020).

Virtual autopsies can help reveal at least part of the mysteries surrounding

COVID-19. Post-mortem CT (PMCT) high incidence of thromboembolic events supports an important role of SARS-Cov-2-induced coagulopathy (Wichmann 2020).

### COVID-19 Radiology Educational Issues

Every cloud has a silver lining, and never before has there been so much interdisciplinary collaboration. Never had knowledge been shared in such a rapid way, with great international collaboration, initiated in China. Most medical journals shared their articles on COVID-19 in open access. Webinars also proliferated in hospitals and medical societies. Imaging databases to share COVID -19 cases have been created as teaching repositories, such as that of the British Society of Thoracic Imaging ([BSTI](#)). Free online courses have been created about COVID-19 imaging, such as [that](#) of Institut de Diagnòstic per la Imatge in Spain.

The radiology societies are offering free access to services related with COVID-19 imaging such as the European Society of Radiology [ESR](#), the [ACR](#), the Sociedad Española de Radiología [SERAM](#), Canadian Association of Radiologists [CAR](#) or the American Roentgen Ray Society ([ARRS](#)), for example.

The cancellation of radiology congresses is another educational and academic consequence of the pandemic. The 2020 edition of the European Congress of Radiology (ECR) in Vienna, was one of the first European medical congresses postponed due to safety concerns regarding COVID-19. Many congresses such as ECR 2020 or the RSNA 2020 are going to be virtual, online-only, and others have been rescheduled to 2021.

Radiology residents' training is among the many challenges that radiology faces during this pandemic due to the requirements of social distance with staff radiologists. Simulated daily worklists and teaching files can be useful in diagnostic radiology. Conferences can be done remotely.

### The Radiology “New Normality”

There are many unknown-known and maybe even more unknown-unknown about COVID-19. The prospect of new waves of the pandemic as long as the fact there is no proper vaccine means that our way of working will change, we do not know for how long, perhaps forever. One can speak of a COVID-19 age in Radiology.

During the peak of the pandemic, the organisation of the radiology departments changed, prioritising the patients with COVID-19, and deferring the follow-up of all non-urgent pathologies, including the oncological, in order to avoid SARS-cov-2 infection of those patients, who must be now our priority (Mazzone 2020).

On the other hand, the significant decrease of outpatient imaging volumes during the peak had significant economic consequences in private practices.

We are now trying to come back to “the new normality” but due to the measures

established to contain the pandemic, such as the need to maintain a social distance or the need for extreme hygiene and disinfection, it is necessary to space the imaging consultations to allow fewer people in the waiting room and for cleaning-up. This implies an increase of the waiting lists and further economic costs for the private radiology centres. At the same time, we must be prepared for a second or even successive waves of COVID-19, the magnitude of which is unknown.

Hospitals must improve patient flow. The COVID-19 patients independent hospital circuit is only theoretical, as the theoretical “COVID-free” areas, due to the high percentage of asymptomatic among the infected people and the false negatives of diagnostic techniques. Organising the movement of patients in the hospital faces architectonic problems, especially in smaller and older hospitals. As swab screening, performed as an out-of-hospital operation, radiology equipment at the entrance or outside of the hospital, or in isolated places must be preferred. At the pandemic peak, in some hospitals, mobile CT units were installed outside hospitals, reports being made by radiologists using teleradiology.

The main radiology societies such as the ACR (Davenport 2020) or the [RSNA](#) have established recommendations on how to return to the new radiological normality. Among the many ideas of the RSNA post to protect staff, performing the CXR through the window of COVID-19 patients’ room is suggested.

In Spain, the Seram published a [guide](#) for radiology appointments during the COVID-19 pandemic, an attempt to prioritise the citation of the most serious cases. Hypothetically, this pandemic may be a starting point to end the overuse of imaging techniques.

## Conclusion

Radiology organisations, at the centre of much of the COVID-19 patient’s process, face multiple challenges. In the age of coronavirus, radiology needs to evolve, looking for new approaches to ensure safe patient imaging while keeping innovation as well as the teaching of the new generations of radiologists. COVID-19 infection prevention of healthcare workers and patients must be a priority. Waiting for a potential new infection wave, we must act adjusting to the local epidemic statistics. Availability of personal protective equipment (PPE) must be guaranteed.

In a disease surrounded by unknowns, COVID-19 patients imaging is shedding a light on the course of their illness. In this changing landscape of uncertainty, it is critical to strengthen teams of prepared and cohesive people, who can face COVID-19 risks with knowledge, technical resources, and adequate protection. ■

### Author: María Jesús Díaz Candamio

Servicio de Radiología | Hospital Universitario A Coruña, A Coruña, Spain

[maria.jesus.diaz.candamio@sergas.es](mailto:maria.jesus.diaz.candamio@sergas.es) | [@Vilavaite](#)

## Key Points

- Initially considered a purely pulmonary process, COVID-19 is a systemic disease that requires a comprehensive imaging approach, with involvement of all techniques and the study of all anatomical areas.
- There are discrepancies regarding the role of CT in diagnosis and screening of COVID-19.
- Radiology teams are in continuous adaptation to local COVID-19 epidemiological changes. COVID-19 infection prevention of healthcare workers and patients must be a priority.
- Many of the changes brought about by the COVID-19 crisis such as portable machines, equipment disinfection, teleradiology, and virtual conferences, for example, are here to stay.
- In this changing landscape of uncertainty, the most important thing is to strengthen teams of prepared and cohesive people, who can face COVID-19 risks with knowledge, technical resources, and adequate protection.

## REFERENCES

- Bhayana R, Som A, Li M [2020] Abdominal Imaging Findings in COVID-19: Preliminary Observations Radiology. In Press. Available from [doi.org/10.1148/radiol.2020201908](https://doi.org/10.1148/radiol.2020201908)
- Belfiore MP, Urraro F, Grassi R et al. [2020] Artificial intelligence to codify lung CT in COVID-19 patients. Radiol Med, 125(5):500-504. [doi:10.1007/s11547-020-01195-x](https://doi.org/10.1007/s11547-020-01195-x)
- Bernheim A, Mei X, Huang M et al. [2020] Chest CT Findings in Coronavirus Disease-19 (COVID-19): Relationship to Duration of Infection. Radiology, 295(3):200463. Available from [doi:10.1148/radiol.2020200463](https://doi.org/10.1148/radiol.2020200463)
- Beydon M, Chevalier K, Al Tabaa O et al. [2020] Myositis as a manifestation of SARS-CoV-2 [published online ahead of print, 2020 Apr 23]. Ann Rheum Dis. Available from [doi:10.1136/annrheumdis-2020-217573](https://doi.org/10.1136/annrheumdis-2020-217573)
- Dangis A, Gieraerts C, De Bruecker Y et al. [2020] Accuracy and reproducibility of low-dose submillisievert chest CT for the diagnosis of COVID-19. Radiology. Available from [doi.org/10.1148/rnct.2020200196](https://doi.org/10.1148/rnct.2020200196)
- Davenport MS, Bruno MA, Iyer RS et al. [2020] ACR Statement on Safe Resumption of Routine Radiology Care During the Coronavirus Disease 2019 (COVID-19) Pandemic [published online ahead of print, 2020 May 6]. J Am Coll Radiol, S1546-1440(20)30510-X. Available from [doi:10.1016/j.jacr.2020.05.001ACR](https://doi.org/10.1016/j.jacr.2020.05.001ACR)
- Fang Y, Zhang H, Xie J et al. [2020] Sensitivity of Chest CT for COVID-19: Comparison to RT-PCR Radiology. Available from [doi.org/10.1148/radiol.2020200432](https://doi.org/10.1148/radiol.2020200432)

For full references, please email [edito@healthmanagement.org](mailto:edito@healthmanagement.org) or visit <https://ij.hm/13/9>

# REVOLUTIONIZING HEMODYNAMIC MONITORING



## ONE SENSOR - FULL HEMODYNAMICS

- > NONINVASIVE & CONTINUOUS
- > EASY-TO-USE TOOL FOR ENHANCED SURGICAL RECOVERY
- > COST-EFFICIENT WITH REUSABLE SENSORS

# Healthcare Cybersecurity in the Time of COVID-19

The European Union Agency for Cybersecurity (ENISA) has just published a cybersecurity guide for hospitals. The body's director, Juhan Lepassaar, explains how the COVID-19 pandemic has made the need for effective cyber hygiene even more urgent.

## What has prompted ENISA to release the Cybersecurity Procurement Guide for Hospitals?

The EU Agency for Cybersecurity (ENISA) is working closely with the cybersecurity community across the EU. The activities in healthcare security started in 2014 and one year later the Agency created the eHealth Security Experts Group, a group comprised of representatives from EU healthcare organisations, medical device manufacturers, as well as national healthcare authorities. Following feedback collected from this group but also from the wider healthcare community, it emerged that cybersecurity guidelines for procurement supporting IT professionals in hospitals would be valuable.

## What has ENISA identified as the most serious blocks to effective cybersecurity in hospitals across Europe?

There are a number of aspects that are specific to the healthcare sector that can result in impediments to building strong cybersecurity. The situation in the healthcare sector regarding cybersecurity can be summarised as follows:

- Low maturity on cybersecurity in the healthcare sector is evident, as hospitals do not have a Chief Information Security Officer, there are a lack of security policies and of access control mechanisms.
- Hospitals are easy targets for malicious attackers due to the many different ways such attackers can gain access to a system. There are many cases of ransomware attacks in hospitals across the EU.
- Lack of security awareness amongst the involved stakeholders and use of walk-around (ie physicians, administrative personnel, patients can all use their personal devices to connect to the hospital network without following any specific strategy).
- The life span of medical devices in use such as CAT scanners or MRI machines can be outdated (longer than what the manufacturer had foreseen) and the patch management process is usually performed by a third party.
- The vulnerable nature of medical devices. For example manufacturers build them

so as to support remote patching and updating of firmware, which creates identifiable loopholes.

The priority is building capabilities and increasing the awareness in the field, and this is exactly what the ENISA has been doing in collaboration with the sector.

## The COVID-19 crisis has highlighted how important HIT is. There has been an increase in telehealth and telemedicine deployment for example. With this in mind, how critical is it that healthcare needs to take note of proper, permanent cybersecurity measures?

The current situation has increased various teleactivities. Teleworking, teleconferencing, telegovernance and e-shopping are some of the activities that are becoming new habits globally. The agency has already created guidelines for a number of these activities, but similarly, healthcare has also become more digitalised. Requirements for telemedicine and remote care are now of paramount importance to society. Indeed until recently, cybersecurity was overlooked as these services didn't score high in the essential healthcare services catalogue. The COVID-19 pandemic proved this to be wrong. ENISA in 2020, will shift its focus to this topic: how can cybersecurity be ensured when telemedicine is practiced? What are the security and data protection measures vendors and providers (ie cloud services providers) should take to meet heavy demand from society while ensuring cybersecurity of the services?

## There have been reports that cyber hackers have been taking advantage of the COVID-19 crisis to target healthcare organisations under more strain than usual. What advice does ENISA have for hospitals and healthcare organisations to mitigate this?

Based on information, ENISA has noted a daily increase of ransomware and phishing attacks, all a result of hackers taking advantage of the COVID-19 pandemic. The attacks are widespread and do not only target healthcare organisations but society overall. In these challenging times, hospitals are more vulnerable than ever. ENISA,



along with European Institutions, strives to support cybersecurity in the essential systems in hospitals and of healthcare organisations. Some recommendations targeting healthcare IT professionals can be summarised as follows:

- First of all, raise awareness internally in healthcare organisations and hospitals by launching campaigns even during the time of crisis (ie hospital staff not to open suspicious emails). Campaigns can be targeted or address the wider public.
- Business continuity plans should be established to be put in place whenever the failure of a system may disrupt the hospital's core services and the role of the supplier in such cases must be well-defined.
- Collaborate with vendors on incident response concerning medical devices or clinical information systems.
- It is important to isolate all network connected devices from the rest of the network by implementing network segmentation. With network segmentation network traffic can be isolated and/or filtered to limit and/or prevent access between network zones.

