



ADRU
Academy of the
Disaster Research Unit



Social, Medical and Technological Innovations in the Wake of the SARS-CoV-2 Pandemic

Academy of the Disaster Research Unit (ADRU)

ADRU Report No. 6

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Abstract

From December 2019 onwards, the SARS-CoV-2 pandemic tested the limits of (health) systems and societies all across the world, but it also drove innovation in various areas. This report presents exemplary findings from a horizon scanning on social, medical, and technological innovations for dealing with the SARS-CoV-2 pandemic that was conducted as part of the ADRU project “CoronaSys: Addressing the corona pandemic in Armenia through systemic risk management”, which was funded by the German Federal Ministry of Research and Education. To this end, more than 70 media outlets and research hubs were screened between July 2020 and January 2021. The innovations found were then collected in an innovation table and tagged to certain categories and keywords in order to generate an overview of interesting innovations. The table features innovations from the following research areas: AI (Artificial Intelligence), Chemistry, Communication Sciences, Digital Health, Engineering, Epidemiology, Humanitarian Aid, IT (Information Technology), Medical Equipment, Medicine, Microbiology & Biotechnology, Pedagogics, Pharmacology & Pharmaceuticals, Politics, Public Health, and Veterinary Medicine. Innovations were also tagged with keywords to describe the area they focused on, namely: Communication & Social Support, Detection & Diagnostics, Education, Policy, Prevention, Prediction, Monitoring & Surveillance, Treatment, infrastructure. Based on the innovation table, more than 40 fact sheets have been drawn up over the course of the project to feature selected innovations.

Keywords: SARS-CoV-2, COVID-19, pandemic control, disaster risk management, innovation, pandemic preparedness and response, Armenia, Germany

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Acronyms

ACT.....	Access to COVID-19 Tools Accelerator
ADRU.....	Academy of the Disaster Research Unit
AI.....	Artificial intelligence
BBC.....	British Broadcasting Corporation
BBK.....	Bundesamt für Bevölkerungsschutz und Katastrophenhilfe
COVAX.....	Covid-19 Vaccines Global Access
COVID-19.....	Coronavirus Disease 2019
DRM.....	Disaster Risk Management
ECDC.....	European Centre for Disease Prevention and Control
ECMO.....	Extracorporeal Membrane Oxygenation
EMA.....	European Medicines Agency
FDA.....	United States Food and Drug Administration
GIZ.....	Gesellschaft für internationale Zusammenarbeit
IT.....	Information Technology
ITWM.....	Fraunhofer-Institut für Techno- und Wirtschaftsmathematik
NHS.....	National Health Service
ODI.....	Overseas Development Institute
PCR.....	Polymerase Chain Reaction
PPE.....	Personal Protective Equipment
RKI.....	Robert Koch-Institut
SWOT.....	Strengths, Weaknesses, Opportunities, Threats
UNDP.....	United Nations Development Programme
WHO.....	World Health Organization

Executive summary

The impact of COVID-19 was not only felt in the health sector, but also in the social, cultural, and economic spheres of countries and communities all over the world. The challenges it posed to health care providers, the economy, education systems, and the cultural, political, and social foundations of most societies were and continue, at time of writing, to be immense.

In response to these challenges, a variety of innovations were developed in almost all sectors of society. The search for possible treatments for the disease and a vaccine against COVID-19 was without a doubt one of the most urgent and most visible efforts to control the pandemic. Never before have so many scientists, pharmaceutical companies, governments, and private sector stakeholders worked so closely together as in the pandemic response, and never before have so many research papers been published on a single topic in such a short time.

Great progress has been made in engineering, chemistry, and communications, to name a few examples. Existing technologies such as artificial intelligence (AI) have been adapted and further developed to address the pandemic in a variety of ways. Through a real-time learning process, new response strategies and policies have been developed not only at the government level but also in municipalities and communities, and even in individual factories, start-ups and micro-businesses.

As part of the CoronaSys project funded by the Federal Ministry of Education and Research, a horizon scanning of social and medical-technological innovations was conducted between July 2020 and January 2021, with a focus on innovations of potential interest for the Armenian and German project partners. To this end, news media, scientific research platforms, journals and other online sources were screened on a weekly basis.

This horizon scanning showed that a large number of very different innovative products and approaches have emerged from almost all areas of science and industry. In particular, substantial progress has been made in the areas of prevention, diagnosis, and treatment of COVID-19. This significantly influenced the pandemic response and, in some cases, made it at all possible to begin with. The innovations found may provide interesting impulses for stakeholders in Germany and Armenia. There have also been numerous innovative concepts, technologies and approaches in other research areas such as AI and digital health, as well as communication and education, to name but a few.

By 15 January 2021, more than 150 innovations from these and other areas were compiled in an innovation table based on more than 700 literature sources and more than 70 media outlets and research platforms screened weekly. Also, more than 40 fact sheets on selected innovations were prepared.

Since the pandemic is still not over, it is to be expected that it will continue to place high demands on all sectors, and thus also continue to drive the development of innovative products and approaches. These innovations, hopefully, will help societies to be better prepared to face future crises and disasters.

1. Introduction

The SARS-CoV-2 pandemic has been referred to as a once in a century phenomenon and as the greatest public health challenge since the end of World War II (Budryk 2020; The Japan Times 2020). Often compared to the great influenza pandemic in 1918, its seemingly sudden onset, as well as its enormous impact, has led to unprecedented measures in many countries and challenged systems and individuals alike.

The pandemic affected not only the health sector, but almost every other aspect of public and private life as well. The pressures it has and continues to put on health care providers, the economy, educational systems and the cultural and social foundations of most societies are immense, making them prominent topics of research in many fields (Deutsches Ärzteblatt 2021d).

In response to these struggles, a wide variety of innovations was developed in almost every research area and industry. Particularly in the medical sector, the pandemic has driven innovation and new policy approaches (Deutsches Ärzteblatt 2020b). But other economic and industrial sectors were also forced to address the demands of the pandemic through new technologies, innovative concepts, and new approaches. New processes were integrated into production chains, new forms of (digital) collaboration were established, and new technologies and products were developed to maintain production and business.

Of course, the search for possible treatments of the disease and a vaccine against COVID-19 has been one of the most urgent and important efforts in controlling the pandemic. Never before had so many drug companies, governments and private sector stakeholders collaborated so closely as in the Access to COVID-19 Tools (ACT) Accelerator and its vaccination branch COVAX (WHO 2020c). And never before have so many research papers been published and reviewed on a single topic in such a short time (Apuzzo and Kirkpatrick 2020).

Great progress has also been made in the fields of engineering, chemistry, and communication. Existing technologies such as AI (Artificial Intelligence) have been adapted and further developed to combat the pandemic in a variety of manners. As part of a real-time learning process, new response strategies and policies were developed not only on the governmental level but also in municipalities and communities.

And although the fight against the pandemic is still ongoing, many researchers and governments as well as private-sector donors, civil organisations and entrepreneurs are already looking for ways to recover in the pandemic's wake. The goal, however, must not simply be to just return to how things were before the pandemic, as it is likely the world will face further pandemic outbreaks in the near future (Morens and Fauci 2020; Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services 2020, 16–27, 40–47). This makes it essential to look for new innovations and policies in pandemic preparedness, but also to strengthen existing structures and networks of collaboration in order to build back better for the challenges yet to come.

2. Background

This report is part of the CoronaSys project “Addressing the Corona pandemic in Armenia through systemic risk management” sponsored by the German Federal Ministry of Education and Research. The main objective of the project was to establish a research collaboration between German and Armenian stakeholders for the acute management of the SARS-CoV-2 pandemic and the medium-to long-term goal of integrated and systemic risk management. A concrete focus of this definition project were the healthcare and civil protection sectors.

The project analysed strengths, weaknesses, needs and capacities, identified existing solutions in Germany and Armenia in a SWOT analysis and looked at the specific vulnerabilities faced by both countries in managing the pandemic. A series of web-based expert discussions and workshops took place to facilitate an exchange of knowledge and mutual learning. The project also analysed socio-political debates with regard to the pandemic and compared existing integrative approaches to pandemic management in both countries.

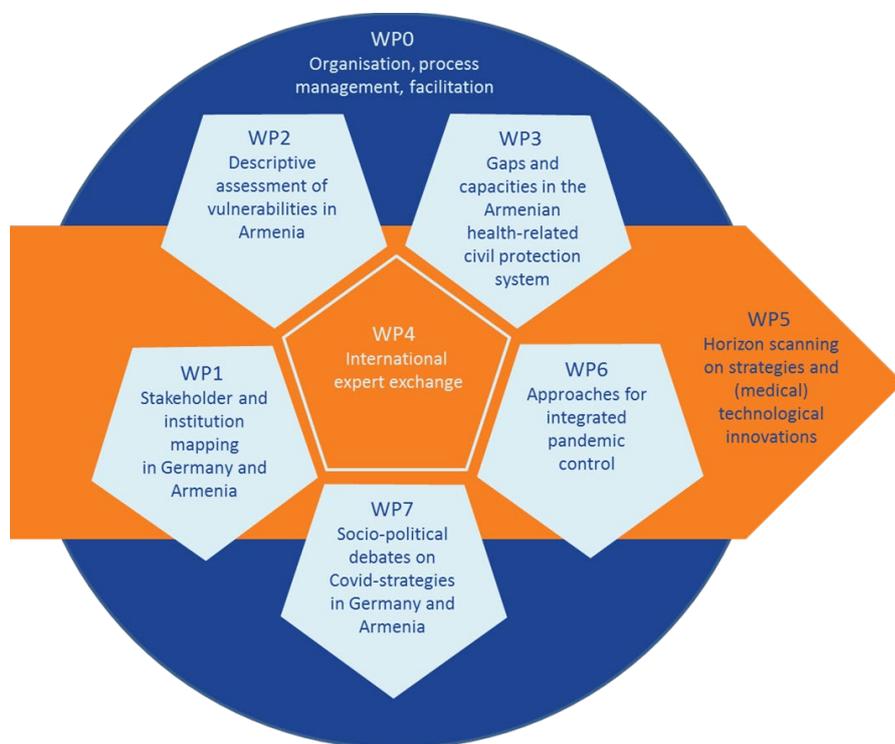


Figure 1 Work packages of the CoronaSys project

As one part of the real-time evaluation of the SARS-CoV-2 pandemic, the CoronaSys research team conducted a continuous monitoring of developments and medical, technical, and social innovations concerning COVID-19.

3. Process and methods

3.1 General considerations

The conducted horizon scanning aimed to collect a variety of innovative products, technologies and policies developed, adjusted, or implemented during the SARS-CoV-2 pandemic that might be of interest for the German and Armenian project partners and relate to their areas of expertise.

Linguistically, the term derives from the Latin “*innovatio*”, which can be translated as “novelty” or “change” (PONS 2020). The meaning of the concept of innovation has significantly changed over the centuries. Innovation during the Renaissance, for example, was often associated with undesirable change, and in a political sense, of going against the established religious and worldly order, as exemplified in reformation, revolution, and social reform (Godin 2015). The 18th century’s quest for production and industrialisation contributed to a shifting understanding in which innovation alludes to dreams, creativity, and also technology (Godin 2015). Nowadays, knowledge societies build on innovation as capital for economic growth (cf. Godin and Vinck 2017b, 5), and as a key resource in addressing prevalent challenges to humanity. In the SARS-CoV-2 pandemic, for example, the development of suitable COVID-19 vaccines became a cornerstone for political and societal strategies for overcoming the pandemic. However, as work in the field of critical innovation studies (cf. Godin and Vinck 2017a) has uncovered, innovations do not only provide solutions but may also create new obstacles of their own. An uncritical pro-innovation bias may not consider the destructive potential of innovations (Goulet and Vinck 2017) or of techno-centric approaches to socio-political reform (Sveiby 2017). Furthermore, it may disregard the possibilities of slow- and no-innovation and de-growth (Leitner 2017). In this sense, innovations require critical scrutiny with regard to the context of their application.

There is currently no consistent definition of the term 'innovation.' Rather, it is used very differently in various fields of research and industry. While economists tend to view innovations as certain products or technical novelties that have to be implemented and widely used in order to classify as “innovation”, social scientists refer to innovations in the context of gradual change or change processes, especially in enterprises or organisations. One can further differentiate between **radical innovations** (such as new products or completely novel processes) and **incremental innovations** characterised by gradual change or improvement of existing innovations (Meyer 2020).

The concept of social innovation is defined in Schumpeter’s “Theory of Economic Development” as a product of entrepreneurial commitment that must sometimes be pushed through against resistance (Schumpeter, Röpke, and Stiller 1912). Furthermore, according to Schumpeter’s explanation, innovations often occur in clusters: After a first breakthrough innovation occurs, it is taken up by other actors and linked to further innovations. By contrast, the theories of evolutionary economics that emerged in the 1970s viewed innovation as the result of social transformation processes, and thus offered a new perspective on innovation, as a process with distinct momentum that can be characterised by path dependencies and coincidences (Hofbauer 2016, 8; Köhrsen, Heidenreich, and Mattes 2016, 16–25).

Based on these and other theories of (social) innovation, several definitions have emerged over the years that seek to provide a more comprehensive grasp on the meaning of innovation within society. In 1989, Zapf defined social innovations as *“new ways of achieving goals, especially new forms of organization, new regulations, new lifestyles that change the direction of social change, solve problems better than previous practices, and are therefore worth imitating and institutionalizing”* (Zapf 1989, 177, author’s translation).

Howaldt and Schwarz (2010b) defined social innovation as *“an intentional (...) reconfiguration of social practices in certain fields of action emanating from certain actors (...) with the aim of solving problems or needs better (...) than is possible on the basis of established practices”*, and added that *“The novelty does not take place in the medium of technological artefacts, but on the level of social practices (of governing, organising, providing, consuming, partnership, negotiation, etc.)”* (TU Dortmund 2020, author’s translation).

According to Hofbauer, however, the following remains to be said in view of the definitions of social innovations:

“The essential characteristics of social innovations, such as problem-solving capacity, intentionality, novelty, diffusion or explicit value reference, show that social innovations are defined and interpreted very differently. A substantial and socially shared essence that goes beyond the aspect of novelty cannot be discerned. In addition, many of the defining characteristics put forward also prove to be not or only partially viable for a social-scientifically tenable definition” (Hofbauer 2016, 13–14, author’s translation).

In the rhetoric and programming of actors in policy and government, **a broader concept of innovation** has been established in recent years that encompasses the promotion of science and technology and includes not only technical but also social, organisational and other factors of innovation (Howaldt and Schwarz 2010a, 5:58).



For the purpose of the horizon scanning, “innovation” is understood as follows:

Innovation in the context of the SARS-CoV-2 pandemic refers to a novel product, process or procedure or the novel use or adaptation of an existing product, process, or procedure beyond its previous use with the aim of combating the pandemic and/or reducing its effects or preventing or mitigating the consequences of similar situations in the future.

This broad definition allows for flexibility and practicability in the search for innovative products or concepts that might be relevant for the CoronaSys project and its network partners in Germany and Armenia in the dynamic context of the SARS-CoV-2 pandemic.

3.2 Media screening

More than 70 national and international media outlets, research platforms, guidelines, newsletters, briefs, and updates were identified as potential resources and gathered in an Excel table, which was continuously expanded throughout the project from July 2020 to January 2021.

Certain areas of interest were identified a priori and expanded and updated over the course of the project. However, the screening process was not scientifically standardised or guided by objectifiable inclusion criteria and allocation rules. Since it was a part of the real-time analysis of the dynamic crisis, flexibility and adaptability were the guiding principles for the media research.

The sheer volume of innovations that emerged worldwide in connection with the SARS-CoV-2 pandemic makes complete coverage impossible within the scope of this project. Also, the horizon scanning explicitly did not aim to capture all innovations in one area (e.g., drugs to treat COVID-19 patients, vaccines, technical innovations, etc.). Rather, a selection was made based on the identified needs and anticipated interests of the project network against the background of current developments. Care was also taken to include innovations from many different areas and backgrounds to address the great heterogeneity in innovative products and concepts.

With regard to the conducted media screening, however, it is important to note some effects that have further limited the selection of innovations. First of all, only information from articles in German and English were included in the innovation table. Although articles in other languages (including Armenian) were also screened, these required translating with the help of an online translation tool, which meant that translation errors could not be ruled out. Therefore, innovations from these articles were only included in the table if the information were also available in German or English and could thus be verified. It follows that innovations mentioned exclusively in articles written in other languages could not be included and have therefore been missed. Furthermore, it can be assumed that articles in German and English primarily consider innovations the authors consider to be relevant and particularly innovative, and from which they expect a special interest of their respective audience (depending on the platform, e.g., medical professionals, electronics experts, or the general public). Lastly, it cannot be ruled out that a publication bias partly prevents the identification of innovations that turned out to be unsuitable, ineffective, or even harmful.

Among others, the conducted horizon scanning covers the following main areas and fields of interest:

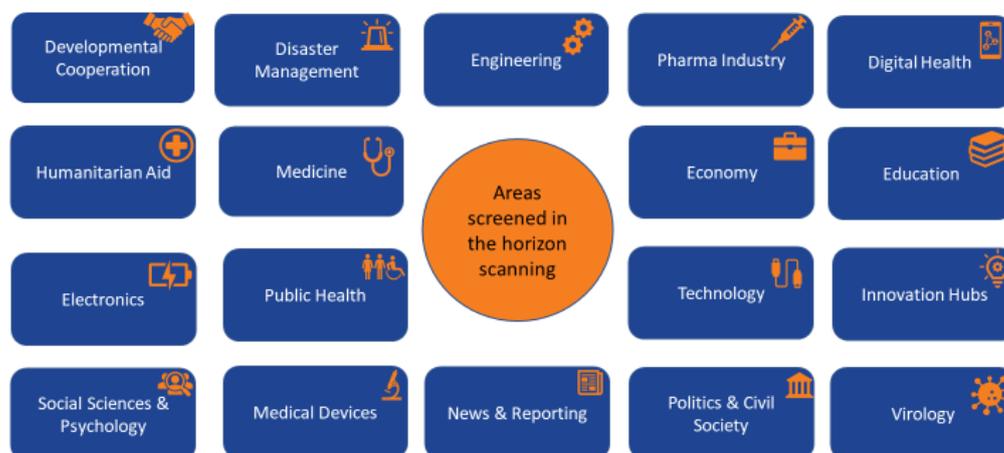


Figure 2 Areas screened in the horizon scanning

The following table presents an overview of over 70 research platforms and websites that were regularly screened as a part of the horizon scanning.

Table 1 Media screened weekly in the horizon scanning process

Name	Area	URL/ Source
Africa Centres for Disease Control and Prevention Covid-19 Research Tracker	Public health	https://africacdc.org/covid-19/covid-19-research-tracker/
Armenian Weekly	News	https://armenianweekly.com/
Armenpress	News	https://armenpress.am/eng/
Ärzte der Welt/ Doctors of the World	Humanitarian aid	https://www.aerztederwelt.org/
Ärzte ohne Grenzen/ Medics Sans Frontiers	Humanitarian aid	https://www.aerzte-ohne-grenzen.de/
BBC (British Broadcasting Corporation)	News	https://www.bbc.com/
BBK (Bundesamt für Bevölkerungsschutz und Katastrophenhilfe)	Disaster management	https://www.bbk.bund.de/DE/Home/home_node.html
German Ministry of Health, Corona Information	Public health	https://www.bundesgesundheitsministerium.de/coronavirus.html
BMJ	Medicine	https://www.bmj.com/
Cell Press	Science	https://www.cell.com/
Civic Innovation Platform	Digital health, AI	https://www.civic-innovation.de/start
CNN (Cable News Network)	News	https://edition.cnn.com/

Co-Creation Hub Nigeria	Innovation mapping	https://cchubnigeria.com/covid-19-support/
Cochrane Library	Medicine	https://www.cochrane.org/
Coronainnovation.at.	Innovation mapping	https://www.coronainnovation.at/
Coronavirus prevention network	Research	https://www.coronaviruspreventionnetwork.org/
COVID-19 Humanitarian	Humanitarian aid	Home COVID19 Humanitarian
Covidinnovate.com	Innovation mapping	https://covidinnovate.com/
Deutsche Gesellschaft für Public Health	Public Health	via Newsletter
Deutsches Ärzteblatt	Medicine	https://www.aerzteblatt.de/
Devicemed.de	Medical devices and diagnostic industry	https://www.devicemed.de/
Digital Health Partnerships	Digital Health	https://www.digitalhealthpartnerships.com/
ECDC (European Centre for Disease Prevention and Control)	Public Health	https://www.ecdc.europa.eu/en
Elektroniknet.de	Electronics	https://www.elektroniknet.de/elektronik
European Public Health Association	Public Health	https://eupha.org/german-public-health-association-dgph
EVN Report	News	https://www.evnreport.com/
GIZ (Gesellschaft für Internationale Zusammenarbeit)	Developmental Cooperation	https://www.giz.de/de/html/index.html
Healthcare in Europe	Medical devices, Medical news	https://healthcare-in-europe.com/en/home/
Ingenieure ohne Grenzen e.V.	Engineering	https://ingenieure-ohne-grenzen.org/
Innovation Hub	Innovation Mapping	https://covid19innovationhub.org/
International Rescue Committee	Humanitarian Aid	https://www.rescue.org/
International Science Council	Science	via Newsletter
Johns Hopkins Corona Virus Research Center	Public Health	https://coronavirus.jhu.edu/
KfW Research	Economy, Science	https://www.kfw.de/KfW-Konzern/KfW-Research/index.jsp
Kompetenznetz Public Health Covid-19	Public Health	https://www.public-health-covid19.de/
Konrad Adenauer Stiftung Armenien	Politics / Civil Society	https://www.ka.s.de/de/web/suedkaukasus
LITCovid	Research Hub	https://www.ncbi.nlm.nih.gov/research/coronavirus/
Massachusetts Institute of Technology	Technology	https://news.mit.edu/
Medical News today	Medicine	https://www.medicalnewstoday.com/coronavirus
Medical Xpress	Medicine / Science	https://medicalxpress.com/
Ministry of Emergency Situations Armenia	Disaster Management	http://mes.am/en/

Ministry of Health Armenia	Public Health	http://www.moh.am/#3/0
New England Journal of Medicine	Medicine	https://www.nejm.org/
New York Times	News	https://www.nytimes.com/
New York Times/ Corona	News	https://www.nytimes.com/news-event/coronavirus
News.am	News	https://news.am/eng/
ODI (Overseas Development Insitute)	Developmental Cooperation	https://www.odi.org/
ODI Humanitarian Action Tracking Tool	Humanitarian aid	https://www.odi.org/covid19-tracking-local-humanitarian-action/
Oxfam	Humanitarian aid	https://www.oxfam.de/
PROCESS	Pharma, Process industry	https://www.process.vogel.de/news/
Pubmed	Medicine	https://pubmed.ncbi.nlm.nih.gov/?term=sars%20cov%20%20OR%20Corona%20OR%20Pandemic&pos=1
Qmed	Medical devices and diagnostic industry	https://www.mddionline.com/
Relief web	Humanitarian aid	https://reliefweb.int/
Researchgate	Science	https://www.researchgate.net/
RKI (Robert Koch-Institute)	Public Health	https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/nCoV_node.html
Social Sciences University of Oxford/ Corona	Science	https://www.socsci.ox.ac.uk/social-sciences-on-coronavirus
Spiegel online/ Corona	News	https://www.spiegel.de/thema/coronavirus/
Süddeutsche Zeitung/ Corona	News	https://www.sueddeutsche.de/thema/Coronavirus
Tagesspiegel/ Corona	News	https://www.tagesspiegel.de/themen/coronavirus/
Technology Networks	Technology	https://www.technologynetworks.com/tn
Techpoint Africa	Technology	https://techpoint.africa/
The Behavioural Insights Team UK	Social science, Psychology	https://www.bi.team/
The Conversation	News	https://theconversation.com/uk/covid-19
The Lancet	Medicine	via Newsletter
The Lancet Global Health	Public Health	via Newsletter
The Lancet Infectious diseases	Public Health	via Newsletter
This week in virology podcast	Virology	https://www.microbe.tv/twiv/
THW (Bundesanstalt Technisches Hilfswerk/ Federal Agency for Technical Relief)	Disaster Management	https://www.thw.de/DE/Startseite/startseite_node.html

UNDP United Nations Development Programme Armenia	Disaster Management	https://www.am.undp.org/content/armenia/en/home/operations/projects/environment and energy /disaster-risk-reduction-and-prevention.html
UNDRR (United Nations Office for Disaster Risk Reduction)	Disaster Management	https://www.undrr.org/news-events/latest-news
VDI (Verein Deutscher Ingenieure) / Corona	Engineering	https://www.vdi.de/aktuelles-zur-corona-krise
Washington Post	News	https://www.washingtonpost.com/
WHO (World Health Organization) Armenia	Public Health	https://www.euro.who.int/en/countries/armenia
WHO Armenia / Corona	Public Health	https://www.covid19healthsystem.org/countries/armenia/country-page.aspx
WHO / Corona	Public Health	https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19
WHO Health System Response Monitor	Public Health	https://www.covid19healthsystem.org/mainpage.aspx
World Economic Forum	Economy, Development	https://www.weforum.org/
World Economic Forum / Corona	Economy	https://www.weforum.org/agenda/archive/covid-19
World Health Summit Covid-19 Database	Public Health	https://www.worldhealthsummit.org/covid-19.html

In addition to the sources mentioned above, daily news media and references to potential innovations in other publications were also included in the horizon scanning in order to generate a wide range of possible sources. This led to a snowball effect in the screening process. The subsection of the projects literature database in Zotero dedicated to the horizon scanning included more than 700 entries as of 15 January, 2021.

Apart from the media screening, the CoronaSys project partners from Germany and Armenia also contributed suggestions for potentially interesting innovations or relevant research fields to include in the screening process. Moreover, the project staff attended 30 webinars on a wide range of topics conducted by different organisations from various backgrounds that also drove the innovation mapping process and helped guide the search to potentially relevant items across multiple fields of interest.

3.3 Innovation table

To document the horizon scanning process, an Excel table was created (see Annex) and updated at least once a week. The purpose of the table was to provide an overview of the steadily growing and developing landscape of possible innovative items and concepts. It comprised of the following columns:

- Date added
- Stakeholders
- Innovation
- Research area
- Focus area
- Innovation features and potentials
- Points to consider
- Potential beneficiaries
- Sources

The column **Date added** was included due to the highly dynamic nature of the ongoing crisis. Due to the vast quantity of innovations screened, not every innovation could be followed through time. In addition, some developments (e.g., vaccine development, treatment recommendations) were particularly dynamic and could therefore not be monitored in their entirety. The date in the column refers to the first time the particular innovation was added to the innovation table. If not mentioned otherwise, the date in this column also indicates the information status to which the entries for the respective innovation refer.

The column **Stakeholders** covers the developers and/or manufacturers involved in the development and/or production of the specific innovation and the country in which the research facility or company is located.

Innovation cites the innovation either by its official trade name or by a very brief description of its nature.

The column **Research area** mentions the field of research or economy the innovation stems from (e.g., Engineering, Medicine,) whereas the column **Focus area** refers to the topic or target of the particular innovation (e.g., Prevention, Treatment). While some of the categories were identified a priori, others emerged inductively out of the screened material.

The table does not attempt to provide a comprehensive summary of innovations or a valid classification of innovations regarding COVID-19. The term “category” refers to the contents of the respective column of the innovation table and does not implicate a certain scientifically derived methodology; rather, it implies a keyword or tag to which certain innovations were allocated in order to create some structure amid the broad variety and the sheer number of innovations included in the table. For lack of a better term, this characterisation will hereafter be referred to as *categories*. One item could be attributed to more than one category since research fields often overlapped, and focus areas were often a combination of several possible applications.

The column **Innovation features and potentials** describes particular characteristics of the innovation and its potential benefits, while the section **Points to consider** lists concerns, limitations or pending research gaps with regard to the specific innovation.

Certain groups of people, parts of society or branches of economy or public life who are most likely to benefit from the particular intervention were mentioned in the column **Potential beneficiaries**, while URLs or literature **sources** were entered in the last column.

At the end of January 2021, the innovation table included more than 150 items. It also served as the basis on which the innovations for the weekly innovation sheets were selected.

3.4 Innovation sheets

Based on the innovation table, some items were selected to be presented in the form of an *Innovation sheet*, a one-to-two-page summary of a specific innovation. This could include items that had received particular media attention or items that were particularly innovative or unusual. Others were selected because one or more of the CoronaSys network partners expressed an interest in the topic, or because the innovation touched a field identified as relevant by the project network.

The innovation sheets aim to provide a **short overview of interesting innovations** and sources for further information on the specific topic while being descriptive in nature and leaving critical analysis and interpretation to the reader.

Most innovations were featured only once, while some others were followed up afterward and updated according to recent developments. All innovation sheets were sent to the project partners and uploaded to the project homepage. By the end of January 2021, the project team had produced the following 45 innovation sheets on innovations of different research and focus areas (cf. annex for innovation sheets):

- | | | | |
|----|---|----|--|
| 1 | “New” Antiviral Face Masks | 27 | Follow-up on BNT162b2-Vaccine |
| 2 | Dyphox Surface Coating | 28 | Lucira™ COVID-19 All-In-One Test Kit |
| 3 | MOVES SLC Portable ICU | 29 | COVID-19 Humanitarian |
| 4 | Portable TRI- KLEEN 500UV | 30 | AI Epidemiology Model |
| 5 | Convalescent Plasma Therapy | 31 | Solar Powered Steam Generator |
| 6 | ASIC-App | 32 | Gradian CCV |
| 7 | BinaxNOW Antigen Test | 33 | Rapid Hospital Readiness Checklist |
| 8 | Corona Traffic Light | 34 | School Reopening Checklist |
| 9 | A Proof-At-Home Antibody Test | 35 | CURIAL AI Screening Test |
| 10 | IVAT Hygiene Tower | 36 | Prioritization Roadmap |
| 11 | LY-CoV555 Antibody Treatment | 37 | Ellume Test |
| 12 | 4C Mortality Score | 38 | TV Schooling |
| 13 | Regional Corona Prediction Model | 39 | Octea Test |
| 14 | Computer-designed Mini-Proteins | 40 | Prognostic Urine Test |
| 15 | Covid-19 Simulator | 41 | ICU Training Video |
| 16 | Trimodulin | 42 | SafeZone |
| 17 | BNT162b2-Vaccine | 43 | Project Hazel |
| 18 | SARS-COV-2 Rapidplex | 44 | Viral Escape Modelling |
| 19 | European Corona Map | 45 | Vaccination Communication Handbook |
| 20 | FELUDA Paper Strip Test | | |
| 21 | Humanitarian Action Mapping Tool | | |
| 22 | IKKA Score | | |
| 23 | WHO Digital Implementation Investment Guide | | |
| 24 | RCCE Toolkit | | |
| 25 | Cough-Analysing App | | |
| 26 | Follow Up on LY-CoV555 Antibody Treatment | | |

4. Selected results

4.1 Overview of relevant research and focus areas

The **Research area column** covers AI (Artificial Intelligence), Chemistry, Communication Sciences, Digital Health, Engineering, Epidemiology, Humanitarian Aid, IT (Information Technology), Medical Equipment, Medicine, Microbiology and Biotechnology, Pedagogics, Pharmacology and Pharmaceutics, Politics, Public Health, and Veterinary Medicine. With regard to this column, most items included in the innovation table stemmed from the fields of Engineering, Microbiology & Biotechnology, AI and Digital Health, as well as Medical Equipment, Medicine and Pharmacology & Pharmaceutics. Given the nature of the pandemic, those areas would be expected to play a major role and are also financially strong research areas.

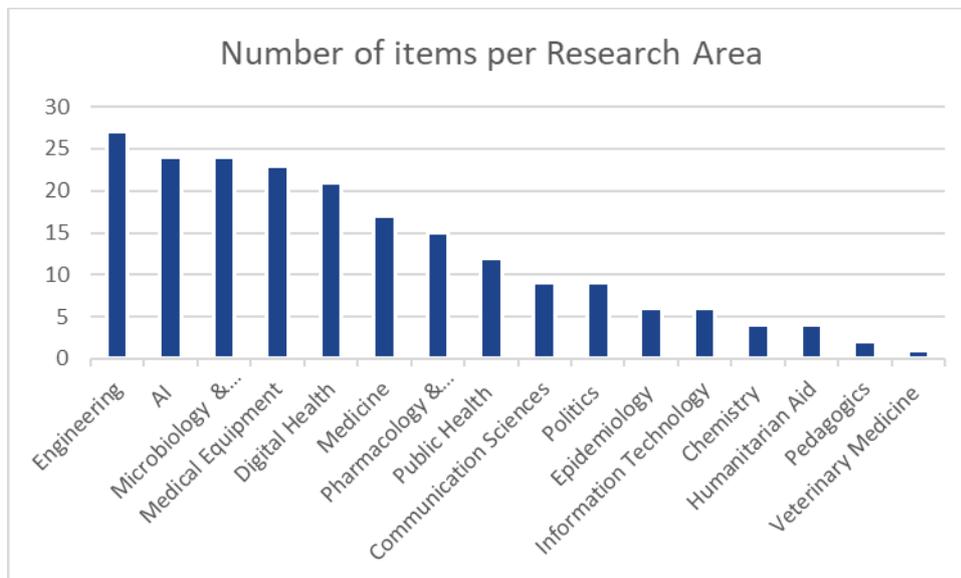


Figure 3 Absolute number of items tagged to the respective Research Area as of January 15, 2021

The **Focus areas** comprise Communication and Social Support, Detection and Diagnostics, Education, Policy, Prevention, Prediction, Monitoring and Surveillance, Treatment, and Infrastructure. In the Focus area section, most items were attributed to the categories Prevention, Detection and Diagnostics and Treatment. Not only are these areas particularly relevant in the light of a public health emergency like the SARS-CoV-2 pandemic, they also received much more media coverage than other aspects of the pandemic response.

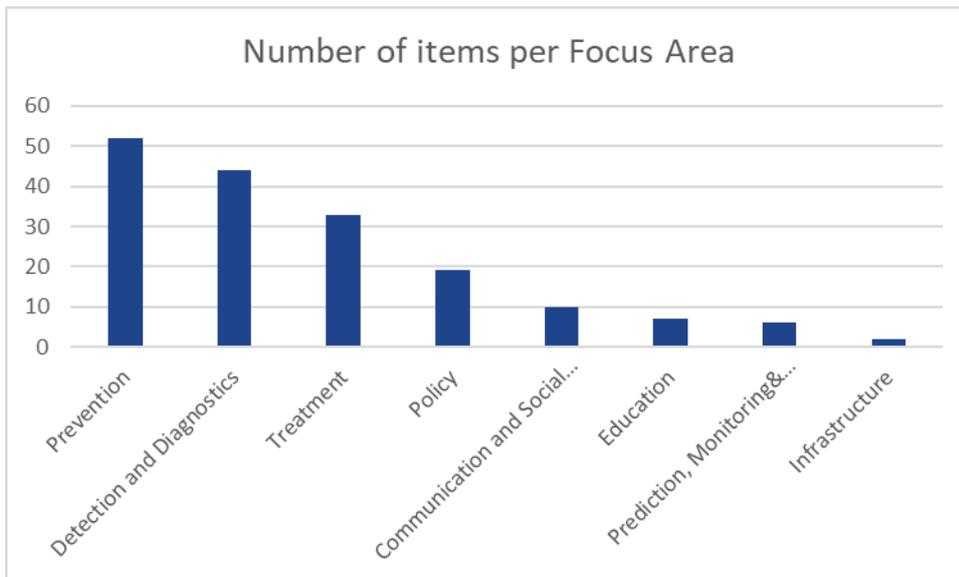


Figure 4 Absolute number of items tagged to the respective Focus Area as of 15 January, 2021

In the following chapters, selected results of the horizon scanning process are presented along the main focus areas identified in the innovation screening. The aim is to provide an exemplary overview of the type of innovations included in the respective category with emphasis on their heterogeneity.

4.2 Selected innovations in the focus area *Prevention*

In a medical sense, prevention can be differentiated into three levels: primary, secondary and tertiary prevention.

- Primary prevention prevents the development of a disease by preventing or reducing exposure to disease-causing agents.
- Secondary prevention aims at early detection of a disease, while
- Tertiary prevention aims at preventing complications in ill individuals (Celentano & Celentano, 2020, pp. 355–356).

Innovations were allocated to the Prevention category of the innovation table if they focused on **primary prevention**, as defined in the box above, and contributed to efforts to mitigate the spread of the virus by preventing or reducing exposure to the virus. Innovations that aimed at **secondary and tertiary prevention** were allocated to the “Detection and Diagnostics” column, to achieve a better overview and intelligibility for the reader of the innovation table.

The prevention category covers various areas, including:

- Personal Protective Equipment (PPE) for medical staff and laypeople
- Technical innovations to reduce the risk of infection, including air filtration systems, antiviral surface coatings, or sensor technology that helps to maintain proper distances
- Policy decisions with the primary aim of preventing infections
- Vaccines, as a part of primary prevention (Celentano and Celentano 2020, 355–56), were also added to this category

Examples of innovations in the field of **PPE** include face shields made of plastic waste (Deutsche Welle 2020; Kell 2020), and masks coated with various antimicrobial substances such as copper oxide or triiodide (Biospace.com 2020; Freie Universität Berlin 2020).

Technical innovations in the field of prevention include different types of air purifiers such as the *IVAT Hygiene Tower* (Ehrenreich 2020) featured in Innovation Sheet No. 10 (Academy of the Disaster Research Unit 2020g) and the anti-microbial surface lacquer *Dyphox* (Dyphox.com 2020; Eichner et al. 2020) featured in Innovation Sheet No. 2 (Academy of the Disaster Research Unit 2020a).

Technological innovations range from assisting people to deal with social distancing via smart-sensor technology (Scott 2020) to disinfecting hospitals, health facilities and public buildings with the help of robots (Blake 2020; Edwards 2020; Murray 2020).

Policy decisions encompass, for example, mask mandates in German schools (Deutschlandfunk.de 2020; SZ.de 2020), a curfew for elderly citizens in Russia (RT.de 2020; T-Online.de 2020), and a radio information project for agricultural workers in Africa conducted by the GIZ (GIZ 2020).

Potential vaccines were added to the innovation table when they were included in a rolling review process by either the United States Food and Drug Administration (FDA) or the European Medicines Agency (EMA) or if they were discussed as a promising candidate in reputable sources. This also means that vaccine candidates were sometimes included some weeks after they first appeared in broad media coverage. For example, the Pfizer/ BioNTech vaccine was featured in two innovation sheets over the course of its development. Innovation Sheet No. 17 (Academy of the Disaster Research Unit 2020b) reported basic information about the mRNA vaccine before EMA started its review process (Dimitrova 2020; Müller 2020), while Innovation Sheet No. 27 (Academy of the Disaster Research Unit 2020e) provided an update on the more recent developments and the results of an interim analysis of the vaccine trial that reported considerably high efficacy rates (BioNTech 2020; Deutsches Ärzteblatt 2020j; 2020k). Other vaccine candidates, among them the AstraZeneca vaccine, the Moderna vaccine, the Russian *Sputnik V* vaccine and several other promising candidates, were also included in the innovation table.

The **WHO Vaccination Prioritization Roadmap** (WHO 2020d), featured in Innovation Sheet No. 36 (Academy of the Disaster Research Unit 2020i), was developed to assist countries in the development of public health strategies regarding vaccination planning and identifying and targeting priority groups for different levels of vaccine availability and epidemiological requirements. This is especially crucial given that vaccine supply is expected to be limited to some extent at the beginning of vaccination campaigns.

4.3 Selected innovations in the focus area *Detection and Diagnostics*

Innovations were included in the category “Detection and Diagnostics” if they aimed at detecting the virus itself (for example through a laboratory testing device) or patients suffering from COVID-19. This is a part of *secondary prevention*, while the efforts to anticipate and identify complications in patients already suffering from COVID-19 also included in this category belong to *tertiary prevention* (Celentano and Celentano 2020, 355–56). Items were also included in this category if their focus was to identify and *trace contacts* of infected persons or suspected cases.

Significant progress has been made in the field of *testing for SARS-CoV-2* over the past few months, as testing was certainly one of the main focus areas for politics and research. In addition to the classic PCR tests, which continue to be the gold standard, numerous existing methods have been adapted and new testing methods have been developed to determine the infection status as quickly, efficiently, and safely as possible. Multiple antigen tests and antibody tests have been invented and improved, production capacities were scaled up, while there were also several attempts to generate a reliable and valid at-home test.

Various rapid tests, for example the *Aproof Corona Virus Antibody test* (Deutsches Ärzteblatt 2020c), the *Lucira™ COVID-19 All-In-One Test Kit* (Lucira Health 2020; U.S. Food and Drug Administration 2020), and the *Lampore-Test* (BBC News 2020a; Striegler 2020) primarily used in the United Kingdom so far, have been integrated into the innovation table. A more cost-sensitive example, applicable in low-income settings as well, is the *FELLUDA paper strip test* developed in India (BBC News 2020b; CNN 2020; ETHealthworld.com 2020). The *Octea test*, developed by a German startup, is a testing device that uses Pulse Controlled Amplification (PCA®). This makes it possible to conduct a PCR test in less than an hour and for less than 20 Euros (Deutsches Ärzteblatt 2020m; GNA Biosolutions 2021). But further innovations have been developed over the course of the pandemic beyond classic laboratory swab and blood tests. A breath test for COVID-19 aims to deliver results in less than five minutes and could contribute to on-site testing from summer 2021 onwards (Healthcare in Europe. com 2020).

Another rather unusual example is a *testing device* developed by researchers from the Massachusetts Institute of Technology. A large sound-database was created by a team of researchers archiving tens of thousands of cough samples. They then trained an artificial intelligence (AI) algorithm to detect the characteristic features of COVID-19 coughs that stem from the temporary neuromuscular impairment caused by the disease (Chu 2020; Foy 2020; Laguarda, Hueto, and Coventry 2020). The test could contribute to non-invasive and cost-effective screening and is featured in Innovation Sheet No. 25 (Academy of the Disaster Research Unit 2020c).

In terms of *tertiary prevention*, the conducted horizon scanning included the *IKKA Score*, a clinical score aimed at early detection of potentially severe clinical courses of COVID-19 (Deutsches Ärzteblatt 2020d; University of Liverpool 2020; Wolfschmidt et al. 2020). Researchers in Germany developed a urine test that can help to identify patients who are likely to suffer from a severe course of the disease by means of the proteomanalysis- technique. The test is already in use for early detection of chronic kidney disease, heart failure and diabetes mellitus and has now been adapted to the requirements of COVID testing (Deutsches Ärzteblatt 2021c; Diapat.de 2021; mdr.de 2021; St. Georg Unternehmensgruppe 2020).