In case of an incident (ransomware/malware), freeze any activity in your systems, directly inform all staff and get in touch with the national cybersecurity authority. They

one person and could, in both cases protect the systems from a potential ransomware attack. There is no "one-size-fits-all" solution in the case of healthcare organisations. However, in our report all good practices are measures that have already been implemented in some healthcare organisations with great success indicating a good preparedness level.

### Since ENISA started operations in 2015, what changes has it seen in the approach to cybersecurity in healthcare?

Since we launched our activities in the sector we have noticed a shift in the approach healthcare organisations are taking towards cybersecurity. This shift was followed by policy initiatives like the Network and Information Security Directive and the General Directive Protection Regulation, but also by several private sector voluntary activities, ie the eHealth Network cybersecurity group; the cybersecurity task force created under the Medical Device Regulation to support corresponding requirements. Several awareness-raising activities have also taken place at the national level, for example SPMS, the Health Ministry's central purchasing and IT authority in Portugal, and on the European level, there is the Joint Action Plan for the eHealth Network activities.

## ENISA has noted a daily increase of ransomware and phishing attacks, all a result of hackers taking advantage of the COVID-19 pandemic

have all the resources and knowledge to support essential operators.

### Where cybersecurity measures are put in place, what has ENISA identified as the most significant failures to effective cybersecurity implementation in hospitals across Europe?

In hospitals, cybersecurity is undeniably not a priority; as in all other cases human error is the most common risk in this sector, based on ENISA reports and feedback from hospital CISOs. Hospital staff who are not appropriately trained, a lack of resources (budget and human) for the IT department and a preference for workarounds are some of the common burdens IT professionals need to overcome.

At the same time, limited flexibility from the medical device manufacturers a lack of contractual obligations related to cybersecurity make the situation even more difficult to handle. The Agency's activities supporting the sector, look into improving the cybersecurity position of all different stakeholders involved in the vast health ecosystem.

### Can ENISA provide examples of hospitals that are implementing good cybersecurity practices?

Several large and small hospitals have been implementing good practices that suit their ecosystem, depending on the resources and the priorities they have. We have seen cases where the IT team is comprised of 30 people and cases where there is only

### Do you have anything to add for healthcare cybersecurity in light of the COVID-19 crisis?

Amidst the global COVID-19 crisis, the importance of information sharing has become essential; through sharing experiences on cybersecurity issues, in the form of early warnings or even recommendations and good practices, the healthcare organisations ensure resilience and continuity of their vital services.

Across EU Member States, cybersecurity experts are creating task forces to offer their services for free to all hospitals and healthcare organisations that are battling with the pandemic. Reaching out to the national cybersecurity authority or to ENISA will make you part of this larger network for information exchange. All of Europe is in this together. ■

To access the full Cybersecurity Procurement Guide for Hospitals report: [enisa.europa.eu/publications/good-practices-for-the-security-of-healthcare-services](https://enisa.europa.eu/publications/good-practices-for-the-security-of-healthcare-services)

#### Interviewee: Juhan Lepassaar

Executive Director | European Union Agency for Cybersecurity

info@enisa.europa.eu | [enisa.europa.eu](https://enisa.europa.eu) | [@enisa\\_eu](https://twitter.com/enisa_eu)

# U.S. Radiology Responds to the Pandemic and Looks Ahead

U.S. radiologists have been significantly negatively impacted by the pandemic but valuable lessons have been learned.

As the United States prepared to face an onslaught of COVID-19 cases that could swamp healthcare facilities and decimate the workforce, it became clear that the American College of Radiology needed to use its power as “the Voice of Radiology” to inform the response of the imaging community. Around the country, radiologists sought guidance on how imaging should be used appropriately and what imaging should be performed at all. ACR leadership relied on our evidence based Appropriate Use Criteria (ACR 2020), and our commitment to doing “all the imaging that is beneficial and necessary and none that is not” to state clearly that CT was not an appropriate screening method for COVID-19 and that non-essential imaging should be deferred. Although many health systems rapidly shut down routine imaging, others were slower to do so fearing the negative impact on revenue and it took the

they need to recuse themselves from deployment for personal reasons. At the same time, we celebrated their heroism (ACR Answering the Call 2020).

The States of Emergency declared by the Federal Government and many States permitted relaxation of many regulatory requirements. Those directly applicable to radiologists included welcome waivers of burdensome pre-authorisation requirements. Advanced Practice Providers (APPs) were permitted to practice without the supervision of a physician during the pandemic. While critically important in ensuring adequate staffing in a crisis this expansion of APP scope of privileges, something that community has long lobbied for, will be threatening to radiologists in the longer term.

Across the US many radiologists were furloughed and many who have their own

## The ACR is seeking to learn from the pandemic by establishing a registry of imaging and clinical data

influence of a national professional organisation to convince them. Many departments stood up remote working on a scale and at a speed they might not have thought possible and the ACR provided guidance to inform safe and secure interpretations from home (ACR COVID-19 Clinical Resources 2020).

The ACR used its voice to advocate for safe working conditions and adequate Personal Protective Equipment (PPE) for technologists who, unlike many of their radiologist colleagues, were unable to work remotely through the pandemic. We also spoke up for trainees, many of whom were redeployed to the “front line” in Intensive Care Units. We sought to ensure their access to sometimes scarce PPE as well as to recognise their potential lack of agency and alternative employment should

practices were forced to lay off their own valued staff as they operated at a fraction of their normal volume. Looking ahead, social distancing and cleaning requirements will make a return to prior volumes impractical for many and the financial future for some practices is uncertain at best. This will obviously have a knock-on effect on the job market for graduating trainees compounded by an anticipated recession and stock market volatility that will cause some senior radiologists to defer retirement. The ACR has worked to advocate for radiologists as Congress has legislated a number of financial relief packages, the details of which are beyond the scope of this article. Continued advocacy is needed as an approximately 10% previously planned cut in imaging reimbursement will take effect in 2021.

Meeting after meeting was postponed, cancelled or transitioned to a virtual format culminating with the “big one” when the largest scientific and industry conference, the annual meeting of the Radiology Society of North America decided to go all virtual. Interviews for fellowships, resident graduations and visiting professorships have been relegated to Zoom and those of us who’ve still performed clinical assignments in person only touch our patients when absolutely necessary. Working from home has become the norm and managing a career as a physician as well as a new role as a home school teacher is a challenging reality for many radiologists who are parents. Troubling data show that while both parents may be juggling that female radiologists’ academic productivity may be suffering disproportionately (Viglione 2020).

Tragically we saw the results of our fragmented and inequitable healthcare delivery system in the disproportionate toll on communities of colour. New York City, where I practice, is a vibrant metropolis that welcomes the world and celebrates its diversity. But the tough realities of living here: the low wage jobs that can’t be executed remotely, the cramped living conditions and poor access to healthcare and social services all compounded to exact a heavy price on the most vulnerable.

### **The challenges notwithstanding, what valuable lessons have we learned and how will our profession move forward?**

Across the US and the world we have collaborated rapidly and generously to understand the role of imaging in the diagnosis and management of COVID-19. Using webinars we have told our stories and learned from each other. Working collaboratively with other US Radiology Societies and Federal Research agencies, the ACR is seeking to learn from the pandemic by establishing a registry of imaging and clinical data.

Traditional hierarchies are losing their grip. I’ve often spoken about the need for established health care organisations to take a “New Power” (Heimans and Timms 2014) approach to including the voices of our younger members and now, having watched in awe as our trainees put their lives on the line and smash the trope of the “invisible radiologist” their voices must be a greater part of the discussion as we make policies going forward.

Recognising that the fee for service payment system failed to provide stability for practices during the crisis we will hopefully redouble our efforts to find reimbursement models that recognise the value of imaging and drive better and more equitable outcomes.

While virtual meetings inevitably lose the informal networking aspect, virtual meetings may, counterintuitively, permit greater participation. The use of more standard criteria for membership of committees and speaker invitations rather than the “who

you know” that may have excluded women and those from underrepresented minorities in medicine. Virtual visiting professorships are opening up speaking opportunities for more junior faculty without the need to travel which will aid in those faculty seeking academic promotion.

The word “unprecedented” has become a cliché when describing this time in our history and yet for most of us it describes the past few months accurately. Our lives will forever be informed by this time and divided into pre and post pandemic chapters. My hope is that we make the next chapter of our profession more inclusive, more collaborative and more focused than ever on improving the health of our population. ■

### **Author: Prof. Geraldine McGinty**

Departments of Radiology and Population Science | Weill Cornell Medicine | New York, NY  
[Gbm9002@med.cornell.edu](mailto:Gbm9002@med.cornell.edu) | [@DrGMcGinty](https://twitter.com/DrGMcGinty)

### Key Points

- National radiology leadership was key to influencing appropriate imaging and personnel safety during the pandemic.
- Radiologists face an uncertain financial future in the US.
- The pandemic has exposed inequities in the US healthcare system.
- Radiologists are learning to interact virtually which may in fact promote diversity.

### REFERENCES

- ACR Appropriateness Criteria (2020) American College of Radiology. Available from [acr.org/Clinical-Resources/ACR-Appropriateness-Criteria](https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria)
- ACR COVID-19 Clinical Resources for Radiologists (2020) American College of Radiology. Available from [acr.org/Clinical-Resources/COVID-19-Radiology-Resources](https://www.acr.org/Clinical-Resources/COVID-19-Radiology-Resources)
- Answering the Call. (2020) American College of Radiology. Available from [acr.org/Practice-Management-Quality-Informatics/Imaging-3/Case-Studies/Quality-and-Safety/Answering-the-Call](https://www.acr.org/Practice-Management-Quality-Informatics/Imaging-3/Case-Studies/Quality-and-Safety/Answering-the-Call)
- Heimans J, Timms H (2014) Understanding New Power. Harvard Business Review. Available from [hbr.org/2014/12/understanding-new-power](https://hbr.org/2014/12/understanding-new-power)
- Viglione G (2020). Are women publishing less during the pandemic? Here’s what the data say. Nature. Available from [nature.com/articles/d41586-020-01294-9](https://www.nature.com/articles/d41586-020-01294-9)

# Healthcare Has No Excuse for Another Pandemic Like COVID-19

A global health consultant and top TED Talk presenter comments on how healthcare around the world has responded to COVID-19 and suggests practical steps for avoiding a future pandemic of the same scale.

## **As a global health expert, what do you think some of the best measures against the spread of COVID-19 have been around the world? Which have been lacking?**

What the data has been showing us is that the travel restrictions and quarantine worked. What has been lacking is timeliness and making the decisions faster. Europe and the U.S. got those measures in too late.

I think Germany's high testing rate is an example of a measure that has been very effective because the more you test the more data you have on how the outbreak is moving and the better able you are to allocate resources and make decisions. I would also single out New Zealand and the extraordinary speed they put their travel restrictions into place.

## **What is the most discouraging thing you think this crisis has revealed about the machinery of healthcare systems? The most encouraging?**

It's an interesting question because it reveals the degree to which a severe shock can make a healthcare system stronger or weaker. If you look at the East Asian healthcare systems, they faced SARS 17 years ago and learnt from that. They recognised that they were unprepared for such a highly infectious virus and they put systems in place so that when COVID-19 showed up they were ready and they responded.

The flip side is we had H1N1 and we got lucky with this because it just wasn't that dangerous in the end. It spread tremendously but it didn't have a particularly high mortality rate so we were able to feel we dodged a disaster there. There was an opportunity for the U.S. and Europe to learn from that and recognise they needed to build up their systems. To some degree, the U.S. did but then they let it go to waste. So, for me, the most discouraging thing is how quickly you can lose your readiness and capacity.

## **Some have argued that, in terms of numbers, the figures on COVID-19**

## **contagions and deaths are low compared to the annual figures for illnesses like seasonal flu. Has there been media hype over this virus spread or is the focus justified?**

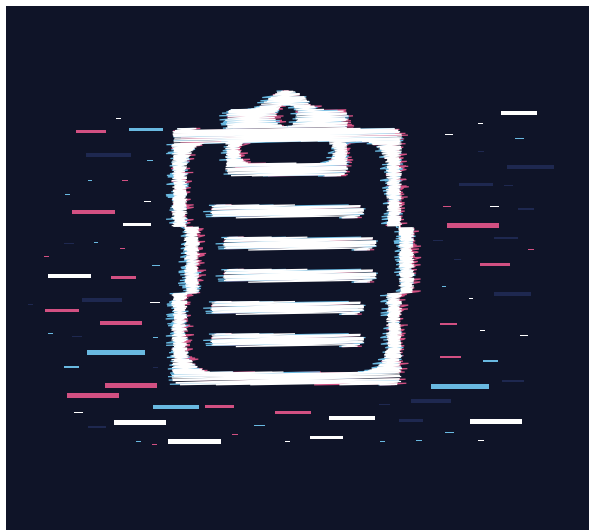
I think this is an issue people focus on because they don't want to face the truth. In the OECD, hospital occupancy rates run from about 60% to 90% capacity. That means when they face a seasonal outbreak like influenza they have enough hospital beds for patients with the infection. But when you have an outbreak like COVID-19 you have vastly more people than the system can absorb and you rapidly run out of the hospital beds that you need. People are dying who wouldn't be dying if decent care was available and then you start running out of supplies and you get healthcare staff getting sick who wouldn't get sick if equipment was available. Part of the problem is the total number of patients but part is about the speed at which that number hits you. When we talk about flattening the curve, influenza is the flat curve. People get influenza over a period which means they never overwhelm the hospitals. Anyone who has watched the news coming out of Spain, Italy or New York City knows that's not what's been happening with COVID-19.

## **Has the move towards lean management contributed to the above shortages?**

Outpatient care is cheaper: it is about having a leaner, more efficient system and conducting minor surgery without paying to keep patients overnight.

But a lean system is a system without reserves or surge capacity. The kinds of expensive inefficiencies like extra beds are also a capacity for resilience. In effect, we have prioritised efficiency over resilience. What we did not prioritise was resilience or surge capacity.

However, I don't think budgeting has to take an either/or approach. I think you can build in more resilience without losing efficiency. You can run pop-up treatment



centres by adding temporary capacity when you need it.

I'd also like to add that, at the end of the day, I think this is a situation about equity. In the U.S. for example, you can see it's people already marginalised who are dying from COVID-19. I think it is a real wake up call about how we treat every member of society and not just the rich.

**What is the most disappointing point you think this crisis has revealed about international health bodies like WHO?**

In my view, most international health bodies bungled the messaging around COVID-19 and in particular around staying home and not getting the disease. I think a lot of people in their 20s and 30s were left with the false impression that it was no big deal if they got this disease and the appeal to social solidarity to stay home to protect the elderly didn't click. They should have focused on the fact that even if it doesn't kill you COVID-19 is a deeply unpleasant infection to have. Having this disease is a horrible experience and even if you have the mild version, all this means is that you weren't hospitalised. If they had focused on this rather than social solidarity they might have got social isolation faster.

I also think the phrase social distancing was a poor choice as it doesn't have any emotional resonance and isn't immediately understandable.

**There has been a lack of coordination and standardisation across, not only the world but different regions in combatting COVID-19. Are you surprised at the lack of unity in Europe, for example, or do you think the staggered response has been inevitable given the involvement of different health systems?**

Based on the low level of coordination before the pandemic, I was not surprised by the lack of unity. There is this idealistic view that we'll all pull together in the face of a crisis but what usually happens is that when systems are under stress we get worse at cooperating on that international level.

I'm sure we could see more multi and bilateral cooperation across healthcare systems once this crisis passes. This situation has pointed to the need of that and it probably will happen.

**What is your advice to governments to ensure that a pandemic like COVID-19 can be avoided or at least mitigated in the future?**

First you have to think beyond your own national borders. You have to pay attention to what is happening in other countries and when you see a virus outbreak in another country, you have to assume it will come home to your borders rather than assuming it will stay somewhere else.

When it comes to mitigation, you can train your healthcare providers on personal protective equipment (PPE), infection control and how to treat whatever infection is coming. You can learn from the countries that already have it. You can ensure your supplies are in place such as PPE. What is your hospital capacity and how can you rapidly increase it if you need to?

In the area of avoidance, it is necessary to make sure every country in the world is able to recognise an emerging infection when it occurs so that it doesn't go global. Every country has some kind of healthcare system and is capable of scaling it up with the right help. They're capable of doing the basics of epidemiology; the simplest epidemiology is very old school. You can do the math by hand if you have to and you can certainly do it in an excel file. A healthcare system is also capable of implementing contact tracing after diagnosis of a patient through literally going and finding everyone they have talked to and testing them. Everybody can do that if they have some support and some funding.

**If you could tell health authorities what to do right now to continue dealing with this crisis, what advice would you give them?**

It is important to have a plan to transition out of self-isolation. You need infection level benchmarks where particular action can take place, for example, when new infections are under a certain level, people can go out again.

**What would you like to see happen once this crisis has passed?**

There should be a reckoning on a national level. Every citizen should think seriously about how their leaders handled this crisis and make the correct judicial and electoral decisions based on this. This isn't something people should forget. ■

**Interviewee: Alanna Shaikh**

Principal Consultant, Tomorrow Global | Washington DC, USA  
[alanna.shaikh@gmail.com](mailto:alanna.shaikh@gmail.com) | [tomorrowglobal.com](http://tomorrowglobal.com) | [@alanna\\_shaikh](https://twitter.com/alanna_shaikh)

# COVID-19 in Private Practice: How to Cope With It?

A radiologist in France's private healthcare sector describes the experience of his clinic and comments on limitations of the system revealed when COVID-19 hit hard.

Our imaging centre is located in Sarcelles-Lochères, a suburban area 15 km North of Paris. We are a 250-bed private clinic with an active emergency department, an oncology centre and many outpatient facilities including a comprehensive imaging department, from Breast Imaging to Interventional Radiology in addition to a large Nuclear Medicine Centre (PET CT and NM).

Our current activity is mainly cancer in all fields, neurology and MSK serving a large area, local and nonlocal, in "la Région Ile de France."

The centre encountered COVID-19/SARS Cov 2 quite early because the first French cluster was identified in nearby Creil. We received patients in early March. Also, one of our medical assistants was struck and needed a, happily, short stay, in ICU.

In the meantime, multiple cases were declared in some parts of the country and multiple French administrations tried to find out how to cope with the epidemic while politicians were discussing the matter under different influences and not without controversy.

One cannot assess our situation without considering our organisation as kind of a general hospital-based practice comprising hospital departments and the Oncology clinic as well as outpatients multi-purpose facilities (Paediatrics, Gyn/Obs, Renal dialysis, etc).

At first, we got orders to freeze all activities and close our departments, except the vital ones, and to postpone all non-urgent procedures and screenings. But, soon the nearby general hospital, a 950-bed hospital, was inundated and our clinic was asked to receive COVID patients in ICU and/or for hospitalisation and all physicians were asked to take on the night shift.

At the same time, the flow of patients soon became tsunami-like.

## Action Plan

We had to simultaneously address diverse acute problems as well as future problems. These were:

**1. Multiple administrative orders:** It is well known that France is a highly administrated country and there is, at present, a large debate about its multiple, parallel, layers.

We received floods of emails from various sources, eventually contradictory if not very imprecise. The Île de France Regional Agency (ARSIF) did the job and one has to consider that it is overseeing a very large region (13 million inhabitants) with multiple hospitals of all types, public and private. In some other regions, the traditional rivalry and, in some cases, discrimination between public and private hospitals contaminated the background situation. However, it should be mentioned that ARSIF is not willing to pay, at present, for the night shifts in private hospitals reflecting the administration's position.

**2. Lack of personal protection equipment (PPE):** Lack of PPE soon appeared leading to unnecessary contamination between people and healthcare workers and to a highly criticised decision to restrict access initially to some identified professionals, excluding at first, town practitioners, GPs and specialists. Pharmacists were unable to deliver any masks either to the population or the practitioners.

Once more, the resourcefulness "Système D" made miracles into a complete nightmare while prices rose at once. At present, resources are a little more stable but still precarious and lots allotted to town physicians are not sufficient.

**3. Knowledge about the disease:** Another flood took place, beneficial this time. We got early information and description through international publications, mainly from Chinese authors, and soon, the French Society of Radiology, and the French Thoracic Imaging Society, published some cases, with commentaries, and some recommendations. Many companies participated in knowledge information through webinars and software promotion, ie, structured report and/or Artificial Intelligence. Regular updates were made available through various networks, including the French network of private radiology clinics, VIDI, about unusual abdominal or neurological cases, and associated pulmonary emboli variants.

**4. Personnel management:** One of the biggest challenges has been, and still is, medical and nonmedical personnel scheduling (various techs, including cleaning). Even though normal activity has been cut by roughly 85% overnight, we had to cope with multiple situations: confinement, closed schools and working parents, real or opportunistic sick leave, depression and fears. Happily, most of our personnel accepted the challenge, floods of potentially infected patients, new rules, protection and patient handling. All radiologists were present and are still postponing holidays and personal

procedures needing more than a doubling of onsite personnel. Protection procedures, protection handling and cleaning were quickly learnt and integrated, successfully.

To date, only one team leader radiology technician got infected quite severely but is now out of danger. We decided not to test all personnel systematically but only if they displayed clinical symptoms.

We also introduced a self-structured reporting system with database construction thanks to an agreement between the VIDJ group and a French software company. This

## We have learnt many things during this crisis and, above all, the human value of our teams

matters.

**5. Healthcare changes:** We used to take care of multiple types of patients through our different specialties and we had a to switch to nearly a single disease within a few days at very short notice. At the beginning, we were able to manage a dedicated COVID circuit, one of our CTs being allocated to COVID patients and dedicated waiting rooms before dispatching either to the emergency department. We also divided patients into COVID/non-COVID cases, or referred to physicians. We had to deploy medical and nonmedical personnel from other departments to the CT department to handle increasing numbers of patients. At the peak, we had to perform up to 70 to 80 thoracic studies a day, often extended to the abdomen and the pelvis, according to clinical presentation. Patients came from the nearby regional hospital, our own emergency department, GPs and self-referral. Self-referral appeared quite early also as people learnt quite soon that CT was a very important tool in COVID's case handling.

One reason is that our area of catchment is located in a impoverished multi-ethnic suburb with sub-standard housing and where cultural habits may have helped virus dissemination. It proved impossible to filter the cases for various reasons, including a language barrier, and we took the decision to image all patients. It was the right decision as we saw a lot of positive cases with many clinical discrepancies, some of them very severe, even in rather young people.

Every patient was met by the radiologist(s) in charge and informed before discharge or dispatching to the emergency department for case management.

In the meantime, we kept MRI, ultrasound and interventional departments on standby mode for "non CT" emergency cases.

At the same time, non-COVID emergency cases tended to be more severe because of delays, whatever the cause, saturating emergency services.

**6. Specific organisation:** Dedicated pathways were soon mandatory but our main problem was, as anyone would expect, disinfection processes and patient/personal protection. Staff and doctors found out quite quickly the proper and efficient handling

promoted structured reporting software dedicated to COVID-19 according to French Society of Radiology (SFR) recommendations.

**7. Financial problems:** As a private imaging centre, we still have to find solutions to cope with an 85% reduction in turnover for an undefined period.

**8. What is next?** Progressive resumption of activity has been announced and we shall have to face undiagnosed cases, aggravated chronic diseases and co-existence with a persistent virus. This will all need costly and lengthy procedures. It is possible that the second wave is ahead.

### The Future

No doubt, the story is not fully written yet. There will be a before and after questioning many aspects of French society that applauds healthcare professionals every evening but is not really willing to change. As we all know, "what doesn't kill you makes you stronger." We have learnt many things during this crisis, above all, the human value of our teams. ■

### Author: Robert Lavayssi re

Staff Radiologist & CEO of Centre d'Imagerie Paris-Nord | Sarcelles, France Honorary member of the French Society of Radiology and member of the Board  
[robert.lavayssiere@groupe-vidj.fr](mailto:robert.lavayssiere@groupe-vidj.fr) | [sfrnet.org/](http://sfrnet.org/)  
[sfr.fr/](http://sfr.fr/) | [ipn-sarcelles.fr/fr/](http://ipn-sarcelles.fr/fr/) | [@SFRradiologie](https://twitter.com/SFRradiologie)

### Key Points

- France's administrative processes caused frustration in dealing with the COVID-19 crisis.
- Overnight, personnel became unavailable because obligations to childcare, sick leave and mental health concerns had to be addressed.
- Non-COVID cases suffered because of the pressure on virus patients.
- The value of a strong team proved itself during the crisis.