Another innovation aimed at detecting COVID-19 patients with the help of artificial intelligence (AI) is the augmented *CoVa Score*. Based on the previously developed *COVID-19 Acuity Score*, the new score uses AI algorithms to determine which patients at urgent care clinics or emergency departments are most likely to develop complications and should be hospitalised (Mddi Online, 2020). The *CAD4COVID Artificial Intelligence software for COVID-19 triage*, developed by Delft, supports health professionals by screening chest X-rays for signs of COVID-19 (Delft Imaging, 2020). Another example of incorporating AI in diagnosing COVID-19 patients is the *CURIAL-AI-Screening test*, that was derived in a study involving data of more than 150.000 patients. It uses routine hospital data such as blood tests, blood gas testing, vital signs, and results of PCR testing for respiratory viruses. The AI model was further trained with different levels of prevalence of COVID-19 in the population to simulate real-life conditions during a pandemic (Soltan et al. 2020).

Included in the category **Apps** were the German Corona-Warn-App, (Bundesregierung.de 2020; Deutsches Ärzteblatt 2020h) as well as the Armenian app (Harutyunyan 2020) and the app for England and Wales (Deutsches Ärzteblatt 2020i). While they differ in certain aspects and additional features as well as in their date of release, all three apps aim at tracing contacts of infected people and warning them of their potential exposure to a known or suspected COVID-19 case.

SORMAS (Surveillance Outbreak Response Management and Analysis System), a mobile digital business management system designed to combat epidemics, was also included in the innovation table, on the basis that it was updated and augmented to fit the needs of the current pandemic. SORMAS-ÖGD is a specialised version for **contact tracing** in the SARS-CoV-2 pandemic. It assists health boards in identifying and monitoring contact persons. Currently, SORMAS-ÖGD is used in Germany, as well as in Nigeria, Ghana, Fiji, and soon also Switzerland, Nepal and Ivory Coast (SORMAS 2020).

4.4 Selected innovations in the focus area *Treatment*

Innovations were included in the treatment category if they aimed at treating patients with COVID-19 and related health conditions. This could comprise newly developed approaches and technologies, or existing drugs and devices which now also prove helpful in the clinical treatment of COVID-19 patients, or have been augmented or adapted to fit these treatment needs or clinical requirements.

Innovations in the treatment category were mostly drugs, medical equipment or technical solutions and digital health interventions that aimed at improving patient management and monitoring of vital parameters or other clinically relevant patient data.

One of the **drugs** discussed widely throughout 2020, included for this reason in this report, is the broad spectrum anti-viral *Remdesivir*. Initially, it had raised high hopes to shorten the duration of illness and to lower mortality, but more recent data suggest that its effect was somewhat overestimated (Cao, Deng, and Dai 2020; Deutsches Ärzteblatt 2020a; 2020l; Singh et al. 2020). On the other hand, *dexamethasone*, a corticosteroid that is well known, accessible and affordable in most parts of the world, was shown in several studies to benefit critically ill patients and significantly improve survival rates (McFee 2020; Weber 2020; WHO 2020b).

Antibody treatments, a medical solution that has been used for other conditions, received a lot of media attention in the summer of 2020, in particular the antibody treatments of Eli Lilly and Regeneron. This was not only due to the fact the antibodies were derived from an elaborate and highly expensive technological process—one of the first therapeutic approaches that seemed to be effective

(Deutsches Ärzteblatt 2020f; Eli Lilly and Company 2020a; Meredith 2020; Zhou and Zhao 2020)—but also because U.S. President Trump received the treatment after his COVID-19 diagnosis. However, the treatment is expensive, and manufacturers will not be able to scale up production capacities fast enough to meet the demand. The treatment also proved effective only if administered quite early in the course of the disease, before severe immune system responses kick in (Deutsche Apotheker-Zeitung 2020; Eli Lilly and Company 2020b; Haseltine 2020; Thomas and Weiland 2020). As one example for antibody treatments, the Eli Lilly drug *Bamlanivimab* was featured in Innovation Sheets No. 11 and 26 (Academy of the Disaster Research Unit 2020h; 2020d).

One interesting novelty in the field of **medical equipment** to treat COVID-19 patients was the *Gradian CCV* portable ventilator designed for challenging settings with limited oxygen and power supply, featured in Innovation Sheet No. 32 (Academy of the Disaster Research Unit 2020f).

A noteworthy innovation mentioned in the field of **digital health** of the innovation table was the *Virus Fighter's Handbook* App. This tool provides clinicians with information on the use and maintenance of newly developed ventilators, as well as specific knowledge on how to handle COVID-19 patients (Devicemed. de 2020).

In the category of **training**, two **video-based approaches** have been included in the innovation table. One is a virtual reality video, developed by Annaberg School for communication in early Summer 2020 (Murugadoss 2020), demonstrating COVID-19 treatment practices to prepare medical staff in remote locations to respond to a possible spike in cases. The video is generally available for everyone, but is specifically designed to meet the needs of health care workers preparing for the treatment of severely ill COVID-19 patients, of which the video covers a short aspect. A more recent and comprehensive video, developed by the University of Tübingen accompanies a (fictive) young coronavirus patient from hospital admission, through intubation to artificial oxygenation of the blood with the help of ECMO (Extracorporeal Membrane Oxygenation) therapy and the subsequent recovery process. Insertions during the video provide detailed information on the background of the individual treatment steps and medical devices used (Deutsches Ärzteblatt 2021b; Sectio chirurgica and University of Tübingen 2020).

4.5 Selected innovations in other areas

Innovation table entries were assigned to the keyword **Policy** if they incorporated specific political and/or organisational initiatives or goals. Most innovations in the area of policy were not only assigned to this category but also to the focus area of prevention, for example, as in the example of the mask requirement in German schools, mentioned above.

One example of innovations in the field of policy is the **COVAX initiative**, where more stakeholders than ever before have collaborated “to accelerate the development and manufacture of COVID-19 vaccines, and to guarantee fair and equitable access for every country in the world” (WHO 2020a). Innovations added to this category could also be mapping tools, such as the COVID-19 mapping tool for humanitarian action developed by the Overseas Development Institute (ODI) that provides an overview on programmes in humanitarian action and keeps track of local and global humanitarian actions regarding COVID-19 (ODI 2020; Spencer 2020).

Naturally, the pandemic was also a major challenge in terms of **(risk) communication and community engagement**, and led to many new approaches in communication, as well as the redesign and adaption of pre-existing ones. The COVID-19 Risk Communication and Community Engagement Toolkit for

Humanitarian Actors (*RCCE Toolkit*), developed by the READY initiative and allocated to the categories Communication and Policy in the innovation table, provides an extensive overview of relevant documents and policies (READY Initiative 2020) and was featured in Innovation Sheet No. 24 (Academy of the Disaster Research Unit 2020j).

Some examples that focus more on *social support* and the mental health of individuals are the NHS text messaging service, through which the British NHS sends text messages warning people of COVID-19 and supporting them during quarantine (Burd and Coleman 2020), or the phone call initiative *COVID-connect* of the Australian Red Cross (Australian Red Cross 2020).

COVID-19 took an enormous toll on the *education system* worldwide (UNESCO 2020a; 2020b), leading UNICEF and the WHO to develop a “*Checklist to support schools re-opening and preparation for COVID-19 resurgences or similar public health crises*” (WHO 2020e). The document offers guidance for decision-makers and suggestions for appropriate measures to re-open schools safely.

An example of novelties in the area of *pedagogics* is the school management platform developed by Dasaran.am. in Armenia. It provides a hub for online video courses created by the teachers or taken from other sources. Courses are available for all registered pupils in the given age group. Teachers can also create quizzes to evaluate the participation and learning outcomes of their classes (Mkrtumyan, 2020). In Mexico, a rather different approach was tested which was also included in the innovation table. As many of students in Mexico do not have access to web-based solutions (e.g., cisco WebEx, zoom, skype), the government decided to ensure the continuance of school lessons by using several television channels. The Mexican government plans to record a comprehensive set of lessons for all grades and then broadcast them on TV (Rivers, Suarez, and Gallón 2020). A similar approach was offered by the British BBC, when the network announced that, from January 2021 onward, it will broadcast educational programmes for several hours per day during the lockdown (Deutsches Ärzteblatt 2021a).

Another keyword category that emerged in the horizon scanning was the focus area of *Prediction, Monitoring and Surveillance*. In the context of the horizon scanning, the keyword “Prediction” does not only refer to the prognosis of the course of virus in individual patients, but also the prediction of epidemiological developments in connection with the SARS-CoV-2 pandemic. One example is a *mathematical model* developed by the city of Kaiserslautern, the German Research Center for Artificial Intelligence at the University of Trier, and the Fraunhofer Institute for Industrial Mathematics (ITWM). The model seeks to predict the further development of the pandemic in the region of Kaiserslautern, calculating how people meet and become, for example, infected at work, in schools or in their leisure time. In addition, an ITWM tool simulates the spread of infections based on a mathematical model (Deutsches Ärzteblatt 2020e). Researchers at the University of Osnabrück and the Research Centre Jülich also developed a mathematical tool that provides up-to-date estimates for new infections as well as a five-day forecast for each German district based on data from the Robert Koch Institute (Deutsches Ärzteblatt 2020g; Pipa 2020; Schlößer 2020). Another approach used an AI model to identify those areas on the viral surface that are likely to mutate and those that are not, providing promising insight for vaccine development and genome sequencing (Hie et al. 2021; Massachusetts Institute of Technology 2021). The researchers have also applied their model to the new variants of SARS-CoV-2 (B.1.1.7 and B.1.351) after their paper was accepted for publication. Those results have yet to be published at the time of writing this report.

Conclusion

The SARS-CoV-2 pandemic has posed immense challenges to societies around the world and continues to do so, but these challenges have also significantly fuelled motivation and funding opportunities for innovations and new approaches in many sectors. Within a remarkably short time, new products were developed to aid in managing and combating the pandemic, and existing solutions were adapted to the requirements of the new situation.

A wide variety of innovative products and approaches focused on the medical, medical-technological, and pharmaceutical fields to contribute to the prevention, diagnosis, and treatment of COVID-19 and to support health systems. In the process, developments were driven forward at a previously unknown speed and new and cooperative ventures were formed that had previously seemed almost inconceivable on this scale.

COVID-19 did not affect the medical sector alone, however, but has had an impact on almost all other sectors of society. In its course, the pandemic has also often ruthlessly exposed and in some cases exacerbated deficiencies and weaknesses in systems, organisations, and approaches. This has led to numerous innovations in the field of economics and working life, new approaches to the education system and new forms of social exchange, to name but a few examples.

These developments are likely to continue in 2021. Although vaccination campaigns against COVID-19 are currently taking off in many countries, the pandemic will continue to have a major impact on public health, economic possibilities, and social life in 2021. This will certainly continue to lead to new innovations and improvements in existing approaches.

Hopefully, these innovations can also contribute to not only restoring the status ante - i.e., the status before the SARS-CoV-2 pandemic - but also to better preparing local and national systems for future crises and disasters in the sense of the United Nations' Sendai Framework for Disaster Risk Reduction document (2015) "building back better" approach, and thus limit future suffering and socio-economic hardships.

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Appendix: Innovation Table and Innovation Sheets 1-45

Date	Stakeholders	Innovation	Research Area	Focus Area	Innovation Features and Potentials	Points to consider	Potential Beneficiaries	Sources and further information
15.07.2020	RKI (Robert Koch Institute), German Government, deutsche Telekom, SAP, Fraunhofer- Society, Helmholtz-Zentrum CISP, Bundesamt für Sicherheit in der Informationstechnik, Bundesbeauftragter für Datenschutz und Informationsfreiheit (Germany)	Corona- Warn- App, Germany	Digital Health	Detection and Diagnostics/ Communication & Social Support	The app captures which smartphones have come close to each other. For this purpose, the devices exchange randomly generated crypto keys via Bluetooth. Based on the signal strength, the distance is estimated. If a user tests positive for Covid-19, they can share the test result in the app to inform users who were close to them. Infected people are explicitly asked if they want to share the result for contact tracking.	Population acceptance remains quite low. Compatible only with relatively new operating systems. The digital connection of the laboratories to the Corona Warning app has been problematic for a long time. Public health authorities said, the app did not benefit them much, since data exchange with the local health department is not automatically provided. There have been several technical issues over the course of the summer that lead to malfunctions of the app and limited its potential.	General Population	https://www.bundesregierung.de/breg-de/themen/corona-warn-app [07/15/2020] https://www.coronawarn.app/en/ [07/15/20] https://www.aerzteblatt.de/nachrichten/116788/Amtsaeerzte-sehen-nur-geringen-Nutzen-der-Corona-App?rr=0f421eeab5917fde312525e48868e06 [09/25/2020]
15.07.2020	TriOptoTec (Germany)	"Dyphox" surface lacquer with antimicrobial effect	Chemistry	Prevention	Virus adhesion to surfaces poses a risk of infection. Surfaces, e.g. desks, doorknobs, can be coated with the clear lacquer. It creates a photodynamic effect designed to kill germs. In addition, the manufacturer offers the disinfecting molecules as an admixture for other coatings. After application, the germ colonization on the surface should be significantly reduced for about a year.	The number of germs is only reduced. Further hygiene measures are mandatory. Furthermore, the product is relatively expensive: according to the manufacturer, the one-time treatment of a desk, for example, costs about 30 euros.	Public spaces and organizations, e.g. public transport, office buildings, production sites, etc.	https://dyphox.com/ [07/15/2020] https://dyphox.com/wp-content/uploads/2020/08/Dyphox-Universal_Onepager.pdf [08/18/2020] Eichner A, Holzmann T, Eckl DB, et al. Novel photodynamic coating reduces the bioburden on near-patient surfaces thereby reducing the risk for onward pathogen transmission: a field study in two hospitals. J Hosp Infect. 2020;104(1):85-91. doi:10.1016/j.jhin.2019.07.016 Online: https://pubmed.ncbi.nlm.nih.gov/31369806/ [07/15/2020] https://www.sueddeutsche.de/wirtschaft/chemie-start-up-die-sauberer-macher-1.4793396 [08/18/2020] https://www.management-krankenhaus.de/news/start-fuer-hygienetechnologie-waechst-weiter-bayern-kapital-investiert-erneuert-optotec [08/18/2020] https://www.welt.de/wirtschaft/article211459977/Corona-Dieser-Lack-soll-Oberflaechen-dauerhaft-von-Viren-befreien.html [7/15/2020] https://www.finanznachrichten.de/nachrichten-2020-05/49646768-dauerhaft-entkeimt-die-technologie-dyphox-haelt-oberflaechen-aller-art-hygienisch-rein-und-st-fuer-mensch-und-natur-voellig-unschaedlich-007.htm [08/18/2020] https://www1.wdr.de/nachrichten/ruhrgebiet/klarlack-gegen-corona-dyphox-in-ruhrbahn-essen-100.html [08/18/2020]
15.07.2020	Infineon Technologies (Germany)	Smart Entrance Counter	Engineering	Prevention	Infineon has developed radar-based access control for stores, government agencies, restaurants and other business premises that counts people reliably and anonymously with a 60 GHz radar sensor and integrated software. Through the use of radar technology, personal data is 100 percent protected. The mobile radar board is only 15mm by 20mm in size and can thus be mounted flexibly and uncomplicatedly on the wall or ceiling of an entrance. In addition to providing a traffic light system at the entrance, the facility can connect to the cloud and provide its customers with a GUI (Graphical User interface) that they can check to see how busy the location is, and enable them to choose a time where its more suitable to come.		Public areas such as airports, restaurants, shops, office buildings, etc.	https://www.elektroniknet.de/elektronik/messen-testen/corona-befluegel-radarsensoren-178398.html [last accessed 07/3/2020] https://www.infineon.com/cms/en/product/promopages/smart_entrance_counter_solution/?redirId=130866 [last accessed 08/05/2020] https://www.infineon.com/dgdl/Infineon-Smartentrancecounter-ProductBrief-v01_00-EN.pdf?fileId=554644627e4942a0173167d16a16225 [last accessed 08/05/2020]
16.07.2020	Schwarzmueller, (Austria)	"Distance vests"	Engineering	Prevention	A sensor is built into the new "distance vests" that permanently measures the distance to the other vests. When the employees of Schwarzmueller in Freinberg (Austria) get too close to each other, bright red stripes flash on the neon yellow vest. However, there is not only an optical warning, the vests also vibrate and also give a loud beep if a pre-set minimum distance is exceeded. How often the alarm is triggered is not recorded.	no follow-up information provided	Production sites, construction sites	https://oe.or.at/stories/3047185/ [07/16/20] https://www.fOCUS.de/gesundheits/coronavirus/schutz-von-angestellten-distanzwesten-im-einsatz-was-signal-ercoent-wenn-mindestabstand-unterschritten-wird_id_11976516.html [07/16/20]
16.07.2020	i3 BioMedical Inc. (Canada); Livinguard (Switzerland); Argaman Technologies Ltd (Israel)	"new" antimicrobial face masks	Medical Equipment; Chemistry	Prevention	Various companies have developed a "new generation" of face masks. The manufacturers claim, that the masks which are coated with various antimicrobial substances (e.g. copper oxide, Triiodide) can render 99% of the Corona Virus suspension on the outside surface of the mask harmless. Several studies have confirmed the efficacy of the respective products.	The principle of action is undisputed. Still, experts warn against over-expectations. Everyday masks in particular do not primarily serve one's own protection, but rather the protection of one's fellow human beings. The "new" masks do not offer 100% protection against infection and often do not close tightly. Furthermore, they are quite expensive at a price range from 6,50 Euros to 43 Euros. Various experts consider the everyday masks and medical masks used to date, together with frequent hand washing and compliance with distance rules, to be sufficient.	General population, Health professionals, public employees (e.g. in public transport, administration, education)	https://www.zdf.de/nachrichten/panorama/coronavirus-maske-biomedical-100.html [07/20/2020] https://3biomedical.com/ [07/17/2020] https://www.biospace.com/article/releases/university-of-toronto-tests-confirm-first-mask-that-deactivates-coronavirus/ [07/17/2020] https://www.br.de/nachrichten/wissen/neue-corona-killer-masken-sollen-virus-abtoeten.55wbz4v [08/04/2020] https://livinguard.com/ [07/20/2020] https://www.fu-berlin.de/en/press/informationen/fup/2020/fup_20_096-gesichtsmasken-corona/index.html [07/20/2020] https://argamantech.com/ [07/20/2020] https://www.prnewswire.com/news-releases/university-of-toronto-tests-confirm-first-mask-that-deactivates-coronavirus-301092580.html [08/04/2020] https://www.br.de/nachrichten/wissen/neue-corona-killer-masken-sollen-virus-abtoeten.55wbz4v [08/04/2020] https://www.swr.de/swraktuell/rheinland-pfalz/viren-toetende-masken-100.html [08/04/2020] https://www.mddionline.com/covid-19/whats-behind-anti-viral-mask-1106/2020
16.07.2020	Several manufacturers	Dexamethasone	Pharmacology & Pharmaceutics	Treatment	Dexamethasone, a drug well known, accessible and affordable, was shown in several studies to have benefits for critically ill patients and significantly improve survival rates. The drug is a corticosteroid used for its anti-inflammatory and immunosuppressant effects in a wide range of conditions.		Critically ill Covid-19 patients	Weber, Nina. "Covid-19: Was kann das Medikament Dexamethason - und was nicht? - DER SPIEGEL - Wissenschaft," June 17, 2020. https://www.spiegel.de/wissenschaft/coronavirus-und-covid-19-was-bewirkt-dexamethason-und-was-nicht-a-638421aa-3b61-4beb-91a7-299975c38d3 . WHO. "Coronavirus Disease (COVID-19): Dexamethasone," June 25, 2020. https://www.who.int/news-room/q-a-detail/coronavirus-disease-covid-19-dexamethasone .
21.07.2020	Armenian Government	Corona- App, Armenia	Digital Health	Detection and Diagnostics/ Communication & Social Support	The most important part of the app is the medical testing of users. Based on the results of answers to some questions the app evaluates the person's health condition and if necessary gives advice what steps should be taken. In addition, the epidemiologists of the Commandant's Office contact the suspected users, conduct an interview during which they decide whether the person needs further medical care or not. The app also provides daily information about the current situation, decisions of the commandant, and some recommendations on how to act in each individual case.	population acceptance, Compatible only with relatively new operating systems, concerns about data security. Did not live up to expectations because of multiple errors and too few people actually using the app	General Population	https://covid19.gov.am/en [last accessed 07/21/2020] https://armenpress.am/en/news/1011540.html [last accessed 07/21/2020] https://news.am/en/news/570571.html [last accessed 07/21/2020] https://www.evmreport.com/politics/efficiency-flaws-and-potential-dangers-of-phone-tracking [last accessed 07/30/2020] https://news.am/en/news/571294.html [last accessed 07/21/2020] https://play.google.com/store/apps/details?id=am.gov.covid19&hl=en [last accessed 07/21/2020]

21.07.2020	UVD Robots (Denmark) Xenex (USA) Fetch Robotics (USA) NGEN (Canada) and others	Robots for surface disinfection	Engineering, AI	Prevention	Some of the robots are fully autonomous ultraviolet-light-disinfection robots, that can be used to disinfect hospitals and nursing homes as well as a wide spectrum of public spaces, including government buildings, offices, hotels, airports and universities. Others are robots that had been modified and retooled rapidly for pandemic response.	High demand may cause extended waiting periods; Robots are not applicable in every hospital due to architectural difficulties, etc.	Hospitals, public spaces such as government buildings, offices, hotels, airports and universities	https://www.forbes.com/sites/ricblake/2020/04/17/in-covid-19-fight-robots-report-for-disinfection-duty/#747cc0952ada [07/21/2020] https://www.therobotreport.com/smartguarduv-disinfection-robot-launched-piedmont-national-fetch-robotics/ [07/21/2020] http://www.uvd-robots.com/ [07/21/2020] https://www.bbc.com/news/business-51914722 [07/21/2020] https://healthcare-in-europe.com/de/news/desinfektions-roboter-was-muss-man-beachten.html [08/11/2020] https://www.covidinnovations.com/home/06052020/pittsburgh-airport-starts-using-autonomous-robots-with-uv-light [08/11/2020]
21.07.2020	Gilead Sciences (USA)	Remdesivir	Pharmacology & Pharmaceutics	Treatment	Remdesivir is a broad-spectrum antiviral medication. It is believed to shorten the time it takes to recover from SARS-CoV-2 if given early. Remdesivir is approved or authorized for emergency use to treat COVID 19 in around 50 countries.	As of November 2020 there is no evidence that treatment with Remdesivir reduces the mortality.	Covid-19 patients	tagesschau.de . "FAQ: Was bringt Remdesivir? Was kostet es?" tagesschau.de. Accessed December 8, 2020. https://www.tagesschau.de/inland/remdesivir-medikament-coronavirus-covid-101.html . Meixner, Jana. "Remdesivir: Wahrscheinlich kein Lebensretter bei COVID-19." Medizin Transparent. Accessed December 8, 2020. https://www.medin-transparent.at/remdesivir-covid-19/ . "WHO Recommends against Using Remdesivir on Hospitalised Covid Patients 'Because There's No Proof It Works.'" Hide Out Now (blog). Accessed December 8, 2020. http://www.hideoutnow.com/2020/11/who-recommends-against-using-remdesivir.html . Cao, Yu-chen, Qi-xin Deng, and Shi-xue Dai. "Remdesivir for Severe Acute Respiratory Syndrome Coronavirus 2 Causing COVID-19: An Evaluation of the Evidence." Travel Medicine and Infectious Disease 35 (May 2020): 101647. Singh, Awadhesh Kumar, Akriti Singh, Ritu Singh, and Anoop Misra. "Remdesivir in COVID-19: A Critical Review of Pharmacology, Pre-Clinical and Clinical Studies." Diabetes & Metabolic Syndrome: Clinical Research & Reviews 14, no. 4 (July 2020): 641-48. https://doi.org/10.1016/j.dsx.2020.05.018 . https://doi.org/10.1016/j.tmaid.2020.101647 .
22.07.2020	OnFrontiers	Corona-Virus Helpdesk	Communication Sciences	Communication and social support.Policy	Helpdesk customers can ask any question they have related to COVID-19, and can then be introduced to an expert on that topic who is ready to jump in and start helping. Consultations can be conducted over the phone, within two days of the initial request. While some experts charge for their services, others provide their services pro bono.	Not all services are free of charge.	Decision makers in various fields	https://covid.onfrontiers.com/experts/ppcollab [07/22/2020]
22.07.2020	Australian Red Cross	Phone call initiative "Covid Connect"	Public Health/ Communication Sciences	Communication and social support.Policy	Telephone calls were made between trained Red Cross volunteers and those who registered on the website to minimize feelings of loneliness and social isolation.		People suffering from isolation and anxiety in home quarantine and as a result of social distancing, eg. elderly people with limited social networks	https://www.redcross.org.au/news-and-media/media-centre/media-releases/covid-connect-launch [last accessed 07/22/2020]
22.07.2020	Helmholtz centre for infection research (HZI); Federal Ministry of Education and Research (Germany); Federal Ministry for Economic Cooperation and Development (Germany)AFENET Nigeria (Nigeria), Ghana Health Services (Ghana); GCnet Ltd.; FMOH (Nigeria); GIZ International (Germany); NCDC (Nigeria)	SORMAS	Digital Health	Detection and Diagnostics	SORMAS (Surveillance Outbreak Response Management and Analysis System) is a mobile digital business management system to combat epidemics. SORMAS-ÖGD is a specialized version for contact tracing regarding the SARS-CoV-2 pandemic. It assists health boards in identifying and monitoring contact persons. Currently, SORMAS-ÖGD is used by 39 health offices in ten federal states in Germany as well as in Nigeria, Ghana, Fiji and soon is to be used in Switzerland, Nepal and Ivory Coast.		Public health officials	https://www.sormas-oegd.de/sormas-in-english/ [08/11/2020]
22.07.2020	National Institute of Applied Sciences and Technology (INSAT) (Nigeria) supported by German development agency GIZ (Germany) the Italian Society of Medical Radiology (Italy) IBM (USA)	X-ray scanning app: COVID-19 Exam CT/XR images by AI	Digital Health/ AI	Detection and Diagnostics	Tunisian engineers have created a web-based platform that scans lung X-rays and evaluates whether patients are likely to be suffering from Covid-19. Once the image is uploaded on the platform, the AI generates a recognition score for the tested person and delivers a result in approximately 15 seconds. Thousands of lung X-rays have been fed into the platform, so that AI can check them for signs of Covid-19. The process is still being optimised in order to detect signs of the virus with even higher reliability.	Still in testing phase	Clinicians , especially in remote areas	https://www.bbc.com/news/world-africa-53776027 [08/18/2020] https://techpointafrica.com/2020/04/23/african-innovations-covid-19/ [08/18/2020] https://www.thestar.com.my/tech/news/2020/04/18/covid-19-tunisia-researchers-use-ai-x-rays-to-create-online-virus-scan-tool [08/18/2020] https://www.giz.de/de/mediathek/84922.html [08/18/2020] https://developer.ibm.com/recipes/tutorials/ai-can-support-covid-19-diagnosis-from-medical-imaging/ [08/18/2020]
23.07.2020	Takataplastics (Uganda)	Face shields made of plastic waste	Medical Equipment	Prevention	To make the face shields - a two-day process - workers sort, clean, shred, melt and mould the waste plastic. Then they attach an adjustable strap, sometimes made from slices of old bicycle innertubes. The group is manufacturing both single-use shields that cost about one dollar - with frames made of cheap foam, or reusable ones, with plastic frames, that cost about \$2.70. In a country where an estimated 600 tonnes of waste plastic is thrown away daily - more than half it uncollected and less than 5 percent recycled - the effort is also helping battle plastic pollution and dirty air.		Health care workers in Uganda and potentially other developing countries	https://www.takatakplastics.com/ [07/22/2020] https://news.berkeley.edu/2020/04/10/student-in-uganda-creates-face-shields-for-covid-19-medical-responders-using-recycled-plastic/ [07/22/2020] https://news.trust.org/item/20200611002521-u8gf1#:~:text=To%20make%20the%20face%20shields%20-%20a%20two-day,sometimes%20made%20from%20slices%20of%20old%20bicycle%20innertubes. [07/23/2020]
26.07.2020	University of Texas (USA); Ghent University (Belgium)	nano-antibodies from llama blood	Microbiology & Biotechnology	Treatment	In initial laboratory experiments, the scientists found that the novel antibody was effective in stopping a "pseudotyped" version of the SARS-CoV-2 virus from infecting cells in a culture.	It is important to note that this approach is still at a very early stage of development and must be tested extensively in animals and humans before it can be established whether or not it will be effective in the treatment of COVID-19.	Patients	https://www.newsweek.com/llama-antibodies-useful-covid-19-study-1501431 [07/20/2020] https://news.utexas.edu/2020/04/29/antibodies-from-llamas-could-help-in-fight-against-covid-19/ [07/20/2020] https://www.cell.com/cell/fulltext/S0092-8674(20)30494-3 [07/20/2020] https://www.nih.gov/news-events/nih-research-matters/llama-antibody-engineered-block-coronavirus [09/30/2020]
28.07.2020	International	Online support groups for Covid-19 patients	Public Health/ Communication Sciences	Communication and social Support	Survivors and infected persons can exchange their experiences, struggles and views regarding Covid-19 infection and recovery.	support groups operate mostly on social media like Facebook so there might be (the usual) concerns about data security	Covid-19 patients and survivors	https://edition.cnn.com/2020/07/26/us/coronavirus-survivor-support-groups-wellness-trnd/index.html [07/28/2020]

30.07.2020	Federal Ministry of Education and Research (Germany); Medizininformatik-Konsortium SMITH; University Hospital RWTH Aachen (Germany)	ASIC- App	Digital Health	Detection and Diagnostics	The app screens routine patient data for signs of acute respiratory failure. If the system finds something, it immediately sends a message to the physician's smartphones- before the patient's condition is deteriorating. After checking the diagnosis at the bedside, the clinicians can initiate appropriate therapeutic measures. The app shows them therapy recommendations that fit for the specific patient in line with the official guidelines.	The app is currently in the last stage of development and testing in several university hospitals in Germany.	Clinicians	https://healthcare-in-europe.com/de/news/asic-app-warmt-vor-akutem-lungenversagen.html [08/12/2020] https://apps.apple.com/de/app/asic-app/id1505315549 [09/01/2020] https://www.healthcare-it-solutions.de/ [09/01/2020] https://www.ukachen.de/en/404.html [09/01/2020]
30.07.2020	Altoros (USA)	Fever scanner	Digital Health, AI	Detection and Diagnostics	Powered by artificial intelligence, the Fever Screener identifies individuals with high body temperature. It could help scanning people flow at airports, hospitals, and other high-traffic areas.		General population, especially at public locations like office buildings, restaurants, bars, etc.	https://www.altoros.com/solutions/mass-fever-screener-with-ai_de [08/11/2020] https://www.covidinnovations.com/home/24042020/us-it-consultancy-assisting-global-2000-organizations-altoros-launches-mass-fever-screener [08/11/2020]
30.07.2020	U.K. Government; Oxford Nanopore Technologies	"LamPORE" rapid tests	Microbiology & Biotechnology	Detection and Diagnostics	To curb the coronavirus, the UK wants to introduce new types of rapid tests to deliver results within 90 minutes. The tests could detect Covid-19 and other viruses such as flu viruses. This greatly increases the test capacity. No trained medical personnel are required to carry out the tests, which means that they could also be carried out in rather non-clinical environments.	British experts are sceptical. They criticize the government for repeatedly buying tests that didn't work. In addition, there are no independent studies on the new tests and no data on how reliable the results are. The government has so far refused to publish data on the sensitivity and specificity of the new rapid tests. In addition, there had been repeated difficulties in delivering tests in the past.	General population, especially vulnerable subgroups like people in nursing homes	https://www.faz.net/aktuell/gesellschaft/gesundheit/coronavirus/grossbritannien-kaempft-mit-corona-schnelltests-gegen-zweite-welle-16887702.html [08/05/2020] https://www.tagesschau.de/ausland/coronavirus-grossbritannien-109.html [08/05/2020] https://www.aerztezeitung.de/Politik/London-will-mit-Schnelltests-Corona-bezwingen-411783.html [08/05/2020] https://www.bbc.com/news/uk-53632043 [08/05/2020] https://nanoporetech.com/covid-19/lampore [08/07/2020] https://nanoporetech.com/covid-19/lampore [08/07/2020]
30.07.2020	ThinkMD (USA)	THINKMD- Covid19 Triage and education tool	Digital Health	Detection and Diagnostics, Communication & Social Support	THINKMD's COVID-19 triage and educational tool guides people through a COVID-19 self-risk assessment to increase healthcare capacity where it is most limited. It is based on the latest published peer-reviewed WHO and CDC clinical data on presenting signs, symptoms and risk factors. Each personal assessment determines if an individual has none, some or many of the clinical symptoms and presenting features. It is functional on any desktop, tablet or mobile smartphone and available via SMS/USDD for feature phone users. It is also functional offline for areas with limited connectivity, associated with COVID-19		General population, especially in rural areas	https://covid19innovationhub.org/innovation/medsinc [08/10/2020] https://thinkmd.org/ [08/10/2020]
30.07.2020	Heraeus Noblelight (Germany)	UV-Disinfection Chamber	Engineering	Prevention	The new UV Disinfection Chamber is designed for disinfection of touch-sensitive objects in nursing homes, hospitals and other healthcare facilities. With the chamber, users can disinfect harmful viruses on masks and other objects in just two minutes and achieve a disinfection rate of up to 99.9 percent.		Hospitals, nursing homes, public touchscreens (ATMs).	https://www.devicemed.de/dankeschreiben-an-ams-fakuma-findet-nicht-statt-a-913983/ [07/29/2020]
30.07.2020	Robots can think (South-Africa)	3D- printed masks	Engineering/ Medical Equipment	Prevention	A small Nigerian business has designed D-printable masks and aims to distribute them to local health facilities	lack of follow- up information since March	General population, Health workers	https://www.bbc.com/news/world-africa-53776027 [08/18/2020] https://techpoint.africa/2020/04/23/african-innovations-covid-19/ [08/18/2020]
30.07.2020	American TelePhysicians (USA)	Smart clinic	Digital Health	Treatment	SmarterClinix is a project of American TelePhysicians, physicians led healthcare organization & is currently being used by various hospitals, clinics and large organizations in multiple countries including USA, Pakistan, Mexico, Australia and Kenya.		Physicians, clinics, hospitals, nursing homes	https://covid19innovationhub.org/innovation/smartclinic [08/10/2020] http://www.smartclinic.net/ [08/10/2020] https://www.smartclinic.net/blog/ [08/10/2020]
31.07.2020	Technion University Faculty of Materials Science and engineering (Israel)	Masks killing COVID with heat from phone charger	Engineering/ Medical Equipment	Prevention	The mask with a USB port connects to a mobile phone charger to self-clean from the heat of the device. The power source can heat an inner layer of carbon fibres to 70°C. The disinfection process takes about 30 minutes.		General Population	https://www.covidinnovations.com/home/29062020/israeli-researchers-design-masks-killing-covid-with-heat-from-phone-charger [08/11/2020] https://www.scmp.com/video/coronavirus/3089849/israeli-researchers-invent-reusable-masks-kill-coronavirus-heat-phone [08/11/2020] https://www.mbs.news/en/2020/06/rechargeable-masks-with-usb-port-to-deal-with-corona-photos-video.html [08/11/2020]
31.07.2020	Ashely Lawrence (USA)	Masks for the hearing impaired	Medical Equipment	Prevention	An American student developed a face mask with a transparent centre that enables lip reading		Hearing impaired people	https://www.coronainnovation.at/?p=1509 [08/07/2020]
31.07.2020	Dutch and French city and district authorities	Mandatory masks in cities	Public Health	Prevention, Policy	Several cities, especially tourist hot spots, have introduced a mask requirement that also applies outside public transport and buildings. From early August on masks will be mandatory in particularly crowded areas or districts where social distancing is difficult.		General Population	https://www.faz.net/aktuell/gesellschaft/gesundheit/coronavirus/corona-verschaerfte-maskenpflicht-in-amsterdam-und-rotterdam-16883619.html https://www.lemonde.fr/les-decodeurs/article/2020/08/04/coronavirus-queles-villes-imposent-le-masque-dans-le-centre-sur-les-marches-ou-dans-tout-l-espace-public_6048106_4355770.html [08/05/2020] https://www.aerzteblatt.de/nachrichten/115467/Paris-fuehrt-ab-sofort-Maskenpflicht-im-Freien-ein?r=0&d21eab5917fd312525e48868ef06 [08/11/2020] https://www.aerzteblatt.de/nachrichten/116025/Maskenpflicht-in-ganz-Paris-an-der-frischen-Luft [08/31/2020]
31.07.2020	Fraunhofer IPA; Festo (Germany)	App „Virus Fighters Handbook“	Digital Health	Treatment	The app provides registered users with information on the use and maintenance of newly developed ventilators, as well as specific knowledge about how to handle Covid 19 patients. With Smartenance, Festo provided an existing and stable platform that had to be reprogrammed with minimal effort. The Smartenance software is usually used for the maintenance and maintenance of machines and equipment in industrial production.	Registration necessary, only applicable for certain types of ventilators	Clinicians	https://www.devicemed.de/fda-notfallzulassung-fuer-antikoerper-test-beatmungsgeraet-fuer-zwei-patienten-a-913983/ [08/10/2020]
31.07.2020	Trekmedics (USA)	Beacon Emergency Dispatch Platform	Digital Health	Treatment	Beacon, a text message-based emergency dispatch platform, is designed specifically for resource-limited settings that makes it possible to alert, coordinate and monitor emergency response networks anywhere there's a mobile phone signal — with or without internet. Beacon works as a wireless emergency alert system and automates the dispatching process by guiding the nearest available emergency care providers to quickly locate, treat, and transport emergency victims.		Population in rural areas, emergency responders, emergency care NGO's	https://covid19innovationhub.org/innovation/beacon [08/10/2020] https://www.trekmedics.org/beacon/ [08/10/2020]

31.07.2020	Open Source Ventilator (OSV) (Ireland)	3-D-printable ventilators and ventilation equipment	Engineering/ Medical Equipment	Treatment	Several companies have developed 3D- printable ventilators and other medical equipment.	Most of the ventilators are not yet fabricated and they have not yet been approved by health authorities. Compatibility issues have to be taken into consideration.	Hospitals, nursing homes. Other medical facilities	https://3druck.com/case-studies/beatmungsgeraet-open-source-3d-druck-5592565/ [07/30/2020] https://www.ovista.de/news/corona-technik-beatmungsgeraete-und-masken-im-3d-druck-381185533 [07/30/2020] https://www.researchgate.net/publication/245374049_Design_and_Prototyping_of_a_Low-Cost_Portable_Mechanical_Ventilator/link/5e7176db2996f15718459167/download [07/30/2020] https://www.boerse.de/nachrichten/KORREKTUR-Corona-Technik-Beatmungsgeraete-und-masken-im-3D-Druck/29758118 [07/30/2020] https://www.finanznachrichten.de/nachrichten-2020-07/50302675-corona-technik-beatmungsgeraete-und-masken-im-3d-druck-016.htm [08/07/2020]
31.07.2020	USA	Preventive anticoagulant therapy in Covid-19 patients	Medicine	Treatment	Covid-19 can lead to (micro-) embolism and thromboembolic disease. Researchers have conducted a retrospective study examining association of AC with mortality, intubation and major bleeding in Covid-19 patients. AC was associated with lower mortality and intubation among hospitalized COVID-19 patients. Compared to prophylactic AC, therapeutic AC was associated with lower mortality, though not statistically significant.	More research, especially randomized controlled trials and prospective studies are needed to determine the efficacy of the treatment and which AC regimen is most effective. A study to shed light on these considerations is currently underway and expected to produce first results by March 2021	Covid-19 patients	https://www.aerzteblatt.de/nachrichten/116051/COVID-19-Antikoagulation-koennen-Sterberisiko-halbieren [31/08/2020] https://www.onlinejacc.org/content/early/2020/08/24/jacc.2020.08.041 [31/08/2020] https://www.mountsinai.org/about/newsroom/2020/mount-sinai-team-offers-additional-data-on-efficacy-of-blood-thinners-for-covid-19-and-insight-on-best-potential-regimens-pr [31/08/2020] https://www.medicalnewstoday.com/articles/covid-19-possible-mechanism-for-blood-clotting-identified
06.08.2020	County authorities (Germany)	Mandatory masks during school lessons	Public Health	Prevention, Policy	Some German counties are requiring students to wear face masks during lessons starting in August 2020. Until then masks had only been mandatory during the breaks and in the halls but not in the classroom itself. The health authorities state that social distancing is not always possible in the classrooms and with sinking temperatures in autumn windows cannot stay open at all times.	Some experts disagree and state that the measure is too drastic. Others are concerned that students might suffer from difficulties concentrating as a result.	Students and tutors	https://www.sueddeutsche.de/politik/corona-deutschland-brandenburg-masken-schulen-1.4987314 [08/05/2020] https://www.onlinejacc.org/content/early/2020/08/24/jacc.2020.08.041 [31/08/2020] https://www.rnd.de/politik/maskenpflicht-in-schulen-kinderarzte-kritisieren-masken-im-unterricht-IAZO3CNRQGEA2K35XRRTLNKLJ.html [08/05/2020] https://www.ksta.de/ratgeber/gesundheit/arzt-ueber-die-maskenpflicht-in-schulen-panische-reaktionen-ernst-nehmen-37137204 [08/05/2020] https://www.tagesspiegel.de/politik/angst-vor-der-zweiten-corona-welle-drei-laender-zeigen-worauf-es-bei-schuloffnungen-ankommt/26062202.html [08/05/2020]
07.08.2020	German Government	mandatory testing after vacation	Public Health	Detection and Diagnostics, Treatment	With the end of the holiday season, Germany has introduced a test obligation for returnees. People who spent their vacation in high-risk areas are to be tested at the airport unless a negative corona test is less than 48 hours old. If people refuse the test, they face a heavy fine of up to €25,000. Testing is to be financed by the statutory health insurance funds.	There are disagreements about how the test should be funded. The health insurance funds criticise the fact that the amounts allocated to them do not cover the costs. Some people consider the financing through the solidarity community to be fundamentally wrong and demand that vacationers themselves should have to pay for the tests.	German vacationers who spent their holidays in declared high- risk areas	https://www.aerzteblatt.de/nachrichten/115369/SARS-CoV-2-Testpflicht-fuer-Einreisende-aus-Risikogebieten-ab-Samstag/r=0fd21eeab5917fde312525e48868ef06 [08/07/2020]
10.08.2020	Thornhill Medical (Canada)	Thornhill Medical - MOVES® SLC™ - portable ICU-Unit	Medical Equipment	Treatment	MOVES® SLC™ can quickly be set up bedside in any location, inside or outside the hospital, to provide immediate intensive care capability, including ventilation, oxygenation, vital signs monitoring, and suction, without the need for compressed oxygen, and while operating on battery power. Being portable and transportable, MOVES® SLC™ can stay with the patient through intra-hospital transport, or through inter-hospital transport. The device is approved by the FDA as well as Health Canada, the European Economic Area (CE Mark), and the Australian Therapeutic Goods Administration (TGA)		Patients who require mechanical ventilation	https://covid19innovationhub.org/innovation/moves-slc [08/10/2020] https://thornhillmedical.com/moves-slc/ [08/10/2020] https://markets.businessinsider.com/news/stocks/thornhill-medical-joins-canadian-response-to-covid-19-1029019768 [08/10/2020] https://www.ept.ca/features/thornhill-medical-to-the-rescue/ [08/10/2020] https://www.canadianmanufacturing.com/manufacturing/a-toronto-firms-portable-life-support-units-could-supplement-icu-beds-250598/ [08/10/2020]
17.08.2020	Tri-Dim (USA), EBM-Pabst (USA)	Portable Tri-Kleen 500UV	Engineering	Prevention/ Hygiene	The device is a portable air filtration system that creates a vacuum in closed treatment or examination rooms to prevent the overflow of virus-contaminated air into neighbouring rooms. The system includes a MERV 9 pre-filter and a cylindrical HEPA filter. This high-performance filter guarantees the filtering of 99.97 percent of all particles with a size of up to 0.3 microns. The effect of filtration is enhanced by the combination of the HEPA filter with a UV lamp, whose light kills germs, bacteria, and viruses.	For now the product is only available on the American Market, but negotiations with other countries are under way	Hospitals and other Medical Facilities in Low Income Countries and/ or remote Areas	https://www.devicemed.de/flexibles-luftfiltersystem-in-rekordzeit-entwickelt-a-955603/ [08/17/2020] https://www.tridim.com/product/tri-kleen-500-500uv/ [08/17/2020] https://www.tridim.com/wp-content/uploads/2020/05/MH_Tri-Kleen-500_Brochure-Final-1.pdf [08/17/2020] https://mag.ebmpapst.com/de/produkte/ventilatoren/luftfilter-system-mann-hummel-ebm-papst-effizienter-ventilator_22264/ [08/24/2020] https://blog.se.com/healthcare/2020/03/03/six-steps-hospital-facilities-can-take-to-reduce-the-risk-of-spreading-infectious-disease/ [08/24/2020]
18.08.2020	MamaOpe, Uganda	MamaOpe- pneumonia diagnostic device	Medical Equipment	Detection and Diagnostics	The device is strapped around the child's chest and determines and interprets respiratory rate and lung sounds using acoustic sensors placed over strategic lung fields. The results are analysed using machine learning to diagnose pneumonia and could also be helpful in diagnosing Covid-19-related respiratory conditions. Patient data can be uploaded to the cloud for remote consulting or telemedicine application.	Not yet implemented as of August 2020	Children with respiratory conditions, especially in remote areas with few health facilities	https://covid19innovationhub.org/innovation/mama-ope/ [08/18/2020] http://mamaope.com/ [08/18/2020]
18.08.2020	AON3D (Canada)	3D- printable face masks and components for ventilators	Engineering/ Medical Equipment	Prevention	The company offers 3D-printed face masks and ventilator components. In addition owners of 3D- printers can download the open-source blueprints for the products		PPE users with access to 3D- printers	https://covid19innovationhub.org/innovation/aon3d/ [08/18/2020] https://www.aon3d.com/3d-printed-medical-supplies-to-fight-covid-19/ [08/18/2020] https://github.com/aon3d/covid-face-shield [08/18/2020]
19.08.2020	IFM Institute for Manufacturing of Cambridge (U.K.); NHS Papworth Hospital Cambridge (U.K.); Gemü (Germany)	1 ventilator for 2 patients	Engineering/ Medical Equipment	Treatment	Scientists are working on a solution to enable clinicians to ventilate Covid-19- patients with one ventilator. This could be made possible by the use of especially developed valves. As soon as they have succeeded they will share the blueprint online. This could save lives- especially in countries with a shortage of ventilators and high hospitalization rates	A solution that can compete with regular ventilators is still in development as of August 2020.	people in need of ventilators	https://www.devicemed.de/gemue-ventile-im-einsatz-gegen-covid-19-a-953766/ [08/18/2020]
24.08.2020	Yale University (USA)	SalivaDirect- rapid saliva test	Microbiology & Biotechnology	Detection and Diagnostics	The test is easy to use and results are available after 3 hours. Yale university will make the instructions for the test public as an "open source" protocol. It can be scaled up quickly and costs about 10 \$. Since mid- August it is FDA- approved in the USA.	For now only available in the US	General Population	https://www.livescience.com/covid-19-saliva-test-yale.html [08/24/2020] https://www.medrxiv.org/content/10.1101/2020.08.03.20167791v1 [08/24/2020] https://edition.cnn.com/2020/08/16/health/us-coronavirus-sunday/index.html [08/24/2020]

15.09.2020	Doarvo, et. al.	Machine learning maps Covid-19 literature gaps	AI	Prediction, Monitoring & Surveillance	Since August 2020, thousands of COVID-19 (Coronavirus Disease 2019) have been published. Manual assessment of their scope is an overwhelming task, and links through metadata analysis (such as keywords) assume that the studies are tagged correctly. However, machine learning approaches can quickly assess the actual text of publication abstracts to identify research overlaps between COVID-19 and other coronaviruses, research hotspots, and exploration areas. Doarvo et. al. propose a fast, scalable and reusable framework to analyse new disease literature.		Researchers	https://www.cell.com/patterns/fulltext/S2666-3899(20)30164-1?utm_campaign=Coronavirus%202020&utm_medium=email&_hsmi=95502496&_hsenc=p2ANqtz-80kvm5qEw1sKwMDreNz4MoSBg6b3NzBRNLNuvdDmrbTchoTBb8IRMLCqevBPwzorX71EK5pmXD-NxQzH2PEQHWkmiO1ew&utm_content=95502544&utm_source=hs_email [09/15/2020]
15.09.2020	Africa CDC Institute for Pathogen Genomics	Africa Pathogen Genomics Initiative (Africa PGI)	Epidemiology, Microbiology & Biotechnology	Prediction, Monitoring & Surveillance	Continent- wide initiative of the Africa CDC to enhance surveillance, pathogen characterization, product development (particularly genome sequencing) and training in order to prevent/ mitigate the effects of communicable diseases. The Africa PGI comprises of a network of public health institutions, a training facility, a digital architecture for bioinformatics and the development of public health use cases for genomic sequencing.	The initiative was founded in 2019 and it remains to be seen how effective its efforts will turn out.	Public Health officials and researchers, ultimately the population	https://africacdc.org/download/africa-pathogen-genomics-initiative-factsheet/ [12/14/2020]
18.09.2020	City of Kaiserslautern (Germany); German Research Center for Artificial Intelligence/ Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI) at the University of Trier; Fraunhofer- Institut für Techno- und Wirtschaftsmathematik ITWM	Kaiserslautern Model	AI	Prediction, Monitoring & Surveillance	With the help of artificial intelligence and a forecasting model, the city of Kaiserslautern wants to predict the further development of the corona pandemic in the region. The tool calculates how people meet and get infected at work, in schools or in leisure time. In addition, an ITWM tool simulates the spread of infections based on a mathematical model. The event is depicted for different age groups. The tool could predict the medium-term development of infections, the number of unreported cases, the number of severe histories and the necessary hospital beds and deaths. The results should help to assess which measures are appropriate. For the first time, such a model will be adapted to a specific city.	As of now there are to yet results available on how effective and accurate the tool works.	City officials and political decision makers	https://www.aerzteblatt.de/treffer?mode=s&wo=17&typ=1&nid=116476&s=kaiserslautern [09/18/2020]
18.09.2020	IVAT GmbH (Germany)	IVAT Hygiene tower	Engineering	Prevention	Thanks to its four-stage high-performance filter, the Hygiene Air Tower cleans the air of more than 99.995 percent of all viruses and can thus generate an air quality that meets the requirements for effective air cleaning of rooms. In addition, it can perform many other tasks, such as cooling or heating rooms, filtering odours, and disinfecting hands and objects	The Hygiene Tower with all its bonus- features might be a little too much for the needs of most cus-tomers in need of air purification, such as schools, offices, or public buildings.	public spaces like schools, public buildings, doctors offices	https://www.augsburger-allgemeine.de/themenwelten/wirtschaft/Die-Corona-Innovation-Made-in-Augsburg-id58121516.html [09/18/2020] https://www.hygiene-air-tower.de/hygiene-air-tower/ [09/18/2020]
18.09.2020	Eli Lilly (Canada), AbCellera (Canada)	LY-CoV555 - and LY-CoV016 monoclonal Antibody treatment	Medicine; Pharmacology & Pharmaceutics	Treatment	An experimental antibody designed to intercept SARS-CoV-2 in the blood has significantly reduced the number of hospitalizations and emergency admissions in patients with mild to moderate conditions and reduced the viral load in the medium dose. This is described in the interim evaluation of the Phase 2 study, the results of which the manufacturer announced in a press release. Serious side effects have not occurred, according to the manufacturer.	One limitation could be that apparently only patients with mild to moderate symptoms were treated, who also remained without complications in the placebo- group. The efficacy in serious cases is therefore not yet proven. It could be that the antibodies no longer have any effect if the disease is advanced and characterized by the already occurring destructions and an excessive immune response.	Covid- patients with mild symptoms	https://www.aerzteblatt.de/nachrichten/116592/COVID-19-Erstes-Antikoerperpreparat-erzielt-Schutzwirkung-bei-leichtereren-Erkrankungen?r=0f021eeab5917fde312525e48868ef06 [09/18/2020] https://investor.lilly.com/news-releases/news-release-details/lilly-announces-proof-concept-data-neutralizing-antibody-ly [09/18/2020]
22.09.2020	Imperial College London	Rapid test	Microbiology & Biotechnology	Detection and Diagnostics	The new test delivers a result within 90 minutes. The sampling takes place as with the current RT-PCR with a swab, the tip of which is then inserted into a "DNA Cartridge". This sample box is then inserted into the so-called "nudge box", which is the size of a shoe box. There, the individual steps of virus detection (extraction of RNA, amplification of the target gene and colour reaction) are performed automatically. The test does not require a special laboratory or trained personnel.	The test has only been used in 8 hospitals so far.	clinicians, laboratories	https://www.aerzteblatt.de/nachrichten/116645/SARS-CoV-2-2-Schnelltests-weisen-Virusgene-ohne-Labor-nach [09/22/2020]
22.09.2020	Massachusetts Institute of Technology (USA) and researchers from various US research institutes.	Rapid test STOPCovid.v2"	Microbiology & Biotechnology	Detection and Diagnostics	The test could produce a result after 30 minutes. The virus genes are detected after extraction of RNA and amplification using CRISPR enzymes. According to the manufacturer, the test is simply carried out. The samples could be taken from the inside of the nasal wings. It is currently being examined whether the test is also possible with saliva samples. This would create the potential for a quick at home test for example for health care workers.	No FDA approval yet	Clinicians, Laboratories	https://www.aerzteblatt.de/nachrichten/116645/SARS-CoV-2-2-Schnelltests-weisen-Virusgene-ohne-Labor-nach [09/22/2020]
25.09.2020	United Kingdom Government	Corona- app for England and Wales	Politics	Detection and Diagnostics, Communication & Social Support	After a log delay due to technical difficulties the Corona app for England and Wales was launched on September 24, 2020. Like the German Corona Warning app, the English app exchanges Bluetooth signals with other mobile phones to track contacts anonymously. In addition to warnings about close contact with corona infected people, as they are also known from the German app, the English program also provides information about the level of corona risk in their own postcode area. The app will also be used when people are in restaurants, cinemas or other public spaces. Operators should apply for and hang a QR code for this, which visitors can scan with the app. If the location develops into an outbreak hotspot, users should be warned via the app.	As with the German App, some citizens fear problems regarding data security and efficacy of the app	General population in England and Wales	https://www.aerzteblatt.de/nachrichten/116778/Corona-App-fuer-England-und-Wales-mit-grosser-Verspaetung-gestartet?r=0f021eeab5917fde312525e48868ef06 [09/25/2020]

25.09.2020	University of Osnabrück, Research centre Jülich (Germany)	Regional Prognosis	AI	Prediction, Monitoring & Surveillance	The model provides up-to-date estimates for new infections as well as a five-day forecast for each German district. For this purpose, data from the Robert Koch Institute (RKI) are statistically analysed on high-performance computers. It not only considers the most likely development or medium development, but also estimates the probability for different scenarios that are compatible with the current data. It is available online	Since the model has not been used to predict Coronavirus infections before, a comprehensive validation of the results is possible only after analysing the predictions in the upcoming months. Furthermore, one has to keep in mind, that the prognosis is highly dependent on the data provided by the local health authorities and therefore susceptible to delays	General population, local authorities	https://www.aerzteblatt.de/nachrichten/116764/Forscher-entwickeln-regionale-Coronavorhersage?rt=0fd21eeab5917fde312525e48868ef06 [09/25/2020] https://covid19-bayesian.fz-juelich.de/ [09/25/2020]
26.09.2020	Moscow officials (Russia)	Curfew for senior citizens	Politics	Prevention	Moscow's mayor Sergei Sobyanin imposed a curfew for senior citizens. Residents over the age of 65 should stay at home and go shopping as rarely as possible	The strict curfew might isolate lonely people even further and lead to mental health issues.	Senior citizens	https://www.tagesspiegel.de/wissen/coronavirus-in-deutschland-und-der-welt-2000-menschen-in-hamm-nach-hochzeit-in-quarantäne/25560996.html [09/25/2020] T-Online.de. "Steigende Infektionszahlen: Moskau Verhängt Ausgangsperre." March 29, 2020. https://www.t-online.de/nachrichten/ausland/id_87612694/steigende-infektionszahlen-moskau-verhaengt-ausgangsperre.html . [12/13/2020]
30.09.2020	Creative Nestlings (South Africa)	Mini-comics for Corona risk communication in South Africa	Communication Sciences	Communication and social support	Series of mini-comics sharing critical information about coronavirus in different local South African languages. The mini-comics will be shared on digital platforms such as WhatsApp and Facebook.		Communities in South Africa	https://cchunigeria.com/covid-19-support/ [09/30/2020]
30.09.2020	Bosch	PCR-based rapid test	Microbiology & Biotechnology	Detection and Diagnostics	Bosch developed a rapid test on the basis of PCR that can deliver a test result within 40 minutes. The test could be particularly useful for rapid testing on airports or nursing homes		General Population	https://www.bosch.com/de/stories/vivalytic-covid-19-schnelltest/ [10/01/2020] https://www.swr.de/swraktuell/baden-wuerttemberg/bosch-bringt-analysengerat-fuer-covid-19-schnelltest-auf-den-markt-100.htm [10/01/2020]
30.09.2020	BD (Becton, Dickinson and Company) (Germany)	SARS-CoV-2 antigen test for use on the BD Veritor™ Plus System	Microbiology & Biotechnology	Detection and Diagnostics	The test can test for influenza and covid within 15 minutes. It has been approved by the FDA in July and has now been cleared by the ECDC. It is available in Europe in October 2020		General Population	https://www.technologynetworks.com/en/product-news/sars-cov-2-assay-for-bd-veritor-plus-system-available-in-europe-by-end-of-october-341005 https://www.bd.com/en-us/company/news-and-media/press-releases/bd-launches-portable-rapid-point-of-care-antigen-test-to-detect-sars-cov-2-in-15-minutes-dramatically-expanding-access-to-covid-19-testing [09/30/2020]
30.09.2020	City of Würzburg (Germany), Livinguard (Switzerland)	Pilotprojekt „Würzburg Care“	Medical Equipment/ Politics	Prevention	Würzburg has been among the German cities most badly affected by coronavirus. In a new pilot project in cooperation with the mask manufacturer Livinguard the city is now testing new masks with electrostatic charge.	There are no results available yet.	Population of Würzburg	https://www.devicemed.de/automatica-abgesagt-beatmungssystem-fuer-wirtschaftspreis-nominiert-a-913983/ [09/30/2020] https://www.mainpost.de/regional/wuerzburg/neue-masken-mit-elektrostatischer-aufladung-gegen-corona.art735,10497246 [09/30/2020]
01.10.2020	Massachusetts Institute of Technology (USA)	Audio AI model to detect Covid-19 in recordings of coughs	AI	Detection and Diagnostics	A new elaborate AI-model might detect Covid-19 in device recorded (e.g. via smartphone) coughs. The researchers have combined several models previously successful in identifying Alzheimer's patients, and fed them with more than 70000 samples, before developing an algorithm. The researchers say their model detected more than 98.5 % of Covid-Cases including 100% of asymptomatic cases. So the tools main purpose is to discern asymptomatic coughs from healthy coughs. If the technology can be transferred in a free app and gets the FDA approval it might contribute to screening efforts. Similar tools have been used before to identify patients suffering from pneumonia. Asthma and even Alzheimer's. The technology could provide a free and non-invasive diagnostic tool which could be instantly distributed to screen asymptomatic people. This might scale up testing capacities and mitigate barriers to get tested. The study was published in IEEE Journal of Engineering in Medicine and Biology	The app is not yet approved by the United States Food and Drug Administration (FDA). Researchers at Augsburg in Germany are developing a similar programme at the moment that focuses on voice samples.	General Population	MIT. "The Massachusetts Institute of Technology (MIT)." Massachusetts Institute of Technology. Accessed November 9, 2020. http://web.mit.edu . Chu, Jennifer. "Artificial Intelligence Model Detects Asymptomatic Covid-19 Infections through Cell-phone-Recorded Coughs." MIT News Massachusetts Institute of Technology, October 29, 2020. https://news.mit.edu/2020/covid-19-cough-cellphone-detection-1029 . [11/09/2020] Laguarda, Jordi, Ferran Hueto, and Brian Coventry. "COVID-19 Artificial Intelligence Diagnosis Using Only Cough Recordings – EMBS." embs.org, September 30, 2020. https://www.embs.org/ojemb/articles/covid-19-artificial-intelligence-diagnosis-using-only-cough-recordings . [11/09/2020]
01.10.2020	University of Washington (USA)	Computer-designed proteins	Medicine, Microbiology & Biotechnology, AI	Treatment	Two approaches were used to create the proteins. First, a segment of the ACE2 receptor was integrated into a series of little protein scaffolds. In the second method, fully artificial proteins that did not pre-exist in nature were created from scratch. The latter method produced the most potent antiviral proteins, including the most promising LCB1, that outperformed monoclonal antibodies. It was then determined how exactly of the mini-proteins bound to the receptor and the binding was improved by further testing and correcting the binding mechanisms were improved. The researchers originated more than two million new spike-binding proteins since January 2020 of which more than 100,000 were then tested in the lab. The computer-designed proteins are quite easy to produce and can be produced relatively fast in large quantities. They do not necessarily need refrigeration and can be applied locally (e.g. nasal via nebulizer). With further development researchers might be able to produce the proteins for future viruses within weeks after their genome has been obtained.	Although the results seem to be promising so far, clinical testing has to be intensified and further research is needed.	Covid-19 patients	https://www.nih.gov/news-events/nih-research-matters/computer-designed-proteins-may-protect-against-coronavirus [10/01/2020] https://scitechdaily.com/computer-designed-synthetic-antiviral-proteins-inhibit-sars-cov-2-covid-19-in-human-cells/#:~:text=Computer%20design%20of%20synthetic%20proteins%20is%20creating%20potent%2C,cells%20from%20SARS-CoV-2%2C%20the%20coronavirus%20that%20causes%20COVID-19. [10/01/2020] https://science.sciencemag.org/content/early/2020/09/08/science.abd9909 [10/01/2020]
02.10.2020	PwC, Samariterbund, AIT Austrian Institute of Technology (Austria)	Covid-19 Simulator	AI	Prevention	The Covid-19 Simulator is a computer simulation of possible viral spread in buildings. With the help of a digital twin of a real building (e.g. office space), the risk of contagion by Covid-19 is calculated. For example, various measures to contain the pandemic in virtual reality are being tested to derive data-driven recommendations for the best possible mix of measures.		public buildings, offices,	https://www.ots.at/presseausendung/OTS_20201001_OT50047/neuer-covid-19-simulator-von-pwc-minimiert-infektionsrisiko-in-gebauten-wie-schulen-oder-bueros-bild [10/02/2020] https://computerwelt.at/news/covid-19-simulator-von-pwc-soll-infektionsrisiko-in-gebauten-reduzieren/ [10/02/2020] https://www.pwc.com/gx/en/about/corporate-governance/network-structure.html . [10/02/2020] https://www.ots.at/presseausendung/OTS_20201001_OT50047/neuer-covid-19-simulator-von-pwc-minimiert-infektionsrisiko-in-gebauten-wie-schulen-oder-bueros-bild . [10/02/2020]
04.10.2020	Nigeria	Rapid tests	Microbiology & Biotechnology	Detection and Diagnostics	Nigeria has developed cheaper tests for Covid-19, that resemble the standard PCR tests but are cheaper and can be conducted by untrained personnel by using a portable testing kit.	The test is hard to validate, since there is not much information provided online	General population in Nigeria	https://edition.cnn.com/2020/10/03/africa/nigeria-cheaper-covid-19-test-kits-intl/index.html [10/26/2020]

21.10.2020	Hongkong	Self-disinfecting doorhandle	Engineering, Chemistry	Prevention	Students from Hongkong developed a self-disinfecting doorhandle. Now the innovative product has been nominated for the Design Award "Beazly Design of the Year" in London. The transparent door handle is coated with titanium oxide. The coating reacts to light and can destroy pathogens. A UV LED light is integrated into the door handle, which is activated as soon as the door is opened or closed. The light is operated by converting energy when opening and closing the door	Smear infection is not the main transmission mode of Covid-19 so the self-disinfecting doorhandle can only be an addition to other measures.	Public buildings, offices,	Ende, Tim. "Effektiv Gegen Corona-Ausbreitung! Dieser Türgriff Desinfiziert Sich Selbst." October 21, 2020. https://www.t-online.de/nachrichten/panorama/id_88787216/effektiv-gegen-corona-ausbreitung-dieser-tuergriff-desinfiziert-sich-selbst.html [10/21/2020]
23.10.2020	SQI Technologies; McMaster University (Canada)	McMaster Diagnostic tool	Microbiology & Biotechnology	Detection and Diagnostics	The developers have created a surface that repels every other element of human blood except some critical cytokine biomarkers like Interleukin-6 (IL-6). This could help to detect the progress of potentially critical cytokine storms in Covid-19 patients and to measure disease severity according to the researchers. The technology could also be used for patients with other acute respiratory diseases	The tool is an advanced diagnostic tool and not yet in common use	Researchers, Laboratories	https://www.mddonline.com/covid-19/sqi-and-mcmaster-university-look-to-measure-severity-covid-19 [10/23/2020]
23.10.2020	Siemens Healthineers (Germany)	Rapid test	Microbiology & Biotechnology	Detection and Diagnostics	The Clinitest Covid-19 Antigen Rapid Test is a point-of-care cassette test that requires no laboratory equipment or specialized laboratory personnel to perform and delivers results in 15 minutes. The CE-certified test showed 96.72 percent sensitivity and 99.22 percent specificity based on a clinical study involving 317 subjects. The test could be helpful for on-site testing in nursing homes, airports or offices for example	FDA approval pending as of October 2020.	General population, especially for on-site testing	https://www.devicemed.de/verschiebung-nicht-dringlicher-operationen-rundumhygiene-in-orthopaediewerkstaetten-a-913983 [10/23/2020]
23.10.2020	WHO (International)	Digital implementation investment guide (DIIG)	Digital Health	Policy	The WHO provides a comprehensive manual for doing just that in its 180-page Digital Implementation Investment Guide launched in September 2020. The guide not only provides key principles for digital innovation enhancement but also a step by step guide that is intended to work governments through the process of identifying, designing, financing and implementing needs-adapted digital health interventions. The DIIG is the result of vast international expertise and is an addition to the "WHO guide-line: recommendations on digital interventions for health system strengthening" and other related WHO documents. The guidelines can be a useful tool for governments in selecting and implementing digital health tools in one or more health programme areas. Due to its needs-based approach and international alignment, it is applicable to low- and middle-income countries (LMIC) as well as high-income countries. The guide might also be helpful for local (health) officials who want to improve their knowledge regarding digital health and possible implementation strategies.	Obviously, the guidelines have to be adapted to the local/ national context and a certain amount of funding will be required.	Governments, local officials	https://www.who.int/publications/i/item/who-digital-implementation-investment-guide [12/14/2020]
23.10.2020	ODI (Overseas Development Institute), Humanitarian Policy Group	Covid-19 mapping tool for humanitarian action	Humanitarian Aid	Policy	The Humanitarian Policy Group (HPG) at the Overseas Development Institute (ODI) has developed an interactive online tool to keep track of local and global humanitarian actions regarding Covid-19. The mapping tool monitors local Covid-19 initiatives on different levels and collects evidence. Users can select a country or a certain level of interventions and read examples of local measures and initiatives as well as review the data collected. Possible impacts, as well as enabling factors and barriers of the respective interventions are provided in a short description.	Since the project is quite new, the data sets are relatively small at the moment.	Humanitarian Aid Providers, Policy makers	https://www.odi.org/covid19-tracking-local-humanitarian-action/?utm_campaign=1548996_Explore%20our%20new%20Covid-19%3A%20tracking%20local%20humanitarian%20action%20and%20complementary%20partnerships%20mapping%20tool&utm_medium=email&utm_source=Overseas%20Development%20Institute&utm_country=&utm_id=402W.X770.69IEFL.445YY.I [10/14/2020] https://www.odi.org/covid19-tracking-local-humanitarian-action/?utm_campaign=1548996_Explore%20our%20new%20Covid-19%3A%20tracking%20local%20humanitarian%20action%20and%20complementary%20partnerships%20mapping%20tool&utm_medium=email&utm_source=Overseas%20Development%20Institute&utm_country=&utm_id=402W.X770.69IEFL.445YY.I# [10/23/2020]
24.10.2020	MAN (Germany)	Covid-19 testing truck	Engineering, Medical Equipment	Detection and Diagnostics	MAN Truck & Bus has developed an innovative diagnostic vehicle that can safely and quickly detect SARS CoV-2 infections at hotspots. With more than 500 tests per vehicle per day, the rolling lab is suitable for conducting on-site tests on suspicion of a potential infection, for example in retirement homes, schools, businesses or other facilities. The tests are carried out within 40 minutes with the help of the Vivalytic device from Bosch Healthcare Solutions. This way, test capacities can be quickly relocated as required and used precisely where they are needed.		General population, particularly for on-site screening	https://www.pressebox.de/inaktiv/man-truck-bus-ag-muenchen/MAN-stellt-mobiles-Coronavirus-Diagnostikfahrzeug-vor-PCR-Testergebnisse-innerhalb-einer-Stunde-verfuegbar/boxid/1028890 [10/24/2020]
24.10.2020	PointGrab (Israel)	Smart sensors tracking social distancing	Engineering, AI	Prevention	The sensors are about the size of a smoke alarm and can record not only the number of people in buildings but also how far apart they are from each other and whether they are moving in a given direction. In addition, an optional alarm can be set up to notify when two people are closer than two meters together for more than 30 seconds, for example.		Office buildings	Scott, Katy. "Smart Sensors Could Track Social Distancing in the Office." CNN, October 23, 2020. https://www.cnn.com/2020/10/23/tech/pointgrab-sensors-social-distancing-office-spc-intl/index.html [12/14/2020]

27.10.2020	Universität Erlangen-Nürnberg ; Ludwigs-Maximilians-Universität München (Germany)	IKKA- Score	Medicine	Prevention	Most previously developed scores take into account comorbidities and sociodemographic information but also rely on clinical parameters such as O2- saturation, laboratory tests to assess the patient's risk for severe Covid-19. Those data are not accessible in a primary prevention setting . The IKKA- score however was especially developed for those settings. It consists of 4 categories: Immunosuppression, Known severity of any pre-existing condition, Known risk factors as defined by the Robert Koch Institute (RKI), and Age. Those categories are evaluated according to a point system. In a second step the employee can then be allocated to one of four occupational groups which determine the possible fields of activity , depending on his/her risk .The score might be a practical tool in risk-assessment for non- clinical settings and can provide helpful and time-efficient guidance in decision making. Occupational physicians can thus work together with the company to look for risk-adapted fields of work for particularly vulnerable workers. The score could also contribute to a more unified decision- making basis in German companies. The score might be adopted in other countries or areas as well.	The numerical classification and assignment of the point values are mostly based on the authors assessment due to the very limited evidence on COVID-19 so far. The score considers purely medical information and does not take into account socio-political or ethical considerations that might emerge .	Covid-19 patients	Deutsches Ärzteblatt. "Primärprävention: Score-System zur COVID-19-Risiko-Einschätzung." Deutsches Ärzteblatt, October 27, 2020. https://www.aerzteblatt.de/nachrichten/117753/Primaerpraevention-Score-System-zur-COVID-19-Risiko-Einschuetzung .
29.10.2020	Massachusetts General Hospital (USA)	CoVa- Score	Medicine, AI	Detection and Diagnostics	Based on the previously developed COVID-19 Acuity Score (CoVA) the new score uses AI algorithms to determine which patients at urgent care clinics or emergency departments are most likely to develop complications and should be hospitalized.		Clinicians, Patients in Emergency departments	https://www.mddionline.com/covid-19/investigators-use-ai-develop-risk-score-covid-19-patients [10/29/2020]
30.10.2020	Research and innovation hub Imec (International)	Breath test	Medicine, Engineering	Detection and Diagnostics	The company has begun to develop a test that aims at detecting Covid-19 in the breath and deliver a test result within 5 minutes.	Development will not be finished until summer 2021	General population, especially for on- site testing	https://healthcare-in-europe.com/en/news/new-sars-cov-2-test-to-deliver-results-in-under-5-minutes.html [12/14/2020]
30.10.2020	University of Halle (Germany)	RESTART Study	Epidemiology	Prevention	In August, the scientists of the University Medicine Halle, with the support of the states of Saxony-Anhalt and Saxony, carried out the world's first study on the conditions under which major events (e.g. concerts) could still take place in the pandemic. The researchers concluded that only seated concerts with strict regulation at entrance and breaks should take place, so that no unnecessary waiting times arise. Several entrances should be provided to avoid crowds, food and drink should be served at the place only. Ventilation (and ventilation systems) also played a major role in ensuring the safety of visitors.	Hopefully, the measures will not need to be that strict, once a vaccine is available and enough people are vaccinated	General population,Event managers, Town Halls, Hotels and other venues.	https://www.nytimes.com/2020/11/03/world/europe/coronavirus-concert-study-germany.html?action=click&campaign_id=154&emc=edit_cb_20201103&instance_id=23769&module=RelatedLinks&nl=coronavirus-briefing&pgtype=Article&regi_id=1465876908&segment_id=43376&ce=1&user_id=7d67092f99efb745964ad1c988857c5c [11/4/2020] Deutsches Ärzteblatt. "Studie RESTART-19: Konzerte in Zeiten von Corona." Deutsches Ärzteblatt, November 6, 2020. https://www.aerzteblatt.de/archiv/216565/Studie-RESTART-19-Konzerte-in-Zeiten-von-Corona . [11/15/2020]
31.10.2020	India	Paper strip test FELLUDA	Microbiology & Biotechnology	Detection and Diagnostics	The Feluda- test is based on the CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) gene- editing technology to identify the genetic components of SARS- CoV-2. SARS-CoV-2 sequence in the sample (nasal swab) reacts with the barcoded Cas9 protein in the test. The SARS-CoV-2-Cas9- complex is then placed on a paper strip. Similar to a pregnancy test, two lines are used (one test, one control) to determine whether the sample is infected with SARS- CoV-2. According to the CSIR-Institute of Genomics and Integrative Biology (IGIB) the test has a sensitivity of 96% and a specificity of 98%. The manufacturers say, that their test is as reliable as a PCR test.. The test has been approved by the Indian drug authority. It costs only about 500 Rupees (about 6,7 US\$) and delivers results within 15 minutes. Since it is quick and easy to produce, apply and interpret it can potentially really scale up testing capacities even in challenging environments. Some researchers believe that the Feluda- test could replace anagen tests since it is cheaper and more accurate	Right now the test still has to be done in laboratories (although no extensive equipment is needed[[]]) but the company is working on manufacturing it for self-testing	General Population	https://edition.cnn.com/2020/10/05/india/covid-19-hour-tests-approved-int/index.html?utm_term=.1602430230745665d882e3b90&utm_source=Coronavirus+Sunday+-+October+11+%2C+2020&utm_medium=email&utm_campaign=249803_1602430230747&bt_ee=e81V7fzSUO3gUQTUgphBy6p4okaaV6RuVeo7n9vT0LUoA6T0zGqzjBF1Y9IKo&bt_ts=1602430230747 [10/12/2020] https://www.outlookindia.com/website/story/india-news-scientists-say-cheap-and-quick-feluda-test-could-help-india-battle-covid-19/361545 [10/21/2020] https://www.bbc.com/news/world-asia-india-54352222 . [10/21/2020] https://indianexpress.com/article/explained/feluda-coronavirus-covid-19-test-tata-sons-crispr-technology-6603573/ . [10/21/2020]
31.10.2020	Researchers of Andrew and Peggy Cheng Department of Medical Engineering, California Institute of Technology and Rehabilitation Clinical Trials Center, Division of Respiratory and Critical Care Physiology and Medicine, The Lundquist Institute for Biomedical Innovation at Harbor-UCLA Medical Center (USA)	SARS-CoV-2 RapidPlex	Microbiology & Biotechnology	Detection and Diagnostics	The SARS CoV-2 Rapidplex is a portable, wireless electrochemical platform for ultra-rapid detection of COVID-19. It detects viral antigen nucleocapsid protein, IgM and IgG antibodies, as well C- resicve protein in blood and saliva. Based on a pilot study the Rapidplex may allow for high frequency at-home testing for COVID-19 telemedicine diagnosis and monitoring and might also be helpful in determining the severity of the disease. It can be produced at very low costs.	The article has not yet been published in a peer-reviewed journal as of October 2020.	Clinicians, General population	https://www.cell.com/matter/fulltext/S2590-2385(20)30553-1?utm_campaign=Coronavirus%202020&utm_medium=email&_hsmi=970139398_hsenccp2ANqz-9MtUTBor3WYT-fGCGkXnsalcvpNy-7-VIXABHNN_4l-pbk&NFRQOjXxHAWGJ_sbzZMCIPQDqafspMYf16ywr5Cx&utm_content=97013491&utm_source=hs_email [10/12/2020]

05.11.2020	READY Initiative (International)	COVID-19 Risk Communication and Community Engagement Toolkit for Humanitarian Actors ("RCCE Toolkit")	Communication Sciences/ Public Health/ Humanitarian Aid	Communication and social support. Policy	The Risk Communication and Community Engagement Toolkit for Humanitarian Actors is designed to help humanitarian actors or others involved in risk communication and community engagement (RCCE), to plan and implement RCCE in their Covid-19- response. It provides many resources, grouped and structured by topic and linked to key steps and components of effective RCCE. It includes guidelines and suggestions for hiring RCCE- staff as well as sample messages and materials. In addition, resources for the inclusion of several potentially vulnerable groups in messaging strategies are provided. The toolkit can be immensely helpful to get a quick overview of the relevant components and basics of a successful RCCE- effort. Since it provides a lot of resources and samples it can contribute to rapid adaption and integration of RCCE in humanitarian contexts. Furthermore, the Initiative offers short courses on several relevant topics free of charge.	The toolkit is not a one-size-fits-all- solution, of course. Although it is well structured and updated regularly, it is crucial for providers to reflect on the situation at hand and adapt the provided guidelines to the local situation.	Humanitarian Actors, national or local authorities and policy makers	READY Initiative. "About – READY Initiative," 2020. https://www.ready-initiative.org/about/ . [05/11/2020] READY Initiative. "COVID-19 Risk Communication and Community Engagement Toolkit for Humanitarian Actors – READY Initiative." ready-initiative.org. 2020. https://www.ready-initiative.org/covid-19-risk-communication-and-community-engagement-toolkit-for-humanitarian-actors/#toggle-id-6-closed . [05/11/2020]
05.11.2020	Gradian Health Systems (USA)	Universal Anaesthesia Machine (UAM)	Medical Equipment	Treatment	The internationally certified anaesthesia machine is especially built for challenging environments and facilities that lack reliable oxygen and steady access to electricity	The most common procedure supported by the UAM is emergency c-sections in rural Africa , meaning that it is most often used for female patients of child-bearing years.	Patients in Low- Income Countries	COVID-19 Innovation hub. "Universal Anaesthesia Machine (UAM)." GIE, November 2020. https://covid19innovationhub.org/innovation/the-universal-anesthesia-machine-uam . [12/11/2020]
14.11.2020	Novosound (U.K.)	Wearable Ultrasound sensors	Medical Equipment	Treatment	Wearable ultrasound sensors can help to monitor patient's lung function remotely. While the patient stays at home, the physicians can monitor several parameters. The raw measurements are processed and interpreted to produce user-friendly data. The device can also be used in ICUs to assist in measuring the effectiveness of a new treatment or ventilation regimen		Recovering COVID- patients	Nichols, Mark. "Ultrasound Confirms Frontline Value in COVID-19 Setting." Healthcare in Europe. com. Accessed September 28, 2020. https://healthcare-in-europe.com/en/news/ultrasound-confirms-frontline-value-in-covid-19-setting.html . [11/14/2020]
16.11.2020	Moderna (USA)	Moderna vaccine	Pharmacology & Pharmaceuticals	Prevention	The vaccine uses the same approach of injecting part of the virus's genetic code in order to provoke an immune response as the BioNTech/ Pfizer vaccine. Preliminary Data (11/15/2020) suggest that it has a 95% efficacy. Moderna's vaccine appears to be easier to store than the BioNTech/ Pfizer vaccine since it can be kept in a standard fridge for up to a month.	It is not yet clear how long immunity will last as volunteers will have to be followed for much longer before this question can be answered. More subgroup analysis has to be done to determine whether the vaccine is as efficient in subgroups of the population The company already warned that there will be delays in distribution if contracts are not signed timely.	General Population	https://www.aerzteblatt.de/nachrichten/118405/SARS-CoV-2-Impfstoff-von-Moderna-erreicht-Schutzwirkung-von-94-5trc=0fd21eeab5917fd6312525e48868e06 [11/16/2020] https://www.nytimes.com/live/2020/moderna-covid-19-vaccine/campaign_id=154&emc=edit_ch_20201118&instance_id=24236&nl=coronavirus-briefing&reg_id=146587690&segment_id=448648&te=1&user_id=7467092f99fb745964d1c988857c5c [11/19/2020] Deutsches Ärzteblatt. "SARS-CoV-2: Impfstoff von Moderna erreicht Schutzwirkung von 94,5 %." Deutsches Ärzteblatt, November 16, 2020. https://www.aerzteblatt.de/nachrichten/118405/SARS-CoV-2-Impfstoff-von-Moderna-erreicht-Schutzwirkung-von-94-5 . [11/19/2020] Deutsches Ärzteblatt. "Moderna warnt Europäer vor Verzögerung bei Impfstoffauslieferung." Deutsches Ärzteblatt, November 17, 2020. https://www.aerzteblatt.de/nachrichten/118453/Moderna-warnt-Europaer-vor-Verzoegerung-bei-Impfstoffauslieferung . [11/22/2020] Deutsches Ärzteblatt. "Europäer bekommen auch Impfstoff von Moderna." Deutsches Ärzteblatt, November 24, 2020. https://www.aerzteblatt.de/nachrichten/118683/Europaer-bekommen-auch-Impfstoff-von-Moderna . [11/25/2020] Grady, Denise. "Moderna Applies for Emergency F.D.A. Approval for Its Coronavirus Vaccine." The New York Times, November 30, 2020, sec. Health. [12/05/2020] https://www.nytimes.com/2020/11/30/health/covid-vaccine-moderna.html . FDA. "Emergency Use Authorization Moderna Vaccine," December 18, 2020. https://www.fda.gov/media/144636/download . [12/21/2022]
16.11.2020	Sanofi (France), GlaxoSmithKline (U.K.)	Sanofi vaccine	Pharmacology & Pharmaceuticals	Prevention	The vaccine belongs to the group of protein- based vaccines. One advantage of the sanofi vaccine is that it can be stored at regular fridge temperatures.	The vaccine will not be ready before late 2021. The formula of the drug needs to be changed because the immune response in the elderly has not been satisfactory.	General Population	Deutsches Ärzteblatt. "Sanofi-Impfstoff-kandidat Kann Bei Kühlschrank-temperatur..." November 16, 2020. https://www.aerzteblatt.de/nachrichten/118386/Sanofi-Impfstoffkandidat-kann-bei-Kuehlschranktemperatur-gelagert-warden?trc=0fd21eeab5917fd6312525e48868e06 . Bückner, kia. "Corona-Impfstoff von Sanofi Kommt Später – Was Bedeutet Das Für Deutschland!" December 11, 2020. https://www.rnd.de/gesundheits/corona-impfstoff-von-sanofi-kommt-spater-was-bedeutet-das-fur-deutschland-SFN7KZAMCZHRNPCXHQHZF47VWP4.html .
18.11.2020	Lucira Health	Lucira™ COVID-19 All-In-One Test Kit	Microbiology & Biotechnology	Detection and Diagnostics	The test is a molecular test based on RT-LAMP-Technology (reverse transcription loop-mediated isothermal amplification). As in the polymerase chain reaction (PCR) used in conventional testing, individual genes are reproduced until they are detectable with a chemical reaction. However, unlike PCR, the reaction can be carried out at a constant temperature. This eliminates the need for a laboratory facility to perform the test. The subsequent chemical reaction is also simple. It consists of a change in the pH value. The test's results were compared with an FDA- approved PCR smear assay, the current gold standard in a "Community Testing" Study. . According to the manufacturer, the test achieved a positive percentage agreement, i.e. sensitivity, of 94% and a negative percentage agreement, i.e. specificity, of 98%. If samples with low viral load (at or below 37.5 Ct) were excluded the test even achieved a 100% positive percentage agreement. With the supplied swab, the users take a sample from the nose, open the test tube of the detection device, tune the swab into the reagent and stir. They then close the test tube again. A slight pressure on the test tube starts the de-tection reaction. The user waits about 30 minutes for a lamp to signal the end of the reaction. Two more lights indicate whether the test was positive or negative. Potentials: The U.S. Food and Drug Administration issued an Emergency Use Authorization (EUA) for the Lucira™ COVID-19 All-In-One Test Kit on November 17, 2020. This makes the kit the first prescription molecular test for COVID- 19. The testing device could help to upscale testing capacities, provide opportunities for at-	The product is a single-use device and with a price of \$50 quite expensive . But the FDA Emergency Use Authorization might help to accelerate the development of similar but less costly testing devices. Currently, the test is available in the United States only	General Population	Lucira Health. "Lucira Health News Release: FDA- Authorizes-First-Prescription-At-Home-Molecular-Test-for-COVID-19-Released-20201118.Pdf." November 18, 2020. https://2nywvdlb4cc4f787m3leist-wpengine.netdna-ssl.com/wp-content/uploads/2020/11/FDA-Authorizes-First-Prescription-At-Home-Molecular-Test-for-COVID-19-released-20201118.pdf . U.S. Food and Drug Administration 2020. "FDA Emergency Use Authorization for Lucira™ COVID-19 All-In-One Test Kit." November 17, 2020. https://www.fda.gov/media/143810/download . [11/19/2020] Lucira Health. "Lucira™ Is Developing a Single Use, Disposable COVID-19 Test That Provides Results in Just 30 Minutes." Lucira Health. Accessed November 19, 2020. https://www.lucirahealth.com/ . Wu, Catherine J. 2020. "The F.D.A. Authorizes the First at-Home Coronavirus Test." The New York Times, November 18, 2020, sec. World. https://www.nytimes.com/live/2020/11/18/world/covid-19-coronavirus . [11/19/2020] Deutsches Ärzteblatt. "SARS-CoV-2: FDA genehmigt ersten Schnelltest für zuhause." Deutsches Ärzteblatt, November 18, 2020. https://www.aerzteblatt.de/nachrichten/118496/SARS-CoV-2-FDA-genehmigt-ersten-Schnelltest-fuer-zuhause . [11/19/2020]