# How COVID-19 Pandemic is Changing Waste Management

The COVID-19 crisis has seen an enormous increase in medical and hazardous waste generation. To protect human health and the environment, it is vital to ensure the safe handling and final disposal of such waste. A UN Environment Programme expert explains the dangers of inadequate medical waste management and outlines the most effective strategies for the future.

## Could you provide a brief overview of different medical waste dangers?

Healthcare waste is all the waste generated by healthcare facilities, medical laboratories and biomedical research facilities, as well as waste from minor or scattered sources. Although hospitals produce the bulk of healthcare waste by volume, they are a small fraction of the total number of sources.

Healthcare waste can be categorised according to the following general classifications:

- Sharps waste
- Pathological waste
- Other infectious waste
- Pharmaceutical waste including cytotoxic waste
- Hazardous chemical waste
- Radioactive waste
- General (non-risk) waste.

Infectious waste is waste that is suspected to contain pathogens (disease-causing bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts.

Improper treatment and disposal of healthcare waste poses serious hazards of secondary disease transmission due to exposures to infectious agents among waste pickers, waste workers, health workers, patients, and the community in general to where waste is improperly disposed. Open burning and incineration without adequate pollution control exposes waste workers and the surrounding community to toxic contaminants in air emissions and ash.

## What would be the most dangerous categories of medical waste and how to manage those?

There is no universal answer to these questions. How dangerous a category of waste is, certainly depends on the nature of the waste, but also very much on local vulnerability. Vulnerability, in turn, depends on exposure, sensitivity and adaptive capacity. The most dangerous waste might not be one that causes immediate, disastrous consequences to a few individuals, but rather one that systemically impacts millions of people, either directly or indirectly through ecosystems.

For example, medical waste contains a lot of plastic, which, if burned, releases known carcinogens into both the atmosphere and the remaining ash. Similarly, chemicals in medical waste, such as mercury (though its medical uses are being rapidly phased out globally thanks in part to the ratification of the Minamata Convention on Mercury), can bioaccumulate in the environment and impact humans through our food supply.

Waste management recommendations, including choice of technologies for destruction or decontamination, are also locally determined. Certain technologies, such as incineration, for example, may be effective when equipment is well maintained and used in the context of strict monitoring and legal oversight, but become a hazard risk if they are poorly maintained, or pushed beyond their design limits.

## Could you share any data about the changes in medical waste management caused by COVID-19?

There is not much quantitative and reliable data yet available. I certainly hope that such data are being kept at the institutional, municipal and national levels as they



will be of enormous value as this pandemic continues, and in better preparing for future pandemics.

The most obvious qualitative change is a massive surge in used personal protective equipment, such as masks, not only in the well-regulated waste streams from medical facilities in developed countries, but in ordinary household waste everywhere on the planet. Much of this equipment is not even properly collected and is right now almost certainly making its way into unmanaged dumpsites and the environment and being burned openly.

### **Should there be compulsory segregation of waste in facilities treating COVID-19 cases?**

In general, between 75% and 90% of the waste produced by healthcare facilities is

the continuity of the services they deliver, with relevant adaptations, during emergencies and disasters. One good source of specific information is the COVID-19 waste management recommendations from the [International Solid Waste Management Association](#).

### **Is involving the manufacturers in medical waste management (eg through mail-back disposal options) a valid idea?**

In the immediate phase of dealing with this pandemic it is unlikely that either an untested new technology or an untested new producer responsibility scheme will be operationalisable. Keep in mind that mail-back is not a disposal option, it is simply a way to shift the responsibility of disposal from users onto manufacturers. The disposal challenge will remain.

## **How dangerous a category of waste is, certainly depends on the nature of the waste, but also very much on local vulnerability**

non-risk (non-infectious, non-hazardous) general waste, comparable to domestic waste. Segregation is therefore an important element in efficient healthcare waste management. By separating hazardous from non-hazardous waste one can dramatically reduce the volume of waste that requires specialised treatment.

Other elements of healthcare waste management include waste classification, minimisation, containerisation, colour coding, labelling, signage, handling, transport, storage, treatment and final disposal. And, of course, to maintain such a system requires continuous training, planning, budgeting, monitoring, evaluation, documentation and record-keeping.

### **What alternative waste management methods could be recommended now for immediate implementation?**

The best way to deal with immediate removal and destruction of COVID-19-related medical waste is to use existing, tried and tested, medical waste management systems. In the event such medical waste management systems are unavailable or overloaded, it is sometimes possible to use, with proper temporary operational adjustments to protect the health of professionals handling waste, existing municipal waste management facilities.

In this context, it is critical to recognise the essential role of waste workers and

Looking beyond only medical waste, the general concept of 'extended producer responsibility' has been used in many countries, for many types of waste, in different ways, with varying levels of success.

### **Will COVID-19 trigger new directions for UNEP?**

Absolutely, it already has. The UNEP COVID-19 Response Building Blocks are still evolving, but they are likely to include the following:

- Block 1: Contribution to the medical and humanitarian emergency phase.
- Block 2: A transformational change for nature and people.
- Block 3: Building back better: greening the fiscal stimulus packages.
- Block 4: Modernising global environmental governance.

UNEP has also contributed to, and will continue to support environmental aspects of, the overall UN framework on a socioeconomic response to COVID-19.

### **Is there any environmental impact of the current crisis medical waste-wise?**

It is too early to know the nature or extent of environmental impacts. Some short-term impacts on the environment could be seen as positive ones – carbon emissions from fossil fuel burning could fall by 2.5 billion tons (about 5%) this year,

which would constitute the largest drop in demand for fossil fuels ever. Air quality has also improved dramatically in many places.

I am sure that longer-term impacts, and the specific impacts of COVID-19-related medical waste on the environment, together with the economies and societies that depend on it, will be the subject of many interesting PhD theses in coming years.

### **What recommendations can you give to countries and healthcare facilities to optimise strategic preparation for future outbreaks?**

My first recommendation is to remind everyone that the current pandemic is ongoing, and may well be for quite a long time. Therefore, in addition to any immediate, urgent measures that may be taken, it will be necessary to continuously adapt, optimise and prepare, not only for future outbreaks, but for the ongoing development of this one.

For medical institutions or governments that do not have adequate medical waste management plans and practices in place, our [UNEP compendium](#) of technologies for medical waste may be useful, if implemented over a timescale of months, to help decide on a path forward. The compendium provides a robust methodology for analysing local healthcare waste generation, composition and disposal needs, and

selecting appropriate technologies as part of a local waste management system.

The process of institutionalisation of a good healthcare waste management system is complex. It entails a waste assessment and evaluation of existing practices, evaluation of waste management options, development of a waste management plan, promulgation of institutional policies and guidelines, establishment of a waste management organisation, allocation of human and financial resources, implementation of plans according to set timelines, as well as a programme of periodic training, monitoring, evaluation and continuous improvement. Countries, cities and institutions that have already done all this and developed an operating waste management system, including disaster contingency planning, are far better able to cope with surges in medical waste associated with disasters, including the ongoing pandemic. ■

 **Author: Keith Alverson**

Director, UNEP International Environmental Technology Centre | Osaka | Japan

[keith.alverson@un.org](mailto:keith.alverson@un.org) | [unenvironment.org/ietc](http://unenvironment.org/ietc)

[@AlversonKeith](https://twitter.com/AlversonKeith) | [IM](https://www.linkedin.com/company/keithalverson) | [@keithalverson](https://www.linkedin.com/company/keithalverson)



HealthManagement.org

**Follow us on LinkedIn**

<https://iii.hm/linkedin>



**HealthManagement.org**

Promoting Management and Leadership

# Delivering Acute Cardiac Care During a Pandemic: Seeds of Opportunity Within a Crisis

In this article, we discuss some of the potential opportunities for positive changes in service provision that may emerge from the COVID-19 public health crisis, with a particular emphasis on changes enacted in our own service.



## Introduction

“The Chinese use two brush strokes to write the word ‘crisis.’ One brush stroke stands for danger; the other for opportunity. In a crisis, be aware of the danger, but recognise the opportunity.”

*John F. Kennedy*

The COVID-19 pandemic represents the defining crisis of our time, heralding unprecedented changes across healthcare systems globally. The resultant large-scale turbulence can provide an impetus for transformational change and allow emergent strategies to form which can result in improvements in healthcare delivery.

The environment we are currently operating in during this pandemic is radically different to our established norm. This has required a shift in our assumptions and a re-orientation of established practice. In this article, we detail some aspects of our practice that have changed positively in response to the COVID-19 restrictions. We then go on to discuss potential opportunities for growth and positive change that may emerge from the current crisis.

## Increased Utilisation of Outpatient Management

Given the projected surge of COVID-19 inpatients, efforts were made within our service to minimise medical admissions where possible. This has led our department to re-evaluate our previous admissions policy and consider whether care can be safely delivered on an outpatient basis. Our experience has been that the majority of patients are happy to go home if their initial investigations are reassuring and they have a defined plan for follow up. In addition, changes in service provision like expedited access to computed tomography coronary angiography has resulted in a quicker turnaround of patients. It is important to remember that patient safety must be paramount to this process and it is crucial that the patient is comfortable with their management plan.

## Establishment of Virtual Clinics

Due to lockdown measures, we have been unable to run our normal outpatient clinic service. Instead, ‘virtual clinics’ have been rapidly implemented, with telephone conversations replacing face to face assessment. This has been embraced by staff in our department and has enabled us to monitor the clinical progress of our patients remotely. If further investigations are required, these can be organised and patients with concerning symptoms can be reviewed in hospital in an ‘urgent review’ slot if necessary. Telemedicine has long been mooted as a potential solution to improving access to healthcare and our initial experience has been largely positive. Our experience has also led us to reflect on the number of patients who receive

annual ‘check up’ appointments in our clinics. Many of these patients have been clinically stable for many years and the value of bringing them in for annual face to face reviews is questionable. Virtual clinics, where long term patients are contacted remotely to screen for concerning symptoms or change in clinical status may be a more efficient way of providing long term cardiac follow up to this cohort. In addition, there may be benefits to this approach for our patients, as they can remain in their own homes and do not need to travel to the hospital and wait for their review. Looking toward the future, it is important that patient feedback is also sought in this regard as some patients may not be comfortable with virtual review and may prefer traditional appointments. In addition, the value of clinical examination and the patient-physician relationship should not be underestimated.

## Improved Communication With Primary Care

As mentioned earlier, we have endeavoured to manage patients as outpatients and avoid emergency department admissions where possible. Another observed feature of the current pandemic is an increase in communication between our service and general practitioners (GPs) in the primary care setting. Where before, patients with cardiac symptoms may have been referred directly to the emergency department, we have noted an increase in GP’s discussing cases over the phone with our service in an effort to avoid an emergency department attendance. In order to respond to this, we have developed a rapid access assessment clinic each morning where up to four patients can be reviewed and receive investigations and clinical assessment as required. This streamlines patient care and fosters development of communication channels between primary and tertiary care. In many cases, these interactions and assessments avoided an unscheduled hospital admission. Improving communication channels with primary care may be an effective strategy to avoid emergency department attendances and improve access for patients and their primary health-care providers to cardiac investigations and specialist assessment.

## Crises as Opportunities for Change

The constraints of the current pandemic have led to a need for creative solutions to continue to deliver high quality care. We feel that the dangers presented by the COVID-19 crisis laid the foundations for rapid change within our service. The force-field analysis model conceptualised by Lewin in 1951 provides a framework for conceptualising this (Lewin 1951). Established customs and practice can provide a powerful impediment to change. Therefore, unless resisting forces are reduced or driving forces increased, a system will remain in a steady state. “Unfreezing” from this status quo during the COVID-19 crisis allowed a service infrastructure to emerge that is radically different to our previous status quo. In our service this

was manifested by the rapid establishment of virtual clinics, a reduction in our reliance on inpatient hospitalised care and enhanced engagement with primary healthcare providers in our community. Together, these developments have allowed us to continue to deliver highly specialised cardiac care in order to meet the needs of our patients.