18.11.2020	Raj Dandekar, Chris Rackauckas, George Barbastathis (Massachusetts Institute of Technology, USA)	Global Diagnostic and Comparative tool	AI; Epidemiology	Prediction, Monitoring & Surveillance	The researchers developed a novel model that analyses and compares the role of quarantine control policies globally and across continents. While other models relied heavily on data derived from the past SARS and MERS outbreaks, this one uses machine-learning optimized algorithms on publicly available COVID-19 data on the basis of an augmented SIR-model. The SIR model is a standard epidemiological tool for outbreak analysis. Among other adaptations, the model was enhanced by training a neural network to include the number of infected people under quarantine, who were therefore longer spreading the infection to others. The researchers found that there was "generally strong correlation between strengthening of the quarantine controls as learnt by the model and actions taken by the regions' respective governments".	The model does not (yet) have predictive elements. To do so, it would need real-time data on social distancing and other parameters.	Policy makers, researchers	Dandekar, Raj, Chris Rackauckas, and George Barbastathis. "A Machine Learning-Aided Global Diagnostic and Comparative Tool to Assess Effect of Quarantine Control in COVID-19 Spread." Patterns. (November 17, 2020). https://doi.org/10.1016/j.patter.2020.100145 . Gallagher, Beth. "Model Quantifies the Impact of Quarantine Measures on Covid-19's Spread." MIT News Massachusetts Institute of Technology, April 16, 2020. https://news.mit.edu/2020/new-model-quantifies-impact-quarantine-measures-covid-19-spread-0416/11/29/2020
18.11.2020	GIZ (Gesellschaft für Internationale Zusammenarbeit)(Germany), Farm Radio International (Kenya), Green innovation centres (Germany and 14 Partner Countries in Africa)	Radio information project for agricultural workers in Africa	Communication Sciences, Humanitarian Aid	Prevention	The project broadcasted health information and information on coronavirus-prevention via radio to more than 300.000 agricultural workers in rural Africa		Agricultural workers in rural Africa	giz. "Radio in Africa: Keeping People Informed in Times of Crisis." October 14, 2020. https://www.giz.de/en/mediacenter/90443.html [11/17/2020]
19.11.2020	• Johns Hopkins Center for Humanitarian Health (USA) • London School of Hygiene & Tropical Medicine (UK) • Geneva Centre of Humanitarian Studies (Switzerland)	COVID-19 Humanitarian	Humanitarian Aid	Prevention, Treatment	Humanitarians can send their programs and field experiences to the online platform where they are reviewed by the three universities together with various guidance documents. After that, the examples are uploaded to the website using an operational framework. At the moment, more than 130 guidance documents and 65 field experiences are accessible on the website. The openly accessible platform allows humanitarians to share their experiences with colleagues and initiate a dialogue on local, regional and global levels. The platform also provides an academic perspective on local solutions and can generate a process of mutual learning to benefit the recipients of all the projects. The platform might even serve as an example for expert exchange in future global health emergencies.	The researchers initially hoped for an advanced feedback loop, meaning that field experiences could serve as a basis for improved COVID-19 humanitarian guidance iterations. As of now, this did not occur sufficiently, probably due to the still very acute development of the pandemic.	Humanitarians, Policy Makers, Recipients of Humanitarian Aid	Blanchet K, Alwan A, Antoine C, et al. Protecting essential health services in low-income and middle-income countries and humanitarian settings while responding to the COVID-19 pandemic. BMJ Glob Health. 2020;5(10):e003675. Johns Hopkins Center for Humanitarian Health. "Center for Humanitarian Health." 2020. https://hopkinshumanitarianhealth.org/ . London School of Hygiene & Tropical Medicine. "Health in Humanitarian Crises Centre." LSHTM. Accessed November 23, 2020. https://www.lshtm.ac.uk/research/centres/health-humanitarian-crises-centre . Geneva Centre of Humanitarian Studies. "Improving Humanitarian Response." Geneva Centre of Humanitarian Studies. 2020. https://humanitarianstudies.ch/ . COVID19 Humanitarian. "Framework. COVID-19 in Humanitarian Settings: Documenting and Sharing Context-Specific Programmatic Experiences Conflict and Health Full Text." Accessed November 23, 2020. https://conflicthathealth.biomedcentral.com/articles/10.1186/s13031-020-00321-w/figures/1 . COVID19 Humanitarian. "Home." 2020. https://www.covid19humanitarian.com/ . Singh, Neha S., Orit Abraham, Chiara Altare, Karl Blanchet, Caroline Favas, Alex Odium, and Paul B. Spiegel. "COVID-19 in Humanitarian Settings: Documenting and Sharing Context-Specific Programmatic Experiences." Conflict and Health 14, no. 1 (November 19, 2020): 79. https://doi.org/10.1186/s13031-020-00321-w .
20.11.2020	Ziath (U.K.)	Covid-19 sample tracking packages	Digital Health	Detection and Diagnostics	The company offers two different sample tracking packages, to assist laboratories in processing the vast amounts of Covid-19 samples for PCR testing		Laboratories	https://www.technologynetworks.com/tri/products/coronavirus-covid-19-sample-tracking-packages-339073 [11/20/2020] http://www.ziath.com/ziath_downloads/ziath_coronavirus_datasheet.pdf [11/20/2020]
20.11.2020	DNANudge (U.K.)	CovidNudge- rapid, lab-free COVID-19 test.	Microbiology & Biotechnology	Detection and Diagnostics	The test can provide results within 90 minutes using DANN analysis. The U.K. Government has already ordered more than 5.8 Million tests for state hospitals.		General Population	https://www.dnanudge.com/en/COVID-Nudge [11/20/2020] Scheuber, Andrew. "90 Minute COVID-19 Tests: Government Orders 5.8 Million DnaNudge Kits Imperial News Imperial College London." Imperial News, August 3, 2020. https://www.imperial.ac.uk/news/201073/90-minute-covid-19-tests-government-orders/ [11/20/2020] https://www.medicalnewstoday.com/articles/wired-healthtech-2020-latest-advances-and-the-fight-against-covid-19#technology-vs.-COVID-19 [11/20/2020]
20.11.2020	Zhoe et al at Massachusetts Institute of Technology (USA)	Passive High-Temperature High-Pressure Solar Steam Generator for Medical Sterilization	Medical Equipment	Prevention	The researchers developed a solar-powered and portable device. The steam generator can power an autoclave to sterilize medical equipment. The built-in solar component heats water to produce steam. The steam is then transferred to a pressure chamber. To avoid heat loss to the environment a so-called aerogel (a foam-like but solid material) made from silica is used as an insulator. The device was tested under realistic weather conditions and can be used on cloudy or hazy days as well. It is built mostly from off-the-shelf components and the prototype did only cost \$38. The same principle could be used to power other devices as well.	Even if it can be manufactured very quickly from commonly available materials, the Steam Generator is just a prototype so far. The generated 240 watts are not sufficient to power the large autoclaves used in big operation theatres, so one would have to combine several of the Steam Generators to power those.	Hospitals and other Medical Facilities in Low Income Countries and/ or remote Areas	https://www.newscientist.com/article/2260057-portable-device-uses-solar-power-to-sterilise-medical-equipment/#ixzz6AupIBSh [11/20/2020] Zhao, Lin, Bikram Bhatia, Lenan Zhang, Elise Strobach, Army Leroy, Manoj K. Yadav, Sungwoo Yang, et al. "A Passive High-Temperature High-Pressure Solar Steam Generator for Medical Sterilization." Joule 0, no. 0 (November 18, 2020). https://doi.org/10.1016/j.joule.2020.10.007 . [11/20/2020]
23.11.2020	CureVac (Netherlands/Germany)	CureVac Vaccine	Pharmacology & Pharmaceuticals	Prevention	Curevac's vaccine is currently in phase 2. A Phase 2a study was launched in Peru and Panama at the end of September 2020. For the first time, older adults and people from regions with high incidence of COVID-19 infections will also be vaccinated. A phase 2b/3 clinical trial relevant to the approval will be launched by the end of 2020. The results so far show good efficacy and tolerability of the vaccine. Curevac's vaccine is similar to Biotech's. Both contain mRNA, which is absorbed by the cells after injection into a muscle and used to form the spike protein. The protein foreign to the body then stimulates the formation of antibodies. Both companies use different technologies to produce the vaccines. One difference is that BioNTech modifies mRNA, while CureVac relies on the chemically unaltered mRNA.	The trials are still ongoing and final results pending	General Population	Medicalxpress.com. "EU Expands Vaccine Options with CureVac Contract," November 16, 2020. https://medicalxpress.com/news/2020-11-eu-vaccine-options-curevac.html [11/20/2020] Saigo, Lina. "German Vaccine Maker CureVac Ramps up Capacity to 300 Million COVID-19 Doses in 2021 - MarketWatch," November 17, 2020. https://www.marketwatch.com/story/german-vaccine-maker-curevac-ramps-up-capacity-to-300-million-covid-19-doses-in-2021-11605628457 . [11/23/2020] Deutsches Ärzteblatt. "COVID-19: Impfstoff von Curevac Erzielt Günstige Zwischenergebnisse In..." November 10, 2020. https://www.aerzteblatt.de/nachrichten/118229/COVID-19-impfstoff-von-curevac-erzielt-guenstige-zwischenergebnisse-in-phase-1-studie [11/24/2020] Ärztelblatt, Deutscher Ärzteverlag GmbH, Redaktion Deutsches. "Curevac startet Studie mit Klinikpersonal." Deutsches Ärzteblatt, December 21, 2020. https://www.aerzteblatt.de/nachrichten/119603/Curevac-startet-Studie-mit-Klinikpersonal . [12/22/2020]
24.11.2020	Durst- Group (Austria)	UV-C Air Filter "Durst-Habitat"	Engineering	Prevention	Compared to other air filters that primarily work with HEPA filters, this product uses UV-C technology in which the infectious air is irradiated with light rays at a certain wavelength and whose effect to kill viruses is proven by scientific studies. The product can be used in all public spaces (schools, offices, restaurants, etc.) and has several ventilation levels.	With its price of 1.900 Euros for the most simplistic edition the product is not exactly inexpensive.	Public spaces like schools, public buildings, doctors offices	Stol.it. "Durst Habitat – Eine Innovation gegen die COVID-Pandemie." stol.it, November 23, 2020. https://www.stol.it/artikel/panorama/panorama/durst-habitat-eine-innovation-gegen-die-covid-pandemie . Durst-Group. "Durst Habitat Luftdesinfektionssystem." 2020. https://www.durst-group.com/de/habitat?utm_source=stol&utm_medium=Article&utm_campaign=durst_habitat .

24.11.2020	Fraunhofer Institute (Germany)	Fraunhofer-Counterproject M'Infekt	Medicine, AI	Treatment	The system (currently under development) addresses long-term decentralized patient monitoring on normal wards as well as in non-clinical environments using multimodal parameters of the cardiovascular system (e.g. heart rate, ECG, oxygen saturation, blood circulation situation) and breathing (e.g. respiratory frequency/volume, respiratory air analysis). The basis for the evaluation are machine learning methods that facilitate diagnosis and ensure location-independent integration into various application and application scenarios. The mobile recording and analysis of patient data can help to ensure remote monitoring and early- detecting of deterioration and help to avoid unnecessary hospitalizations and save hospital bed capacities.	The project is still in development	(Covid-19) patients who do not require immediate hospitalization	Veigel, Kathrin. "Dezentrales Monitoring von Patienten: Covid-19-Krankheitsverläufe schnell und sicher diagnostizieren." Elektroniknet, October 30, 2020. https://www.elektroniknet.de/messen-testen/covid-19-krankheitsverlaufe-schnell-und-sicher-diagnostizieren.180663.html .
25.11.2020	Deutsches Zentrum für Infektionsforschung (DZIF)(Germany)	Central databases for Covid-19 vaccination studies in Germany and Europe	Epidemiology, Microbiology & Biotechnology	Prevention	At the German Center for Infection Research (Deutsches Zentrum für Infektionsforschung DZIF), test subject databases for vaccination studies on coronavirus SARS-CoV-2 are developed. Scientists are creating a German and a Europe-wide platform that covers all centres where vaccines against the coronavirus are tested. Interested citizens can register via a simple electronic questionnaire in the subject database at the University Hospital Cologne. The database is aimed at adults of all ages, with and without pre-existing conditions.		Researchers, General population	Deutsches Ärzteblatt. "Zentrale Datenbank für COVID-19-Impfstudien im Aufbau." Deutsches Ärzteblatt, November 24, 2020. https://www.aerzteblatt.de/nachrichten/118656/Zentrale-Datenbank-fuer-COVID-19-Impfstudien-im-Aufbau .
25.11.2020	AstraZeneca (Great Britain, Sweden) in Cooperation with University of Oxford (U.K.)	"Oxford vaccine"	Pharmacology & Pharmaceutics	Prevention	The AstraZeneca vaccine was the first to be enrolled in the EMA approval process. In November 2020, the company reported that the vaccine proves to be about 90% effective. The AstraZeneca vaccine can be stored at normal refrigeration temperatures for up to 6 months. AstraZeneca has already committed to providing more doses globally than any other manufacturer by a factor of 2 over the nearest manufacturer (Novavax)—including for low-and-middle-income countries and the WHO COVAX Facility.	AstraZeneca had to temporarily pause the process due to one patient developing a (not specified) serious illness. Zeneca has resumed its studies in Great Britain as of October 8, 2020. After the company published the preliminary results in November, there was reporting of some irregularities that eroded confidence in the shot. The company said it would begin a new global trial to assuage concerns.	General Population	https://www.apotheke-adhoc.de/nachrichten/detail/pharmazie/ema-ueberprueft-astrazeneca-impfstoff/ [10/08/2020] https://www.tagesschau.de/ausland/astrazeneca-corona-impfstofftest-101.html / https://www.nytimes.com/live/2020/11/19/world/covid-19-coronavirus/campaign_id=1548&mc=edit_cb_2020/1120&instance_id=24284&nl=coronavirus-briefing&reg_id=146587690&segment_id=44995&te=1&user_id=7467092f99eb745964d1c988857c5cfnew-results-on-astrazeneca-vaccine-boost-hopes-that-vaccines-will-work-well-for-older-adults [11/20/2020] Jee, Charlotte. "The Oxford/AstraZeneca Vaccine Will Be Tested in a New Trial after Questions over Its Data." MIT Technology Review, November 27, 2020. https://www.technologyreview.com/2020/11/27/1012680/the-oxford-astrazeneca-vaccine-will-be-tested-in-a-new-trial-after-questions-over-its-data/ . https://www.aerzteblatt.de/nachrichten/118531/SARS-CoV-2-Britischer-Impfstoff-erzielt-in-Phase-2-3-Studie-auch-bei-(gesunden)-Senioren-eine-hohe-Immunitaet?r=0fd21eeab5917de312525e48868e06 AstraZeneca. "AZD1222 Vaccine Met Primary Efficacy Endpoint in Preventing COVID-19." November 23, 2020. https://www.astrazeneca.com/media-centre/press-releases/2020/azd1222.html . Medicalpress.com. "AstraZeneca Says Its Vaccine Needs 'Additional Study.'" November 27, 2020. https://medicalpress.com/news/2020-11-additional-astrazeneca-vaccine-company.html . [11/28/2020] Robbins, Rebecca, and Benjamin Mueller. "After Admitting Mistake, AstraZeneca Faces Difficult Questions About Its Vaccine." The New York Times, November 25, 2020, sec. Business. https://www.nytimes.com/2020/11/25/business/coronavirus-vaccine-astrazeneca-oxford.html . Deutsches Ärzteblatt. "EMA erwartet Zulassung von COVID-19-Impfstoff von Astrazeneca noch im..." Deutsches Ärzteblatt, January 8, 2021. https://www.aerzteblatt.de/nachrichten/119989/EMA-erwartet-Zulassung-von-COVID-19-Impfstoff-von-Astrazeneca-noch-im-Januar. [01/12/2021]
26.11.2020	MBL Solutions - Misumi, (Italy)	"LPMA-100" Mask production machine	Engineering	Prevention	The developers created this machine within less than 4 months and helped to scale up production capacities for face masks in Italy by making local manufacturing possible (up until Summer 2020 they were only imported).		General Population	Engelke, Julia. "Maschinenbauer im Anti-Corona-Einsatz." November 26, 2020. https://www.devicemed.de/maschinenbauer-im-anti-corona-einsatz-a-982964/ . [11/29/2020]
26.11.2020	Infinion Technologies (Germany); Texas Instruments (USA)	Intelligent sensor systems	Engineering	Prevention	CO2-measuring instruments can provide information about the air quality in a room. With the help of a holistic "Connected Sensor" system, information on indoor air quality can not only trigger an alarm, but can also be collected, evaluated and analysed in a cloud. In this way, public institutions such as schools or universities, as well as shopping centres and gyms, can ensure optimum quality of indoor air. One solution is intelligent ventilation systems controlled by CO2 sensors. The measurement results of the sensors define when and for how long to ventilate in order not to exceed defined limits.	Evaluation boards for the Xensiv PAS CO2 sensor are now available to customers. The product launch of the sensor is planned for mid-2021.	Public buildings, offices, schools, etc.	Infinion Technologies. "INFINEON Technologies AG - Anbieterkompass - Anbieterkompass – Elektroniknet," 2020. https://www.infineon.com . Dausinger, Katharina. "Mit Connected Sensors gegen Covid-19: Sensorik zur Raumluftüberwachung." Elektroniknet, November 26, 2020. https://www.elektroniknet.de/messen-testen/sensorik/sensorik-zur-raumluftueberwachung.181312.html . [11/29/2020]
27.11.2020	Labor Berlin, Mattnet, Charité, Vivantes (Germany)	"BVLOS network" - Drones delivering medical materials	Engineering	Detection and Diagnostics	Drones have been in use in Berlin since 17 November in order to be able to process laboratory samples more quickly. The use of drones is intended to significantly reduce the transport time for particularly time-critical samples between individual clinic sites and the central laboratory of Labor Berlin, the first joint venture of Charité and Vivantes. For this reason, Labor Berlin and Mattnet have been preparing intensively for a long time to transport laboratory samples by drone. The initiators thus lay the foundation for the first inner-city BVLOS network (beyond visual line of sight) for the delivery of medical materials through the air		Laboratories and other clinic sites in Berlin	Devicemed.de. "Antimikrobielles Schutzschild / Maschinenbauer im Anti-Corona-Einsatz." November 27, 2020. https://www.devicemed.de/antimikrobielles-schutzschild-maschinenbauer-im-anti-corona-einsatz-a-913983/ . [11/29/2020]
27.11.2020	Karlsruher Institut für Technologie (Germany)	"Aerobuster" Air Purifier	Engineering	Prevention	The air purifier is simple, compact, and can very effectively inactivate viruses and other pathogens from the room air. According to the manufacturer, the product can inactivate viruses effectively and is significantly lower in price than other air purifiers.		Public buildings, offices, schools, etc.	Devicemed.de. "Antimikrobielles Schutzschild / Maschinenbauer im Anti-Corona-Einsatz." November 27, 2020. https://www.devicemed.de/antimikrobielles-schutzschild-maschinenbauer-im-anti-corona-einsatz-a-913983/ . [11/29/2020]
29.11.2020	Traverso, Giovanni et al at MIT	Re-usable respirator with N95 filters	Medical Equipment	Treatment	A team led by Assistant Professor Giovanni Traverso, of the Department of Mechanical Engineering, developed a durable respirator with N95 filters that can be sterilized and reused.		Critically ill Covid-19 patients in Low- and- middle- income countries	MIT News Massachusetts Institute of Technology [11/29/2020]

30.11.2020	Georgia Institute of Technology, Biological Sciences, GT-BIOS (USA)	COVID-19 Event Risk Assessment Planning Tool	Epidemiology	Prevention	the "site provides interactive context to assess the risk that one or more individuals infected with COVID-19 are present in an event of various sizes. The model is simple, intentionally so, and provided some context for the rationale to halt large gatherings in early-mid March and newly relevant context for considering when and how to re-open. Precisely because of under-testing and the risk of exposure and infection, these risk calculations provide further support for the ongoing need for social distancing and protective measures"	Focuses mainly on the first wave of the pandemic	General Population	Georgia Institute of Technology, Biological Sciences. "COVID-19 Event Risk Assessment Planning Tool." 2020. https://covid19risk.biosci.gatech.edu/ . [11/26/2020]
30.11.2020	China National Biotech Group (CNBG) . Sinopharm (China)	Sinopharm-Vaccine	Pharmacology & Pharmaceutics	Prevention	Sinopharm claimed last week they had already vaccinated nearly a million people through a so-called emergency program with the CNBG- vaccine. According to the manufacturer there were no reports of serious side effects, and only a few patients had developed mild symptoms.	Unlike western manufacturers, neither CNBG nor Sinopharm have published more accurate data on the effectiveness of their drugs, which makes comparison difficult. In China, state media have been reporting for weeks on vaccinations of certain population groups, (military personnel, hospital staff, employees of state-owned corporations). They are given vaccine candidates for whom clinical trials have not been completed.	General Population	https://www.aerzteblatt.de/nachrichten/118714/Chinesische-Firma-beantragt-Zulassung-fuer-Coronaimpfstoff?r=0fd21eeab5917fd6312525e48868ef06 [11/26/2020] Gan, Nectar, and Tatiana Arias. "Chinese COVID-19 Vaccine Far Less Effective than Initially Claimed in Brazil, Sparking Concerns." Coronavirus, January 13, 2021. https://www.ctvnews.ca/health/coronavirus/chinese-covid-19-vaccine-far-less-effective-than-initially-claimed-in-brazil-sparking-concerns-1.5264695 . [14/01/2021]
30.11.2020	Gradian Health Systems (USA)	"Gradian CCV"- Portable ventilator for challenging settings	Medical Equipment	Treatment	"The Gradian CCV is a comprehensive care ventilator that provides mechanical ventilation in a wide variety of settings—including those with unreliable access to oxygen and/or electricity. It is built to ventilate critically-ill adult and paediatric patients wherever they present, with up to 21 hours of battery power and portability features to enable ease of use throughout the continuum of critical care. The Gradian CCV is CE-certified and has been cleared by the U.S. FDA. "COVID-19 Innovation hub, "Gradian Comprehensive Care Ventilator (CCV)."	The centre of business for Gradian Health Systems is Africa so that some support services might not be available in other parts of the world.	Patients in Low- Income Countries	COVID-19 Innovation hub. "Gradian Comprehensive Care Ventilator (CCV)." GIE, November 2020. https://covid19innovationhub.org/innovation/gradian-comprehensive-care-ventilator . Gradian Health. "Gradian CCV Gradian Health Systems," 2020. https://www.gradianhealth.org/our-products/gradianccv/ . [11/30/2020]
30.11.2020	International	Ozon- Therapy for Covid-19 patients	Medicine	Treatment	Franzini et al presented preliminary findings of their study on ozone therapy for critically ill Covid-19 patients that suggested it would be a promising therapy for COVID-19 patients. "It leads patients to a fast recovery from ARDS via the improvement of major respiratory indexes and blood gas parameters, following a relatively short time of dispensed forced ventilation" (Franzini et al.,2020) the researchers claimed.	The study is still ongoing and final results are pending. Further research is needed to determine if the treatment is superior to the current gold standards. In Addition, treatment of Covid-patients has improved since the start of the pandemic due to better clinical management by healthcare providers who have gained a greater understanding of the disease. Additionally, treatment options, have improved beyond supplemental oxygen and supportive care.	Critically ill Covid- 19 patients	Franzini, Mariano, Luigi Valdenassi, Giovanni Ricevuti, Salvatore Chirimbolo, Markus Depfenhart, Dario Bertossi, and Umberto Tirelli. "Oxygen-Ozone (O2-O3) Immunocellular Therapy for Patients with COVID-19. Preliminary Evidence Reported." International Immunopharmacology 88 (November 2020): 106879. https://doi.org/10.1016/j.intimp.2020.106879 . [11/30/2020]
30.11.2020	Niagara Health, St. Josephs Health care, (Canada)	"COVID Care @ Home" Programme	Public Health	Treatment	"COVID Care @ Home is a uniquely designed program intended for those with a confirmed COVID diagnosis who do not require hospitalization. Complementing existing local COVID initiatives, the program will support integrated care at home, early discharge from hospitals with supports and help to prevent hospitalization. It will also help to prevent outbreaks by providing Infection Prevention and Control (IPAC) and coaching support for community congregate settings.(Finanzen.net, "St. Joseph's Health System, Niagara Health launch new innovative care model COVID Care @ Home.)	At the moment, the program is only applied in Canada.	COVID patients who do not require hospitalization	Finanzen.net. "St. Joseph's Health System, Niagara Health launch new innovative care model COVID Care @ Home." finanzen.net, November 8, 2020. https://www.finanzen.net/nachricht/aktien/st-joseph-s-health-system-niagara-health-launch-new-innovative-care-model-covid-care-home-9507782 . [11/30/2020]
07.12.2020	University of Graz (Switzerland)	Lung Sound Recording System; LSRS	Medicine/ Digital Health	Detection and Diagnostics	A research team at the Graz University of Technology has intensively studied noise recording and the development of computer-aided analytical methods as a supplement to medical diagnosis. The work resulted in a prototype of a multi-channel recording device and the ongoing development of an associated computer-aided diagnostic system a few months ago. The system is now to be further developed for the screening of Covid-19 patients. The recording of lung noise is non-invasive.	The device is still under development and its usefulness as a diagnostic tool for COVID-19 has not yet been proven (as of December 2020)	Clinicians	https://www.devicemed.de/vdma-erhoeht-prognose-fuer-2021-draeger-offnet-eigenen-online-shop-fuer-ffp-masken-a-913983/ [12/08/2020]
14.12.2020	Technotrans SE	Ecotec Cold Storage	Engineering/Medical Equipment	Infrastructure	company developed a low-temperature container solution for vaccine storage. The special feature is an efficient multi-zone system consisting of a low-temperature storage room with minus 80 degrees Celsius and a zone with an individually designed minus temperature. Since these rooms are insulated cells, the concept prevents undesirable moisture entry into the freezer cell and significantly saves energy thanks to lower temperature differences. The main advantage of this concept, however, lies in individuality: in a single storage room, vaccines from different manufacturers can be stored safely and stable with the optimum temperatures for this product.		Clinicians, Vaccination sites	https://www.devicemed.de/vdma-erhoeht-prognose-fuer-2021-draeger-offnet-eigenen-online-shop-fuer-ffp-masken-a-913983/ [01/14/2021]

12.12.2020	University of Oxford (United Kingdom)	CURIAL-AI Screening Test	Digital Health, AI	Detection and Diagnostics	The CURIAL AI screening test was derived in a study involving data of more than 150,000 patients – “the largest dataset of any laboratory artificial intelligence study on COVID-19 to date”. It uses routine hospital data like blood tests, blood gas testing, vital signs, and results of PCR testing for respiratory virus-es. The AI model was further trained with different levels of prevalence of Covid-19 in the population to simulate real-life conditions during a pandemic. The AI model derived from the study has a sensitivity of 77.4% and a specificity of 95.7% which means the test can efficiently identify Non-Covid patients. Test results are available after one hour. Potentials: The AI- model can help to provide rapid triage for COVID-19 based on routine hospital data. It fits into routine procedures and clinical pathways and can therefore speed up the patient flow. It can be conducted with existing equipment in high- and middle-income countries. This means the test could be implemented quite quickly and inexpensively. The model can also be rapidly adapted to various scenarios and might be a helpful pretest for PCR testing where availability is limited.	A possible limitation of the study is a quite limited ethnic diversity of the patients included, although ethnic disparities might be influential in the clinical course of patients. Also, patients under the age of 18 were excluded, so that the AI model might not perform as well in different subsets of the population and further research is needed in this area. The test is primarily designed for infrastructures available in high and middle-income countries. Its applicability for other contexts has to be further assessed.	Clinicians in High- and Middle-Income Countries	Soltan, Andrew A S, Samaneh Kouchaki, Tingting Zhu, Dani Kyasseh, Thomas Taylor, Zaamin B Hussain, Tim Peto, Andrew J Brent, David W Eyre, and David A Clifton. “Rapid Triage for COVID-19 Using Routine Clinical Data for Pa-tients Attending Hospital: Development and Prospective Validation of an Artificial Intelligence Screening Test.” December 11, 2020. https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)30274-0/fulltext [12/12/2020] Healthcare in Europe. com. “AI Test Rules out Covid-19 Diagnosis within One Hour,” December 11, 2020. https://healthcare-in-europe.com/en/news/ai-test-rules-out-covid-19-diagnosis-within-one-hour.html . [12/12/2020]
	WHO (Internacional)	WHO School Reopening Checklist	Politics	Education/ Policy	WHO has developed the “Checklist to support schools re-opening and preparation for COVID-19 resur-gences or similar public health crises”. The document distinguishes several phases and three levels (national, subnational and individual school level) of coordination for school responses. In addition, the checklist identifies 38 essential actions for the different levels and phases of the response and offers many links to relevant guidance documents. The checklist can help to determine whether facilities have the necessary arrangements in place and to augment the schools capacity to respond to the needs in different phases of reopening and responding to case surges. Furthermore, the document helps to divide responsibilities among the different stakeholders involved and provides concrete measures to implement.	All recommendations have to be checked for their feasibility for the individual context. Due to the fact, that the guidance derives its recommendations through real-time analysis it has to be regularly updat-ed to include new information on epidemiological considerations and best practices in the field. For example, the checklist was published just before the data of a new study examining the spread of Covid-19 in Austrian schoolchildren which stated that children play a more significant role in the spread of COVID-19 than initially assumed.	<ul style="list-style-type: none"> •Policy makers in Health and Education •National and regional school management boards •Individual schools 	UNESCO. “UNESCO COVID-19 Education Response: How Many Students Are at Risk of Not Returning to School? Advocacy Paper - UNESCO Digital Library.” 2020. https://unesdoc.unesco.org/ark:/48223/pf0000373992 . WHO. “Checklist to Support Schools Re-Opening and Preparation for COVID-19 Resurgences or Similar Public Health Crises.” December 2020. UNESCO. “Act Now: Reduce the Impact of COVID-19 on the Cost of Achieving SDG 4 - UNESCO Digital Library.” Accessed December 12, 2020. https://unesdoc.unesco.org/ark:/48223/pf0000374163 . Von Bredow, Rafaela. “Neue Corona-Studie: So Ansteckend Sind Kinder Wirklich - DER SPIEGEL.” 2020 122AD. https://www.spiegel.de/wissenschaft/mensch/neue-corona-studie-so-ansteckend-sind-kinder-wirklich-a-2dc73cb4-ec20-4c92-a94b-96ff52e5f740 .
21.12.2020	National Research Centre for Epidemiology and Microbiology in Moscow (Russia)	Sputnik V- Vaccine	Pharmacology& Pharmaceutics	Prevention	The vaccine was the first to be officially announced and applied. Russia claims that it has an efficacy of 95%. As of December several other states (e.g. India) have announced that they will start producing the vaccine in 2021. AstraZeneca announced in December that they will cooperate with the russians to combine the two vaccines in order to achieve even better results. With only \$20 per shot the vaccine is relatively inexpensive.	There was some confusion about the data basis of the initial trials and Russias announcement in August that it had found a vaccine candidate was met with criticism regarding a lack of transparency. The vaccine was authorized before the end of clinical trials.	General Population	Soldatkin, Vladimir. “Moscow Rolls out Sputnik V COVID-19 Vaccine to Most Exposed Groups Reuters.” December 5, 2020. https://www.reuters.com/article/health-coronavirus-russia-vaccination-idUKKBN28F09G . [12/21/2020] Adkins, William. “Sputnik V Coronavirus Vax Has 95 Percent Efficacy, Says Russia.” POLITICO, November 24, 2020. https://www.politico.eu/article/sputnik-v-vaccine-has-95-percent-efficacy-says-russia/ . [12/21/2020] Osborn, Andrew, and Polina Nikolskaya. “Don’t Mix Sputnik Vaccine with Alcohol, Says Russian Official. Some Recoil.” Reuters, December 9, 2020. https://uk.reuters.com/article/health-coronavirus-russia-vaccine-alcohol-idUKKBN28J23B . [12/21/2020] Roxby, Philippa. “Russian Covid Vaccine Shows Encouraging Results - BBC News.” November 11, 2020. https://www.bbc.com/news/health-54905330 . [12/21/2020]
21.12.2020	Ellume	Ellume- Test	Microbiology & Biotechnology	Detection and Diagnostics	The FDA has f granted emergency approval for the Ellume-at-home test. The test can be used for children and adults with and without symptoms and delivers results withi 15 minutes according to the manufacturer		General Population	Ellume. “FDA Authorizes Ellume COVID-19 Home Test as First Over-the-Counter Fully At-Home Diagnostic Test.” Ellume (blog), December 15, 2020. https://www.ellumehealth.com/2020/12/15/fda-authorizes-ellume-covid-19-home-test-as-first-over-the-counter-fully-at-home-diagnostic-test/ . [12/21/2020] Stieg, Cory. “The FDA Just Approved a \$30 At-Home Covid Test — Here’s What You Need to Know.” CNBC, December 16, 2020. https://www.cnbc.com/2020/12/16/fda-approves-ellume-home-covid-test-how-it-works-and-antigen-accuracy.html . [12/21/2020] NS Healthcare.com. “FDA Authorizes Ellume Covid-19 Home Test as OTC Product.” December 16, 2020. https://www.ns-healthcare.com/news/ellume-covid-19-at-home-test/ . [12/21/2020]
21.12.2020	WHO (Internacional)	Population Prioritization Roadmap	Public Health	Policy, Prevention	Based on the WHO- values framework the Roadmap for prioritizing uses of Covid-19 vaccines (Prioritization Roadmap) was developed to assist countries in the development of public health strategies regarding vaccination, planning, and identifying and targeting priority group for different levels of vaccine availability and epidemiologic requirements. The roadmap will be updated regularly and followed-up by recommendations for specific vaccines, as soon as there is enough scientific evidence to derive such recommendations.		Policy Makers, Health officials	WHO. “WHO SAGE Roadmap For Prioritizing Uses Of COVID-19 Vaccines In The Context Of Limited Supply.” November 13, 2020. https://www.who.int/publications/m/item/who-sage-roadmap-for-prioritizing-uses-of-covid-19-vaccines-in-the-context-of-limited-supply . [12/22/2020]
21.12.2020	WHO (International)	WHO Values Framework for the Allocation and Prioritization of COVID-19 Vaccination	Public Health	Policy, Prevention	The Values Framework defines six core principles (Human Well-Being, Equal Respect, Global Equity, National Equity, Reciprocity, Legitimacy) complemented by twelve objectives that should guide distribution. In order to make recommendations for the distribution of vaccines between countries and to prioritise groups vaccination in each country, the Values Framework needs to be complemented with information on specific characteristics of available vaccines, the quantity and speed of vaccine supply, the risk-benefit trade-offs for different population groups, and the current state of epidemiology, clinical management, as well as the economic and social impact of the pandemic. Therefore, the final vaccination strategy will depend on the characteristics of the available vaccines accessible in each country.		Policy Makers, Health officials	WHO. “WHO SAGE Values Framework for the Allocation and Prioritization of COVID-19 Vaccination.” September 14, 2020. https://apps.who.int/iris/bitstream/handle/10665/334299/WHO-2019-nCoV-SAGE_Framework-Allocation_and_prioritization-2020-1-eng.pdf?ua=1 . [12/22/2020]
22.12.2020	Novavax	NVX-CoV2373- vaccine	Pharmacology& Pharmaceutics	Prevention	The vaccine is engineered from the virus genome and uses “recombinant nanoparticle technology to generate antigen derived from the coronavirus spike protein” (Novavax, 2020)		General Population	Novavax. “Have You Heard about Novavax and Its SuperNOVA Team?” Novavax, 2020. https://www.novavax.com/our-pipeline . [12/22/2020] Christensen, Jen. “Novavax Coronavirus Vaccine Is Safe, Elicits Immune Response - CNN.” September 3, 2020. https://edition.cnn.com/2020/09/02/health/novavax-vaccine-safe/index.html . [12/22/2020]