Many of these adopted processes have involved the streamlining of previously proposed strategies for redesign of services. A strategy can be defined as a deliberate or emergent process which is dictated by real world conditions. Deliberate, planned change can frequently spark resistance within an organisation and stifle efforts to evolve. We feel that the seismic shift in environmental conditions created by the COVID-19 pandemic opened a window of opportunity for these new practices to emerge in our service. When a service is found to be out of sync with its environment, it can be shocked into a cultural revolution. This can side-step much of the resistance that may otherwise be encountered and strategy can thus be formulated rather than formed in response to an evolving situation. Actions that emerge can be legitimised and adopted to allow the organisation to embark on a new direction. This allowed us to take a “quantum leap” with the radical redesign of certain services in a short period of time (Mintzberg 1987).

Story-telling is important throughout any change process and the clear and imminent threat posed by the COVID-19 pandemic created sufficient societal turbulence to cultivate commitment across the hospital to achieving delivery of healthcare within an onerous set of circumstances. This had the effect of creating a highly motivated workforce with greater congruence of employee and organisational goals. We attempted to communicate a clear vision of how this would be achieved which proved highly compelling to win over “hearts and minds” and to foster a sense of empowerment out of the crisis.

The concept that strategy should purely be the domain of a single, all-knowing leader is a fallacy and a noted feature in our institution was that strategy emerged across the grass roots of the hospital. Processes emerged organically within the crisis and those that improved workflow were nurtured. Co-operation and co-production in this regard allowed a sense of collective ownership and organisational pride to develop. We feel that this helped overcome traditional hierarchies within the organisation and created a culture of empowerment, self-direction and commitment (McGregor 1960).

## Conclusions

While COVID-19 presents a significant challenge to healthcare providers worldwide, the discontinuity presents an opportunity for positive change. Strategies can be enacted which not only meet the needs of service delivery within the current

climate but that also align with the long-term vision of the organisation. Nurturing these new processes may offer a promising new direction for service provision for the future. We would urge all healthcare providers to consider the ‘seeds of opportunity’ within this crisis and to reflect on how they can be used to improve patient care. ■

### Author: JJ Coughlan

Department of Cardiology | St James's Hospital | Kilmainham | Dublin, Ireland  
[jjcoughl@gmail.com](mailto:jjcoughl@gmail.com)

### Author: Cormac Mullins

Department of Anaesthesiology | Intensive Care and Pain Medicine  
 St James's Hospital Kilmainham | Dublin, Ireland  
[cormacmullins1@gmail.com](mailto:cormacmullins1@gmail.com) | [@cormac\\_mullins](https://twitter.com/cormac_mullins)

## Key Points

- The COVID-19 crisis has heralded unprecedented change across healthcare systems globally.
- This change can also be viewed as an opportunity to change the way in which healthcare is delivered.
- Our department has instituted several changes due to the coronavirus pandemic.
- Crises can often provide a window of opportunity for new practices to emerge, bypassing institutional resistance to change.
- We invite our colleagues worldwide to look for the seeds of opportunity within the COVID-19 pandemic.

## REFERENCES

- Lewin K (1951). Field theory in social science.
- Mintzberg H (1987) Crafting Strategy: Harvard Business School Press, Boston MA.
- McGregor D (1960) Theory X and theory Y. Organisation theory, 358:374.

# COVID-19 - Present and Future Effect on Radiologist Training?

The effects of COVID-19 have been manifold but one of the areas which has seen destabilising implications is the training of radiologists.

The immediate effects of the coronavirus pandemic have been precipitous and manifold. The longer term consequences promise to be persistent and profound. Its range of disruption is obvious with respect to patient care and the economy in all its manifestations. One of those areas for which destabilising implications have emerged and are likely to be uncomfortably accommodated is the training of radiologists in the United States - its clinical determinants and the means of didactic instruction.

Both the American and various European countries' curricula and regulations differ, the product gained - competent and respected specialists - are similar in

the introduction into the diagnostic armamentarium of CT, MR, ultrasonography and more versatile interventional techniques. By the late 1990s, fellowships - one to two years of sub-specialty training - became not just commonplace but nearly universal. Moreover, the residency term was designated to extend for four years with a certifying written and oral examination administered in the last year. The notion, then current, was that fully-trained radiologists should be multi-competent in all aspects of the specialty even if they had gained further capability later in the area of their fellowship. But the fourth year became in large measure a clinically unproductive period because of "board anxiety." Then, ten

---

**Of the 170 or so radiology residency programmes nationally, 30% are in the profoundly challenged areas within the scope of high COVID intensity**

---

quality and technical currency. But to better understand the threats the pandemic has already realised on this side of the Atlantic, it is important to consider the history of residency and fellowship training here, its assumptions and evolving skein of regulations which are standardised throughout the country.

In the 1960s, the residency term was three years after a one year clinical internship - two years of diagnostic imaging and one year of radiation therapy with two months of nuclear medicine squeezed in. In the 1970s, the two branches split and imaging became a three-year obligation, just in time to accommodate

years ago, the oral exam was shifted to the third year. In the early part of the past decade, radiology residencies became increasingly shunned by American medical students and its future vitality became questionable. However, five years ago, in recognition of the burgeoning importance of interventional radiology, a new pathway was introduced with a detailed prescribed assignment of months and case requirements. That innovation has been extremely successful.

In nearly all hospitals in the northeastern United States and, to a slightly lesser extent, in the urban areas of Detroit, Chicago, New Orleans, Seattle, and Atlanta,

the onslaught of the virus transformed health delivery. Even spare hospital rooms became ICUs, serving only such afflicted patients. Temporary hospitals were set up to serve them and to function as sites for displaced non-COVID patients. Elective surgery was cancelled and has still not been re-introduced to any extent. Outpatient imaging in sites adjacent to acute hospitals were closed. Mammography facilities likewise were shut down and remain so now in early-June. In these COVID rich facilities, interventional procedures had by and large been limited to line placement. At this time, the incidence curve is bending downward slowly in these metropolitan areas, but rising in other places which previously had only been relatively mildly affected.

By my reckoning of the 170 or so radiology residency programmes nationally, 30% are in the profoundly challenged areas within the scope of high COVID intensity. These include many University-associated, prestigious programmes which tend to have a larger training complement than general hospitals that provide specialty training. Hence, nearly 40% of all residents and a similar percentage of similarly trained fellowship positions are within this “envelope.”

What have been the components of imaging education in this new environment? Well, many radiology residents have been assigned to other duties, not radiology-oriented, such as ICU care of COVID patients. A skeletal crew of attending physicians ie instructors, remain in the hospital. All others review from home or have been put on furlough to save money for the hospitals which typically receive much of their income from elective surgery, now in abeyance. There are generally few, if any, regularly scheduled teaching conferences and most of them are by Zoom or other remote interactions. Research has by-and-large been put on hold. In short, for the past three months, education by traditional means has been suspended. Radiologists are mostly not on-site, and trainees for the most part have been reassigned.

It is likely that the first phase of the pandemic will gradually abate and pre-existing didactic means and modes will be restored but undoubtedly not as they were before. The fact that teleradiology has now fully become the means of “film-reading” legitimises for hospital administrators the notion that traditional common teaching areas have lost their necessity and can be appropriately re-assigned. That has already happened at the institution whose radiology department I led for 25 years, until four years ago. Now, the larger imaging interpretation area has been taken away for several reasons including the difficulty of maintaining social distancing. And person-to-person learning with student and teacher sitting together also violates the social distancing paradigm. With three months of nearly no cases it is doubtful that interventional radiology residents and fellows will meet their requisite case load. Can they then present themselves

for employment if they have not met specified case rosters? What will be the accepted minimum of breast radiology cases if there is a closed facility for a further unknown period? Will there be grand rounds, interdepartmental conferences on a regular basis, guest speakers etc? Will the prospect of unexpected or repeat clinical reassignment away from radiology deter prospective applicants?

Moreover, will the vitality of radiology not just as a teaching focus, but also as a distinct specialty be preserved? For example, more and more, orthopaedists are reading their own studies performed with their own equipment without the intercession of a radiologist. Additionally, the spectre of AI looms ever larger independent of the pandemic as a challenge to the maintenance of radiology as it, I should say, used to be.

In sum, at least in the United States, despite the increasing volume and the further capabilities and relevance of our devices and the established skill of its practitioners, our specialty is being thrown for a loop. The medical public, in general, will soon realise it and I believe potential applicants are perceiving its risks as a career choice to be as relevant as its rewards. ■

#### Author: Prof. Stephen R. Baker

Member of the Editorial Board IMAGING

Professor and Former Chair of the Department of Radiology  
Rutgers New Jersey Medical School, USA

#### Key Points

- The immediate effects of the coronavirus pandemic have been precipitous and manifold.
- The American and various European countries' curricula and regulations differ, but competent and respected specialists are similar in quality and technical currency.
- The onslaught of the virus transformed health delivery.
- Many radiology residents have been assigned to other duties, not radiology-oriented, such as ICU care of COVID patients.
- Despite the increasing volume and the further capabilities and relevance of our devices and the established skill of its practitioners, our specialty is being thrown for a loop.

# The Impact of COVID-19 Pandemic on Women's Health and Pregnancy Care

Amid the COVID-19 pandemic women are often deprived of necessary health care. The research on women's health in this context is scarce and might often be compromised, but also widely distributed in the media. The International Academy of Perinatal Medicine, therefore, is adamant to uphold the best scientific standards.

Without a doubt, COVID-19 has already changed the world on the magnitude never seen before. The invisible devil has affected the life of virtually every single human being on the planet. Worldwide, the virus has infected more than 5.6 million people and killed over 350,000 as of May 28. The real numbers of COVID-19 infections are much higher due to the lack of testing capacity and under-reporting. The invisible enemy has locked down entire countries, grounded most of the air traffic, paralysed the industry and affected normal life in every sense. COVID-19 is, although dangerous, a very fair virus choosing not only poor, homeless, or old people with chronic diseases but also prime ministers, crown princes, celebrities and wealthy people. It is omnipresent, ready to ambush anywhere, from the glass palaces of New York to remote villages in the African deserts. One of the most vulnerable groups to cope with the consequences of the COVID-19 pandemic are women, particularly pregnant ones.

## Lessons Learned and Results Reporting

The data about the outcome of pregnancies with COVID-19 infection are scarce, and the results of the current studies are inconsistent and obtained mostly from middle or low-income countries with different healthcare systems, unequal access to pregnancy care and pregnancy surveillance. The knowledge gained from previous human coronavirus outbreaks, namely severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) as well as Ebola virus disease (EVD), suggests that pregnant women and their foetuses may be particularly susceptible to poor outcomes (Sochas et al. 2017). Admission to intensive care is common, and a case fatality rate of up to 35% has been documented.

The prevalence of the COVID-19 infection during pregnancy in the epidemic areas is largely unknown despite of two existing systematic reviews. Data from only 108 pregnancies between December 8, 2019 and April 1, 2020, have been summarised in a recent systematic review (Zaigham and Andersson 2020). Three maternal intensive care unit admissions were recorded, but no maternal deaths. There was one neonatal death and six admissions to an intensive care unit. Although it seems that severe pregnancy and neonatal complications during COVID-19 pandemic are mostly due to the premature birth and caesarean delivery complications (as the predominant delivery mode), the latest systematic review that included a total of 324 pregnant women with COVID-19 reported seven maternal deaths (Juan 2020).

While most of the reported cases focussed specifically on the maternal outcomes and possible vertical transmission, less attention has been paid to foetus as a patient in such pregnancies. For example, the majority of publications are systematically lacking data on antenatal steroid use for the foetal lung maturation and foetal neuroprotection in the imminent premature birth, which are the cornerstones of the antenatal interventions for the improvement of outcomes in premature delivery frequently associated with COVID-19 infection. Also, changes in existing guidelines concerning antenatal interventions caused by COVID-19 pandemic are more rule than exception, with scarce or no evidence-based approach to such adjustments (Stefanovic 2020).

During the EVD outbreak in Liberia, overall monthly reporting from health facilities plunged by 43%, access to antenatal care declined by 50%, and reported deliveries fell by one third. Reported deliveries by skilled attendants and caesarean sections declined by 32% and 60%, respectively. Facility-based deliveries dropped



by 35%, and reported community deliveries fell by 47% (Shannon et al. 2017). The study showed a substantial gap in reported access to antenatal care and deliveries. There was a severe decline in institutional deliveries performed. This was especially evident in C-sections and deliveries by skilled attendants. The monthly reports submitted by health facilities dropped substantially during the outbreak. Additionally, a recent assessment evaluated how the Ebola outbreak in the Democratic Republic of the Congo, which peaked between 2018 and 2019, impacted sexual and reproductive health services there (International Rescue Committee 2020). The assessment made several recommendations on how to maintain these services in the midst of outbreaks, which we can draw from now.

During the Ebola outbreak, barriers, including cost of healthcare and physical inaccessibility of healthcare facilities, delayed or prevented 90% of rural and 59% of urban pregnant women from receiving health care in Sierra Leone, the country with the world's highest estimated maternal mortality. The vast majority of women did seek assistance in labour, but many did not subsequently receive it. This suggests

and wrong answers can cause greater damage than an accurate, but slow one. An additional problem is that every single research is getting huge media attention worldwide, with an increasing number of published preprint results; results of scientific papers, which anyone can publish on prepublication platforms, without any serious scientific or professional review. Scientists will have no trouble distinguishing serious research from that with serious flaws, but journalists will have harder time making that distinction. Thus, it is realistic to expect a whole series of daily reports on various 'scientific research results,' which in a week or two will turn out to be wrong or unfounded. It is a shame that so much time and media space is constantly being wasted on completely unfounded reports and results. But that is one of the fundamental characteristics of this 'infodemic' we are experiencing.

### COVID-19 and Other Women's Health Issues

Pregnancy and labour are usually a time of joy, but can also be associated with increased anxiety as well as increased risk of wellbeing disturbances, both during

---

## Changes in existing guidelines concerning antenatal interventions caused by COVID-19 pandemic are more rule than exception

---

that help was unavailable to a substantial proportion of women, particularly in rural areas (Elston et al. 2020). This decrease in utilisation of life-saving health services translates, in Sierra Leone alone, to 3,600 additional maternal, neonatal and still-birth deaths in the year 2014-2015 under the most conservative scenario (Sochas et al. 2017). Learning from West Africa's large, multicountry EVD outbreak of 2014-2016 tells us that there were significant impacts on sexual and reproductive health systems, particularly in the early stages of that outbreak, largely related to health facility closures (International Rescue Committee 2020).

It should be stated that most of the scientific research on COVID-19 (also, during pregnancy) is currently being conducted in a way that would probably be completely unacceptable to serious science in any other circumstances. The research has been fast-tracked to publication and possibly without proper peer-review process, using small and often insufficiently representative samples. Numerous imperfections in the research design are being overlooked as well as many other details, which are usually taken into account. All these factors resulted in a flood of superficial research, all in a desire to get answers as fast as possible. Unfortunately, rushed

pregnancy and after birth. The consequences of COVID-19 are unfortunately unequally distributed among the countries. Pregnant women in developed countries with well-organised healthcare systems suffer mostly due to the uncertainty regarding the impact of illness on mothers and newborns, and anxiety caused by the social isolation and limited number of birth companions. The struggles of pregnant women in developing countries during COVID-19 pandemic might be more existential in nature. While data are scarce, reports from several countries suggest an increase in domestic violence cases since the COVID-19 outbreak. For example, the number of such cases reported to a police station in Jingzhou, a city in Hubei Province in China, tripled in February 2020 compared to the same period in the previous year (Allen-Ebrahimian 2020). Security, health and money worries create tensions and strains accentuated by the cramped and confined living conditions of the lockdown. More than half of the world's population was under lockdown conditions by early April.

Social isolation due to the lockdown in many countries will affect many women as significant proportion of them will (and already have) become jobless (eg, those

working in services, tourism, or administration). Difficulties in seeking medical care will result in defective postpartum and post-abortion care, the access to emergency contraception will also suffer, and mental health issues will emerge (the majority of physicians and nurses taking care of COVID-19 patients are women). The magnitude of the problem will be estimated in the future.

### Future Perspectives

The impact of the COVID-19 pandemic on women's and reproductive health services needs to be considered from the outset to avoid disruption or loss of confidence in those services. Maternity and public health services should be planned well in advance to minimise delays in accessing and receiving care. When healthcare facilities are feared, they are avoided. It is essential that messages reach the women and help them and their families to seek early advice and make timely decisions. This is particularly important for women in areas of quarantine, in self-isolation, or with reduced transport options. For women who have complications during pregnancy, a late presentation can have serious consequences for the

managing chronic conditions and promoting medication adherence while other health personnel is battling the COVID-19 pandemic on the front line is key to easing the disease burden on health systems, particularly in developing countries. This will provide support to the call by the World Health Organization to maintain essential services in order to prevent non-COVID-19 disease burden on already strained health systems in low-income countries (Kretchy et al. 2020).

The activities of the International Academy of Perinatal Medicine have had a remarkable impact on perinatal care worldwide (Kurjak 2014). Naturally, the future depends on the role of its members because no academy can be appreciated by itself, but only by the reputation of each and all of its members. Indeed, science is a truly global activity because its very nature is global. Most of us welcomed positive globalisation process, but with the current COVID-19 pandemic we are facing the negative part of globalisation with many unpredictable developments (Kurjak 2016). In science, we do not have good and bad work. By following our principal duties, we justifiably expect that creative and visionary members of the Academy show again their intellectual power in order to defeat this global pandemic. The future relies

---

## Maternity and public health services should be planned well in advance to minimise delays in accessing and receiving care

---

outcomes, as experiences from previous epidemics have shown.

Community members and healthcare providers should be made aware of the increased risk of social isolation and the lockdown to the complexity of women's health issues. Women may have less contact with family and friends who may provide support and protection from violence. Additionally, violence against women can result in physical injuries and serious physical, mental, sexual and reproductive health problems, including sexually transmitted infections, HIV and unplanned pregnancies. Violence against women remains a major global public health concern and threatens women's health during emergencies.

Suggested solutions, like social distancing and lockdowns in many areas, to help to contain the spread of the virus may affect this vulnerable population due to its inability to access healthcare facilities for routine care and medicines management. One of the solutions may be the extended use of mobile devices and tablets that has revolutionised healthcare for some of the hardest-to-reach communities across Asia, Africa and the Middle East.

It should be emphasised that the contribution of community pharmacists in

on the past, and now it is proper time to show our own vision of the future (Kurjak 2017).

Our Academy has both the responsibility and the privilege to conduct scientific research on the impact of the COVID-19 pandemic on maternal, foetal and neonatal health. Studies recently published in prestigious journals are, unfortunately, of very suspicious quality, and the results of the studies not only give little additional information to healthcare providers but also cause confusion with inappropriate adjustments of the antenatal care without scientific background.

Without any doubt, this will open the way to new visionary solutions, and one of them will be deep analysis of what the science in perinatal medicine assessed and recommended to perinatal world (Kurjak et al. 2008; Kurjak and Dudenhausen 2007). In a world of rapid advances in scientific discovery, with an unprecedented insight and understanding of human development, which are reshaping the meaning and value of human existence, it is clear that we all are living in the global setting of computer-based video conferencing and satellite transmission. Therefore, a new idea born in a small global village will soon be available in every corner of

the world.

We are lucky to have our official Journal of Perinatal Medicine, and Academy Corner in it dedicated to the wise thoughts of the Academy members. What should we really offer through the journal and its Academy Corner to our readers in this complicated part of our lives (Kurjak et al. 2010)?

The principle of the Academy should not be 'any information is better than none.' The information should be feasible, usable and implementable and proven according to the best scientific principles. It may be that the research of the Academy members will not be the first to be published, but we certainly aim that the scientific evidence published by the Academy will be fast, reliable and implementable. ■

#### Author: Prof. Vedran Stefanovic

Professor, Department of Obstetrics and Gynecology | Helsinki University Hospital, University of Helsinki | Helsinki | Finland  
[vedran.stefanovic@hus.fi](mailto:vedran.stefanovic@hus.fi)

#### Author: Prof. Asim Kurjak

Professor Emeritus | Sarajevo School of Science and Technology | Sarajevo | Bosnia and Herzegovina  
President, International Academy of Perinatal Medicine  
[asim.kurjak.office@gmail.com](mailto:asim.kurjak.office@gmail.com)

### Key Points

- With the COVID-19 pandemic, women are one of the most vulnerable groups, not receiving necessary care and experiencing additional negative impacts.
- The data on women's health with COVID-19 infection are scarce and inconsistent, but previous infectious disease outbreaks suggest increased likelihood of poor outcomes.
- As a result of COVID-19 restrictions, women may not only receive insufficient health care but also face difficulties such as financial insecurity, domestic violence and mental health issues.
- The consequences of these will only transpire in the future, and currently various support options should be put in place (eg, telehealth services).
- Most of the relevant scientific research would not count for 'serious science' under normal circumstances, but, unfortunately, it receives much media attention.
- The International Academy of Perinatal Medicine reiterates its adherence to solid scientific research principles and encourages its members to provide only the best scientific evidence.

### REFERENCES

Allen-Ebrahimian B [2020] China's Domestic Violence Epidemic. *Axios*. Available from [iii.hm/13et](https://www.axios.com/2020/03/23/china-domestic-violence-epidemic)

Elston JWT et al. [2020] Maternal health after Ebola: unmet needs and barriers to healthcare in rural Sierra Leone. *Health Policy and Planning*, 35(1):78-90. Available from [iii.hm/13eu](https://doi.org/10.1093/heap/ckz012)

International Rescue Committee [2020] Not All That Bleeds is Ebola – how the DRC outbreak impacts reproductive health. Available from [iii.hm/13ev](https://www.irc.org/our-work/health-reproductive-health/2020/03/23/not-all-that-bleeds-is-ebola)

Juan J et al. [2020] Effects of Coronavirus Disease 2019 (COVID-19) on Maternal, Perinatal and Neonatal Outcomes: A Systematic Review. *Ultrasound Obstet Gynecol*, 55(5):586-592 [Epub ahead of print]. Available from [iii.hm/13ex](https://doi.org/10.1111/1471-2546.15922)

Kretchy IA et al. [2020] Medication management and adherence during the COVID-19 pandemic: Perspectives and experiences from low-and middle-income countries. *Res Social Adm Pharm* [Epub ahead of print]. Available from [iii.hm/13ey](https://doi.org/10.1111/rsad.12444)

Kurjak A [2014] Global education in perinatal medicine: will the bureaucracy or smartocracy prevail? [Academy Corner]. *J Perinat Med*, 42(3):269-271

Kurjak A [2016] First 10 years of the International Academy of Perinatal Medicine – which lessons we have learned and what are future challenges [Academy Corner]. *J Perinat Med*, 44(7):733-735

Kurjak A et al. [2008] Editorial: Does globalization and change

demand a different kind of perinatal research? *J Perinat Med*, 36:273-275

Kurjak A et al. [2010] Globalization and perinatal medicine – How do we respond? *The Journal of Maternal-Fetal and Neonatal Medicine*, 23(4):286-296

Kurjak A, Dudenhausen JW [2007] Editorial: Poverty and perinatal health. *J Perinat Med*, 35:263-265

Kurjak A [2017] Editorial: 3D/4D Sonography. *J Perinat Med*, 45(6):639-641

Shannon FQ et al. [2017] Effects of the 2014 Ebola outbreak on antenatal care and delivery outcomes in Liberia: a nationwide

analysis. *Public Health Action*, 7(Suppl 1): S88-S93.