16.12.2020	Technical University of Graz (Switzerland)	Lung Sound recording System	Digital Health, AI	Detection and Diagnostics	Researchers at Graz University of Technology were involved in the development of computer-assisted analysis methods as a supplement for medical diagnosis. The work culminated a few months ago in a prototype of a multi-channel recording device and the ongoing development of an associated computer-aided diagnosis system. The group now wants to further develop the system for screening Covid 19 patients. The multi-channel Lung Sound Recording System (LSRS) is equipped with very powerful microphones. The recording of lung sounds is non-invasive and could help to detect COVID-19.	Still in development	Clinicians	https://www.devicemed.de/vdma-erhoeht-prognose-fuer-2021-draeger-oeffnet-eigenen-online-shop-fuer-ffp-masken-a-913983/ [12/23/2020]
16.12.2020	WHO (International)	School Reopening Guidance	Public Health	Policy, Education	WHO has developed the "Checklist to support schools re-opening and preparation for COVID-19 resurgences or similar public health crises". The document distinguishes several phases and three levels (national, subnational and individual school level) of coordination for school responses. In addition, the checklist identifies 38 essential actions for the different levels and phases of the response and offers many links to relevant guidance documents.	All recommendations have to be checked for the individual context. Due to the fact, that the guidance derives its recommendations through real-time analysis it has to be regularly updated to include new information on epidemiological considerations and best practices in the field. For example, the checklist was published just before the data of a new study examining the spread of Covid-19 in Austrian schoolchildren which stated that children play a more significant role in the spread of COVID-19 than initially assumed	Students and Teachers	UNESCO. "Education: From Disruption to Recovery." UNESCO, March 4, 2020. https://en.unesco.org/covid19/educationresponse . [12/16/2020] UNESCO. "UNESCO COVID-19 Education Response: How Many Students Are at Risk of Not Returning to School? Advocacy Paper - UNESCO Digital Library." 2020. https://unesdoc.unesco.org/ark:/48223/pf0000373992 . [12/16/2020] WHO. "Checklist to Support Schools Re-Opening and Preparation for COVID-19 Resurgences or Similar Public Health Crises." December 2020. P 4. [12/16/2020] UNESCO. "Act Now: Reduce the Impact of COVID-19 on the Cost of Achieving SDG 4 - UNESCO Digital Library." Accessed December 12, 2020. https://unesdoc.unesco.org/ark:/48223/pf0000374163 . [12/16/2020]
16.12.2020	University of Oxford (United Kingdom)	CURIAL AI Screening Test	AI	Detection and Diagnostics	The CURIAL AI screening test was derived in a study involving data of more than 150,000 patients – "the largest dataset of any laboratory artificial intelligence study on COVID-19 to date". It uses routine hospital data like blood tests, blood gas testing, vital signs, and results of PCR testing for respiratory virus-es. The AI model was further trained with different levels of prevalence of Covid-19 in the population to simulate real-life conditions during a pandemic. The AI model derived from the study has a sensitivity of 77.4% and a specificity of 95.7% which means the test can efficiently identify Non-Covid patients. Test results are available after one hour. The AI-model can help to provide rapid triage for COVID-19 based on routine hospital data. It fits into routine procedures and clinical pathways and can therefore speed up the patient flow. It can be conducted with existing equipment in high- and middle-income countries. This means the test could be implemented quite quickly and inexpensively. The model can also be rapidly adapted to various scenarios and might be a helpful pretest for PCR testing where availability is limited	A possible limitation of the study is a quite limited ethnic diversity of the patients included, although ethnic disparities might be influential in the clinical course of patients. Also, patients under the age of 18 were excluded, so that the AI model might not perform as well in different subsets of the population and further research is needed in this area. The test is primarily designed for infrastructures available in high and middle-income countries. Its applicability for other contexts has to be further assessed.	Clinicians	University of Oxford. "Coronavirus Research." 2020. https://www.research.ox.ac.uk/Area/coronavirus-research . [12/16/2020] Soltan, Andrew A. S. Samaneh Kouchaki, Tingting Zhu, Dani Kiyasseh, Thomas Taylor, Zaamin B Hussain, Tim Peto, Andrew Brent, David W Eyre, and David A Clifton. "Rapid Triage for COVID-19 Using Routine Clinical Data for Patients Attending Hospital: Development and Prospective Validation of an Artificial Intelligence Screening Test." December 11, 2020. 10. https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)30274-0/fulltext [12/16/2020] Healthcare in Europe. com. "AI Test Rules out Covid-19 Diagnosis within One Hour." December 11, 2020. https://healthcare-europe.com/en/news/ai-test-rules-out-covid-19-diagnosis-within-one-hour.html [12/16/2020]
07.01.2021	GNA Biosolutions (Germany)	Occea test	Microbiology & Biotechnology	Detection and Diagnostics	Unlike the antigen rapid tests commonly used so far, the new rapid test is a PCR test that directly detects the genetic material of the COVID-19 pathogen but unlike the PCR tests used so far, it can deliver results within an hour. The testing device is portable and can process eight samples simultaneously. The technology, called Pulse Controlled Amplification (PCA®), combines sample preparation and nucleic acid amplification processes, reducing time and material requirements for the test. The test could help to scale up testing capacities. GNA Biosolutions plans to apply for EU-wide approval in March. Due to its speed and its relatively low price (around 20 Euros) it might be particularly valuable for testing at hospitals, nursing homes and airports for example	The German state of Bavaria has already secured the purchasing privilege for 1,000 testing devices and one million tests. It remains to be seen how fast the manufacturer can scale up their production capacities to serve other countries as well.	General Population	GNA Biosolutions. "GNA Biosolutions Beyond Molecular Boundaries." 2021. https://www.gna-bio.com/covid19/ . [01/15/2021] Deutsches Ärzteblatt. "Bayerischer PCR-Schnelltest erhält Sonderzulassung." Deutsches Ärzteblatt, December 30, 2020. https://www.aerzteblatt.de/nachrichten/119746/Bayerischer-PCR-Schnelltest-erhaelt-Sonderzulassung [01/15/2021] GNA Biosolutions. "GNA Biosolutions Beyond Molecular Boundaries Technology." 2021. https://www.gna-bio.com/technology/ . [01/15/2021]
08.01.2021	Germany	Visiting bans in hospitals and nursing homes	Public Health	Prevention/ Policy	Since the first wave of the pandemic, hospitals and care facilities have repeatedly imposed complete or partial visiting bans to protect patients, relatives and staff from infection.	Visiting bans pose mental health risks particularly for long-term patients and terminally ill patients and their relatives	Patients in Hospitals and Care facilities and their relatives	Ärztblatt, Deutscher Ärzteverlag GmbH, Redaktion Deutsches. "Neues Besuchsverbot an der Charité mit wenigen Ausnahmen." Deutsches Ärzteblatt, January 7, 2021. https://www.aerzteblatt.de/nachrichten/119931/Neues-Besuchsverbot-an-der-Charite-mit-wenigen-Ausnahmen . [01/15/2021] Thurm, Frieda. "Besuchsverbot in Krankenhäusern: Was Ersetzt Die Nähe Eines Geliebten Menschen? ZEIT ONLINE." December 21, 2020. https://www.zeit.de/gesellschaft/zeitgeschehen/2020-12/besuchsverbot-krankenhaeuser-corona-todesfaelle-familie-einsamkeit-sterben . [01/15/2021]
08.01.2021	BBC (United Kingdom)	TV Schooling	Pedagogy/ Communication Sciences	Education/ Policy	Because not all pupils in the United Kingdom have access to the internet and online learning tools, BBC and several other television networks will broadcast educational programs for several hours per day during the lockdown. Since Monday this week, three hours of primary school lessons have been broadcast every day, plus at least two hours for secondary school pupils. Mexico had adopted a similar approach early in the pandemic to support students without internet access. The Mexican government cooperated with several networks to produce a comprehensive set of lessons for all grade levels and broadcast those lessons via TV and radio	Since television does not really allow for interactive and participatory learning, online tools will remain an important part of remote learning. This is why some experts are demanding a cut of internet fees and the distribution of laptops and other devices to help low-income families in the UK to enable their children to take part in remote learning. Obviously, none of the remote learning techniques can fully replace the face-to-face teaching in schools where pupils can also socially engage with their classmates.	Students in the UK	Deutsche Welle. "Coronavirus: Boris Johnson Orders New Lockdown for England DW 04.01.2021." DW.COM, January 4, 2021. https://www.dw.com/en/coronavirus-boris-johnson-orders-new-lockdown-for-england/a-56128556 . [01/07/2021] Wirtschaft.com. "Boris Johnson announces closure of school as part of stricter virus measures." Nachrichten zur Wirtschaft - aktuelle Wirtschaftsnachrichten. Accessed January 7, 2021. [01/07/2021] https://wirtschaft.com/boris-johnson-announces-closure-of-school-as-part-of-stricter-virus-measures/ [01/07/2021] Coughlan, Sean. "Thousands of Primary Pupils Face Closed Schools." BBC News, January 4, 2021, sec. Family & Education. https://www.bbc.com/news/education-55525681 . [01/07/2021] Ärztblatt, Deutscher Ärzteverlag GmbH, Redaktion Deutsches. "BBC sendet täglich Schulfernsehen während Lockdowns." Deutsches Ärzteblatt, January 6, 2021. https://www.aerzteblatt.de/nachrichten/119909/BBC-sendet-taeglich-Schulfernsehen-waehrend-Lockdowns . [01/07/2021] Mast, Noa Lara. "British Broadcasting Corporation unterstützt Kinder im Homeschooling." Nau. Accessed January 7, 2021. https://www.nau.ch/news/europa/british-broadcasting-corporation-unterstuetzt-kinder-im-homeschooling-65847595 . [01/07/2021] Rivers, Matt, Karol Suarez, and Natalie Gallón. "Mexico Launches School Broadcasts on Television and Radio for Kids - CNN." CNN, August 27, 2020. https://edition.cnn.com/2020/08/27/americas/mexico-covid-19-classes-on-tv-intel/index.html . [01/07/2021] Kellon, Leo. "Online Schooling: Calls to Cut Data Fees during Covid Lockdowns - BBC News." January 6, 2021. https://www.bbc.com/news/technology-55544196 . [01/07/2021]

11.01.2021	International	tocilizumab and sarilumab Interleukin-6 antibodies	Pharmacology & Pharmaceutics	Treatment	The two antibodies tocilizumab and sarilumab, which neutralise interleukin-6 receptors and thus counteract hyperinflammation, significantly reduced mortality in patients with severe COVID-19 in an international study.	However, treatment does not guarantee survival of the disease. Even with optimal intensive care in treatment with steroids plus an interleukin-6 blocker, the disease ended in death for one in four patients according to the researchers	Patients with severe Covid-19	"Interleukin-6 Receptor Antagonists in Critically Ill Patients with Covid-19 – Preliminary Report MedRxiv." Accessed January 11, 2021. https://www.medrxiv.org/content/10.1101/2021.01.07.21249390v1 . [01/08/2021] Deutsches Ärzteblatt, "REMAP-CAP-Studie: Tocilizumab und Sarilumab senken Sterberisiko bei..." Deutsches Ärzteblatt, January 8, 2021. https://www.aerzteblatt.de/nachrichten/119982/REMAP-CAP-Studie-Tocilizumab-und-Sarilumab-senken-Sterberisiko-bei-schwerem-COVID-19 . [01/08/2021]
12.01.2021	• DiaPat GmbH (Germany) • Mosaiques (Germany) • St. Georg Hospital Leipzig (Germany)	DiaPat-CoV-50 Urine Test	Microbiology & Biotechnology	Detection and Diagnostics	The DiaPat-CoV-50 test uses Proteomanalyse- technique to identify patients with a higher risk for complication. Per urine sample, a special device analyses up to 14,000 proteins and detects changes. The test has already been in use for early detection of chronic kidney disease, heart failure and diabetes mellitus. It was adapted to the requirements of Covid-testing and has received a special use authorization by the German Federal Institute for Drugs and Medical Devices in December 2020 after the results of a study conducted in summer 2020 were confirmed. The test has a specificity and a sensitivity of 83%. Compared to a purely clinical prognosis of the expected course of the disease, the test provides an increase in predictive accuracy of 20 %, according to the study leader. Early identification would enable adequate early treatment.	The test is only possible in seven German cities and with 850 Euros per sample, it is quite expensive. The German Ministry of Health is currently negotiating with the manufacturer about future pricing.	Covid-19 patients, Clinicians	Mosaiques Diagnostics And Therapeutics AG. "Mosaiques Diagnostics And Therapeutics AG." 2021. https://mosaiques-diagnostics.de/mosaiques-diagnostics/ . [01/12/2021] DiaPat.de. "Über Den DiaPat®-Test - DiaPat DE." 2020. https://diapat.de/de/ueber-den-diapat-r-test . [01/12/2021] mdr.de. "Urin-Test sagt schweren Covid-19-Verlauf voraus Das Erste." January 7, 2021. https://www.mdr.de/brisan/coronavirus-urintest-100.html . [01/12/2021] DiaPat.de. "Über Den DiaPat®-Test - DiaPat DE." 2020. https://diapat.de/de/ueber-den-diapat-r-test . [01/12/2021] BfArM. "BfArM - Homepage." 2021. https://www.bfarm.de/EN/Home/home_node.html . [01/12/2021] St. Georg Unternehmensgruppe. "COVID-19 - Studie anhand Urin-Test." St. Georg, 2020. https://www.sanktgeorg.de/artikel/covid-19-studie-anhand-urin-test-488.html . [01/12/2021] Deutsches Ärzteblatt. "Urintest zur Verlaufprognose bei COVID-19 zugelassen." Deutsches Ärzteblatt, January 11, 2021. https://www.aerzteblatt.de/nachrichten/119977/Urintest-zur-Verlaufprognose-bei-COVID-19-zugelassen . [01/12/2021]
12.01.2021	University of Tübingen (Germany)	ICU Training Video	Medicine	Treatment	The video was developed by doctors and medical students. Together with intensive care nurses, the developers realistically recreated the treatment of a COVID-19 patient in a replica of a fully equipped intensive care unit. The video accompanies a (fictive) young covid patient from hospital admission, through intubation to artificial oxygenation of the blood with the help of ECMO (Extracorporeal Membrane Oxygenation) therapy and the subsequent recovery process. In between, insertions provide detailed information on the background of the individual treatment steps (like for example proning, ventilation modes and ECMO-Therapy) and medical devices used. The video is to be used in medical teaching. It can also give medical laypeople an insight into how the care of a Covid patient actually unfolds and therefore help to generate awareness. The video could also be helpful for staff assigned to ICU from other parts of the hospital to treat covid patients or for relatively inexperienced ICU staff.	As of now, the video is available in German and English only. It is also tailored to the context of very high-capacity intensive care medicine in highly developed and resource-rich countries.	Clinicians	University of Tübingen. "Home University of Tübingen." 2021. https://uni-tuebingen.de/en/ . Sectio chirurgica, and University of Tübingen. "Die COVID-19-Infektion: Intensivmedizinische Be-handlung, 2020. https://www.youtube.com/watch?v=b_V...mmtMc&feature=youtu.be Deutsches Ärzteblatt. "COVID-19: Lehrvideo zur Versorgung auf Intensivstation vorgestellt." Deutsches Ärzteblatt, January 11, 2021. https://www.aerzteblatt.de/nachrichten/120028/COVID-19-Lehrvideo-zur-Versorgung-auf-Intensivstation-vorgestellt .
13.01.2021	Kinexon (Germany)	SafeZone	Engineering/ IT	Prevention	The German start-up Kinexon has developed a sensor system called SafeZone. The sensors are very smart and can be integrated in wristbands. The technology tracks distance using ultra-broadband signals and gives an acoustic and visual alarm when the set distance of 1.5m is not maintained. The technology is helpful to encourage employees to maintain the appropriate distance and currently used by more than 200 companies worldwide. The system could also have a behavioural aspect: through the acoustic warning tones, the sensors "punish" violations of social distancing, which could change people's behaviour in the long run.	As often with movement tracking devices there are some concerns regarding data safety and privacy issues. Not only do the sensors track who engages with whom but they theoretically enable the man-agements to constantly keep tabs on their employees movements	Companies and Offices	Schuetze, Christopher F. "On Factory Floors, a Chime and Flashing Light to Maintain Distance - The New York Times." January 12, 2021. https://www.nytimes.com/2021/01/12/business/kinexon-safezone-wearable-tech.html . [01/13/2021] Kinexon. "COVID-19 einsindmen." KINEXON, 2021. https://kinexon.com/de/safezone . [01/13/2021] Singer, Natascha. "The Hot New Covid Tech Is Wearable and Constantly Tracks You - The New York Times." November 15, 2020. https://www.nytimes.com/2020/11/15/technology/virus-wearable-tracker-privacy.html . [01/13/2021]
26.08.2020	Axial 3D (Ireland)	3D-printed swabs	Engineering/Medical Equipment	Detection and Diagnostics	The company developed 3D- printable face shields, ventilator parts and nasopharyngeal swabs for testing. After clinical trials in the USA, the company has sent hundreds of thousands of specially designed swabs to capture COVID-19 samples across the United States, Europe and Asia. The swabs are produced on Formlabs printers on surgical guide resin and keep samples more intact than traditional swabs, according to the manufacturers. Each printer produces 1,000 a day.	Demand is huge so there may be waiting periods	Clinicians, Testing sites, Hospitals, Nursing Homes	Jones, Rachel. "10 Healthcare Innovations in the Fight against COVID." Raconteur (blog), August 24, 2020. https://www.raconteur.net/healthcare/healthcare-innovation-covid/ . [01/13/2021] Axial3D. "Axial3D 3D Printed NP Swabs." 2021. http://info.axial3d.com/swabs . [01/13/2021]
26.08.2020	Isansys Lifecare (UK)	The Patient Status Engine (PSE)	AI/ Digital Health	Treatment	"The Patient Status Engine (PSE) automates the collection of raw patient data and decision-support tools for clinicians, combining wearable sensors with wireless networks and big data to provide high-resolution patient monitoring. Currently used in two NHS trusts and globally, it's a class-2 medical device that's FDA-approved in America and, says maker Isansys Lifecare, the only medically certified end-to-end digital solution of its kind [..] Installed behind hospital firewalls, this healthcare innovation includes wireless connections as part of its design, with patients connected through an Android "gateway" running Isansys applications that receive incoming data from sensors via doubly encrypted Bluetooth." (Jones, 2020).	Might not be applicable to all patient monitoring systems	Hospitals	Jones, Rachel. "10 Healthcare Innovations in the Fight against COVID." Raconteur (blog), August 24, 2020. https://www.raconteur.net/healthcare/healthcare-innovation-covid/ . [01/13/2021] Isansys. "Welcome to Isansys." 2021. https://www.isansys.com/ . [01/13/2021]
26.08.2020	Locilabs (UK)	UWB - SafeSpace system	Engineering/ IT	Prevention/ Surveillance	The system uses watches and badges to track how close and for how long people come into contact by monitoring the time of flight of radio signals between units. It also triggers warnings and real-time feedback via a cloud platform to identify those at risk from COVID-19. So the system can tell when the contact has happened and give the total time of exposure.	Data security and data protection rights might be an issue depending on local and national legislation.	National Surveillance, individual Companies or other places with high numbers of contacts	Jones, Rachel. "10 Healthcare Innovations in the Fight against COVID." Raconteur (blog), August 24, 2020. https://www.raconteur.net/healthcare/healthcare-innovation-covid/ . Locilabs. "Contact Tracing Solution Locilabs UWB Track and Trace." SafeSpace by Locilabs, 2020. https://www.locilabs.co.uk/ . [08/26/2020]

26.08.2020	SDG (Italy)	Docdot	AI	Treatment	The app assists clinicians in remotely monitoring vital signs of their patients by using AI-technology. It has undergone clinical trials in Canada, India and Japan, and is now used in US hospitals. The app works using light signal processing technology known as remote photoplethysmography, or rPPG, through which a smartphone camera records light reflected by blood vessels beneath the skin. Blood volume in micro-vascular tissue varies in response to respiration, blood pressure and other changes; the app converts this into measurements reportedly 90 per cent as accurate as hospital-grade monitors. Docdot enables people to look into their smartphone's screen and share early indicators of infection. It records heart rate, oxygen saturation and stress, collects data in real time, geo-references it and collates this to show COVID-19 cases and hotspots" (Jones, 2020).	Might not be applicable to all patient monitoring systems	Hospitals, GPs, Other health facilities	Jones, Rachel. "10 Healthcare Innovations in the Fight against COVID." Raconteur (blog), August 24, 2020. https://www.raconteur.net/healthcare/healthcare-innovation-covid/ . [01/13/2021]
26.08.2020	ResMed (USA)	AirView patient data management software.	Digital Health, AI	Treatment	The cloud-based system uses cellular chips in ventilation devices that send data which is then sorted and made available to clinicians in an easy-to-read format. Medical staff can change settings remotely. The company currently offers training for the NHS staff.	Might not be applicable to all patient monitoring systems	Hospitals and other health facilities	Jones, Rachel. "10 Healthcare Innovations in the Fight against COVID." Raconteur (blog), August 24, 2020. https://www.raconteur.net/healthcare/healthcare-innovation-covid/ . [01/13/2021]
28.08.2020	University College London (UK) Mercedes-AMG	UCL-Ventura ventilation device	Medical Equipment	Treatment	The collaboration re-engineered an off-patent mechanical device, previously used in the NHS, to create a version that needs less oxygen. This involved redesigning the entrainment port and improving flow and pressure. More than a countries are now using the UCL team's designs.		Hospitals and other health facilities	Jones, Rachel. "10 Healthcare Innovations in the Fight against COVID." Raconteur (blog), August 24, 2020. https://www.raconteur.net/healthcare/healthcare-innovation-covid/ . [01/13/2021]
13.01.2021	Imperial College London (UK)	JAMVENT Emergency Ventilator	Medical Equipment	Treatment	The emergency ventilator is easily to assemble by use of commonly available tools and components. That makes it an high-performance device at very low costs while it also helps to avoid problems regarding bottlenecks in global supply chains for ventilation devices.		Hospitals and other health facilities	Jones, Rachel. "10 Healthcare Innovations in the Fight against COVID." Raconteur (blog), August 24, 2020. https://www.raconteur.net/healthcare/healthcare-innovation-covid/ . [01/13/2021] JAMVENT. "Clinical Need JAMVENT." 2020. https://www.jamvent.com/clinical-need/ . [01/13/2021]
13.01.2021	Razer	Project Hazel- Mask	Medical Equipment	Prevention	The gaming equipment manufacturer Razer has developed a face mask that ventilates the air while at the same time amplifying the voice of the user. "The mask uses an N95 medical-grade respirator; detachable and rechargeable ventilators; and airflow regulators. The ventilators can be recharged and sanitized by putting them inside the wireless charging box, which features disinfecting UV lights. The company said the waterproof, scratch-resistant mask is made from recyclable plastics, reducing its environmental impact further." (Guy, 2021)	As of now, the mask is still a concept and not available for purchase. Moreover, it is to be expected that such a technologically and aesthetically sophisticated design will not come all too cheap.	General Population	Guy, Jack. "Razer's Reusable Face Mask Ventilates the Air and Amplifies Your Voice - CNN." CNN, January 13, 2021. https://edition.cnn.com/2021/01/13/americas/razer-smart-face-mask-scli-int-wellness/index.html . [01/13/2021] Razer. "The World's Smartest Mask - Project Hazel." 2021. https://www.razer.com/concepts/razer-project-hazel/ . [01/13/2021]
14.01.2021	Hack Partners (UK)	"Mind - the Gap" Social Distancing App	Engineering/ IT	Prevention	The app was designed to enable office workers to keep the distance needed to effectively prevent the spread of SARS-CoV-2. It uses audio and bluetooth signals to warn employees when they get too close. The app is widely used by Network Rail staff being rolled out to other companies.	Data security and data protection rights might be an issue depending on local and national legislation.	Workplace	Criddle, Christina. "App Tells If Office Workers Are Not Socially Distanced - BBC News." September 9, 2020. https://www.bbc.com/news/technology-54091539 . [01/13/2021]
14.01.2021	Johnson & Johnson (USA)	Johnson and Johnson Vaccine Ad26.COV2.S.	Pharmacology & Pharmaceutics	Prevention	According to preliminary results from the vaccine trials, the Johnson & Johnson vaccine generates an immune response while causing no serious side effects. The vaccine uses a modified version of a common cold adenovirus to carry genetic material from the virus into the body. This prompts human cells to produce pieces of the virus which are then recognized by the immune system.	The Ad26.COV2.S.- vaccine trials are not completed yet, so authorization is pending	General Population	Fox, Maggie. "Johnson & Johnson Coronavirus Vaccine Generates Immune Response, Few Side Effects, in Early Trials - CNN." January 13, 2021. https://edition.cnn.com/2021/01/13/health/johnson-coronavirus-vaccine-early-trials/index.html . Sadoff, Jerald, Mathieu Le Gars, Georgi Shukarev, Dirk Heerwegh, Carla Truysers, Anne M. de Groot, Jeroen Stoop, et al. "Interim Results of a Phase 1-2a Trial of Ad26.COV2.S Covid-19 Vaccine." New England Journal of Medicine 0, no. 0 (January 13, 2021): null. https://doi.org/10.1056/NEJMoa2034201 . [01/14/2021] Deutsches Ärzteblatt. "SARS-CoV-2: Impfstoff von Janssen könnte bereits nach der ersten Dosis..." Deutsches Ärzteblatt, January 14, 2021. https://www.aerzteblatt.de/nachrichten/120179/SARS-CoV-2-Impfstoff-von-janssen-koennte-bereits-nach-der-ersten-dosis-schuetzen . [01/15/2021] Johnson & Johnson. "Homepage." Content Lab U.S., 2021. https://www.jnj.com/ . [01/13/2021]
15.01.2021	Dräger (Germany)	Stockpiling concept for FFP masks	Medical Equipment	Infrastructure	In order to be able to cover the demand for FFP masks in the event of a pandemic, Dräger has developed a stockpiling concept for FFP masks. This is aimed at industry, healthcare, fire brigades and authorities. FFP2 and FFP3 masks can be pre-ordered from the medical and safety technology manufacturer Dräger. Dräger takes care of the storage, renewal and delivery of the masks. The masks are produced in France, Sweden or Great Britain. The purchase price and delivery dates are agreed in advance. Until the need arises, the customers only pay an annual provision fee - there is no obligatory purchase.		Hospitals	Devicemed.de. "Antigen-Test erlangt CE-Zulassung für Probenentnahme aus dem vorderen Nasenbereich / Doctolib koordiniert die Impftermine in der Hauptstadt." Accessed January 15, 2021. https://www.devicemed.de/antigen-test-erlangt-ce-zulassung-fuer-probenentnahme-aus-dem-vorderen-nasenbereich-doctolib-koordiniert-die-impftermine-in-der-hauptstadt-a-913983/ . Dräger. "Bevorratungs-Service Zur Pandemievorsorge." 2021. https://www.draeger.com/de_de/Applications/Draegerservices/bevorratungs-service .
15.01.2021	SciBeh Research collaboration (International)	Vaccination Communication Handbook	Communication Sciences	Communication & Social Sci	The 16-page manual draws on information from the World Health Organization (WHO), UNICEF, the U.S. Food and Drug Administration (FDA), the Royal Society and other agencies and scientific organizations. It provides information on vaccination in general and Covid-19 vaccination in particular, as well as factors that promote vaccination readiness within the population. In addition, it devotes several sections to the topic of communication, providing basic information on risk communication as well as practical advice on how to deal with or prevent misinformation.	The handbook can only provide assistance in conducting informational interviews and must be adapted to the respective situation. Continuous updating is crucial to ensure that the information is up to date.	Doctors, journalists, nurses, policy makers, local and national health officials, researchers, teachers, students and parents...	SciBeh. "Authors and acknowledgements." HackMD, 2021. https://hackmd.io/@scibehC19vax/contributors . [01/15/2021] Deutsches Ärzteblatt. "Impfmythen begegnen: Handbuch bietet Kommunikationsleitfaden." Deutsches Ärzteblatt, January 13, 2021. https://www.aerzteblatt.de/nachrichten/120035/Impfmythen-begegnen-Handbuch-bietet-Kommunikationsleitfaden . [01/15/2021] Lewandowsky, S., Cook, J., Schmid, P., Hoford, D. L., Finn, A., Leask, J., Thomson, A., Lombardi, D., Al-Rawi, A. K., Amazeen, M. A., Anderson, E. C., Armaos, K. D., Betsch, C., Bruns, H. H. B., Ecker, U. K. H., Gavaruzzi, T., Hahn, U., Herzog, S., Juchacz, M., Kendeou, P., Newman, E. J., Pennycook, G., Rapp, D. N., Sah, S., Sinatra, G. M., Tapper, K., Vraga, E. K. "The COVID-19 Vaccine Communication Handbook: A Practical Guide for Improving Vaccine Communication and Fighting Misinformation." 2021. https://sls.tolc19vax.com/ . [01/15/2021]

15.01.2021	Smu (Southern Methodist University) (USA)	Lab-on-a-chip test	Microbiology & Biotechnology	Detection and Diagnostics	"conventional immunosensor antibody tests tend to be slow to show results and frequently inaccurate. Researchers estimate the lab-on-a-chip test could detect immune responses to coronavirus in two to three minutes, with just a drop of blood. The materials used to create the test are inexpensive, which should result in low-cost mass production"	Still in development	General Population	Smu (Southern Methodist University). "Lab-on-a-Chip Test Has Potential to Detect COVID-19 Immune Response Faster than Current Antibody Testing," January 14, 2021. https://phys.org/news/2021-01-lab-on-a-chip-potential-covid-immune-response.html . [01/15/2021]
15.01.2021	MIT (USA)	AI- Model to analyze Viral escape	AI	Prediction, Monitoring & S	Mutation allows viruses to evade the antibodies generated by a particular vaccine, through a process known as "viral escape". MIT researchers have now developed an AI- model that "can predict which sections of viral surface proteins are more likely to mutate in a way that enables viral escape, and it can also identify sections that are less likely to mutate, making them good targets for new vaccines."(Massachusetts Institute of Technology, "Model Analyzes How Viruses Escape the Immune System," January 14, 2021. https://phys.org/news/2021-01-viruses-immune.html)		Vaccine developers	Massachusetts Institute of Technology. "Model Analyzes How Viruses Escape the Immune System," January 14, 2021. https://phys.org/news/2021-01-viruses-immune.html . [01/15/2021]

Background on Innovation Sheet Series

As part of a real-time evaluation of the SARS CoV 2 pandemic (with focus on epidemiological, medical, economical, societal, technical, and cultural developments in Germany and Armenia) the CoronaSys research team, under the leadership of Prof. Dr. Martin Voss, is conducting a continuous monitoring of developments and medical, technical, and social innovations concerning Covid-19.

Multiple national and international media outlets, research platforms, and scientific and organizational guidelines, briefs, and updates are screened to feed into this outlet. The rationale behind this is to support the projects' network partners in Armenia and Germany with short summaries of key developments and promising innovations that are shaping the global, German, and Armenian outbreak response and recovery.

The aim of these short briefs is to give condensed and structured information on selected innovations emerging out of the conducted horizon scanning. This could be mainstream big-ticket items or fringe subjects that are easily overlooked in the global flood of information. Some innovations will be followed through their evolution in time while others may only appear once. While subjectively selected, the briefs are descriptive in nature and leave analysis and critical interpretation to the reader. Network partners in both countries are invited to provide feedback on their interest areas and suggest particularly relevant topics for the CoronaSys Workshop series.

The CoronaSys Innovation Sheet Series is published by the [Academy of the Disaster Research Unit](#), which is, as a non-profit limited liability company, a spin-off of the [Disaster Research Unit](#) at the Free University of Berlin. The series is part of the research project "[CoronaSys](#): Addressing the corona pandemic in Armenia through systemic risk management", sponsored by the German Federal Ministry of Education and Research.

If you have any questions, suggestions, or if you wish to be taken on (or off) the project mailing list for CoronaSys updates, innovation sheets, and workshop invitations, please send a message to Janina Schäfer (schaefer@a-kfs.de). For general project inquiries, you may contact the team lead Sara Merkes (merkes@a-kfs.de) or the project lead Martin Voss (voss@a-kfs.de).

CoronaSys Innovation Sheets

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- 4 Portable TRI- KLEEN 500UV
- 5 Convalescent Plasma Therapy
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- 8 Corona Traffic Light
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- 10 IVAT Hygiene Tower
- 11 LY-CoV555 Antibody Treatment
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All previous CoronaSys Innovation Sheets are available online:

<http://coronasys.a-kfs.de/category/innovation-stream/>

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CORONASYS INNOVATION SHEET 1

“NEW” ANTIVIRAL FACE MASKS

Background

A study established that people touch their faces 23 times per hour on average¹. Especially people who are not used to wearing masks tend to touch their faces to adjust the masks very often. Furthermore, the coronavirus that causes Covid-19 remains present and infectious on the outer layer of masks for up to 7 days, according to a study published in *The Lancet Microbe*². Several companies³ have developed “new” forms of antimicrobial face masks that receive quite a lot of media coverage at the moment.

Features

Some types of “new” masks are coated with various antiviral and antimicrobial substances (e.g. copper oxide, Triiodide), while others work by destroying the negatively charged microbes on contact with the strongly positively charged surface of the textiles. The manufacturers claim that the “new” masks can render 99% of the Corona Virus suspension on the outside surface of the mask harmless⁴. Studies have confirmed the efficacy of the respective products⁵. The masks are reusable and come at a price range from about 6€ to 45€.

Potentials

The masks can help limit transmission by preventing the spread of the virus over the mask surface. They also prevent unpleasant smells of the masks. The “new” masks might therefore be an added value especially for health workers or other essential workers who need to wear the masks for longer time periods.

Points to consider

The efficacy under laboratory conditions is undisputed. Still, experts warn against over-expectations and a false sense of security. The “new” masks do not offer 100% protection against infection since other forms of transmission are still far more likely. In addition, it must be noted that only the surface of the masks is largely virus-free but not the other parts of the face that are touched frequently. The products can therefore only be an addition to existing hygiene and social distancing measures in tackling the pandemic⁶.

Conclusion

The effect of the “new” masks has been proven but further studies are needed to assess effectiveness and long-term safety of the new products under everyday conditions⁷. Especially for people who must wear the masks for a long time, they might represent an added value. In general, however, existing mask models seem to be sufficient and offer a good price-performance ratio. Various experts consider the everyday masks and medical masks used to date, together with frequent hand washing and compliance with social distancing rules, to be sufficient.

State of information: 13/08/2020

Market launch: July 2020

Countries: Canada, Israel, Switzerland

Focus area: Prevention; PPE

Developers:

- i3 BioMedical Inc. (Canada)
- Livingguard (Switzerland)
- Argaman Technologies Ltd (Israel)

Beneficiaries:

- general public, especially essential (health) workers

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- Klein, Oliver (17.07.2020). Sollen Coronaviren töten -Was taugen die neuen Supermasken?, Online: <https://www.zdf.de/nachrichten/panorama/coronavirus-maske-biomedical-100.html> (11.08.2020).
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CORONASYS INNOVATION SHEET 2

“DYPHOX” SURFACE COATING

Background

The SARS-CoV-2 virus can remain infectious on inanimate surfaces for some time, depending on the environmental conditions¹². Transmission of SARS CoV-2 through contaminated surfaces can therefore not be ruled out, especially in the immediate vicinity of infectious persons. Surfaces that are touched by many people can pose a particularly high risk of infection. Manual disinfection only works in a temporal context and recontamination between disinfection cycles can hardly be prevented³. The permanently effective antimicrobial coating “dypfox” can help to close those hygiene gaps.

Features

Surfaces (e.g. desks and doorknobs in public buildings, grab handles in public transport, and near-patient surfaces in hospitals and nursing homes) can be coated with the clear lacquer⁴⁵. It creates a photodynamic effect to kill bacteria, viruses, and fungi and works on dry and wet surfaces⁶⁷. In addition, the manufacturer⁸ offers the disinfecting molecules as an admixture for other coatings⁹. A study¹⁰ showed that the germ colonization on the surface is significantly reduced for about a year. The agent causes a germ reduction of more than 99.99%.¹¹ The relative risk of high germ loads has been shown to decrease by up to 67% and thus also the risk of spreading germs over surfaces. According to the manufacturer, the one-time treatment of a desk, for example, costs about 30 Euros¹².

Potentials

The varnish could be a valuable addition to other measures. In particular, frequently touched surfaces in public buildings and health facilities could be treated with it to reduce the transmission of coronaviruses and other germs. A major advantage is that the transparent lacquer can be applied to almost all kinds of surfaces. Also, the technology is environmentally friendly¹³.

Points to consider

The number of germs is only reduced and other ways of transmission are still far more likely for SARS-CoV-2- infections than smear infection via contaminated surfaces. Therefore, further hygiene measures are of course mandatory and must be obeyed.

Conclusion

In public buildings, public transport, nursing homes, and hospitals the coating can be a good addition to existing pandemic management and prevention measures. However, it is not a substitute for these existing measures.

State of information: 18/08/2020

Market launch: 2018

Country: Germany

Focus area: Prevention, Disinfection

Developers: TriOptoTec GmbH

Beneficiaries:

- general public
- especially in public areas and in health facilities

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- ¹ van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. The New England journal of medicine. 2020.
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- ⁹ Dostert, Elisabeth (02/11/2020). Die Saubermacher. Online: <https://www.sueddeutsche.de/wirtschaft/chemie-start-up-die-saubermacher-1.4793396> [08/18/2020]
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- ¹³ Dyphox product website (2020). Online: <https://dyphox.com/> [08/15/2020]

CORONASYS INNOVATION SHEET 3

MOVES SLC™ PORTABLE ICU

Background

Covid-19 infections can lead to respiratory distress, and especially patients with pre-existing conditions may need intensive care¹². However, advanced intensive care units are not always available, particularly in rural areas. Shortages in ICU beds, ventilators, and compressed oxygen can further complicate the challenges in fighting Covid-19³⁴.

Features

The MOVES® SLC™ addresses these problems by providing ventilation, oxygenation, vital signs monitoring, and suction, without the need for compressed oxygen⁵, and while operating on battery power for more than six hours⁶. Its low weight of just 17 Kg makes it easy to handle. It is intended for adults and pediatric patients who weigh between 10 kg and 120 kg. MOVES® SLC™'s circle-circuit ventilator enables a high FiO₂ of up to 85% with low flow O₂ so that no O₂ tanks are required⁷. If a higher FiO₂ is required, the system can operate with 95% less oxygen than the open-circuit ventilators currently in use according to the manufacturer⁸⁹.

Potentials

The system can quickly be set up bedside in any location to ventilate and monitor patients¹⁰. It can be used for intra- hospital or inter- hospital transport, to set up a temporarily OR or to scale up intensive care and ventilator capacities in hospitals, field hospitals or other locations¹¹.

Points to consider

Although the MOVES® SLC™ does comply with a wide range of international standards, potential users should check the compatibility with their systems. The system does not have defibrillation capability¹².

Conclusion

The product might be a valuable addition to existing equipment and can be used to temporarily scale up ICU capacities in the wake of the Covid-19 pandemic and in the context of other disasters.

State of information: 19/08/2020

Market launch: 2017

Implemented in:

- Canada
- Belgium
- Australia
- United States
- Malaysia
- Israel

Focus area: Treatment

Developers: Thornhill Medical

Beneficiaries:

- critically ill patients
- health care providers

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CORONASYS INNOVATION SHEET 4

PORTABLE TRI- KLEEN 500UV

Background

Droplet infection and infection through aerosols are the main ways of transmission for SARS- CoV-2¹². Particularly in hospitals where infected persons are being treated the risk of infection in the patients' rooms and examination rooms may be especially high³⁴⁵. Many hospitals do not have enough isolation facilities with special air filtering systems (Airborne Infection Isolation Rooms, AIIR) that prevent contaminated air from spilling into other parts of the hospital. In the wake of the COVID- 19 pandemic *Tri-Dim* and *EBM- Pabst* have rapidly developed a portable solution.

Features

The portable TRI- KLEEN 500UV is a portable air filtration system that creates a vacuum in closed treatment or examination rooms to prevent the overflow of virus-contaminated air into neighboring rooms⁶. The system includes a MERV 9 pre-filter and a cylindrical HEPA filter⁷⁸. This high-performance filter guarantees the filtering of 99.97 percent of all particles with a size of up to 0.3 microns⁹. The effect of filtration is enhanced by the combination of the HEPA filter with a UV lamp, whose light kills germs, bacteria, and viruses¹⁰.

Potentials

No renovation work is necessary to install the system. The device is mobile and can be set up rapidly and moved according to current needs. It therefore can present a quick solution to provide additional protection for hospital staff and patients.

Points to consider

For now, the product is only available on the American market, but negotiations with other countries are underway and the manufacturers are preparing for the production of 230 Volt-models.

Conclusion

The product might be a valuable addition to other CDC- recommended infection control measures¹¹¹². Since it is mobile and quick to be installed it can increase the flexibility of healthcare providers in reacting to patient surges.

State of information: 25/08/2020

Market launch: April 2020 (USA)

Country: USA

Focus area: Prevention, Hospital Hygiene

Developers: *Tri-Dim, EBM-Pabst*

Beneficiaries:

- Hospital patients and staff

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- ⁸ Mann+ Hummel Group (2020): Tri-Kleen: Antiviral air purification for your facility. Online: <https://airfiltration.mann-hummel.com/our-segments/virus-contaminated-air/antiviral-air-purification/solutions/tri-kleen/> [08/25/2020]
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CORONASYS INNOVATION SHEET 5

CONVALESCENT PLASMA THERAPY

Background

As of late August 2020, the USA have reported around 5.780.000 Covid- 19 cases and 178.000 deaths related to Covid- 19¹. This makes the USA to one of the countries that are hit hardest by the pandemic². Since there is no causal therapy and no vaccine available yet, clinicians and researchers have been searching for other solutions to support recovery. One of those possible solutions is convalescent plasma therapy. Together with President Trump, the U.S. Food & Drug Administration (FDA) announced on August 23, 2020, that they issued an emergency authorization for convalescent plasma therapy³.

Features

The therapy approach is based on the transfusion of blood plasma of recovered Covid-19 patients to patients currently suffering from the disease. Because there is no vaccine yet that stimulates the formation of antibodies against SARS-CoV-2, patients are given antibodies from people who have formed them after a natural infection⁴.

Potentials

Plasma therapy has been used for more than 100 years and is considered safe for patients⁵⁶. Plasma may particularly help patients in the early stages of the disease⁷. This is indicated by a study on the efficacy of the treatment conducted by the Mayo Clinic: Out of 35,000 patients treated with plasma, those who were treated earlier benefited more from the treatment. In the group that received the plasma within the first three days of their diagnosis, 8.7 percent died within the following week, while a transfusion after four or more days resulted in a death rate of 11.9 percent⁸.

Points to consider

However, the Mayo Clinic- study is not sufficient proof of the treatment's efficacy for Covid- 19, since there was no comparison group⁹¹⁰. A Cochrane review also found serious shortcomings in the overall evidence to date, both in terms of the quantity of the studies and their quality¹¹. Besides, the emergency authorization does not correspond to a formal authorization with much higher hurdles. And while plasma treatment has been used safely against different diseases over the last 100 plus years, its effectiveness on different diseases is very mixed¹². Plasma supply is also limited, as it can only be obtained from blood donations. The amount of plasma simply would not be enough for the number of patients who need help in the course of a pandemic wave in the clinics¹³. Plasma therapy is also not the announced breakthrough: approximately 70,000 people have already received plasma under FDA's "expanded access" program¹⁴. Critics claimed that the FDA and President Trump were pushing the therapy ahead of the republican national convention this week to support Trump's narrative about the pandemic¹⁵.

Conclusion

There are currently around 50 studies underway worldwide¹⁶, which will examine the topic and are expected to show results by the end of the year. Twenty-two of these studies are Randomized Controlled Trials. Plasma therapy could, therefore, be a supplement if its effectiveness can be proven. However, it is by no means a comprehensive solution.

State of information: 27/08/2020

FDA emergency authorization: August 2020

Country: USA

Focus area: Treatment

Beneficiaries:

- Possibly patients in early stages of Covid-19 infections

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- ¹⁴ Associated Press (08/25/ 2020): FDA chief apologizes for overstating plasma effect on virus, <https://www.nbc12.com>. Online: <https://www.nbc12.com/2020/08/25/fda-chief-apologizes-overstating-plasma-effect-virus/> [08/26/2020]
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CORONASYS INNOVATION SHEET 6

ASIC- APP

Background

Covid-19 patients in intensive care units often develop Acute Respiratory Distress Syndrome (ARDS)¹². Despite all the advances in intensive care medicine, the mortality rate of ARDS and resulting complications is still estimated at 25-50% depending on the severity³⁴. Effective therapy is based on the timely detection of impending lung failure, early and appropriate treatment of the underlying disease, and adequate ventilation therapy to prevent further ventilation-associated lung damage⁵⁶⁷. The ASIC- App aims at assisting clinicians in early diagnosis of ARDS and therapeutic decision making in order to improve patients outcomes.

Features

The App screens the routine data of ICU patients (e.g. PEEP and oxygen settings of the ventilator, oxygenation, Horovitz- index, and other variables) for signs of early stages of ARDS. If it detects hints for ARDS it alerts the doctors via smartphone- before the patient's clinical condition deteriorates. It then suggests diagnostic pathways and therapeutic measures based on current guidelines⁸.

Potentials

The App can be a valuable addition to regular monitoring and diagnostic measures since it can help to detect changes in huge amounts of data. Particularly in times of overburdened health systems and staff shortages, its step by step guidance might be helpful in the early detection of ARDS. The App is free of charge⁹.

Points to consider

As of now, the app only operates on Apple- devices and requires iOS 8 or newer¹⁰. The App is currently only used in Germany and therefore certainly has to be adapted to other countries in terms of software compatibility. Although the developers¹¹ applied high standards for data protection, the local user has to check for potential security breaches and compliance with the data protection laws of the respective country. The app is relatively new, so some optimization potentials will only become apparent over time.

Conclusion

The App might be an addition to other monitoring and diagnosis tools if it is compatible with local technologies and data protection laws.

State of information: 01/09/2020

Launch: July 2020

Country: Germany

Focus area: Treatment

Developers:

- RWTH Aachen University clinic
- Healthcare IT solutions GmbH
- Federal Ministry for Education and Research

Beneficiaries:

- Clinicians
- Critically ill patients

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- ¹⁰ Apple Store (2020). ASIC App. Online: <https://apps.apple.com/de/app/asic-app/id1505315549> (09/01/2020)
- ¹¹ RWTH Aachen University clinic (2020): <https://www.ukaachen.de/en/404.html> [09/02/2020]
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- Federal Ministry of Education and Research (2020): <https://www.bmbf.de/en/index.html> [09/02/2020]

CORONASYS INNOVATION SHEET 7

BINAXNOW ANTIGEN TEST

Background

Testing has posed a major challenge to health systems tackling the novel Coronavirus. Shortages of certain items like swabs and reagents added to the supply chain problems. Overburdening of laboratories and delays in delivering the test results to the patients have been huge problems in the US and elsewhere¹. The company Abbott claims to have a solution for those difficulties with their BinaxNOW antigen test.

Features

Rapid Antigen tests have been used in the detection of other respiratory infectious diseases before². The BinaxNOW test looks for a specific protein on the virus surface which implies an infection with SARS CoV-2³. Antigen tests do not necessarily require specialized labs, certain machines, or highly trained staff.⁴ The test result can be read directly from the card. The manufacturer claims that the test can deliver results in 10-15 minutes and will cost around 5 US- Dollars.