Sochas L et al. [2017] Counting indirect crisis-related deaths in the context of a low-resilience health system: the case of maternal and neonatal health during the Ebola epidemic in Sierra Leone. *Health Policy and Planning*, 32(3):iii32–iii39

Stefanovic V [2020] COVID-19 infection during pregnancy: fetus as a patient deserves more attention. *J Perinat Med* [Epub ahead of print]. Available from [iii.hm/13ez](https://doi.org/10.1111/1471-2546.15922)

Zaigham M, Andersson O [2020] Maternal and perinatal outcomes with COVID-19: A systematic review of 108 pregnancies. *Acta Obstet Gynecol Scand* [Epub ahead of print]. Available from [iii.hm/13fo](https://doi.org/10.1111/aob.14100)

# COVID-19: No Return to Normal

A patient engagement authority reflects on the impact of pharma's response to COVID-19 and outlines hope for a better perception of the sector as providers of health solutions beyond the pill.

Since the first awareness of COVID-19 in the medical press and alert to the World Health Organization on December 31 2019, global health agencies and organisations have been in a cooperative and cathartic collision of communications.

In just 12 weeks we have contributed to sharing science, solutions and stories about a micro-invader that has forever altered both how we report research and how we relate to one another. The medical and ethical repercussions from the worldwide response to the COVID-19 pandemic are such that there will be no return to 'normal.' The disruption in how the pharmaceutical industry is perceived and in the patient-physician-pharma dynamic, are both now completely different. This is the change in mindset that has been desperately needed and will pave the way for healthier and more productive relationships underpinned by better communications that are already evident.

What then does COVID mean for the future of pharma-patient engagement and health literacy/communications? It can be summarised as follows:

- Care – as the primary 'efficacy' measure for any new medicine or therapy.
- Openness – transparency and collaboration in research and publishing.
- Veracity – industry has a global cadre of experts with habitual truthfulness.
- Infodemiology – no more excuses for avoiding the social health channels.
- Dependency – the pendulum for trust has swung back towards pharma/experts.

## Care

For decades pharma has been providing 'beyond the pill' health solutions in 'patient support programmes' (PSPs) as well as disease awareness campaigns. Sceptics have dismissed this as 'disease mongering' but there is no doubt that helping people to make lifestyle changes to assist with adherence to pharmacotherapy, participation in clinical trials and the sharing of health success stories and support of patient groups is a part of 'integrated health solutions.' PSPs have proven economic ROI with one study describing a 35% reduction in disease-related medical costs (Brixner 2019) and all-cause medical costs by providing a PSP. Patient engagement programmes are starting to demonstrate similar healthcare savings (Levitan's 2015 study showed a 500:1 ROE for patient engagement programmes).

Collaborative care is evidently a critical component therefore to assist with early management of the COVID-19 pandemic while the production of a diagnostic test, antiviral therapies and a vaccine are in development. Within weeks companies like Novartis announced the provision of millions of 'free' doses of the antimalarial medication hydroxychloroquine as the only possible pharmacotherapy available for immediate use for patients. Mighty collaborations were formed with drug giants such as GSK and Sanofi to develop vaccines, and GSK and AZ to develop testing kits. CEO Emma Walmsley assured people that the company would not show any net profit from vaccine sales and that along with future research investment, GSK would use any profits to subsidise vaccine deliveries to developing countries. This is a public commitment to care using expertise that was arguably, to be expected given the profits pharma receives for management of human health. However, on a smaller scale, patient engagement experts from within pharma walls were reaching out to all the groups and charities they work with and offering help through additional life-style support measures and information. Furthermore, pharma has focused communications and scientific expertise into impressive public health initiatives and disseminated valuable information through all possible digital channels to ameliorate fears and myths about COVID-19. In non-emergency therapeutic areas, patient engagement programmes are already perceived as an adjuvant therapy (Hermans 2016), and pharma support of online patient communities and story-sharing for health management are now 'prescribed' as part of integrated care plans. Acknowledging that pharma contributes to such broader public health management initiatives and that meaningful patient engagement delivers better health outcomes (EFPIA 2020) is part of the next positive change – openness.

## Openness

For too long, publishing medical information through medical journals has been expensive and laboured under a long and lofty peer-review process. The requirement for real-time, rapid sharing of data, knowledge and response to the COVID-19 threat has seen open-access publication platforms from scientific publishers such as Nature

and the Academic Data Science Alliance. The ‘Living Papers’ project (Ku Leuven 2020) where structured compilations of scientific data about COVID-19 include data about the virus, the disease and its control are updated daily to stimulate transdisciplinary initiatives.

The genie is out of the ‘paywall’ bottle around free downloads of scientific papers and expedited peer-review process which is in parallel to regulatory authorities promising fast review of tests and treatments. Such openness is the hallmark of change and a return to archotyping pharma companies as competitive, secretive and unwilling to share health data will become moot in concert with openness through scientific publishers and regulators.

### Veracity

For the general public with a usual low-level appreciation of complex medical data, the repeated media exposure to the COVID-19 crisis can cause anxiety. The emergence of myths and conspiracy theories compounds this and lack of understanding

wearable devices and the social channels. Pharma regulators in particular have often questioned the reliability and reproducibility of data from anything other than traditional clinical trials; we can no longer dismiss the diagnostic and data signals emerging from the digital channels, however.

The study by Qun et al. (2020) used social-media search indices (SMSI) to highlight that early symptoms of COVID-19 recorded on social channels provide an average ‘meteorological health alert’ of outbreak and early diagnosis 6–9 days earlier than new and suspected COVID-19 infection. As an effective early predictor, SMSI gives scope for sensible allocation of health resources and public health campaigns. However, despite the huge increase in people seeking information on the internet pertaining to COVID-19, Cuan-Baltazar et al. (2020) reviewed 110 popular websites and found an outpouring of misinformation of COVID-19 – the quality of the information was dire (only 1.8% and 10% of websites attained standard accuracy benchmarks used routinely in the HONcode seal and JAMA quality criteria respectively).

As the Internet is such an important source of health information for non-scientists,

## Acknowledging pharma contributes to broader public health management initiatives and meaningful patient engagement delivers better health outcomes is part of the next positive change – openness

of the drug development process can lead to frustration and increase fear where people may ‘take matters into their own hands’ and follow unproven and dangerous health advice that is not verified by trusted medical sources. From people ingesting toxic cleaning fluids through to ‘Headline Headache’ and behavioural responses such as rushing to stockpile goods; poor-quality and scaremongering health information induces a heightened stress response and misplaced behaviours.

Goncalves (2020) described this as ‘human bias’ that needs to be accounted for where it is better to absorb overwhelming health information from medical leaders such as Dr Anthony Fauci. This is the time to put political point scoring aside and allow the experts to take centre-stage.

Accordingly, it is clear that simple, socially acceptable, short guidelines for health-protective behaviours are as much an important aspect of health management responses to COVID-19 disease prevention and recovery as medicines. The veracity of facts, accuracy and communication of digestible public health information is key to manage ‘pandemonium’ on a global scale. What is also intriguing is the ensuing change from ‘patient generated data’ and ‘real world data’ harnessed through

responsibility for the quality of information available must be assumed by the experts; otherwise misinformation becomes a risk to health. Pharma has an ethical imperative to play a key role in the most important communication science for the public – health literacy and infodemiology.

### Infodemiology

The first five months coming-to-terms with the impact of COVID-19 has seen over-use of the term ‘unprecedented’ and has turned millions of us into healthcare professionals, medical communicators, epidemiologists, social workers, home workers and, fearfully, potential patients.

The COVID-19 pandemic has forced us to look at the Venn Overlap Space where patient engagement and medical education cross into public health. This is predominantly practised via the social media channels and pharma can no longer legitimately refuse to participate as it is an important provider of health information that is accurate and helpful. A communications crisis follows in the wake of the wave of the infection and in the absence of strong, supportive,

trustworthy communications fear, anxiety and mis-information fill the void. The social media term of 'going viral' is prevalent when it comes to spreading bad news.

Early studies of use of social media as part of health management of COVID-19 is yielding insightful opportunities to elevate the status of social media from 'chit chat' to a research, diagnostic and public health tool and therapy of merit. Abt-Alrazaq et al. (2020) used sentiment analytics to review approximately 2.8 million tweets related to COVID-19, identifying four topic themes from which communication responses and advice could be created: (i) origin of the virus, (ii) its sources, (iii) its impact on people, countries, and the economy, and (iv) ways of mitigating the risk of infection. Health systems also can integrate data from social channel monitoring to assist with disease detection and surveillance systems. Basch et al. (2020) analysed the 100 most viewed YouTube videos to ascertain if preventive behaviours to mitigate transmission of COVID-19 were projected; despite collective views of over 125 million, fewer than one-third of the videos covered any of the seven prevention behaviours listed by the US Centers for Disease Control and Prevention (CDC 2020), which is clearly a gargantuan missed opportunity for disease prevention.

This is why the social channels, online patient communities and social health campaigns will become an inevitable change following COVID-19 lessons in health crisis management as part of a standard communication and health literacy aspect of pharma-patient engagement. We've witnessed profound improvements in the development of treatments and the provision of care beyond pharmacotherapies as a result of online communities and hearing the voice of the patient in pharmaceutical research and development. We have also vastly improved how we communicate about medical science and the 'experts' have benefitted from how social channels have helped not hindered. Yes, there are aspects of social health sharing that can be frustrating, but just as the 'ice bucket challenge' of 2014 was remarkable for raising awareness and research monies among the public about amyotrophic lateral sclerosis, so too can the social channels and online communities really enable and expedite good public health messages and 'wraparound' social care that helps people get through the COVID-19 crisis one 'isolated' day at a time.

### Dependency

For decades there has been a 'pantomime villain' label tagged onto big pharma as only interested in profits over people. Mainstream media persistently reinforces this archetype, and this is compounded by a poor health literacy surrounding the parameters and regulations of drug research and development. To a certain extent, the trepidation of pharma to competently engage with patients in social channels and reluctance to be more overt in its relationships with patient organisations has not helped to ameliorate the criticism of its motives.

However, the onslaught from COVID-19 has left society, health organisations and

pharma's loudest critics with no choice than to seek to trust that pharma can be relied upon to collaborate to create treatments, vaccines and provide supportive care. Accordingly, media outlets and pharma's own corporate communications departments have adapted to deliver the 'dependency' message that patients desperately need to believe in. Not only have impressive collaborations been orchestrated, but strong communications have been made to reassure people that pharma is diligently working to get treatments to patients.

There are at least 11 companies with therapies and vaccines in development; the COVID-19 structure was decoded in days, antiviral drugs have been re-purposed and vaccines have gone into testing at unprecedented rates of development. The very clear message is that you can depend on pharma to deliver.

As we start to come through this medical crisis, I hope there will be a catharsis that, to all of us likely to be touched by this pandemic, that will lead to great change. How we carry out clinical trials, how we respond as a society to a public health crisis, how we relate to patients will change. How we perceive the pharmaceutical industry must change so that society sees it as providing healthcare solutions beyond the pill. I am optimistic that future medical writers will reflect and that 'the COVID-19 2020 crisis' will be the case study that demonstrated just how much research collaboration can deliver. We are in this for the long haul and leading with good communications and exemplary patient engagement, not mis-leading with sensationalism, matters. ■

#### Author: Emma Sutcliffe

Head of Patient Engagement, NexGen Healthcare Communications | London, UK

[Emma@nexgenhc.com](mailto:Emma@nexgenhc.com) | [nexgenhc.com](http://nexgenhc.com) | [@NexGenHC](https://twitter.com/NexGenHC)

### Key Points

- The COVID-19 crisis is a chance to change the image of the pharma industry as that one that is transparent.
- The crisis has disrupted the patient-physician-pharma dynamic.
- COVID-19 has highlighted the power of viral misinformation to the non-medical public.
- The spread of the disease has presented an opportunity for cross-collaboration which we must not forget once the crisis is over.

#### REFERENCES

For full references please email [edito@healthmanagement.org](mailto:edito@healthmanagement.org) or visit <https://jii.hm/12td>

# Providing Alternative Outpatient Delivery Channels

The COVID-19 pandemic has accelerated implementation of key digitalisation tenets of the UK's NHS Five-Year Plan for outpatients, but how can healthcare maintain achievements forged under pressure once the crisis has passed?

The COVID-19 pandemic is putting global healthcare systems under immense pressure and outpatient services are not excluded. The need to transform and reduce outpatients has never been greater. If we can reduce outpatient numbers, this would allow clinicians to focus on the sickest patients and reduce face-to-face contact without limiting access to acute clinical decision-making. Whilst the NHS Long Term Plan (NHS 2019) established the need for outpatients to transform over the next five years, COVID-19 has become the burning platform to realise this change in a matter of days.

While this accelerated transformation is a challenge, it is possible. Focusing on virtual consultations and other alternative outpatient delivery methods can ensure providers improve their productivity, reduce their referral-to-treatment times, and overall demand. A previous redesign programme we conducted of referral pathways for a large NHS Trust converted 2,500 appointments from face-to-face to virtual, releasing capacity for more than 900 extra appointments per year. In the context of COVID-19 demand, such improvements have a significant impact on freeing up vital resources.

In the short-term, guiding patients to the right care setting from the start is key to reducing the pressure on outpatient departments. There are three core principles to ensuring this:

- Think virtual first for low-risk patients.
- Optimise across available delivery channels.
- Keep patients informed.

## Think Virtual First for Low-Risk Patients

Delay measures that focus on reducing or eliminating face-to-face contact, and therefore demand, are particularly challenging because outpatient appointments are typically delivered face-to-face. In 2018/19, NHS figures show less than 3% of first, and 4% of follow-up, appointments were 'virtual', with over 53.9 million patients waiting over two weeks for an appointment over the same period (NHS 2019a). So,

even before COVID-19, there was a clear need to modernise the model of care in outpatients, including embracing digital to create a more patient-centric and efficient service.

But first you need to decide in which care settings to see patients. A risk stratification approach that separates low and high-risk patients is best for both patients and staff.

## Optimise Across Available Delivery Channels

Virtual consultations are a great alternative to face-to-face appointments, and yet they are still not widely adopted, missing opportunities for providers to create more productive services. In addition to a digital offer, providers have five other delivery channels available to optimise care and minimise face-to-face interaction:

- **Telephone clinics and SMS messaging.** Practitioners run appointments via phone and send a review of notes to the patient through text messages.
- **Patient initiated follow-up pathways.** Patients with an existing condition control the timing of follow-up appointments. Instead of automatically setting them up every six months, patients make an appointment when they need one, such as if their condition flares up.
- **Non-consultant led consultations.** Appointments conducted by clinical nurse specialists or advanced healthcare practitioners free up consultants. Non-consultants can support patients in areas such as irritable bowel disease clinics, rheumatology non-inflammatory clinics and dermatological clinics.
- **Self-care or remote care.** Encouraging patients to use, and providing access to, information that helps them manage their conditions. Wearable technologies can also help here.
- **Patient care via primary care.** Low-risk patients could get treatment through their GP or other community services. This limits patient travel, particularly important as we work to prevent the spread of COVID-19. It also keeps more complex cases for secondary care.

## Keep Patients Informed

In some instances, such as an antenatal appointment, a two-week wait cancer appointment or an urgent referral, there will be a clinical need to see patients face-to-face despite the pandemic. In those cases, providers will need to consider how they ensure the safety of patients and staff and keep them separate from others. For example, they could use different entrances or alternative sites to maintain appropriate infection control processes.

To make any new arrangements work, you need to effectively communicate with patients. Actively engaging with them through SMS, email, social media and automated calls will ensure they understand new arrangements and requirements as the pandemic evolves.

More communication that outlines a wider choice of delivery channels will also encourage patients to cancel appointments that become unnecessary and therefore reduce the demand further. This will give clinicians a more accurate view for scheduling and avoids did not attends, which the NHS National Benchmarking Network Report for Outpatients (NHS 2019b) says cost the NHS around £1 billion a year.

## Maintaining Momentum from COVID-19 to Create Legacy

By implementing alternative delivery channels to cope with the immediate crisis, providers need to acknowledge that a transformational step-change is being achieved. But in doing so, they must challenge themselves to ensure any change is truly maintained. Otherwise, behaviours will slip back to the old way of delivering outpatients – those which prompted the NHS Long Term Plan in the first place. Now is a better time than ever to create and maintain a legacy in outpatient service delivery that will help support demand challenges faced once the pandemic is over. There are three key points on how to ensure the changes made are successful:

- **Embrace your new baseline.** Where changes have been implemented KPIs should focus on measuring the impact. With the work achieved there will be ways to drive efficiency from the change, including improved demand management and utilising resources more effectively. For example, virtual note reviews of patients versus a conventional clinic typically allow a clinician to deal with more patients within the same timeframe. Equally, change presents a great opportunity for providers to engage with their patients, to understand how the new ways of communicating have worked for them, to solidify processes within business as usual.
- **Continue at scale.** Change creates opportunities to share knowledge and expand learning. Not only does it allow you to upskill the rest of the workforce, it enables an organisation to standardise its approach, reducing variations in patient experience. The initial changes made in the response to COVID-19 are a great platform to expand across organisations. Scale will be required by providers to

enable the acceleration of how they address their backlogs and return to “normal” in a post-COVID world.

- **Build on behavioural changes.** The pandemic has allowed patients and clinicians to think differently about how they deliver and receive care. Providers should work alongside patients to seek feedback to evidence the impact of change and ensure they don't revert to their old expectation. The demand challenge will remain, but with similar transformations across Inpatients, there are lessons to be learnt, and a collective view on what the new world looks like will ultimately improve access to patients.

The effect of this crisis cannot be underestimated. Clinician and patient behaviour will be forever changed as a result of COVID-19, especially those patients with chronic conditions who have been safely managed remotely both in acute and community settings. Through implementing alternative delivery methods, more productive clinics and reductions in unnecessary attendances can be achieved, to help manage the demand mid-pandemic and when it returns to business as usual across the NHS. The effective triage, vetting, management and discharge of patients have been cornerstones of the revised models of care that have been achieved in a very short space of time. It will be integral to review and redesign the traditional clinical pathways to optimise the patient journey and sustain the disruptive innovation achieved as a result of COVID-19. ■

 Author: **Sam Baker**

Healthcare Expert | PA Consulting | London, UK

[Sam.Baker@PACONSULTING.COM](mailto:Sam.Baker@PACONSULTING.COM) | [paconsulting.com](http://paconsulting.com) | [@PA\\_Consulting](https://twitter.com/PA_Consulting)

## Key Points

- In light of the current COVID-19 pandemic, the need to transform outpatient service provision is now more critical than ever.
- Think virtual first for low-risk patients.
- Non face-to-face alternative delivery channels are available.
- Keep patients informed.
- Maintain momentum in a post COVID-19 world through establishing a new baseline, continuing at scale and building on behavioural changes achieved through the pandemic.

## REFERENCES

NHS (2019) The NHS Long Term Plan. Available from [longtermplan.nhs.uk/publication/nhs-long-term-plan/](https://longtermplan.nhs.uk/publication/nhs-long-term-plan/)

NHS Benchmarking Network (2019) 2019 Outpatients project – Results published. Available from [nhsbenchmarking.nhs.uk/news/2019-outpatients-project-results-published](https://nhsbenchmarking.nhs.uk/news/2019-outpatients-project-results-published)



# COVID-19 from the Perspective of Telemedicine

A retired physician offers insights into COVID-19 telemedicine following a stint volunteering for a telephone support service for patients with the disease.

After years of serving as a primary healthcare services manager in Barcelona and promoting the use of ICT, in the face of the COVID-19 pandemic, I decided to volunteer as a retired physician for a telephone support service for patients suffering from COVID-19 infection at home. The call to participate in this initiative was made by the Catalan Health Service under the umbrella of the Barcelona College of Physicians.

The intervention was made to citizens that have downloaded and used the local COVID App: “STOP COVID19 CAT” (available in the iOS and Android stores). Volunteers like me had access to details on symptomatology, fever, some pathologies and previous comments of my colleagues with regards to each of the app users.

My job consisted of calling patients, raising their spirits with an ‘injection’ of hope and confidence and assessing their overall health status. Once we finished the call, volunteers had to score the results with our opinion and the recommendation prescriptions made to patients. To date, I have made more than 150 calls, with an average of 15 minutes per call. According to this experience, and after a few of weeks of intense work (which has, fortunately, declined latterly), I think it could be of interest to share my thoughts. My reflections aren’t presented as a scientific discussion but personal views based on my knowledge and previous experience.

The field of telemedicine has proven valuable during the COVID-19 crisis for the following reasons:

- Telemedicine services, supported by screening algorithms, can be very useful in cases like this one, to meet a surge in demand. However, to be absolutely effective, it needs the support of skilled and empathetic healthcare professionals.
- The vast majority of patients are conscious of the gravity of the situation and act with responsibility before it. Most of them deplore the misinformation given by the media and are very grateful for trustworthy, expert and scientific advice.
- It is known that the heterogeneity of the primary care healthcare provision is a problem worldwide, even in countries like Spain that has robust and organised

public health services. The problem is that, in some cases and especially in the COVID-19 situation, this can create a serious inequity problem.

- The main problem I detected is about healthcare navigation that arises from the need to strengthen the coordination/integration among hospitals, primary care and healthcare services governance.

Discussion and publication within the medical community about the COVID-19 crisis has been too heavily focused on hospital-centred care rather than community-centred care. The latter is, in my opinion, the way it should be addressed.

To paraphrase: care means care, and this should be in the mainstream of the healthcare services. ■

## Author: Josep Manuel Picas

Health Advisor | Catalan Health Service | Barcelona, Spain

[josep.manuel.picas@bismart.com](mailto:josep.manuel.picas@bismart.com) | [gencat.cat](http://gencat.cat) | [@gencat](https://twitter.com/gencat)

## Key Points

- Telemedicine has proven efficient and robust during COVID-19 crisis.
- Patients need the advice of a healthcare professional for telemedicine to have true value.
- COVID-19 has highlighted that healthcare discussion focuses on hospital-centred care at the expense of community care.

## Upcoming Issue

# Cover Story: COVID-19 Super Heroes

In this issue, we salute healthcare heroes who have put their lives on the line to take care of COVID-19 patients around the globe. Our contributors talk about their personal experience, the challenges they faced, the critical decisions they had to take, the long work hours, the stress and anxiety and the overall struggle to manage a pandemic such as COVID-19. We also pay tribute to those who gave up their lives and we acknowledge their contribution and their sacrifice.

**Subscribe for FREE:**

<https://iii.hm/hm5x2020>



# Don't Compromise Your Breast Care.



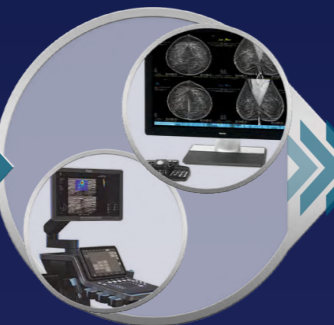
When you partner with Hologic, you are opting for the advantage of integrated solutions across the Breast Health Continuum of Care.

From screening to monitoring, our clinically proven breast and skeletal health innovations support you in delivering excellence in disease management along the patient pathway.

## RADIOLOGY



SCREENING



ANALYTICS, DETECTION & DIAGNOSIS



BIOPSY

## BREAST SURGERY



LOCALIZE



SENTINEL LYMPH NODE BIOPSY\*



REMOVAL, FILLING & MARKING\*\*

## PATHOLOGY



SPECIMEN EVALUATION

## MONITORING



BONE HEALTH AND BODY COMPOSITION

ARTIFICIAL INTELLIGENCE

**HOLOGIC** - Your Trusted Breast and Skeletal Health Partner.

3dimensionssystem.eu | info@hologic.com

\*TruNode<sup>®</sup>: Available in selected markets only  
\*\*BioZorb<sup>®</sup>: Not CE marked Not for sales, not for distribution

ADS-02949-EUR-EN Rev.001 / 2020©Hologic, Inc. All rights reserved. Hologic, The Science of Sure, TruNode, BioZorb, LOCALizer and associated logos are trademarks and/or registered trademarks of Hologic, Inc. and/or its subsidiaries in the US and/or international markets. All other trademarks, registered trademarks, and product names are the property of their respective owners. This information is intended for medical professionals and is not intended as a product solicitation or promotion where such activities are prohibited. Because Hologic materials are distributed through websites, eBroadcasts and tradeshows, it is not always possible to control where such materials appear. For specific information on what products are available for sale in a particular country, please contact your local Hologic representative or write to info@hologic.com