Potentials

The Food and Drug Administration (FDA) issued an emergency use authorization for the test on August 26, 2020⁵⁶. This could massively scale up testing capacities in the United States⁷. The manufacturer plans to produce and distribute 50 million tests per month⁸. The tests might be especially useful in screening asymptomatic people if they get approved for this usage.

Points to consider

The speed of the test comes with trade-offs. Antigen tests are very specific but are not as sensitive as molecular tests. The tests are more likely to produce false-negative results, meaning there is a higher risk to miss an active coronavirus infection compared to molecular tests. The full FDA Approval process is still ongoing and the test is currently only authorized for people with COVID-19 symptoms within the first 7 days, which is problematic because Covid-19 is asymptomatic in many cases.⁹

Conclusion

The test may rapidly scale up testing capacity. But it remains to be seen whether it can provide accurate and reliable results in large numbers of tests and in asymptomatic patients. A similar test has been developed by the Suisse pharma company Roche and is to be launched on the European Market in September 2020¹⁰¹¹.

State of information: 02/09/2020

Launch: August 2020

Country: USA

Focus area: Testing

Developers: Abbott

Beneficiaries: General population

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CORONASYS INNOVATION SHEET 8

CORONA TRAFFIC LIGHT

Background

Many European countries have seen surges in Covid- 19 infections after the holiday season¹². This is also true for Austria.³ There are many different approaches to evaluate the severity of the situation and to decide which measures should be taken. Austria has now developed a so-called “Corona traffic light” that has gained a lot of media coverage to inform its decision making regarding the pandemic⁴. Similar concepts have already been implemented for example in Berlin⁵ and the USA⁶.

Features

The Corona situation in Austria is now evaluated weekly with a traffic light system. Four colors from green (low risk) to red (very high risk) correlate with specific measures to apply to the affected region. The Berlin system in comparison does only involve three colors and includes only three parameters (incidence, the R-value, which indicates how many people an infected person infects on average, and the percentage of ICU- beds required for Covid- 19 patients)⁷.

Criteria for traffic light colors in Austria are not only the case numbers over seven days but also their traceability, whether sick people became infected in their home town or elsewhere, the capacity of hospitals, the total number of tests, and other factors such as tourism⁸⁹. The traffic light aims to carry out the risk assessment according to objective criteria and to standardize the response to it. For example, in the case of yellow, the requirement to wear masks is to be tightened in shops, restaurants, and during events. Students will also have to wear a mask in schools if the traffic light turns yellow¹⁰.

Potentials

The traffic light could help officials to make informed decisions, communicate to the public, and provide guidance for the implementation of specific measures according to scientific knowledge, regional differences, and manageability.

Points to consider

However, the traffic light is not excluded from political influence. It is carried out by a commission to which five representatives of the Federal Government and nine representatives of the counties are sent. There will be five experts as well (e.g. virologists) but they are also appointed by the Federal Government.¹¹ Some cities have already criticized the government's strategy. They claim that the traffic light does not consider the differences between regions and does not paint an adequate picture of the situation¹². Another point to ponder is whether there should be a green light at all. One could argue that this leads to a false sense of security. The US- System, for example, does not include a green light¹³. Some accuse Austria's government of using the classification to make local officials look bad and enhance the governing parties (ÖVP) chances in the state elections in autumn. Furthermore, some say there is not yet a jurisdictional basis for the traffic light system¹⁴.

Conclusion

In theory, the Austrian Corona traffic light system is a helpful tool to respond to challenges regarding Corona measures. In practice, however, it needs to be improved and a consensus between state and local authorities as well as leading scientists should be reached.

State of information: 08/09/2020

Launch: September 2020

Country: Austria

Focus area: Monitoring, policy, and public communication

Developers: Austrian government

Beneficiaries: General population, decision makers

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- ⁶ „PHDMC | - Coronavirus Updates.“ Accessed September 14, 2020. <https://www.phdmc.org/coronavirus-updates>. <https://www.phdmc.org/coronavirus-updates> [09/14/2020]
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- ¹² Deutsches Ärzteblatt. „Österreich startet ‚Corona-Ampel‘“. Deutsches Ärzteblatt, 4. September 2020. <https://www.aerzteblatt.de/nachrichten/116262/Oesterreich-startet-Corona-Ampel>.
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- ¹⁴ Listner, Astrid. „Österreichs Bundesregierung startet Corona-Ampel“. swr. online, 4. September 2020. <https://www.swr.de/swraktuell/oesterreich-corona-ampel-100.html>. [09/09/2020]

CORONASYS INNOVATION SHEET 9

A PROOF-AT-HOME ANTIBODY TEST

Background

People who have been infected with Sars-CoV-2 usually form antibodies against the virus within approximately one to two weeks¹. These are to be detected by the test developed by Adversis Pharma² in collaboration with the Biotechnological Biomedical Center (BBZ) of the University of Leipzig³. According to the manufacturer the test can easily be carried out by laymen at home. The test has been heavily advertised in Germany.

Features

People can order the test online and will receive a set, with which they can collect a few drops of blood from the fingertip with a lancet and drip the blood onto a filter card. The blood sample must then be dried and sent to a laboratory in Leipzig⁴, where it is tested for antibodies using the standard ELISA method⁵. The result can be retrieved online with the personalized code in the testing kit within 24 to 48 hours. The manufacturer claims that the test has a sensitivity of 100% and a specificity of 99.4%⁶. The test costs 49 euros⁷.

Potentials

The user receives information about whether or not he has antibodies against Sars-CoV-2. Since the majority of those infected have mild or no symptoms, the knowledge of an infection acquired retrospectively could affect how individuals assess the situation and deal with the pandemic⁸. Moreover, the test is part of a larger research project aimed, among other things, at obtaining data on the immune status of the population (especially titers of neutralizing antibodies), which could also play a role in the long term in disease monitoring and the development of vaccines⁹.

Points to consider

The presence of antibodies is not to be equated with immunity¹⁰¹¹. Until now, many researchers had hoped that one would be immune to the virus after infection. But at the end of August, several cases of individuals infected with Sars-CoV-2 a second time became known¹²¹³. In addition, the body usually develops better detectable IgG antibodies, for which the test is designed, not until a few weeks after infection. So if one does the test too early, one will not get a reliable test result. But if the test is conducted too late it might not produce a valid result either, as cases are known where the concentration of antibodies dropped again after a short period of time¹⁴¹⁵. Furthermore, The Federal Association of German Pharmacists' Associations (ABDA) strongly advises pharmacies against offering such tests to their customers due to legal concerns, referring to a passage in the German Medical Devices Act¹⁶. Initially, Adversis had been counting on pharmacies to sell the product in addition to the online sale.

Conclusion

For patients with symptoms, a PCR test is the means of choice anyway, because it shows an active infection. Antibody testing is more likely to be useful in asymptomatic patients who want to know if they have already survived the infection. The data collected could also contribute to a better understanding of the immune situation of the population.

State of information: 10/09/2020

Launch: September 2020

Country: Germany

Focus area: Testing

Developers:

- Adversis Pharma
- Biotechnological Biomedical Center (BBZ) of the University of Leipzig

Beneficiaries: General population

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- ² "Adversis Pharma." Accessed September 10, 2020. <https://adversis-pharma.de/>.
- ³ Universität Leipzig. "Biotechnologisch-Biomedizinisches Zentrum." Accessed September 10, 2020. <https://www.bbz.uni-leipzig.de/>.
- ⁴ Deutsches Ärzteblatt, Deutscher Ärzteverlag GmbH, Redaktion Deutsches. "Leipziger Forscher entwickeln Coronaantikörper-test für zuhause." *Deutsches Ärzteblatt*, September 1, 2020. <https://www.aerzteblatt.de/nachrichten/116099/Leipziger-Forscher-entwickeln-Coronaantikoeperptest-fuer-zuhause>.
- ⁵ Hnasko, Robert, ed. *ELISA: Methods and Protocols. Methods in Molecular Biology 1318*. New York: Humana Press, 2015.
- ⁶ Deutsches Ärzteblatt. "Leipziger Forscher entwickeln Coronaantikörper-test für zuhause." *Deutsches Ärzteblatt*, September 1, 2020. <https://www.aerzteblatt.de/nachrichten/116099/Leipziger-Forscher-entwickeln-Coronaantikoeperptest-fuer-zuhause>.
- ⁷ Product Website. "AProof® Coronavirus Antikörper-test." *Aproof-corona.de*. Accessed September 10, 2020. <https://www.a-proof-corona.de/>.
- ⁸ Spiegel Online. "Coronavirus: Was Taugt Der Antikörper-test Für Zu Hause? - DER SPIEGEL." *Spiegel Online*, January 9, 2020. <https://www.spiegel.de/wissenschaft/medizin/coronavirus-was-taugt-der-antikoerper-test-fuer-zu-hause-a-b7b67cab-9766-45ad-b63a-074dac7e1d06>.
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- ¹² Deutsches Ärzteblatt. "Nach 4 Berichten zu Re-Infektionen: Wie lange hält eine Immunität..." *Deutsches Ärzteblatt*, August 31, 2020. <https://www.aerzteblatt.de/nachrichten/116059/Nach-4-Berichten-zu-Re-Infektionen-Wie-lange-haelt-eine-Immunitaet-gegen-SARS-CoV-2-an>.
- ¹³ To, Kelvin Kai-Wang, Ivan Fan-Ngai Hung, Jonathan Daniel Ip, Allen Wing-Ho Chu, Wan-Mui Chan, Anthony Raymond Tam, Carol Ho-Yan Fong, et al. "COVID-19 Re-Infection by a Phylogenetically Distinct SARS-Coronavirus-2 Strain Confirmed by Whole Genome Sequencing." *Clinical Infectious Diseases*. Accessed September 10, 2020. <https://doi.org/10.1093/cid/ciaa1275>.
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CORONASYS INNOVATION SHEET 10

IVAT HYGIENE TOWER

Background

Aerosols are, in addition to droplet infection, the main way of transmission for SARS CoV-2¹². These aerosols can float in the air for hours indoors and lead to infection even if the infected person is no longer in the room³⁴. The risk of infection is particularly high in public places where many people are in contact with each other. With the end of the summer vacation season, this is for example the case for schools and other public buildings. With the colder season approaching people also spend more time indoors. This requires additional solutions to policies like mask-wearing and social distancing to decrease the risk of infection in public spaces. Air purification devices can contribute to these aims⁵.

Features

The above-mentioned study by the University of the Bundeswehr Munich recommends the change of the indoor air at least six times per hour to maintain the desired low aerosol concentration.⁶With its four-stage high-performance filter, the Hygiene Air Tower cleans the air of more than 99.995 percent of all viruses at the necessary speed and can thus generate an air quality that meets the requirements for effective air cleaning of rooms. In addition, it can perform many other tasks, such as cooling or heating rooms, filtering odors, and disinfecting hands and objects. The embedded monitor can be used for videoconferencing or to display advertising or other content. The tower is completely quiet and comes at a price range from about 5000 to 30 000 Euros depending on the included features⁷.

Potentials

While the tasks of the Hygiene Tower during the day are primarily the cleaning of the air and the monitoring of its quality, it can also serve at night as an alarm and fire alarm center, including video surveillance for protection against burglary⁸.

Points to consider

The Hygiene Tower with all its bonus- features might be a little too much for the needs of most customers in need of air purification, such as schools, offices, or public buildings.

Conclusion

The Hygiene Tower can be an addition to other hygiene measures such as mask-wearing and frequent hand washing during the SARS CoV-2 pandemic and afterward, especially if institutions benefit from the towers many additional features.

State of information: 18/09/2020

Launch: 2020

Country: Germany

Focus area: Prevention

Developers: IVAT GmbH

Beneficiaries: Public and health institutions, working spaces etc.

¹ Machhi, Jatin et al.(2020): The Natural History, Pathobiology, and Clinical Manifestations of SARS-CoV-2 Infections. Journal of neuroimmune pharmacology: the official journal of the Society on NeuroImmune Pharmacology, 1–28. 21 Jul. 2020, doi:10.1007/s11481-020-09944-5

² Robert Koch Institut (2020): SARS-CoV-2 Steckbrief zur Coronavirus-Krankheit-2019 (COVID-19) Stand: 21.8.2020. Online: https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Steckbrief.html#doc13776792bodyText1 [09/14/2020]

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⁵ Kähler, Christian J, Thomas Fuchs, and Rainer Hain. "Quantifizierung eines Viomed Klinik Akut V 500 Entkeimungsgerätes zur Reduzierung der indirekten SARS-CoV-2 Infektionsgefahr durch Aerosolpartikel," n.d., 20.

⁶ Kähler, Christian J, Thomas Fuchs, and Rainer Hain. "Quantifizierung eines Viomed Klinik Akut V 500 Entkeimungsgerätes zur Reduzierung der indirekten SARS-CoV-2 Infektionsgefahr durch Aerosolpartikel," n.d., 20.

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CORONASYS INNOVATION SHEET 11

LY-CoV555 ANTIBODY TREATMENT

Background

Neutralizing antibodies are one of the research foci in the search for a possible treatment for COVID-19¹. Several companies are researching different approaches to antibody treatment for the disease². Eli Lilly and Company published data from an interim analysis of the BLAZE-1 clinical trial³ on September 16. The data showed reduced hospitalization rates for patients treated with LY-CoV555, a SARS-CoV-2 neutralizing antibody. The randomized, double-blind, placebo-controlled Phase 2 study evaluated LY-CoV555 for the treatment of symptomatic COVID-19 in the outpatient setting. The trial enrolled mild-to-moderate recently diagnosed COVID-19 patients⁴.

Features

The antibody LY-CoV555 was originally produced by one of the first COVID-19 patients in America. It is one of about 500 antibodies that the patient's immune system had formed against SARS-CoV-2 after infection. Using a special method, the researchers were able to detect the B cells that produce the antibody, isolate the gene, and produce them in larger quantities using recombinant cells. Treatment consisted of a single intravenous infusion of the antibodies at a dose of 700 mg, 2,800 mg, or 7,000 mg. In a fourth group, patients received an infusion without antibodies⁵.

Potentials

A significant advantage over placebo in reducing viral load after 11 days was detectable only after the mean dose of 2,800 mg. In the three LY-CoV555 groups, only 1.7% had to be hospitalized or treated by an emergency physician. In the placebo group, this was required for 6% of patients. This corresponds to an absolute risk reduction of 4.3 % and a relative risk reduction of 72%. According to the press release, no patient had to be mechanically ventilated. There were also no deaths⁶. Most hospitalizations occurred for patients with underlying risk factors (age or BMI). The infusion was well tolerated by all patients. Serious side effects have not occurred, according to the manufacturer⁷. Some experts hope that the real benefit of neutralizing antibody treatments will be not only as a treatment of the sick but as a means of infection prevention⁸.

Points to consider

One limitation could be that only patients with mild to moderate symptoms were treated, who also remained without complications in the placebo- group. The efficacy in serious cases is therefore not yet proven. It is possible that the antibodies no longer have any effect if the disease is advanced and characterized by an excessive immune response. The manufacturer is still hoping for early approval by the U.S. Food and Drug Administration (FDA). A price has not been mentioned, but antibodies are usually high-priced drugs⁹.

Conclusion

The promising results still need to be peer-reviewed by independent researchers and published in a peer-reviewed journal. Further research is needed to determine whether the treatment is effective in patients suffering from advanced and severe clinical manifestations of COVID- 19.

State of information: 18/09/2020

Launch: September 2020

Country: USA, Canada

Focus area: Treatment

Developers:

- Eli Lilly and Company in collaboration with
- AbCellera Biologics Inc.
- Shanghai Junshi Bioscience Co., Ltd.

Beneficiaries: patients with mild to moderate symptoms

¹ Zhou, Guangyu, and Qi Zhao. "Perspectives on Therapeutic Neutralizing Antibodies against the Novel Coronavirus SARS-CoV-2." *International Journal of Biological Sciences* 16, no. 10 (March 15, 2020): 1718–23.

<https://doi.org/10.7150/ijbs.45123>.

² Meredith, Sam. "Eli Lilly Reports a Reduced Rate of Hospitalization for Coronavirus Patients Using Its Antibody Treatment." *CNBC*, September 16, 2020. <https://www.cnn.com/2020/09/16/coronavirus-eli-lilly-reports-a-reduced-rate-of-hospitalization-for-patients-using-its-antibody-treatment.html>.

³ U.S. National library of medicine. "A Study of LY3819253 (LY-CoV555) and LY3832479 (LY-CoV016) in Participants With Mild to Moderate COVID-19 Illness - Full Text View - ClinicalTrials.gov." *ClinicalTrials.gov*. Accessed September 19, 2020. <https://clinicaltrials.gov/ct2/show/NCT04427501>.

⁴ Eli Lilly and Company. "Lilly Announces Proof of Concept Data for Neutralizing Antibody LY-CoV555 in the COVID-19 Outpatient Setting | Eli Lilly and Company." *investor.lilly.com*, September 16, 2020. <https://investor.lilly.com/news-releases/news-release-details/lilly-announces-proof-concept-data-neutralizing-antibody-ly>.

⁵ Deutsches Ärzteblatt. "COVID-19: Erstes Antikörperpräparat erzielt Schutzwirkung bei..." *Deutsches Ärzteblatt*, September 17, 2020. <https://www.aerzteblatt.de/nachrichten/116592/COVID-19-Erstes-Antikoerperpraeparat-erzielt-Schutzwirkung-bei-leichteren-Erkrankungen>.

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⁷ Deutsches Ärzteblatt. "COVID-19: Erstes Antikörperpräparat erzielt Schutzwirkung bei..." *Deutsches Ärzteblatt*, September 17, 2020. <https://www.aerzteblatt.de/nachrichten/116592/COVID-19-Erstes-Antikoerperpraeparat-erzielt-Schutzwirkung-bei-leichteren-Erkrankungen>.

⁸ Griffin, Riley, and Christin Flanagan. "Eli Lilly Says Its Antibody Therapy May Reduce Covid Hospitalisations." *NDTV.com*. Accessed September 19, 2020. <https://www.ndtv.com/world-news/eli-lilly-says-its-antibody-therapy-may-reduce-covid-hospitalisations-2296684>.

⁹ Deutsches Ärzteblatt. "COVID-19: Erstes Antikörperpräparat erzielt Schutzwirkung bei..." *Deutsches Ärzteblatt*, September 17, 2020. <https://www.aerzteblatt.de/nachrichten/116592/COVID-19-Erstes-Antikoerperpraeparat-erzielt-Schutzwirkung-bei-leichteren-Erkrankungen>.

CORONASYS INNOVATION SHEET 12

4C MORTALITY SCORE

Background

Hospitals around the world are facing an influx of Covid-19 patients. In order to identify those with the highest risk of death or severe complications timely, there is a need for valid screening tools. Pre-existing scores developed for influenza, pneumonia or sepsis have not been sufficient¹² since Covid-19 patients often present a clinical picture that leads to different clinical courses than patients with the diseases mentioned above go through³. Researchers in the United Kingdom now developed a score that supports clinicians in assessing the severity of Covid-19 in hospital patients by using easily accessible parameters.

Features

The prospective cohort study⁴⁵ in which the score was developed included 35.000 adult patients admitted to one of 260 hospitals in England, Scotland, and Wales with Covid-19 in the derivation dataset and a further 22.000 patients in the validation dataset. The researchers identified eight variables available at initial hospital assessment to stratify patients according to their risk of mortality or severe complications: age, sex, number of comorbidities, level of consciousness, respiratory rate, peripheral oxygen saturation, level of C reactive protein, and level of urea. The maximum of the 4C score is 21 points. Patients with a high score (>15) had a 62% mortality while patients with a score of 3 or less had a mortality of 1%⁶.

Potentials

The score outperformed other risk stratification tools and showed real utility for clinical decision making⁷. The score can help clinicians to assess the severity of disease in Covid-19 patients at hospital admission. Especially in times where less experienced personnel might have to perform the initial assessment due to staff shortages a score with a high predictive value might be helpful in deciding which therapeutic options should be initiated for the individual patient⁸.

Patients with a higher score could immediately be treated more aggressively to tackle the disease before the patient's condition deteriorates while patients with a lower score could possibly be sent home for convalescence⁹.

Points to consider

The scores' applicability for other populations has to be further evaluated¹⁰.

Conclusion

The score can be a valuable contribution to the initial assessment of Covid-19 hospital patients and might help clinicians to decide on the clinical pathway.

State of information: 24/09/2020

Launch: September 2020

Country: United Kingdom

Focus area: patient assessment, Treatment

Developer: ISARIC „Coronavirus Clinical Characterisation Consortium“, involving researchers from

- University of Liverpool
- University of Edinburgh
- University of Glasgow and
- Imperial College London

Beneficiaries: clinicians

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- ¹ Chen, J.-H., S.-S. Chang, J. J. Liu, R.-C. Chan, J.-Y. Wu, W.-C. Wang, S.-H. Lee, and C.-C. Lee. "Comparison of Clinical Characteristics and Performance of Pneumonia Severity Score and CURB-65 among Younger Adults, Elderly and Very Old Subjects." *Thorax* 65, no. 11 (November 1, 2010): 971–77. <https://doi.org/10.1136/thx.2009.129627>.
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- ⁴ ISRCTN Registry. "ISRCTN - ISRCTN66726260: Clinical Characterisation Protocol for Severe Emerging Infection." Accessed September 25, 2020. <https://doi.org/10.1186/ISRCTN66726260>.
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CORONASYS INNOVATION SHEET 13

REGIONAL CORONA PREDICTION MODEL

Background

As many countries in Europe are seeing surging case numbers of Covid-19 infections¹² and German authorities are aiming at preventing a second nationwide lockdown³ and to rely on local measures instead, regional prediction of infections gains ever more importance. Researchers of the University of Osnabrück⁴ and the Forschungszentrum Jülich⁵ have developed a mathematical model to assess and predict infections for every German district.

Features

The model provides up-to-date estimates for new infections as well as a five-day forecast for each German district. For this purpose, data from the Robert Koch- Institute (RKI) are statistically analyzed on high-performance computers. The model not only considers the most likely development but also estimates the probability for different scenarios that are compatible with the current data⁶⁷. In addition, the spatial-temporal component of the infections with Covid-19 is estimated and presented as a so-called "interaction kernel"⁸. This method has already been used in 2019 to describe the course of infections with rotavirus, Lyme disease, and Campylobacter bacteria⁹.

Potentials

The model can help to predict local infection trends and contribute to a comprehensive local risk assessment. The tool is accessible online for everybody¹⁰ and can therefore serve as a source of information for the general public as well as for local authorities.

Points to consider

Since the model has not been used to predict Coronavirus infections before, a comprehensive validation of the results is possible only after analyzing the predictions in the upcoming months. Furthermore, one has to keep in mind, that the prognosis is highly dependent on the data provided by the local health authorities and therefore susceptible to delays¹¹.

Conclusion

The model can be a helpful tool in assessing and predicting local outbreaks and case numbers but is highly dependent on the underlying data of course.

State of information: 25/09/2020

Launch: September 2020

Country: Germany

Focus area: Prediction

Developers:

- Osnabrück University
- Forschungszentrum Jülich
- In Cooperation with Robert Koch- Institute (RKI)

Beneficiaries: general population, local authorities and decision makers

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CORONASYS INNOVATION SHEET 14

COMPUTER-DESIGNED MINI-PROTEINS

Background

The surface of SARS-CoV-2 is covered with spike proteins. These proteins connect to human cells, allowing the virus to enter and infect them. Once inside the cell, the virus can copy itself and reproduce¹. But the spike proteins are also a weakness of the virus due to their exposed position². Researchers have been testing monoclonal antibody treatments to neutralize the virus by binding the spike protein. But these antibodies are often quite difficult to produce, relatively unstable, and require refrigeration in most cases. Researchers have now generated computer-designed proteins to do the job.

Features

SARS- COV-2 binds to the ACE2 receptor on the surface of human cells³. Two approaches were used to create the computer- based proteins. First, a segment of the ACE2 receptor was integrated into a series of little protein scaffolds. In the second method, fully artificial proteins that did not pre-exist in nature were created from scratch. The latter method produced the most potent antiviral proteins, including the most promising LCB1, that outperformed monoclonal antibodies in lab tests⁴. It was then determined how exactly the mini- proteins bound to the receptor and by further testing and correcting the binding mechanisms were improved⁵. The researchers originated more than two million new spike- binding proteins since January 2020 of which more than 100,000 were then tested in the lab⁶.

Potentials

The computer-designed proteins are quite easy to produce and can be produced relatively fast in large quantities. They do not necessarily need refrigeration and can be applied locally (e.g. nasal via nebulizer)⁷⁸. With further development researchers might be able to produce the proteins for future viruses within weeks after their genome has been obtained⁹.

Points to consider

Although the results seem to be promising so far, clinical testing has to be extended and further research is needed.

Conclusion

The computer-designed antiviral proteins might be a promising innovative method in the fight against future viruses, although much more clinical research is needed to prove their efficacy and effectiveness in human beings under everyday conditions.

State of information: 10/01/2020

Publication: September 2020

Country: USA

Focus area: possibly treatment

Developers: University of Washington

Beneficiaries: Covid-19 patients

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CORONASYS INNOVATION SHEET 15

COVID-19 SIMULATOR

Background

With the start of the cold season people in the northern hemisphere begin to spend more time indoors and case numbers are increasing in many countries¹². At the same time, there are often signs of “corona-fatigue” in many communities, and adherence to recommended measures and (often non-transparent) hygiene concepts is not always ensured³. Austrian researchers have developed a Computer- simulation that aims at protecting people's health while at the same time keeping as much of the economy running as possible⁴.

Features

The Covid-19 simulator developed by PwC⁵ aims at modeling scenarios for viral spread based on up- to- date medical findings and crowd- simulations and displays them in 3D⁶. By using a digital twin of a specific building (e.g. a school) the simulator calculates the risk of Covid-19 transmission and compares different measures for infection protection. It then calculates the best possible mix of measures to protect people in this specific building⁷. The Simulator is now used in a project in cooperation with the Samariterbund⁸, the Austrian Institute of Technology (AIT)⁹, and the Initiative „innovate4vienna“ in order to improve infection control in different buildings over the course of the next months.

Potentials

The Simulation might be helpful in deciding which measures should be prioritized or amplified. The simulator might help to communicate the basis for decisions in a transparent and comprehensible way. The graphic display might also help to motivate people to comply with the measures identified as most important¹⁰.

Points to consider

Although the innovation has already been used with some success, only time and use in different contexts will tell if and how much the Simulator can contribute to infection control.

Conclusion

The computer simulation might be a helpful tool in adjusting infection control measures and increasing people's support of those measures.

State of information: 10/02/2020

Launch: September 2020

Country: Austria

Focus area: Prevention

Developers:

- pwC in Cooperation with
- Samariterbund
- Austrian Institute of Technology (AIT)

Beneficiaries: people in public buildings

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CORONASYS INNOVATION SHEET 16

TRIMODULIN

Background

Since the start of the SARS-CoV-2 pandemic much progress has been made very rapidly in researching possible treatments for Covid-19. Most therapeutics known today, like monoclonal antibody treatment or Remdesivir for example, seem to be most effective when administered in the early stages of the disease¹²³. With Trimodulin the manufacturer Biotest⁴ aims at developing a drug that benefits those most severely affected by Covid-19. The company announced that in the ESSCOVID (Escape from severe COVID-19) study the first seriously ill COVID-19 patient was treated with Trimodulin in Spain. In addition, the study was submitted for approval by the authorities in Russia, Brazil, and France.

Features

Trimodulin (IgM Concentrate) is an innovative immunoglobulin therapeutic derived from human blood plasma. Compared to pure immunoglobulin G preparations (IVIGs), Trimodulin contains IgM and IgA antibodies in addition to IgG. It is currently being developed by for the treatment of patients with severe community-acquired pneumonia (sCAP) or COVID-19 with severe disease progression. According to previous studies⁵⁶⁷, it works through a variety of mechanisms that could inhibit pathophysiological processes that could otherwise lead to severe respiratory disorders, severe sepsis, multi-organ failure and ultimately the death of the patient⁸. In the ongoing prospective, double-blind, placebo-controlled phase II trial 160 patients with severe Covid-19 are to be enrolled.

Potentials

If its efficacy is proven, the drug could contribute to the treatment of critically ill Covid-19 patients in later stages of the disease. The manufacturer expects a significant reduction of mortality and duration of ventilation⁹. Especially the IgM component in Trimodulin could reduce misdirected immune reactions and therefore possibly also help preventing patients from developing exacerbated symptoms of the disease¹⁰.

Points to consider

The study is not finished yet and it remains to be seen whether Trimodulin performs as well in Covid-19 patients as expected. If so, the manufacturer aims at applying for an expedited approval of Trimodulin by the European Medicines Agency (EMA)¹¹ which already worked together with Biotest by providing “Rapid Scientific Advice” in the planning phase of the study. But although the company’s share price skyrocketed after the announcement that the first patient has been treated¹², the final proof of the drug’s efficacy in critically ill Covid-19 patients is still pending.

Conclusion

The drug could not only contribute to the standard therapy for Covid-19 but might also be helpful in treating community acquired pneumonia which is a significant public health risk beyond and in addition to the current pandemic¹³. But its effectiveness has yet to be proven and further research is needed.

State of information: 10/08/2020

Public announcement: October 2020

Country: Germany

Focus area: Treatment

Developers: Biotest AG

Beneficiaries: Patients with severe Covid-19

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CORONASYS INNOVATION SHEET 17

BNT162B2- VACCINE

Background

Since the start of the pandemic, researchers have been working hard to develop a vaccine against SARS-CoV-2. Worldwide more than 160 potential vaccines are being tested as of now¹. One of the promising candidates is the BNT162b2- vaccine developed by BioNTech² in cooperation with Pfizer³.

Features

The European Medical Association EMA just started the rolling review process for the potential vaccine⁴. The Rolling Review process is a regulatory tool that the EMA can use to assess a promising drug during a public health emergency, such as the current pandemic⁵.

The potential vaccine belongs to the group of gene-based vaccines – it is a mRNA vaccine. It contains genetic information of the pathogen in order to produce the surface protein (spike protein), with which the virus penetrates cells. The aim of the vaccination is then to encourage the body to form antibodies and T-cells against this protein⁶. In addition, the active substance is supposed to activate other immune system defense mechanisms⁷.

Potentials

BioNTech is, after AstraZeneca, the second company to be in the EMA rolling review process⁸. The vaccine is currently being tested in a phase II/III clinical trial⁹. In this phase, the efficacy is further tested, and the appropriate dosage is determined¹⁰. If successful, the vaccine could help to end the pandemic. One advantage of mRNA vaccines is that they can be produced more rapidly and cheaper than traditional vaccines¹¹.

Points to consider

If the rolling review process is completed successfully, the company still has to go through a formal application process for marketing authorization¹². As of now, it is not clear how many doses of the vaccine are needed to induce a sufficient immune response, but experts estimate that it will take as long as summer 2021 to produce the necessary amounts of vaccine to immunize the population^{13,14}.

Conclusion

The agent might be one of the vaccines against Covid-19 if the trial is completed successfully.

State of information: 10/11/2020

Public announcement: October 2020

Country: Germany, USA

Focus area: Vaccination

Developers: BioNTech (Germany) in Cooperation with Pfizer (USA, Germany)

Beneficiaries: General public

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CORONASYS INNOVATION SHEET 18

SARS-CoV-2 RAPIDPLEX

Background

Upscaling testing capacities is one of the major challenges with regard to the pandemic¹. Overburdened laboratories and health care facilities are still a reality in many parts of the world. Researchers from the California Institute of Technology² and the Lundquist Institute for Biomedical Innovation³ have developed a testing device that they claim can be used by laymen at home, therefore eliminating the need to visit a health facility to get tested and providing several further advantages.

Features

The SARS-CoV-2 Rapidplex is a portable, wireless electrochemical platform that can identify a patient's past and present infection status by using blood or saliva samples⁴. The sensors contain a graphene surface with tiny pores. Due to this large surface area, the sensor is sensitive enough to detect substances that are only present in very small amounts with high accuracy⁵. It detects viral antigen nucleocapsid protein, IgM, and IgG antibodies, as well as C-reactive protein (CRP). The sensor also contains antibodies and proteins that enable it to detect the virus itself. It can track the infection progression by diagnosing the stage of the disease, allowing for the clear identification of individuals who are infectious, vulnerable, or immune according to the developers⁶. The test takes less than 10 minutes.

Potentials

Since the platform detects IgM and IgG antibodies and CRP it can not only diagnose the disease but also help to determine how serious the infection might become and how contagious a person is. The parts of the platform are easily available so that the device can be mass-produced at low costs⁷. Since it can be done at home, it can help to treat patients remotely by monitoring them via telemedicine devices.

Points to consider

It remains to be seen if the platform can live up to those high expectations and how it compares to pre-existing tests in broad use. With the pilot study now completed, it is now planned to test how long the sensor lasts and to test its efficacy in Covid- 19 patients. More research is also needed to determine sensitivity and specificity in real-life conditions. After this the device will need to receive regulatory approval so it might still take some time before it is available⁸.

Conclusion

The platform might help scale up testing capacities and determine infection status after it's effectiveness has been proven and it has completed the approval process required.

State of information: 10/13/2020

Publication: October 2020

Country: USA

Focus area: Testing

Developers:

- California Institute of Technology
- Lundquist Institute for Biomedical Innovation (USA)

Beneficiaries: General public, clinicians

¹ Statista.com. "COVID-19 Testing Rate by Country." Statista, October 13, 2020. <https://www.statista.com/statistics/1104645/covid19-testing-rate-select-countries-worldwide/>.

² California Institute of Technology. California Institute of Technology. Accessed October 13, 2020. <https://www.caltech.edu/>.

³ The Lundquist Institute. "Home | The Lundquist Institute." lundquist.org. Accessed October 13, 2020. <https://lundquist.org/>.

⁴ Torrente-Rodríguez, Rebeca M., Heather Lukas, Jiaobing Tu, Jihong Min, Yiran Yang, Changhao Xu, Harry B. Rossiter, and Wei Gao. "SARS-CoV-2 RapidPlex: A Graphene-Based Multiplexed Telemedicine Platform for Rapid and Low-Cost COVID-19 Diagnosis and Monitoring." Matter, October 2020, S2590238520305531. <https://doi.org/10.1016/j.matt.2020.09.027>.

⁵ California Institute of Technology. "SARS-CoV-2 RapidPlex: New Sensor Rapidly Detects COVID-19 Infection." SciTechDaily (blog), October 4, 2020. <https://scitechdaily.com/sars-cov-2-rapidplex-new-sensor-rapidly-detects-covid-19-infection/>.

⁶ Torrente-Rodríguez, Rebeca M., Heather Lukas, Jiaobing Tu, Jihong Min, Yiran Yang, Changhao Xu, Harry B. Rossiter, and Wei Gao. "SARS-CoV-2 RapidPlex: A Graphene-Based Multiplexed Telemedicine Platform for Rapid and Low-Cost COVID-19 Diagnosis and Monitoring." Matter, October 5, 2020. <https://doi.org/10.1016/j.matt.2020.09.027>.

⁷ Torrente-Rodríguez, Rebeca M., Heather Lukas, Jiaobing Tu, Jihong Min, Yiran Yang, Changhao Xu, Harry B. Rossiter, and Wei Gao. "SARS-CoV-2 RapidPlex: A Graphene-Based Multiplexed Telemedicine Platform for Rapid and Low-Cost COVID-19 Diagnosis and Monitoring." Matter, October 2020, S2590238520305531. <https://doi.org/10.1016/j.matt.2020.09.027>.

⁸ California Institute of Technology. "SARS-CoV-2 RapidPlex: New Sensor Rapidly Detects COVID-19 Infection." SciTechDaily (blog), October 4, 2020. <https://scitechdaily.com/sars-cov-2-rapidplex-new-sensor-rapidly-detects-covid-19-infection/>.

CORONASYS INNOVATION SHEET 19

EUROPEAN CORONA- MAP

Background

Covid-19 case numbers are growing all over Europe¹ and some countries are close to reaching their capacity limits in the health sector²³⁴. At the same time, rules and regulations concerning the pandemic are inconsistent in Europe⁵. The European Parliament now approved of a European Corona- traffic light to guide states on decisions concerning travelling restrictions in the EU.

Features

Depending on the infection numbers, regions in Europe shall be marked either green, orange, or red. States should not impose travel restrictions on "green" areas with few corona cases. Travel restrictions might be imposed on orange or red areas. The traffic light- map will be produced by the European health agency ECDC and updated weekly⁶. In addition to the EU countries, it will also include Iceland and Norway. Criteria for the corona map will be the 14-day incidence – i.e. the number of corona infections per 100,000 inhabitants within the past two weeks – the rate of positive tests and the rate of tests carried out⁷.

Potentials

The traffic light approach might help to guide informed decision-making regarding travelling restrictions. It might also contribute to transparent information of the public.

Points to consider

The concept does not provide for common rules for travellers from orange or red-marked regions. Nor did the EU countries agree on Europe-wide standards for quarantine and testing rules. Furthermore, the traffic light is not binding but only offers suggestions that Countries might or might not adopt⁸.

Conclusion

The traffic light falls short of the expectations since it does not provide binding rules. In a European Union divided not only regarding Covid-19 this might not be enough to ensure adherence to the recommended measures.

State of information: 10/16/2020

Publication: October 2020

Country: European Union

Focus area: Policy

Developers: EU Parliament

Beneficiaries: General public, policy makers

¹ WHO. “WHO Coronavirus Disease (COVID-19) Dashboard,” October 16, 2020. <https://covid19.who.int>.

² France 24. “All Eyes on Macron as Hospitals Chief Warns of ICU Saturation Due to Covid-19 Surge.” France24.com, October 14, 2020. <https://www.france24.com/en/20201014-all-eyes-on-macron-as-hospitals-chief-warns-of-icu-saturation-due-to-covid-19-surge>.

³ Benito, Emilio de. “Spanish Health Ministry Reports Nearly 12,000 New Coronavirus Infections, Adds 209 Victims to the Death Toll.” EL PAÍS, October 15, 2020. <https://english.elpais.com/society/2020-10-15/spanish-health-ministry-reports-nearly-12000-new-coronavirus-infections-adds-209-victims-to-the-death-toll.html>.

⁴ Pidd, Helen, and Josh Halliday. “Covid ICU Cases in Northern England Could Pass April Peak in 22 Days, MPs Told.” The Guardian, October 8, 2020, sec. World news. <https://www.theguardian.com/world/2020/oct/08/whitty-covid-icu-cases-in-northern-england-could-pass-peak-in-22-days>.

⁵ BBC News. “Europe Lockdown: New Coronavirus Rules Country-by-Country - BBC News.” bbc.com, October 15, 2020. <https://www.bbc.com/news/explainers-53640249>.

⁶ ECDC. “Maps in Support of the Council Recommendation on a Coordinated Approach to the Restriction of Free Movement in Response to the COVID-19 Pandemic in the EU/EEA and the UK.” European Centre for Disease Prevention and Control. Accessed October 16, 2020. <https://www.ecdc.europa.eu/en/covid-19/situation-updates/weekly-maps-coordinated-restriction-free-movement>.

⁷ Deutsches Ärzteblatt “Corona: EU-Staaten einigen sich auf Ampel-Karte für Reisen.” Deutsches Ärzteblatt, October 9, 2020. <https://www.aerzteblatt.de/nachrichten/117290/Corona-EU-Staaten-einigen-sich-auf-Ampel-Karte-fuer-Reisen>.

⁸ Deutsches Ärzteblatt. “EU-Staaten Einigen Sich Auf Ampelkarte Für Reiseeinschränkungen.” aerzteblatt.de, October 13, 2020. <https://www.aerzteblatt.de/nachrichten/117357/EU-Staaten-einigen-sich-auf-Ampelkarte-fuer-Reiseeinschraenkungen?rt=0fd21eeab5917fde312525e48868ef06>.

CORONASYS INNOVATION SHEET 20

FELUDA PAPER STRIP TEST

Background

India is one of the countries most affected by Covid-19¹ and has suffered more than 115,000 deaths since the pandemic hit². India's large population with many people living in crowded spaces or below the poverty line³ requires a test that is quick, easy to administer, and inexpensive. Indian researchers claim to have found at least one part of the solution to India's testing challenges with the FELUDA-test.

Features

The FELUDA-test is based on the CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) gene-editing technology to identify the genetic components of SARS-CoV-2. The SARS-CoV-2 sequence in the sample (nasal swab) reacts with the barcoded Cas9- protein in the test. The SARS-CoV-2-Cas9-complex is then placed on a paper strip. Similar to a pregnancy test, two lines are used (one test, one control) to determine whether the sample is infected with SARS-CoV-2⁴. According to the CSIR-Institute of Genomics and Integrative Biology (IGIB) the test has a sensitivity of 96% and a specificity of 98%⁵. The manufacturers say that their test is as reliable as a PCR test⁶.

Potentials

The test has been approved by the Indian drug authority. It costs only about 500 Rupees (about 6,70 US\$) and delivers results within 15 minutes⁷. Since it is quick and easy to produce, apply, and interpret, it can potentially scale up testing capacities even in challenging environments. Some researchers believe that the Feluda-test could replace antigen tests since it is cheaper and more accurate⁸.

Points to consider

Right now the test still has to be done in laboratories (although no extensive equipment is needed⁹) but the company is working on manufacturing it for self-testing¹⁰ as well.

Conclusion

The paper strip test could be helpful in the fight against Covid-19 by making testing more available and accessible at a reasonable price.

State of information: 10/22/2020

Launch: September 2020

Country: India

Focus area: Testing

Developers:

- Council of Scientific and Industrial Research at the Institute of Genomics and Integrative Biology (CSIR-IGIB)
- Tata Group

Beneficiaries: General public

¹ Alluri, Aparna, and Shadab Nazmi. "Coronavirus: What's Driving India's 100,000 Covid-19 Deaths?" BBC News, October 3, 2020, sec. India. <https://www.bbc.com/news/world-asia-india-54352222>.

² WHO. "India: WHO Coronavirus Disease (COVID-19) Dashboard," October 22, 2020. <https://covid19.who.int>.

³ UN India. "Poverty and Urbanisation." UN India (blog). Accessed October 22, 2020. <https://in.one.un.org/poverty-and-urbanisation/>.

⁴ De, Abhishek. "Explained: The Feluda Test for Covid-19, Approved by India." The Indian Express (blog), September 27, 2020. <https://indianexpress.com/article/explained/feluda-coronavirus-covid-19-test-tata-sons-crispr-technology-6603573/>.

⁵ CSIR, (Council of Scientific and Industrial Research). "CSIR India in Fight against COVID-19." covid19csir.urdip.res.in. Accessed October 22, 2020. <https://covid19csir.urdip.res.in/>.

⁶ Esha Mitra. "India's Drug Authority Approved Paper-Strip Covid-19 Test That Could Return Results within Hour." CNN, October 5, 2020. <https://www.cnn.com/2020/10/05/india/india-covid-19-hour-tests-approved-intl/index.html>.

⁷ BBC News. "India's New Paper Covid-19 Test Could Be a 'Game Changer.'" BBC News, October 4, 2020, sec. India. <https://www.bbc.com/news/world-asia-india-54338864>.

⁸ BBC News. "India's New Paper Covid-19 Test Could Be a 'Game Changer.'" BBC News, October 4, 2020, sec. India. <https://www.bbc.com/news/world-asia-india-54338864>.

⁹ Outlook India. "Scientists Say Cheap And Quick 'Feluda' Test Could Help India Battle COVID-19." <https://www.outlookindia.com/>, October 5, 2020. <https://www.outlookindia.com/website/story/india-news-scientists-say-cheap-and-quick-feluda-test-could-help-india-battle-covid-19/361545>.

¹⁰ Mitra, Esha. "India's Drug Authority Approved Paper-Strip Covid-19 Test That Could Return Results within Hour." CNN, October 5, 2020. <https://www.cnn.com/2020/10/05/india/india-covid-19-hour-tests-approved-intl/index.html>.

CORONASYS INNOVATION SHEET 21

HUMANITARIAN ACTION MAPPING TOOL

Background

Covid-19 adds to the threats faced by people around the world and to the challenges of humanitarian aid providers¹². With the dynamic nature of the pandemic and other humanitarian crisis, as well as travel restrictions that make it difficult, if not impossible, to deploy humanitarian staff, the need for local response strategies and initiatives is stronger than ever. Much can be learned from the efforts others made to address those challenges.

Features

The Humanitarian Policy Group³ (HPG) at the Overseas Development Institute⁴ (ODI) has developed an interactive online-tool to keep track of local and global humanitarian actions regarding Covid-19. The mapping tool monitors local Covid-19 initiatives on different levels and collects evidence. Users can select a country or a certain level of interventions and read examples of local measures and initiatives as well as review the data collected⁵. Possible impacts, as well as enabling factors and barriers of the respective interventions are provided in a short description. ODI will report on key findings regularly.

Potentials

The tool can help to nudge policy makers to a more localized response and to generate more funding and recognition for local efforts⁶ not only with regard to Covid-19 but also concerning other humanitarian challenges. It also offers possibilities for mutual learning and inspiration for possibly transferable measures to include in one's own context.

Points to consider

Since the project is quite new, the data sets are relatively small at the moment but growing day by day.

Conclusion

The Covid-19 tracking tool can be a valuable source of information and can help local authorities and initiatives to identify potentially helpful policies or measures.

State of information: 10/23/2020

Launch: October 2020

Country: International

Focus area: Humanitarian Aid

Developers: Overseas Development Institute (ODI)

Beneficiaries:

- Humanitarian Aid Providers
- Local and national policy makers

¹ ReliefWeb. “World Humanitarian Day: August 19, 2020 - Aid Worker Challenges in the Time of COVID-19 - World.” ReliefWeb. Accessed October 23, 2020. <https://reliefweb.int/report/world/world-humanitarian-day-august-19-2020-aid-worker-challenges-time-covid-19>.

² Médecins Sans Frontières (MSF) International. “Challenges in Supporting Coronavirus COVID-19 Response | MSF.” Médecins Sans Frontières (MSF) International, March 16, 2020. <https://www.msf.org/challenges-supporting-covid-19-response>.

³ ODI. “About Humanitarian Policy Group.” ODI. Accessed October 23, 2020. <https://www.odi.org/our-work/programmes/humanitarian-policy-group/about>.

⁴ ODI. “Home.” Accessed October 23, 2020. <https://www.odi.org/home>.

⁵ ODI. “ODI Covid-19: Tracking Local Humanitarian Action and Complementary Partnerships.” Accessed October 23, 2020. <https://www.odi.org/covid19-tracking-local-humanitarian-action/>.

⁶ SpencerAlexandra. “Covid-19 and Local Humanitarian Action: Five Emerging Trends.” ODI, October 13, 2020. <https://www.odi.org/blogs/17437-covid-19-and-local-humanitarian-action-five-emerging-trends>.

CORONASYS INNOVATION SHEET 22

IKKA SCORE

Background

Covid-19 diagnostics have been developed and improved with unprecedented speed. In addition to diagnostic tests, several scores have also been developed. But so far most of them focused on hospitalized patients or emergency room- patients and aimed at identifying those likely to develop complications or to guide clinical decision making¹²³⁴. The IKKA- score, developed by researchers at the University of Erlangen-Nuremberg⁵ and Ludwigs-Maximilians-University Munich⁶, aims at detecting those most at risk in everyday workplace settings.

Features

Most previously developed scores take into account comorbidities and sociodemographic information but also rely on clinical parameters such as O₂- saturation and laboratory tests to assess the patient's risk for severe Covid-19. Those data are not accessible in a primary prevention setting⁷. The IKKA- score, however, was specially developed for those settings. It consists of 4 categories: **I**mmunosuppression, **K**nown severity of any pre-existing condition, **K**nown risk factors as defined by the Robert Koch Institute (RKI)⁸, and **A**ge. Those categories are evaluated according to a point system. In a second step, the employee can then be allocated to one of four occupational groups which determine the possible fields of activity depending on his*her risk⁹.

Potentials

The score might be a practical tool in risk assessment for non-clinical settings and can provide helpful and time-efficient guidance for decision-making. Occupational physicians can thus work together with the company to look for risk-adapted fields of work for particularly vulnerable workers. The score could also contribute to a more unified decision-making basis in German companies. The score might be adopted in other countries or areas as well.

Points to consider

The numerical classification and assignment of the point values are mostly based on the authors' assessment due to the very limited evidence on COVID-19 so far. The score considers purely medical information and does not take into account socio-political or ethical considerations that might emerge¹⁰.

Conclusion

The score might provide guidance in alignment with the guidelines of the Federal Ministry of Labour and Social Affairs¹¹ and might be applicable to other settings as well.

State of information: 10/29/2020

Launch: October 2020

Country: Germany

Focus area: Diagnostics, Occupational medicine

Developers:

- Ludwigs-Maximilians-University Munich
- University of Erlangen-Nuremberg

Beneficiaries:

- (Occupational) physicians

¹ ISRCTN Registry. "ISRCTN - ISRCTN66726260: Clinical Characterisation Protocol for Severe Emerging Infection." Accessed September 25, 2020. <https://doi.org/10.1186/ISRCTN66726260>.

² University of Liverpool News. "Discovery of Four COVID-19 Risk Groups Helps Guide Treatment - University of Liverpool News." News (blog), September 10, 2020. <https://news.liverpool.ac.uk/2020/09/10/discovery-of-four-covid-19-risk-groups-helps-guide-treatment/>.

³ Deutsches Ärzteblatt. "COVID-19: Einfacher Score kann schwere Verläufe vorhersagen." Deutsches Ärzteblatt, September 10, 2020. <https://www.aerzteblatt.de/nachrichten/116420/COVID-19-Einfacher-Score-kann-schwere-Verlaeufe-vorhersagen>.

⁴ mddionline.com. "Investigators Use AI to Develop Risk Score for COVID-19 Patients." mddionline.com, October 26, 2020. <https://www.mddionline.com/>.

⁵ fau.eu. "Friedrich-Alexander-Universität Erlangen-Nürnberg." Accessed October 29, 2020. <https://www.fau.eu/>.

⁶ "LMU Munich." Accessed October 29, 2020. <https://www.en.uni-muenchen.de/index.html>.

⁷ Ärzteblatt, Deutscher Ärzteverlag GmbH, Redaktion Deutsches. "Primärprävention: Score-System zur COVID-19-Risiko-Einschätzung." Deutsches Ärzteblatt, October 27, 2020. <https://www.aerzteblatt.de/nachrichten/117753/Primaerpraevention-Score-System-zur-COVID-19-Risiko-Einschaetzung>.

⁸ Robert Koch Institut. "SARS-CoV-2 Steckbrief zur Coronavirus-Krankheit-2019 (COVID-19) Stand: 30.10.2020" Accessed October 30, 2020. https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Steckbrief.html#doc13776792bodyText15

⁹ Wolfschmidt, Anna, Uta Ochmann, Dennis Nowak, and Hans Drexler. "IKKA-Score zur Vereinheitlichung der Beurteilung des individuellen Risikos durch SARS-CoV-2 | ASU," October 20, 2020. <https://www.asu-arbeitsmedizin.com/praxis/zur-diskussion-gestellt-ikka-score-zur-vereinheitlichung-der-beurteilung-des-individuellen>.

¹⁰ Wolfschmidt, Anna, Uta Ochmann, Dennis Nowak, and Hans Drexler. "IKKA-Score zur Vereinheitlichung der Beurteilung des individuellen Risikos durch SARS-CoV-2 | ASU," October 20, 2020. <https://www.asu-arbeitsmedizin.com/praxis/zur-diskussion-gestellt-ikka-score-zur-vereinheitlichung-der-beurteilung-des-individuellen>.

¹¹ www.bmas.de. "BMAS - Homepage." Accessed October 29, 2020. <https://www.bmas.de/EN/Home/home.html>.

CORONASYS INNOVATION SHEET 23

WHO DIGITAL IMPLEMENTATION INVESTMENT GUIDE

Background

Digital health solutions can contribute to the health of people worldwide. They can be a major help especially for people with disabilities, people in rural areas where health facilities are scarce, or in times and areas where health care staff are limited¹. During Covid-19, the importance and potentials of digital health solutions have been further emphasised²³. Digital health solutions contributed to almost every area of the fight against the pandemic: diagnostics, contact tracing, information, treatment and social support are just a few examples⁴⁵. But the pandemic also emphasised the need for investments in digital health not just to tackle the current crisis but also to “build back better”, make health systems more resilient against future crisis and increase availability and inclusiveness of existing technologies and new developments.

Features

The WHO provides a comprehensive manual for doing just that in its 180-page *Digital Implementation Investment Guide launched in September 2020*⁶. The guide not only provides key principles for digital innovation enhancement but also a step by step guide that is intended to work governments through the process of identifying, designing, financing and implementing needs-adapted digital health interventions⁷. The DIIG is the result of vast international expertise and is an addition to the “WHO guideline: recommendations on digital interventions for health system strengthening”⁸ and other related WHO documents⁹¹⁰.

Potentials

The guidelines can be a useful tool for governments in selecting and implementing digital health tools in one or more health programme areas. Due to its needs-based approach and international alignment, it is applicable to low- and middle-income countries (LMIC) as well as high-income countries. The guide might also be helpful for local (health) officials who want to improve their knowledge regarding digital health and possible implementation strategies.

Points to consider

Obviously, the guideline needs to be applied to the local context and the specific needs of the community.

Conclusion

The guide can contribute to informed decision-making and strategic planning of digital health investments. It might contribute to the availability and accessibility of digital health solutions not only for communicable diseases like the SARS-CoV-2 pandemic but for other (public) health needs as well.

State of information: 10/30/2020

Launch: September 2020

Country: International

Focus area: Policy, Digital Health

Author: WHO

Beneficiaries:

- Governments
- Local authorities
- Public health officials
- population

¹ Federal Ministry for Economic Cooperation and Development. “Digital Health Ecosystem for African Countries: A Guide for Public and Private Actors for Establishing Holistic Digital Health Ecosystems in Africa,” 2018. https://www.bmz.de/en/publications/topics/health/Materilie345_digital_health_africa.pdf.

² WHO. “COVID-19 and Digital Health: What Can Digital Health Offer for COVID-19?,” April 10, 2020. <https://www.who.int/china/news/feature-stories/detail/covid-19-and-digital-health-what-can-digital-health-offer-for-covid-19>.

³ Keesara, Sirina, Andrea Jonas, and Kevin Schulman. “Covid-19 and Health Care’s Digital Revolution.” *New England Journal of Medicine* 382, no. 23 (June 4, 2020): e82. <https://doi.org/10.1056/NEJMp2005835>.

⁴ Statucki, Tazia, Nigel Howard, Wade Ackerman, and Christina Kuhn. “The Potential Benefits of Digital Health Technology in Managing COVID-19.” *Covington Digital Health*, March 27, 2020. <https://www.covingtondigitalhealth.com/2020/03/the-potential-benefits-of-digital-health-technology-in-managing-covid-19/>.

⁵ World Health Summit, PD 27. Digital Health & AI for Pandemic Preparedness, 2020. <https://www.youtube.com/watch?v=BbgdA6hGtKk>.

⁶ Henderson, Emily. “WHO Launches New Guide to Ensure Effective and Sustainable Digital Health Investments.” *News-Medical.net*, October 14, 2020. <https://www.news-medical.net/news/20201014/WHO-launches-new-guide-to-ensure-effective-and-sustainable-digital-health-investments.aspx>.

⁷ WHO. Digital Implementation Investment Guide (DIIG): Integrating Digital Interventions into Health Programmes, 2020. <https://www.who.int/publications/i/item/who-digital-implementation-investment-guide>.

⁸ World Health Organization. WHO Guideline. Recommendations on Digital Interventions for Health System Strengthening, 2019. <http://www.ncbi.nlm.nih.gov/books/NBK541902/>.

⁹ WHO. “Classification of Digital Health Interventions v1.0: A Shared Language to Describe the Uses of Digital Technology for Health. Technical Documents.,” 2018. <https://apps.who.int/iris/handle/10665/260480>.

¹⁰ WHO. “WHO | EHealth at WHO.” World Health Organization. Accessed October 30, 2020. <http://www.who.int/ehealth/about/en/>.

CORONASYS INNOVATION SHEET 24

RCCE TOOLKIT

Background

Covid-19 has emphasised once more the importance of adequate risk communication and community engagement not only in ensuring adherence to the recommended measures but also in reassuring and supporting people in coping with this extraordinary situation¹². This might be particularly relevant in humanitarian settings, where Covid-19 is not the only challenge people face but occurs on top of a humanitarian crisis. This not only increases the susceptibility for the virus but makes it harder to treat and protect people and to reach them with communication tools³⁴⁵. This is why the *Global Readiness for Major Disease Outbreak Response Initiative*⁶ has created a toolkit that assists officials in planning and adapting their Covid-19 messaging in humanitarian contexts.

Features

The *Risk Communication and Community Engagement Toolkit for Humanitarian Actors* is designed to help humanitarian actors or others involved in risk communication and community engagement (RCCE), to plan and implement RCCE in their Covid-19- response. It provides many resources, grouped and structured by topic and linked to key steps and components of effective RCCE. It includes guidelines and suggestions for hiring RCCE- staff as well as sample messages and materials. In addition, resources for the inclusion of several potentially vulnerable groups in messaging strategies are provided⁷.

Potentials

The toolkit can be immensely helpful to get a quick overview of the relevant components and basics of a successful RCCE- effort. Since it provides many resources and samples it can contribute to rapid adaption and integration of RCCE in humanitarian contexts. Furthermore, the Initiative offers short courses on several relevant topics free of charge.

Points to consider

The toolkit is not a one-size-fits-all- solution, of course. Although it is well structured and updated regularly, it is crucial for providers to reflect on the situation at hand and adapt the provided guidelines to the local situation.

Conclusion

The toolkit might be a valuable tool to improve RCCE not only in humanitarian settings.

State of information: 11/05/2020

Launch: 2020

Country: International

Focus area: Policy, Risk Communication and Community Engagement

Developer: READY- Initiative

Beneficiaries:

- Humanitarian actors
- Local authorities
- Public health officials
- Community workers

¹ Malecki, Kristen M. C., Julie A. Keating, and Nasia Safdar. "Crisis Communication and Public Perception of COVID-19 Risk in the Era of Social Media." *Clinical Infectious Diseases*. Accessed November 5, 2020. <https://doi.org/10.1093/cid/ciaa758>.

² Wu, Albert W., Cheryl Connors, and George S. Everly. "COVID-19: Peer Support and Crisis Communication Strategies to Promote Institutional Resilience." *Annals of Internal Medicine* 172, no. 12 (April 6, 2020): 822–23. <https://doi.org/10.7326/M20-1236>.

³ Rodriguez-Morales, Alfonso J., Viviana Gallego, Juan Pablo Escalera-Antezana, Claudio A. Méndez, Lysien I. Zambrano, Carlos Franco-Paredes, Jose A. Suárez, et al. "COVID-19 in Latin America: The Implications of the First Confirmed Case in Brazil." *Travel Medicine and Infectious Disease* 35 (2020): 101613. <https://doi.org/10.1016/j.tmaid.2020.101613>.

⁴ Wu, Albert W., Cheryl Connors, and George S. Everly. "COVID-19: Peer Support and Crisis Communication Strategies to Promote Institutional Resilience." *Annals of Internal Medicine* 172, no. 12 (April 6, 2020): 822–23. <https://doi.org/10.7326/M20-1236>.

⁵ Dahab, Maysoon, Kevin van Zandvoort, Stefan Flasche, Abdihamid Warsame, Ruwan Ratnayake, Caroline Favas, Paul B. Spiegel, Ronald J. Waldman, and Francesco Checchi. "COVID-19 Control in Low-Income Settings and Displaced Populations: What Can Realistically Be Done?" *Conflict and Health* 14, no. 1 (July 31, 2020): 54. <https://doi.org/10.1186/s13031-020-00296-8>.

⁶ READY Initiative. "About – READY Initiative," 2020. <https://www.ready-initiative.org/about/>.

⁷ READY Initiative. "COVID-19 Risk Communication and Community Engagement Toolkit for Humanitarian Actors – READY Initiative." ready-initiative.org, 2020. <https://www.ready-initiative.org/covid-19-risk-communication-and-community-engagement-toolkit-for-humanitarian-actors/#toggle-id-6-closed>.

CORONASYS INNOVATION SHEET 25

COUGH-ANALYSING APP

Background

Covid-19 diagnostics have been advanced in unprecedented speed over the last months. Most of them however focused on laboratory testing and virus detection¹. Researchers of the Massachusetts Institute of Technology² have developed an AI model that could diagnose Covid-19 by analysing cough and voice samples.

Features

The researchers built a large database of tens of thousands of cough samples and trained an Artificial Intelligence (AI) algorithm to detect the characteristic features of Covid-19- coughs that stem from the temporary neuromuscular impairment caused by the disease. The model could be used in form of an app: The user can then send a recorded forced- cough sample to the system and will get a result within minutes³.

The model is said to achieve a sensitivity of 100% and a specificity of 83.2% in asymptomatic patients⁴. Similar tools have been used before to identify patients suffering from pneumonia, asthma and even Alzheimer's^{5,6}.

Potentials

The technology could provide a free and non- invasive diagnostic tool which could be instantly distributed to screen asymptomatic people⁷. This might scale up testing capacities and mitigate barriers to get tested.

Points to consider

The app is not yet approved by the Federal Drug Administration (FDA). Researchers at Augsburg in Germany are developing a similar programme at the moment that focuses on voice samples⁸.

Conclusion

The app might add to the landscape of diagnostic devices when its effectiveness has been further proven and it has completed the approval process.

State of information: 11/08/2020

Publication: September 30, 2020

Country: USA

Focus area: AI, Diagnostics

Developer: Massachusetts Institute of Technology (MIT)

Beneficiaries: General population

¹ World Health Summit 2020. Innovations to Improve Pandemic Preparedness, 2020.

<https://www.youtube.com/watch?v=xruVNdSPw9w>.

² MIT. “The Massachusetts Institute of Technology (MIT).” Massachusetts Institute of Technology. Accessed November 9, 2020. <http://web.mit.edu>.

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<https://news.mit.edu/2020/covid-19-cough-cellphone-detection-1029>.

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⁵ Chu, Jennifer. “Artificial Intelligence Model Detects Asymptomatic Covid-19 Infections through Cell-phone-Recorded Coughs.” MIT News | Massachusetts Institute of Technology, October 29, 2020.

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⁶ Foy, Kylie. “Signs of Covid-19 May Be Hidden in Speech Signals.” MIT News | Massachusetts Institute of Technology, August 7, 2020. <https://news.mit.edu/2020/signs-covid-19-may-be-hidden-speech-signals-0708>.

⁷ Laguarda, Jordi, Ferran Hueto, and Brian Coventry. “COVID-19 Artificial Intelligence Diagnosis Using Only Cough Recordings – EMBS.” embs.org, September 30, 2020. <https://www.embs.org/ojemb/articles/covid-19-artificial-intelligence-diagnosis-using-only-cough-recordings/>.

⁸ Ärzteblatt. “Forscher wollen Coronainfektion an der Sprache erkennen.” Deutsches Ärzteblatt, November 6, 2020. <https://www.aerzteblatt.de/nachrichten/118103/Forscher-wollen-Coronainfektion-an-der-Sprache-erkennen>.

CORONASYS INNOVATION SHEET 26

FOLLOW- UP ON LY-CoV555 ANTIBODY TREATMENT

Background

This innovation sheet is a follow up on Innovationsheet No. 11 of this series from September 18th, 2020. Neutralizing antibodies are still one of the research foci in the search for a possible treatment for COVID-19¹. Several companies are researching different approaches to antibody treatment for the disease². Eli Lilly and Company published data from an interim analysis of the BLAZE-1 clinical trial³ on September 16. The data showed reduced hospitalization rates for patients treated with LY-CoV555, a SARS-CoV-2 neutralizing antibody. After further randomized- controlled trials the Federal Drug Administration (FDA) granted an Emergency Authorization for the antibody treatment now named Bamlanivimab on November 9th, 2020⁴.

Features

The antibody LY-CoV555 is one of about 500 antibodies that the immune system of one of Americas first Covid- patients had formed against SARS-CoV-2 after infection. The researchers were able to detect the B cells that produce the antibody, isolate the gene, and produce them in larger quantities using recombinant cells. The treatment consists of a single intravenous infusion of the antibodies⁵. The research was continued in the BLAZE- 1⁶ and BLAZE- 2⁷ trial as well as the ACTIV- 2⁸ and ACTIV- 3⁹ trials over the last months.

Potentials

The initial trials showed significant advantage over placebo in reducing viral load after 11 days after the mean dose of 2,800 mg. Patients with mild to moderate Covid-19 had to be hospitalized or treated by a physician at significantly lower rates than patients in the placebo group. This corresponded to an absolute risk reduction of 4.3 % and a relative risk reduction of 72%. Deaths, need for mechanical ventilation or serious side effects were not reported in the initial studies^{10,11}. In the ACTIV- trials the efficacy was tested in different subsets of patients and larger cohorts. With the FDA's decision Bamlanivimab is now "authorized for the treatment of mild to moderate COVID-19 in adults and paediatric patients 12 years and older with a positive COVID-19 test, who are at high risk for progressing to severe COVID-19 and/or hospitalization"¹².

State of information:

- 18/09/2020
- Updated 11/13/2020

Launch: September 2020

Country: USA, Canada

Focus area: Treatment

Developers:

- Eli Lilly and Company in collaboration with
- AbCellera Biologics Inc.
- Shanghai Junshi Bioscience Co., Ltd.

Beneficiaries: patients with mild to moderate symptoms

Points to consider

The drug's efficacy in serious cases could not be proven which is why the company first paused¹³ and then terminated the ACTIV-3 trial with critically ill Covid-patients in October^{14,15}. It showed that the antibodies no longer have any significant effect once the disease is advanced and characterized by an excessive immune response. This is why the drug is not authorized for patients hospitalized with Covid or requiring oxygen therapy¹⁶. In order to be as effective as possible the drug should be administered as early as possible after the diagnosis. Right now, the drug is in short supply so that questions have been raised, as to who should be treated with the first doses available¹⁷. Antibodies are usually high-priced drugs¹⁸. The U.S. government has already purchased 300.000 doses for about 375. Mio US Dollars¹⁹.

Conclusion

For individual patients treated with Bamlanivimab, the drug could be a factor to save their lives and/ or regain their health. But although the drug proved to be effective in mild to moderate Covid-cases in an outpatient setting, it is in far too short supply to actually curb the virus even if the company can scale up its production and distribution capacities as planned.

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- ¹ Zhou, Guangyu, and Qi Zhao. "Perspectives on Therapeutic Neutralizing Antibodies against the Novel Coronavirus SARS-CoV-2." *International Journal of Biological Sciences* 16, no. 10 (March 15, 2020): 1718–23. <https://doi.org/10.7150/ijbs.45123>.
- ² Meredith, Sam. "Eli Lilly Reports a Reduced Rate of Hospitalization for Coronavirus Patients Using Its Antibody Treatment." *CNBC*, September 16, 2020. <https://www.cnbc.com/2020/09/16/coronavirus-eli-lilly-reports-a-reduced-rate-of-hospitalization-for-patients-using-its-antibody-treatment.html>.
- ³ U.S. National library of medicine. "A Study of LY3819253 (LY-CoV555) and LY3832479 (LY-CoV016) in Participants With Mild to Moderate COVID-19 Illness - Full Text View - ClinicalTrials.Gov." *ClinicalTrials.gov*. Accessed September 19, 2020. <https://clinicaltrials.gov/ct2/show/NCT04427501>.
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- ⁵ Deutsches Ärzteblatt. "COVID-19: Erstes Antikörperpräparat erzielt Schutzwirkung bei..." *Deutsches Ärzteblatt*, September 17, 2020. <https://www.aerzteblatt.de/nachrichten/116592/COVID-19-Erstes-Antikoerperpraeparat-erzielt-Schutzwirkung-bei-leichtereren-Erkrankungen>.
- ⁶ US National Library of Clinical Medicine. "A Study of LY3819253 (LY-CoV555) and LY3832479 (LY-CoV016) in Participants With Mild to Moderate COVID-19 Illness - Full Text View - ClinicalTrials.Gov." Accessed November 13, 2020. <https://clinicaltrials.gov/ct2/show/NCT04427501>.
- ⁷ US National Library of Clinical Medicine. "A Study of LY3819253 (LY-CoV555) in Preventing SARS-CoV-2 Infection and COVID-19 in Nursing Home Residents and Staff - Full Text View - ClinicalTrials.Gov," November 10, 2020. <https://clinicaltrials.gov/ct2/show/NCT04497987>.
- ⁸ "ACTIV-2: A Study for Outpatients With COVID-19 - Full Text View - ClinicalTrials.Gov," November 12, 2020. <https://clinicaltrials.gov/ct2/show/NCT04518410>.
- ⁹ US National Library of Clinical Medicine. "ACTIV-3: Therapeutics for Inpatients With COVID-19 - Full Text View - ClinicalTrials.Gov." *ClinicalTrials.gov*, November 9, 2020. <https://clinicaltrials.gov/ct2/show/NCT04501978>.
- ¹⁰ Eli Lilly and Company. "Lilly Announces Proof of Concept Data for Neutralizing Antibody LY-CoV555 in the COVID-19 Outpatient Setting | Eli Lilly and Company." *investor.lilly.com*, September 16, 2020. <https://investor.lilly.com/news-releases/news-release-details/lilly-announces-proof-concept-data-neutralizing-antibody-ly>.
- ¹¹ Deutsches Ärzteblatt. "COVID-19: Erstes Antikörperpräparat erzielt Schutzwirkung bei..." *Deutsches Ärzteblatt*, September 17, 2020. <https://www.aerzteblatt.de/nachrichten/116592/COVID-19-Erstes-Antikoerperpraeparat-erzielt-Schutzwirkung-bei-leichtereren-Erkrankungen>.

¹² Eli Lilly and Company. “Lilly’s Neutralizing Antibody Bamlanivimab (LY-CoV555) Receives FDA Emergency Use Authorization for the Treatment of Recently Diagnosed COVID-19 | Eli Lilly and Company,” November 9, 2020. <https://investor.lilly.com/news-releases/news-release-details/lillys-neutralizing-antibody-bamlanivimab-ly-cov555-receives-fda>.

¹³ Deutsche Apotheker- Zeitung. “Eli Lilly Unterbricht Erprobung von Corona-Antikörpertherapie.” DAZ.online, October 14, 2020. <https://www.deutsche-apotheker-zeitung.de/news/artikel/2020/10/14/eli-lilly-unterbricht-erprobung-von-antikoerpertherapie>.

¹⁴ Haseltine, William A. “Eli Lilly Stops Antibody Trial In Hospitalized Covid-19 Patients.” Forbes, October 28, 2020. <https://www.forbes.com/sites/williamhaseltine/2020/10/28/eli-lilly-stops-antibody-trial-in-hospitalized-covid-19-patients/>.

¹⁵ US National Library of Clinical Medicine. “ACTIV-3: Therapeutics for Inpatients With COVID-19 - Full Text View - ClinicalTrials.Gov.” ClinicalTrials.gov, November 9, 2020. <https://clinicaltrials.gov/ct2/show/NCT04501978>.

¹⁶ Eli Lilly and Company. “Lilly’s Neutralizing Antibody Bamlanivimab (LY-CoV555) Receives FDA Emergency Use Author-ization for the Treatment of Recently Diagnosed COVID-19 | Eli Lilly and Company,” November 9, 2020. <https://investor.lilly.com/news-releases/news-release-details/lillys-neutralizing-antibody-bamlanivimab-ly-cov555-receives-fda>.

¹⁷ Thomas, Katie, and Noah Weiland. “Eli Lilly’s Antibody Treatment Gets Emergency F.D.A. Approval.” The New York Times, November 10, 2020, sec. Health. <https://www.ny-times.com/2020/11/09/health/covid-antibody-treatment-eli-lilly.html>.

¹⁸ Deutsches Ärzteblatt. “COVID-19: Erstes Antikörperpräparat erzielt Schutzwirkung bei...” Deutsches Ärzteblatt, Sep-tember 17, 2020. <https://www.aerzteblatt.de/nachrichten/116592/COVID-19-Erstes-Antikoerperpraeparat-erzielt-Schutzwirkung-bei-leichtereren-Erkrankungen>.

¹⁹ Thomas, Katie, and Noah Weiland. “Eli Lilly’s Antibody Treatment Gets Emergency F.D.A. Approval.” The New York Times, November 10, 2020, sec. Health. <https://www.ny-times.com/2020/11/09/health/covid-antibody-treatment-eli-lilly.html>.

CORONASYS INNOVATION SHEET 27

FOLLOW-UP ON BNT162B2-VACCINE

Background

This innovation sheet is a follow-up on Innovation sheet No. 17 of this series from October 11th, 2020¹. Since the start of the pandemic, researchers have been working hard to develop a vaccine against SARS-CoV-2. Worldwide more than 160 potential vaccines are being developed, 10 of them are in the phase 3 trial stage². One of the promising candidates is the BNT162b2-vaccine developed by BioNTech³ in cooperation with Pfizer⁴. This week the developers announced that an interim analysis showed very promising results⁵.

Features

The BioNTech-vaccine is a mRNA-vaccine and belongs to a new group of gene-based vaccines. It stimulates the body to produce antibodies and T-cells by inserting an m-RNA-part responsible for producing the virus' spike protein⁶. The vaccine is likely to activate other immune system defense mechanisms as well⁷. According to the manufacturer, serious side effects have not yet been registered and vaccination protection is achieved one week after the second vaccination dose and 28 days after the first injection⁸.

Potentials

The vaccine is currently being tested in a multicentered phase II/III clinical trial^{9,10} with more than 44.000 patients where efficacy is further tested and the appropriate dosage is determined¹¹. BioNTech and Pfizer reported an efficacy of 90% for their vaccine. This would suggest a high protective effect, similar to vaccines for measles or rubella¹². One advantage of mRNA vaccines is that they can be produced more rapidly and cheaper than traditional vaccines¹³. In terms of tolerability, a positive factor could be that BNT162b2 works without an adjuvant¹⁴.

Points to consider

As of now, the data are not published yet and a comprehensive subgroup-analysis needs to determine whether the vaccine is effective in different subsets of the population (e.g. the elderly and high-risk groups) as well¹⁵. One major problem regarding vaccine distribution is that the BNT162b2- vaccine needs to be stored at minus 70 degrees so that areas without proper cooling facilities are not eligible for distribution which could be a major disadvantage for poorer countries¹⁶. (Some of the other potential vaccines, however, can be cooled by a regular fridge and do not need such low temperatures). Furthermore, some companies have already contracted with large and rich states, so that it might be increasingly difficult for Low- and Middle-Income Countries (LMIC) to access the vaccine timely¹⁷.

State of information:

- 10/11/2020
- Updated 11/13/2020

Public announcement: November 2020

Country: Germany, USA

Focus area: Vaccination

Developers:

- BioNTech (Germany) in Cooperation with
- Pfizer (USA, Germany)

Beneficiaries: General public

Conclusion

The vaccine surely raised hope for a nearing end to the pandemic and is a positive sign for the development of other potential vaccines as well. Still, the trial has to be completed, formal approval has to be granted by the various authorities and the vaccine has to be distributed and administered. This process will take well into the next year and it remains to be seen if the COVAX initiative¹⁸ can ensure fair and transparent availability and accessibility to the vaccine for all people in need.

¹ Academy of the Disaster Research Unit (2020): BNT162b2-vaccine. CoronaSys Innovation Sheet 17. Berlin: ADRU. <http://coronasys.a-kfs.de/category/innovation-stream/>

² WHO. “Draft Landscape of COVID-19 Candidate Vaccines,” November 13, 2020. <https://www.who.int/publications/m/item/draft-landscape-of-covid-19-candidate-vaccines>.

³ BioNTech. “BioNTech: We Aspire to Individualize Cancer Medicine.” BioNTech. Accessed October 12, 2020. <https://www.biontech.de>.

⁴ Pfizer. “Pfizer Deutschland: COVID-19-Spezial.” Accessed October 12, 2020. <https://www.pfizer.de/covid-19-spezial>.

⁵ BioNTech. “Pfizer and BioNTech Announce Vaccine Candidate Against COVID-19 Achieved Success in First Interim Analysis from Phase 3 Study. Press Release.” investors.biontech.de, November 9, 2020. <https://investors.biontech.de/news-releases/news-release-details/pfizer-and-biontech-announce-vaccine-candidate-against-covid-19/>.

⁶ Dimitrova, Elena Kostadinova. “EMA Starts Second Rolling Review of a COVID-19 Vaccine.” Text. European Medicines Agency, October 5, 2020. <https://www.ema.europa.eu/en/news/ema-starts-second-rolling-review-covid-19-vaccine>.

⁷ Stern.de. “Impfstoff-Zulassungsprozess von Mainzer Unternehmen startet.” stern.de. Accessed October 12, 2020. <https://www.stern.de/panorama/arzneimittelbehoerde-ema-impfstoff-zulassungsprozess-von-mainzer-unternehmen-startet-9441630.html>.

⁸ Deutsches Ärzteblatt. “SARS-CoV-2: Impfstoff von Biontech/Pfizer verhindert in Phase-3-Studie...” Deutsches Ärzteblatt, November 9, 2020. <https://www.aerzteblatt.de/nachrichten/118189/SARS-CoV-2-Impfstoff-von-Biontech-Pfizer-verhindert-in-Phase-3-Studie-mehr-als-90-der-bestaetigten-Infektionen>.

⁹ Clinical Trials Register. “2020-001038-36.” clinicaltrialsregister.eu. Accessed October 12, 2020. <https://www.clinicaltrialsregister.eu/ctr-search/trial/2020-001038-36/DE>.

¹⁰ US National Library of Clinical Medicine. “Study to Describe the Safety, Tolerability, Immunogenicity, and Efficacy of RNA Vaccine Candidates Against COVID-19 in Healthy Individuals - Full Text View - ClinicalTrials.Gov.” Accessed November 13, 2020. <https://clinicaltrials.gov/ct2/show/NCT04368728>.

¹¹ Stern.de. “Impfstoff-Zulassungsprozess von Mainzer Unternehmen startet.” stern.de. Accessed October 12, 2020. <https://www.stern.de/panorama/arzneimittelbehoerde-ema-impfstoff-zulassungsprozess-von-mainzer-unternehmen-startet-9441630.html>.

¹² Deutsches Ärzteblatt. “SARS-CoV-2: Impfstoff von Biontech/Pfizer verhindert in Phase-3-Studie...” Deutsches Ärzteblatt, November 9, 2020. <https://www.aerzteblatt.de/nachrichten/118189/SARS-CoV-2-Impfstoff-von-Biontech-Pfizer-verhindert-in-Phase-3-Studie-mehr-als-90-der-bestaetigten-Infektionen>.

¹³ University of Cambridge. “RNA Vaccines: An Introduction.” PHG Foundation. Accessed October 12, 2020. <https://www.phgfoundation.org/briefing/rna-vaccines>.

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- ¹⁴ Deutsches Ärzteblatt. "SARS-CoV-2: Impfstoff von Biontech/Pfizer verhindert in Phase-3-Studie..." Deutsches Ärzteblatt, November 9, 2020. <https://www.aerzteblatt.de/nachrichten/118189/SARS-CoV-2-Impfstoff-von-Biontech-Pfizer-verhindert-in-Phase-3-Studie-mehr-als-90-der-bestaetigten-Infektionen>.
- ¹⁵ Deutschlandfunk. "Corona-Impfstoff von Biontech/Pfizer - Noch viele offene Fragen." Deutschlandfunk, November 10, 2020. https://www.deutschlandfunk.de/corona-impfstoff-von-biontech-pfizer-noch-viele-offene.2897.de.html?dram:article_id=487291.
- ¹⁶ Deutsches Ärzteblatt. "Bei Minus 70 Grad Um Die Welt." Ärzteblatt.de, November 12, 2020. <https://www.aerzteblatt.de/nachrichten/118314/Bei-minus-70-Grad-um-die-Welt>.
- ¹⁷ Dohmen, Caspar. "Gesundheit und Gewinne - Das Rennen um den Corona-Impfstoff." Deutschlandfunk, October 28, 2020. https://www.deutschlandfunk.de/gesundheits-und-gewinne-das-rennen-um-den-corona-impfstoff.724.de.html?dram:article_id=486560.
- ¹⁸ who.int. "COVAX: Working for Global Equitable Access to COVID-19 Vaccines," 2020. <https://www.who.int/initiatives/act-accelerator/covax>.

CORONASYS INNOVATION SHEET 28

LUCIRA™ COVID-19 ALL-IN-ONE TEST KIT

Background

While testing remains a major challenge around the globe¹, the U.S. Food and Drug Administration (FDA) has granted Emergency Use Authorization² to the first molecular at-home test developed by Lucira Health³.

Features

The test is based on RT-LAMP-Technology (reverse transcription loop-mediated isothermal amplification). As in the polymerase chain reaction (PCR) used in conventional testing, individual genes are reproduced until they are detectable with a chemical reaction. However, unlike PCR, the reaction can be carried out at a constant temperature. This eliminates the need for a laboratory facility to perform the test. The subsequent chemical reaction is also quite simple. It consists of a change in the pH.

The test's results were compared with an FDA- approved PCR smear assay, the current gold standard, in a "Community Testing" Study. According to the manufacturer, the test achieved a positive percent agreement, i.e. sensitivity, of 94% and a negative percent agreement, i.e. specificity, of 98%. If samples with low viral load (at or below 37.5 Ct) were excluded the test even achieved a 100% positive percent agreement⁴⁵.

With the supplied swab, the user takes a sample from the nose, opens the test tube of the detection device, tuns the swab into the reagent and stirs. After the test tube is closed again a slight pressure on the test tube starts the detection reaction. The user waits about 30 minutes for a lamp to signal the end of the reaction. Two more lights indicate whether the test was positive or negative⁶.

Potentials

The Lucira™ COVID-19 All-In-One Test Kit is the first prescription molecular test for COVID-19. The testing device could help to upscale testing capacities, provide opportunities for at-home testing, and help to ease the pressure on laboratories and primary care physicians.

Points to consider

The product is a single-use device and with a price of \$50 quite expensive⁷. But the FDA Emergency Use Authorization might help to accelerate the development of similar but less costly testing devices. Currently, the test is available in the United States only⁸ and requires a prescription from a health care provider⁹.

Conclusion

The test might be a nice addition in an effort to upgrade testing capacities in the United States. Hopefully, there will soon be similar products at a lower price range in order to make the technology accessible and useful for larger scales of the population.

State of information: 11/20/2020

Emergency Use Authorization: November 2020

Country: USA

Focus area: Testing

Developers: Lucira Health

Beneficiaries: General Population

¹ Statista.com. "COVID-19 Testing Rate by Country as of November 19, 2020." Statista, November 19, 2020. <https://www.statista.com/statistics/1104645/covid19-testing-rate-select-countries-worldwide/>.

² FDA. "Coronavirus (COVID-19) Update: FDA Authorizes First COVID-19 Test for Self-Testing at Home." FDA, November 18, 2020. <https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-authorizes-first-covid-19-test-self-testing-home>.

³ Lucira Health. "Lucira™ Is Developing a Single Use, Disposable COVID-19 Test That Provides Results in Just 30 Minutes." Lucira Health. Accessed November 19, 2020. <https://www.lucirahealth.com/>.

⁴ Deutsches Ärzteblatt. "SARS-CoV-2: FDA genehmigt ersten Schnelltest für zuhause." Deutsches Ärzteblatt, November 18, 2020. <https://www.aerzteblatt.de/nachrichten/118496/SARS-CoV-2-FDA-genehmigt-ersten-Schnelltest-fuer-zuhause>.

⁵ Lucira Health. "Lucira Health News Release: FDA-Authorizes-First-Prescription-At-Home-Molecular-Test-for-COVID-19-Released-20201118.Pdf," November 18, 2020. <https://2nyvwd1bf4ct4f787m3leist-wpengine.netdna-ssl.com/wp-content/uploads/2020/11/FDA-Authorizes-First-Prescription-At-Home-Molecular-Test-for-COVID-19-released-20201118.pdf>.

⁶ Lucira Health. "Lucira-HCP-Instructions-For-Use-IFU.Pdf." Accessed November 19, 2020. <https://2nyvwd1bf4ct4f787m3leist-wpengine.netdna-ssl.com/wp-content/uploads/2020/11/Lucira-HCP-Instructions-For-Use-IFU.pdf>.

⁷ Deutsches Ärzteblatt. "SARS-CoV-2: FDA genehmigt ersten Schnelltest für zuhause." Deutsches Ärzteblatt, November 18, 2020. <https://www.aerzteblatt.de/nachrichten/118496/SARS-CoV-2-FDA-genehmigt-ersten-Schnelltest-fuer-zuhause>.

⁸ Armus, Teo, and Meryl Kornfield. "A Rapid At-Home Covid-19 Test — for under \$50 — Just Got FDA Approval." Washington Post, November 18, 2020. <https://www.washingtonpost.com/nation/2020/11/18/home-test-coronavirus-covid-fda/>.

⁹ Wu, Catherine J. "The F.D.A. Authorizes the First at-Home Coronavirus Test." The New York Times, November 18, 2020, sec. World. <https://www.nytimes.com/live/2020/11/18/world/covid-19-coronavirus>.

CORONASYS INNOVATION SHEET 29

COVID-19 HUMANITARIAN

Background

While COVID-19 is certainly challenging for every country affected, those who are suffering from humanitarian crisis are particularly vulnerable to its impact¹²³⁴. This is why researchers from the Johns Hopkins Center for Humanitarian Health⁵, the London School of Hygiene & Tropical Medicine⁶ and the Geneva Centre of Humanitarian Studies⁷ developed an [online platform](#) where humanitarians can share their experiences.

Features

Humanitarians can send their programs and field experiences to the online platform where they are reviewed by the three universities together with various guidance documents. After that, the examples are uploaded to the website using an operational framework⁸. At the moment, more than 130 guidance documents and 65 field experiences are accessible on the website⁹.

Potentials

The openly accessible platform allows humanitarians to share their experiences with colleagues and initiate a dialogue on local, regional and global levels. The platform also provides an academic perspective on local solutions and can generate a process of mutual learning to benefit the recipients of all the projects. The platform might even serve as an example for expert exchange in future global health emergencies¹⁰.

Points to consider

The researchers initially hoped for an advanced feedback loop, meaning that field experiences could serve as a basis for improved COVID-19 humanitarian guidance iterations. As of now, this did not occur sufficiently¹¹, probably due to the still very acute development of the pandemic.

Conclusion

The online platform can be a very useful tool for humanitarians and might provide valuable insights into COVID-19 response for all stakeholders involved in tackling the pandemic.

State of information: 11/23/2020

Publication: November 2020

Country: International

Focus area: Humanitarian Aid

Developers:

- Johns Hopkins Center for Humanitarian Health
- London School of Hygiene & Tropical Medicine
- Geneva Centre of Humanitarian Studies

Beneficiaries:

- Humanitarian Assistance
- Local, regional and global policy makers

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⁵ Johns Hopkins Center for Humanitarian Health. "Center for Humanitarian Health," 2020. <http://hopkinshumanitarianhealth.org/>.

⁶ London School of Hygiene & Tropical Medicine. "Health in Humanitarian Crises Centre." LSHTM. Accessed November 23, 2020. <https://www.lshtm.ac.uk/research/centres/health-humanitarian-crises-centre>.

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⁹ COVID19 Humanitarian. "Home," 2020. <https://www.covid19humanitarian.com/>.

¹⁰ Singh, Neha S., Orit Abraham, Chiara Altare, Karl Blanchet, Caroline Favas, Alex Odlum, and Paul B. Spiegel. "COVID-19 in Humanitarian Settings: Documenting and Sharing Context-Specific Programmatic Experiences." *Conflict and Health* 14, no. 1 (November 19, 2020): 79. <https://doi.org/10.1186/s13031-020-00321-w>.

¹¹ Singh, Neha S., Orit Abraham, Chiara Altare, Karl Blanchet, Caroline Favas, Alex Odlum, and Paul B. Spiegel. "COVID-19 in Humanitarian Settings: Documenting and Sharing Context-Specific Programmatic Experiences." *Conflict and Health* 14, no. 1 (November 19, 2020): 79. <https://doi.org/10.1186/s13031-020-00321-w>.

CORONASYS INNOVATION SHEET 30

AI- EPIDEMIOLOGY- MODEL

Background

Covid- 19 cases are still surging across the globe while governments are trying to figure out which measures are most effective in curbing the spread of the disease¹. Researchers of the Massachusetts Institute of Technology² (MIT) have developed a tool that combines machine learning and epidemiology and could help in assessing the effectiveness of nationwide lockdowns.

Features

The researchers developed a novel model that analyses and compares the role of quarantine control policies globally and across continents. While other models rely heavily on data derived from the past SARS and MERS outbreaks, this one uses machine-learning optimized algorithms on publicly available COVID-19 data based on an augmented SIR-model³. The SIR-model is a standard epidemiological tool for outbreak analysis⁴. Among other adaptations, the model was enhanced by training a neural network to include the number of infected people under quarantine, who are therefore no longer spreading the infection to others⁵. The researchers found that there was “generally strong correlation between strengthening of the quarantine controls as learnt by the model and actions taken by the regions' respective governments”⁶.

Potentials

The model is globally applicable and can help to assess the impact of certain policies aimed at slowing down the spread of SARS- CoV-2. The data are accessible online via a public [platform](#) that shows the results for the 70 most-affected countries⁷. According to the researchers, the model could also be extended to include even more and more complex data (e.g. hospitalization rates, distinctions between symptomatic and asymptomatic carriers, ...) so that it could be adapted to any province, state, or country globally. This could be a useful tool for policymakers⁸.

Points to consider

The model does not (yet) have predictive elements. To do so, it would need real-time data on social distancing and other parameters that are currently under development. ⁹

Conclusion

The model might be a helpful addition to other tools in assessing the impact of certain measures to curb the spread of SARS-CoV-2.

State of information: 11/20/2020

Publication: November 17, 2020

Country: USA/ International

Focus area: Evaluation

Developers: Massachusetts Institute of Technology

- Raj Dandekar
- Chris Rackauckas
- George Barbastathis

Beneficiaries:

- Researchers
- Governmental policy makers
- Local authorities

¹ “WHO Coronavirus Disease (COVID-19) Dashboard.” Accessed November 20, 2020. <https://covid19.who.int>.

² MIT. “The Massachusetts Institute of Technology (MIT).” Massachusetts Institute of Technology. Accessed November 20, 2020. <http://web.mit.edu>.

³Dandekar, Raj, Chris Rackauckas, and George Barbastathis. “A Machine Learning-Aided Global Diagnostic and Comparative Tool to Assess Effect of Quarantine Control in COVID-19 Spread.” *Patterns* 0, no. 0 (November 17, 2020). <https://doi.org/10.1016/j.patter.2020.100145>.

⁴ University of Graz. “SIR - A Model for Epidemiology.” Accessed November 20, 2020. <http://systems-sciences.uni-graz.at/etextbook/sw2/sir.html>.

⁵ . Gallagher, Beth. “Model Quantifies the Impact of Quarantine Measures on Covid-19’s Spread.” MIT News | Massachusetts Institute of Technology, April 16, 2020. <https://news.mit.edu/2020/new-model-quantifies-impact-quarantine-measures-covid-19-spread-0416>

⁶ Dandekar, Raj, Chris Rackauckas, and George Barbastathis. “A Machine Learning-Aided Global Diagnostic and Comparative Tool to Assess Effect of Quarantine Control in COVID-19 Spread.” *Patterns* 0, no. 0 (November 17, 2020). <https://doi.org/10.1016/j.patter.2020.100145>.

⁷ Dandekar, Raj, Chris Rauckauckas, Emma Wang, and George Barbastathis. “COVID19 - ML| QuarantineControl.” Accessed November 20, 2020. <https://raidandekar.github.io/COVID-QuarantineStrength/>.

⁸ Dandekar, Raj, Chris Rackauckas, and George Barbastathis. “A Machine Learning-Aided Global Diagnostic and Comparative Tool to Assess Effect of Quarantine Control in COVID-19 Spread.” *Patterns* 0, no. 0 (November 17, 2020). <https://doi.org/10.1016/j.patter.2020.100145>.

⁹ Dandekar, Raj, Chris Rackauckas, and George Barbastathis. “A Machine Learning-Aided Global Diagnostic and Comparative Tool to Assess Effect of Quarantine Control in COVID-19 Spread.” *Patterns* 0, no. 0 (November 17, 2020). <https://doi.org/10.1016/j.patter.2020.100145>.

CORONASYS INNOVATION SHEET 31

SOLAR- POWERED STEAM GENERATOR

Background

Covid- 19 highlighted the challenges Low- and Middle-Income Countries (LMIC) face in ensuring the provision of health care to their citizens. Not only limited financial resources but also shortages in certain materials and frequent power cuts can limit their ability to do so. This applies not only to direct patient care (e.g. ventilators, medical devices) but also to necessary services such as sterilisation of medical products and invasive medical equipment. Additionally, LMIC suffer from a particularly high burden of healthcare-associated infections, partly due to the use of materials not properly sterilized¹². Researchers from the Massachusetts Institute of Technology³ have developed a Steam Generator that can keep up with challenging environments.

Features

The researchers developed a solar-powered and portable device. The steam generator can power an autoclave to sterilize medical equipment. The built-in solar component heats water to produce steam. The steam is then transferred to a pressure chamber. To avoid heat loss to the environment a so-called aerogel (a foam-like but solid material) made from silica is used as an insulator⁴.

Potentials

The device was tested under realistic weather conditions and can be used on cloudy or hazy days as well. It is built mostly from off-the-shelf components and the prototype did only cost \$38. The same principle could be used to power other devices as well⁵.

Points to consider

Even if it can be manufactured very quickly from commonly available materials, the Steam Generator is just a prototype so far⁶. The generated 240 watts are not sufficient to power the large autoclaves used in big operation theatres, so one would have to combine several of the Steam Generators to power those⁷.

Conclusion

The Steam Generator (or similar products) could help to relieve healthcare-related infection burden in challenging environments. Particularly in situations like the current pandemic, the device can add to a cost-effective, accessible, and applicable solution for remote settings.

State of information: 11/27/2020

Publication: November 18, 2020

Country: USA/ International

Focus area: Prevention

Developers: Massachusetts Institute of Technology

- Zhao et al.

Beneficiaries:

- Clinics and physicians in remote areas

¹ Allegranzi, Benedetta, Sepideh Bagheri Nejad, Christophe Combescure, Wilco Graafmans, Homa Attar, Liam Donaldson, and Didier Pittet. “Burden of Endemic Health-Care-Associated Infection in Developing Countries: Systematic Review and Meta-Analysis.” *The Lancet* 377, no. 9761 (January 15, 2011): 228–41. [https://doi.org/10.1016/S0140-6736\(10\)61458-4](https://doi.org/10.1016/S0140-6736(10)61458-4).

² WHO. “Report on the Burden of Endemic Health Care-Associated Infection Worldwide,” 2011. https://apps.who.int/iris/bitstream/handle/10665/80135/9789241501507_eng.pdf?sequence=1&isAllowed=y.

³ MIT. “The Massachusetts Institute of Technology (MIT).” Massachusetts Institute of Technology. Accessed November 27, 2020. <http://web.mit.edu>.

⁴ Lu, Donna. “Portable Device Uses Solar Power to Sterilise Medical Equipment.” *New Scientist*, November 18, 2020. <https://www.newscientist.com/article/2260057-portable-device-uses-solar-power-to-sterilise-medical-equipment/>.

⁵ Zhao, Lin, Bikram Bhatia, Lenan Zhang, Elise Strobach, Arny Leroy, Manoj K. Yadav, Sungwoo Yang, et al. “A Passive High-Temperature High-Pressure Solar Steam Generator for Medical Sterilization.” *Joule*, November 2020, S2542435120304967. <https://doi.org/10.1016/j.joule.2020.10.007>.

⁶ Zhao, Lin, Bikram Bhatia, Lenan Zhang, Elise Strobach, Arny Leroy, Manoj K. Yadav, Sungwoo Yang, et al. “A Passive High-Temperature High-Pressure Solar Steam Generator for Medical Sterilization.” *Joule*, November 2020, S2542435120304967. <https://doi.org/10.1016/j.joule.2020.10.007>.

⁷ Lu, Donna. “Portable Device Uses Solar Power to Sterilise Medical Equipment.” *New Scientist*, November 18, 2020. <https://www.newscientist.com/article/2260057-portable-device-uses-solar-power-to-sterilise-medical-equipment/>.

CORONASYS INNOVATION SHEET 32

GRADIAN CCV

Background

Many Covid- 19 patients need mechanical ventilation¹². This can be a major challenge especially in rural areas where ICU beds and oxygen- supply are scarce and power cuts frequent. Gradian Health Systems³ has developed a ventilator designed especially for those environments.

Features

The Gradian CCV is a portable ventilator designed for challenging environments. It can be operated for 21 hours on battery and has a built-in oxygen compressor that allows to mix in room air or use an external oxygen source. Some commonly used ventilation modes are pre-programmed allowing clinicians less experienced in ventilation therapy to optimize patient ventilation. The product comprises of generic components, that are locally available at low costs. The ventilator can be used for adults and children > 5 Kg⁴⁵⁶.

Potentials

Gradian Health Systems is a Nonprofit Medical Technology company that targets low- resource settings. The company also offers comprehensive customer support via Email, Whatsapp, Phone and in-person as well as locally contextualized training for medical teams⁷. Gradian Health Systems also developed the Universal Anaesthesia Machine, “the first internationally-certified anaesthesia machine that can generate its own medical oxygen and work without electricity”⁸.

Points to consider

As of now, the company is not yet present in the near and middle east and Europe⁹, so its additional services like local customers support and training might not be available in these areas.

Conclusion

The CCV ventilator might be an affordable and valuable asset in low- resource settings and challenging environments.

State of information: 12/02/2020

Broader Implementation: 2020

Countries: USA, Rwanda, Nigeria, Nepal, Zambia, Uganda, Tanzania, Sierra Leone and Kenya

Focus area: Treatment

Developers: Gradian Health Systems

Beneficiaries: Clinics and physicians in remote areas

¹ National Institutes of Health. “COVID- 19 Treatment GuidelinesOxygenation and Ventilation.” COVID-19 Treatment Guidelines, July 17, 2020. <https://www.covid19treatmentguidelines.nih.gov/critical-care/oxygenation-and-ventilation/>.

² Wunsch, Hannah. “Mechanical Ventilation in COVID-19: Interpreting the Current Epidemiology.” American Journal of Respiratory and Critical Care Medicine 202, no. 1 (July 1, 2020): 1. <https://doi.org/10.1164/rccm.202004-1385ED>.

³ Gradian Health Systems. “Gradian Health Systems | A Nonprofit Medical Technology Company,” 2020. <https://www.gradianhealth.org/>.

⁴ Gradian Health Systems. “CCV-Specifications,” 2020. <https://www.gradianhealth.org/customer-support/>

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⁷ Gradian Health Systems. “Training.” Gradian Health Systems, 2020. <https://www.gradianhealth.org/training/>.

⁸ Gradian Health Systems. “Anaesthesia Workstation.” Gradian Health Systems, 2020. <https://www.gradianhealth.org/our-products/uam/>.

⁹ Gradian Health Systems. “Gradian’s Global Presence.” Gradian Health Systems, 2020. <https://www.gradianhealth.org/where-we-work/gradians-global-presence/>.

CORONASYS INNOVATION SHEET 33

RAPID HOSPITAL READINESS CHECKLIST

Background

Hospitals all around the world are still struggling to keep up with the high influx of COVID-19 patients. With the cumulative number of cases worldwide now topping 66 Million and more than 1.5 million people dead¹ the burden COVID-19 poses for healthcare systems worldwide is evident. Some argue that Europe neglected its chance to enhance health system preparation and response in summer when case numbers were relatively low². Even with promising vaccines on the horizon, COVID-19 will continue to challenge health systems and societies for the foreseeable future³. Preparedness and response remain crucial to mitigate the devastating consequences of the virus and its effects on society.

Features

WHO has developed and updated the [“Rapid hospital readiness checklist”](#)⁴. It can be used to inform decision-making and (contingency) planning before, after and amid the pandemic. The checklist can help to determine current capacities and identify relevant gaps along 12 key components: Leadership and Incident management, Coordination and Communication, Surveillance and information management, Risk communication and community engagement, Administration, finance and business continuity, Human resources, Surge capacity, Continuity of essential support services, Patient management, Occupational health, mental health and psychosocial support, Rapid identification and diagnosis, Infection prevention and control⁵. The Checklist comes with an Excel file to quantify and analyse a hospital’s readiness⁶.

Potentials

The checklist can help to determine whether facilities have the necessary arrangements in place and the functioning capacity to respond to COVID-19 surges. It can identify potentials and priority actions to enhance the facilities response. The tool can also help to monitor the development of hospital emergency readiness over time⁷.

Points to consider

All recommendations have to be checked for their feasibility for the individual context. Due to the fact, that the guidance derives its recommendations through real-time analysis it has to be regularly updated to include new information on best practises in the field.

Conclusion

The WHO Rapid hospital readiness checklist can be a useful tool for local health officials in assessing and enhancing hospital capacity for COVID-19.

State of information: 12/06/2020

Publication: 11/25/2020

Countries: International

Focus area: Hospital Preparedness and Response

Developers: WHO

Beneficiaries:

- Hospital leaders, managers, and administrators
- managers and administrators of long-term care facilities
- Ministries of Health

¹ Johns Hopkins Coronavirus Resource Center. “COVID-19 Map.” Johns Hopkins Coronavirus Resource Center, December 6, 2020. <https://coronavirus.jhu.edu/map.html>.

² Knight, Ben. “Coronavirus: WHO Warns of COVID-19 Third Wave, Says Europe Failed to Learn from Asia | DW | 22.11.2020.” DW.COM, November 22, 2020. <https://www.dw.com/en/coronavirus-who-warns-of-covid-19-third-wave-says-europe-failed-to-learn-from-asia/a-55690325>.

³ PBS NewsHour. “Even with a Vaccine, COVID-19 Will Last for Years, Expert Says.” PBS NewsHour, November 12, 2020. <https://www.pbs.org/newshour/show/even-with-a-vaccine-covid-19-will-last-for-years-expert-says>.

⁴ WHO. “Rapid Hospital Readiness Checklist: Interim Guidance,” November 25, 2020. <https://www.who.int/publications-detail-redirect/WHO-2019-nCoV-hospital-readiness-checklist-2020.1>.

⁵ WHO. “Hospital Readiness Checklist. A Module from the Suite of Health Service Capacity Assessments in the Context of the COVID-19 Pandemic.” WHO, November 25, 2020.

⁶ WHO. “Rapid Hospital Readiness Checklist: Interim Guidance,” 2020. <https://www.who.int/publications-detail-redirect/WHO-2019-nCoV-hospital-readiness-checklist-2020.1>.

⁷ WHO. “Hospital Readiness Checklist. A Module from the Suite of Health Service Capacity Assessments in the Context of the COVID-19 Pandemic.” WHO, November 25, 2020.

CORONASYS INNOVATION SHEET 34

SCHOOL REOPENING CHECKLIST

Background

Since the beginning of the pandemic, school closures have occurred again and again in many parts of the world, some of which have been of significant duration¹. As a result, children's educational opportunities have been reduced worldwide and children from vulnerable backgrounds were affected particularly hard²³. Schools were faced with the challenge of making classroom teaching safe and offering effective remote learning services that reach as many children as possible⁴.

Features

WHO has developed the “Checklist to support schools re-opening and preparation for COVID-19 resurgences or similar public health crises”. The document distinguishes several phases and three levels (national, subnational and individual school level) of coordination for school responses. In addition, the checklist identifies 38 essential actions for the different levels and phases of the response and offers many links to relevant guidance documents⁵.

Potentials

The checklist can help to determine whether facilities have the necessary arrangements in place and to augment the schools capacity to respond to the needs in different phases of reopening and responding to case surges. Furthermore, the document helps to divide responsibilities among the different stakeholders involved and provides concrete measures to implement⁶.

Points to consider

All recommendations have to be checked for their feasibility for the individual context. Due to the fact, that the guidance derives its recommendations through real-time analysis it has to be regularly updated to include new information on epidemiological considerations and best practises in the field. For example, the checklist was published just before the data of a new study examining the spread of Covid-19 in Austrian schoolchildren which stated that children play a more significant role in the spread of COVID-19 than initially assumed⁷.

Conclusion

The WHO checklist can be a useful tool for local health and education officials in assessing and enhancing the capabilities of schools in different phases of the pandemic.

State of information: 12/12/2020

Publication: 12/11/2020

Countries: International

Focus area: Education

Developers: WHO

Beneficiaries:

- Policy makers in Health and Education
- National and regional school management boards
- Individual schools

¹ UNESCO. “Education: From Disruption to Recovery.” UNESCO, March 4, 2020. <https://en.unesco.org/covid19/educationresponse>.

² UNESCO. “UNESCO COVID-19 Education Response: How Many Students Are at Risk of Not Returning to School? Advocacy Paper - UNESCO Digital Library,” 2020. <https://unesdoc.unesco.org/ark:/48223/pf0000373992>.

³ WHO. “Checklist to Support Schools Re-Opening and Preparation for COVID-19 Resurgences or Similar Public Health Crises,” December 2020. P 4.

⁴ UNESCO. “Act Now: Reduce the Impact of COVID-19 on the Cost of Achieving SDG 4 - UNESCO Digital Library.” Accessed December 12, 2020. <https://unesdoc.unesco.org/ark:/48223/pf0000374163>.

⁵ WHO. “Checklist to Support Schools Re-Opening and Preparation for COVID-19 Resurgences or Similar Public Health Crises,” December 2020.

⁶ WHO. “Checklist to Support Schools Re-Opening and Preparation for COVID-19 Resurgences or Similar Public Health Crises,” December 11, 2020. <https://www.who.int/publications-detail-redirect/9789240017467>.

⁷ Von Bredow, Rafaela. “Neue Corona-Studie: So Ansteckend Sind Kinder Wirklich - DER SPIEGEL,” 2020 122AD. <https://www.spiegel.de/wissenschaft/mensch/neue-corona-studie-so-ansteckend-sind-kinder-wirklich-a-2dc73cb4-ec20-4c92-a94b-96ff52e5f740>.

CORONASYS INNOVATION SHEET 35

CURIAL AI SCREENING TEST

Background

Although the good news of an effective vaccine on the horizon largely dominated the news over the last weeks, testing remains a major issue in the fight against SARS-CoV-2 as well. With the new and large surges currently seen in many countries, laboratory capacities remain strained and PCR testing requires some time even without overburdened testing sites and labs. Researchers at the University of Oxford¹ may have found a way to distinguish non- COVID-19 patients from those infected with SARS-CoV-2 with an Artificial Intelligence testing model.

Features

The CURIAL AI screening test was derived in a study involving data of more than 150.000 patients – “the largest dataset of any laboratory artificial intelligence study on COVID-19 to date”². It uses routine hospital data like blood tests, blood gas testing, vital signs, and results of PCR testing for respiratory viruses. The AI model was further trained with different levels of prevalence of Covid-19 in the population to simulate real-life conditions during a pandemic. The AI model derived from the study has a sensitivity of 77.4% and a specificity of 95.7% which means the test can efficiently identify Non-Covid patients. Test results are available after one hour.³

Potentials

The AI- model can help to provide rapid triage for COVID-19 based on routine hospital data. It fits into routine procedures and clinical pathways and can therefore speed up the patient flow. It can be conducted with existing equipment in high- and middle-income countries. This means the test could be implemented quite quickly and inexpensively. The model can also be rapidly adapted to various scenarios⁴ and might be a helpful pretest for PCR testing where availability is limited⁵.

Points to consider

A possible limitation of the study is a quite limited ethnic diversity of the patients included⁶, although ethnic disparities might be influential in the clinical course of patients^{7,8,9}. Also, patients under the age of 18 were excluded, so that the AI model might not perform as well in different subsets of the population and further research is needed in this area¹⁰. The test is primarily designed for infrastructures available in high and middle-income countries. Its applicability for other contexts has to be further assessed.

Conclusion

The AI test might be a helpful to rule- out non-COVID patients in facilities that already have the necessary equipment.

State of information: 12/12/2020

Publication: 12/11/2020

Country: United Kingdom

Focus area: Testing

Developers: University of Oxford

Beneficiaries:

- Clinicians in high- and- middle- income countries

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- ¹ University of Oxford. “Coronavirus Research,” 2020. <https://www.research.ox.ac.uk/Area/coronavirus-research>.
- ² Soltan, Andrew A S, Samaneh Kouchaki, Tingting Zhu, Dani Kiyasseh, Thomas Taylor, Zaamin B Hussain, Tim Peto, Andrew J Brent, David W Eyre, and David A Clifton. “Rapid Triage for COVID-19 Using Routine Clinical Data for Patients Attending Hospital: Development and Prospective Validation of an Artificial Intelligence Screening Test,” December 11, 2020, 10. [https://www.thelancet.com/journals/landig/article/PIIS2589-7500\(20\)30274-0/fulltext](https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)30274-0/fulltext)
- ³ Soltan, Andrew A S, Samaneh Kouchaki, Tingting Zhu, Dani Kiyasseh, Thomas Taylor, Zaamin B Hussain, Tim Peto, Andrew J Brent, David W Eyre, and David A Clifton. “Rapid Triage for COVID-19 Using Routine Clinical Data for Patients Attending Hospital: Development and Prospective Validation of an Artificial Intelligence Screening Test,” December 11, 2020, 10. [https://www.thelancet.com/journals/landig/article/PIIS2589-7500\(20\)30274-0/fulltext](https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)30274-0/fulltext)
- ⁴ Healthcare in Europe. com. “AI Test Rules out Covid-19 Diagnosis within One Hour,” December 11, 2020. <https://healthcare-in-europe.com/en/news/ai-test-rules-out-covid-19-diagnosis-within-one-hour.html>.
- ⁵ Soltan, Andrew A S, Samaneh Kouchaki, Tingting Zhu, Dani Kiyasseh, Thomas Taylor, Zaamin B Hussain, Tim Peto, Andrew J Brent, David W Eyre, and David A Clifton. “Rapid Triage for COVID-19 Using Routine Clinical Data for Patients Attending Hospital: Development and Prospective Validation of an Artificial Intelligence Screening Test,” December 11, 2020, 10. [https://www.thelancet.com/journals/landig/article/PIIS2589-7500\(20\)30274-0/fulltext](https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)30274-0/fulltext)
- ⁶ Soltan, Andrew A S, Samaneh Kouchaki, Tingting Zhu, Dani Kiyasseh, Thomas Taylor, Zaamin B Hussain, Tim Peto, Andrew J Brent, David W Eyre, and David A Clifton. “Rapid Triage for COVID-19 Using Routine Clinical Data for Patients Attending Hospital: Development and Prospective Validation of an Artificial Intelligence Screening Test,” December 11, 2020, 10. [https://www.thelancet.com/journals/landig/article/PIIS2589-7500\(20\)30274-0/fulltext](https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)30274-0/fulltext)
- ⁷ Webb Hooper, Monica, Anna María Nápoles, and Eliseo J. Pérez-Stable. “COVID-19 and Racial/Ethnic Disparities.” *JAMA* 323, no. 24 (June 23, 2020): 2466. <https://doi.org/10.1001/jama.2020.8598>.
- ⁸ Laurencin, Cato T., and Aneesah McClinton. “The COVID-19 Pandemic: A Call to Action to Identify and Address Racial and Ethnic Disparities.” *Journal of Racial and Ethnic Health Disparities* 7, no. 3 (2020): 398–402. <https://doi.org/10.1007/s40615-020-00756-0>.
- ⁹ Abuelgasim, Eyad, Li Jing Saw, Manasi Shirke, Mohamed Zeinah, and Amer Harky. “COVID-19: Unique Public Health Issues Facing Black, Asian and Minority Ethnic Communities.” *Current Problems in Cardiology* 45, no. 8 (August 2020): 100621. <https://doi.org/10.1016/j.cpcardiol.2020.100621>.
- ¹⁰ Soltan, Andrew A S, Samaneh Kouchaki, Tingting Zhu, Dani Kiyasseh, Thomas Taylor, Zaamin B Hussain, Tim Peto, Andrew J Brent, David W Eyre, and David A Clifton. “Rapid Triage for COVID-19 Using Routine Clinical Data for Patients Attending Hospital: Development and Prospective Validation of an Artificial Intelligence Screening Test,” December 11, 2020, 10. [https://www.thelancet.com/journals/landig/article/PIIS2589-7500\(20\)30274-0/fulltext](https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)30274-0/fulltext)

CORONASYS INNOVATION SHEET 36

PRIORITIZATION ROADMAP

Background

Over the past few weeks, much attention has been paid to COVID-19 vaccines and the start of vaccination campaigns in some countries¹²³⁴. Since the vaccine will initially only be available in limited quantities, it has also become clear that countries are taking different approaches in distributing the vaccine and deciding who gets the first doses⁵. A WHO document assists in the development of the prioritisation policy.

Features

Based on the WHO “SAGE Values Framework for the Allocation and Prioritization of COVID-19 Vaccination”⁶ the “Roadmap for prioritizing uses of Covid-19 vaccines” (Prioritization Roadmap) was developed to assist countries in the development of public health strategies regarding vaccination planning and identifying and targeting priority groups for different levels of vaccine availability and epidemiological requirements.

The Prioritization Roadmap offers three examples for rationales for prioritisation a) Health workers at high to very high risk of becoming infected and transmitting SARS-CoV-2 in the community b) Sociodemographic groups at significantly higher risk of severe disease or death, e.g. elderly people c) Social/employment groups at elevated risk of acquiring and transmitting infection because they are unable to effectively physically distance⁷.

State of information: 21/12/2020

Publication: 13/11/2020

Country: International

Focus area: Policy

Developer: WHO

Beneficiaries:

- Policy makers
- Health officials

Potentials

The document also offers epidemiological setting and vaccine supply scenarios as well as recommendations for prioritization in the context of limited supply⁸.

Points to consider

As of now, the roadmap does not include special recommendations for specific vaccines. The roadmap will be updated regularly and followed-up by recommendations for specific vaccines, as soon as there is enough scientific evidence to derive such recommendations. Due to the dynamic nature of the pandemic, it is likely that refinements of the Roadmap will be needed.⁹

Conclusion

The Roadmap can assist policymakers and health officials in identifying and targeting priority groups for COVID-19 vaccination while taking into account epidemiological developments and availability issues.

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- ⁸ WHO. "WHO SAGE Roadmap For Prioritizing Uses Of COVID-19 Vaccines In The Context Of Limited Supply," November 13, 2020. <https://www.who.int/publications/m/item/who-sage-roadmap-for-prioritizing-uses-of-covid-19-vaccines-in-the-context-of-limited-supply>.
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CORONASYS INNOVATION SHEET 37

ELLUME TEST

Background

Although vaccination campaigns have started in many countries testing will remain an issue for the foreseeable future. The US Food and Drug Administration (FDA) has now authorized the first over the counter COVID-19 test¹² produced by the Australian manufacturer Ellume³.

Features

The test uses a patented detection method that combines several known procedures for antigen detection. Contrary to other at-home tests, the swabs do not have to be sent to a laboratory per mail but can be analysed on-site. The test can be used for adults and children older than 24 months with and without symptoms of COVID-19. It costs about 30 US\$⁴⁵. The manufacturers reported a specificity of 97% and a sensitivity of 95% compared to an emergency use-authorized RT-PCR laboratory test. The Ellume test delivers results within 15 minutes⁶.

State of information: 22/12/2020

FDA Authorization: 12/15/2020

Country: Australia

Focus area: Detection and Diagnostics

Developers: Ellume

Beneficiaries: General population

Potentials

The test could help to scale up testing capacities. It saves the user a trip to a clinic or testing site and therefore helps to minimize contacts. One major advantage is that the test requires the user to download an app that transmits the result to a cloud where local health officials can access the data which means that the test result can be included in the official epidemiological statistics.⁷

Points to consider

Like other antigen tests, there is a probability of false-negative results, since these tests perform best in cases with high viral load⁸⁹. Some experts also argue that a negative test result might lead to a false sense of security and more reckless behaviour in people who do not realize that the test can be negative the one day and they can acquire the virus the next day. Another issue is that the manufacturer will need some time to produce a sufficient quantity of the assays although production capacities have already been scaled up. Additionally, the test has to be authorized by each country separately to give people access to this form of testing¹⁰.

Conclusion

The test might be a valuable addition to existing tests as soon as it is available and accessible for the respective population.

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² NS Healthcare.com. “FDA Authorises Ellume Covid-19 Home Test as OTC Product,” December 16, 2020. <https://www.ns-healthcare.com/news/ellume-covid-19-at-home-test/>.

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⁷ Wan, William. “FDA Authorizes First Rapid, over-the-Counter Home Coronavirus Test.” Washington Post, December 16, 2020. <https://www.washingtonpost.com/health/2020/12/15/covid-home-rapid-test/>.

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⁹ European Centre for Disease Prevention and Control. “Options for the Use of Rapid Antigen Tests for COVID-19 in the EU/EEA and the UK.” European Centre for Disease Prevention and Control, November 19, 2020. <https://www.ecdc.europa.eu/en/publications-data/options-use-rapid-antigen-tests-covid-19-eueea-and-uk>.

¹⁰ Wan, William. “FDA Authorizes First Rapid, over-the-Counter Home Coronavirus Test.” Washington Post, December 16, 2020. <https://www.washingtonpost.com/health/2020/12/15/covid-home-rapid-test/>.

CORONASYS INNOVATION SHEET 38

TV SCHOOLING

Background

Homeschooling has been a challenge for parents and caretakers all over the world since the SARS-CoV-2 pandemic interrupted education systems in an unprecedented manner¹². Against the background of high infection rates and the virus mutant recently discovered, the United Kingdom imposed a new strict lockdown on its citizens³. After opening the schools again in summer and autumn they are now forced to close again posing renewed challenges to education⁴⁵.

Features

Because not all pupils in the United Kingdom have access to the internet and online learning tools, BBC and some other television networks will broadcast educational programs for several hours per day during the lockdown. Since Monday, January 4, 2021, three hours of primary school lessons will be broadcasted every day, plus at least two hours for secondary school pupils⁶⁷. Mexico had adopted a similar approach early in the pandemic to support students without internet access. The Mexican government cooperated with several networks to produce a comprehensive set of lessons for all grade levels and broadcast those lessons via TV and radio⁸.

State of information: 01/07/2021

Launch: 01/04/2021

Country: United Kingdom

Focus area: Education

Developers: BBC

Beneficiaries: Pupils in the UK

Potentials

TV-based education could help to reach students who do not have sufficient access to online learning tools.

Points to consider

Since television does not really allow for interactive and participatory learning, online tools will remain an important part of remote learning. This is why some experts are demanding a cut of internet fees and the distribution of laptops and other devices to help low-income families in the UK to enable their children to take part in remote learning⁹. Obviously, none of the remote learning techniques can fully replace the face-to-face teaching in schools where pupils can also socially engage with their classmates.

Conclusion

The TV education might be an addition to existing remote learning techniques and devices but it certainly cannot fully substitute online tools or even face-to-face teaching in schools.

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³ Deutsche Welle. “Coronavirus: Boris Johnson Orders New Lockdown for England | DW | 04.01.2021.” DW.COM, January 4, 2021. <https://www.dw.com/en/coronavirus-boris-johnson-orders-new-lockdown-for-england/a-56128556>.

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⁹ Kelion, Leo. “Online Schooling: Calls to Cut Data Fees during Covid Lockdowns - BBC News,” January 6, 2021. <https://www.bbc.com/news/technology-55544196>.

CORONASYS INNOVATION SHEET 39

OCTEA TEST

Background

PCR tests are still the gold standard for detecting a SarsCoV-2 infection. However, especially against the background of the testing strategy recommended by the EU Commission¹, novel and reliable rapid tests are increasingly coming into focus. Rapid antigen tests show within a few minutes whether infection with the coronavirus is present, but they are generally considered somewhat less reliable than PCR tests². The German Startup GNA Biosolutions³ has now developed a promising new technology.

Features

Unlike the antigen rapid tests commonly used so far, the new rapid test is a PCR test that directly detects the genetic material of the COVID-19 pathogen but unlike the PCR tests used so far, it can deliver results within an hour. The testing device is portable and can process eight samples simultaneously.⁴ The technology, called Pulse Controlled Amplification (PCA[®]), combines sample preparation and nucleic acid amplification processes, reducing time and material requirements for the test⁵.

Potentials

The test could help to scale up testing capacities. GNA Biosolutions plans to apply for EU-wide approval in March. Due to its speed and its relatively low price (around 20 Euros), it might be particularly valuable for testing at hospitals, nursing homes and airports, for example.⁶

Points to consider

The German state of Bavaria has already secured the purchasing privilege for 1000 testing devices and one million tests⁷. It remains to be seen how fast the manufacturer can scale up their production capacities to serve other countries as well.

Conclusion

The test could help to increase testing capacities after approval in the respective country. Especially in busy places like airports, care facilities and hospitals, it could contribute to a much anticipated "return to normality".

State of information: 01/07/2021

Authorization in Germany: 12/29/2020

Country: Germany

Focus area: Detection and Diagnostics

Developers: GNA Biosolutions

Beneficiaries: General population

¹ Deutsches Ärzteblatt. “Millionen Schnelltests Für Europa: EU-Kommission Empfiehlt Strategie,” December 18, 2020. <https://www.aerzteblatt.de/nachrichten/119590/Millionen-Schnelltests-fuer-Europa-EU-Kommission-empfeHLT-Strategie>.

² European Centre for Disease Prevention and Control. “Options for the Use of Rapid Antigen Tests for COVID-19 in the EU/EEA and the UK.” European Centre for Disease Prevention and Control, November 19, 2020. <https://www.ecdc.europa.eu/en/publications-data/options-use-rapid-antigen-tests-covid-19-eueea-and-uk>.

³ GNA Biosolutions. “GNA Biosolutions | Beyond Molecular Boundaries,” 2021. <https://www.gna-bio.com/covid19/>.

⁴ Deutsches Ärzteblatt. “Bayerischer PCR-Schnelltest erhält Sonderzulassung.” Deutsches Ärzteblatt, December 30, 2020. <https://www.aerzteblatt.de/nachrichten/119746/Bayerischer-PCR-Schnelltest-erhaelt-Sonderzulassung>.

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⁶ Deutsches Ärzteblatt. “Bayerischer PCR-Schnelltest erhält Sonderzulassung.” Deutsches Ärzteblatt, December 30, 2020. <https://www.aerzteblatt.de/nachrichten/119746/Bayerischer-PCR-Schnelltest-erhaelt-Sonderzulassung>.

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CORONASYS INNOVATION SHEET 40

PROGNOSTIC URINE TEST

Background

While covid cases continue to rise or are stable at high levels in many regions of the world¹, hospital capacity is strained in a lot of countries²³⁴⁵. This makes it all the more important to identify from the many infected people those who are most likely to experience a severe course or even require treatment in the intensive care unit. A urine test developed by Mosaiques⁶ and DiaPat GmbH⁷ aims to help clinicians identify patients at risk.

Features

The DiaPat-CoV-50 test uses Proteomanalyse- technique to identify patients with a higher risk for complications. Per urine sample, a special device analyses up to 14,000 proteins and detects changes⁸. The test has already been in use for early detection of chronic kidney disease, heart failure and diabetes mellitus⁹. It was adapted to the requirements of Covid-testing and has received a special use authorization by the German Federal Institute for Drugs and Medical Devices¹⁰ in December 2020 after the results of a study¹¹ conducted in summer 2020 were confirmed.

Potentials

The test has a specificity and a sensitivity of 83%. Compared to a purely clinical prognosis of the expected course of the disease, the test provides an increase in predictive accuracy of 20 %, according to the study leader¹². Early identification would enable adequate early treatment.

Points to consider

The test is only possible in seven German cities¹³ and with 850 Euros per sample, it is quite expensive. The German Ministry of Health is currently negotiating with the manufacturer about future pricing¹⁴.

Conclusion

The test could help to identify patients who might suffer a severe course of the disease. But the local possibilities for implementation would have to be expanded so that there is enough capacity to test the patients in need. Especially with regard to implementation in countries with fewer resources, the price of the test still seems quite high.

State of information: 01/12/2021

Authorization in Germany: December 2020

Country: Germany

Focus area: Detection and Diagnostics

Developers:

- DiaPat GmbH
- Mosaiques
- St. Georg Hospital Leipzig

Beneficiaries:

- Covid-19 patients
- Clinicians

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- ¹¹ St. Georg Unternehmensgruppe. “COVID-19 - Studie anhand Urin-Test.” St. Georg, 2020. <https://www.sanktgeorg.de/artikel/covid-19-studie-anhand-urin-test-488.html>.
- ¹² Deutsches Ärzteblatt. “Urintest zur Verlaufsprognose bei COVID-19 zugelassen.” Deutsches Ärzteblatt, January 11, 2021. <https://www.aerzteblatt.de/nachrichten/119977/Urintest-zur-Verlaufsprognose-bei-COVID-19-zugelassen>.
- ¹³ Diapat.de. “CoV-50-Test - Diapat DE.” Accessed January 12, 2021. <https://diapat.de/de/cov-50-test>.
- ¹⁴ Deutsches Ärzteblatt. “Urintest zur Verlaufsprognose bei COVID-19 zugelassen.” Deutsches Ärzteblatt, January 11, 2021. <https://www.aerzteblatt.de/nachrichten/119977/Urintest-zur-Verlaufsprognose-bei-COVID-19-zugelassen>.

CORONASYS INNOVATION SHEET 41

ICU TRAINING VIDEO

Background

Although significant progress has been made in the treatment of Covid-19 over the last year, it continues to pose significant challenges for ICU teams. A team of researchers from the University of Tübingen¹ has now developed a training video that gives medical students and the interested public a comprehensive insight into the care of a Covid-19 patient.

Features

The [video](#)² was developed by doctors and medical students. Together with intensive care nurses, the developers realistically recreated the treatment of a Covid-19 patient in a replica of a fully equipped intensive care unit.

The video accompanies a (fictive) young Covid patient from hospital admission, through intubation to artificial oxygenation of the blood with the help of ECMO (Extracorporeal Membrane Oxygenation³) therapy and the subsequent recovery process. In between, insertions provide detailed information on the background of the individual treatment steps (like for example proning⁴, ventilation modes⁵ and ECMO-Therapy^{7,8}) and medical devices used⁹.

Potentials

The video is to be used in medical teaching. It can also give medical laypeople an insight into how the care of a Covid patient actually unfolds and therefore help to generate awareness¹⁰. The video could also be helpful for staff assigned to ICU from other parts of the hospital to treat covid patients or for relatively inexperienced ICU staff.

Points to consider

As of now, the video is available in German and English only. It is also tailored to the context of very high-capacity intensive care medicine in highly developed and resource-rich countries.

Conclusion

Even apart from the particularly advanced treatment equipment and methods, the video can provide valuable insights into the actual treatment of Covid-19 patients. This can generate awareness of the severity of the disease and the care required, especially among medical laypeople.

State of information: 01/12/2021

Launch : November 2020

Country: Germany

Focus area: Treatment

Developers: University of Tübingen

Beneficiaries:

- General population
- Medical students
- ICU staff

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- ⁸ Deutsches Ärzteblatt. “COVID-19: Mehrheit Der Patienten Überlebt Mit ECMO,” September 28, 2020. <https://www.aerzteblatt.de/nachrichten/116907/COVID-19-Mehrheit-der-Patienten-ueberlebt-mit-ECMO>.
- ⁹ Deutsches Ärzteblatt. “COVID-19: Lehrvideo zur Versorgung auf Intensivstation vorgestellt.” *Deutsches Ärzteblatt*, January 11, 2021. <https://www.aerzteblatt.de/nachrichten/120028/COVID-19-Lehrvideo-zur-Versorgung-auf-Intensivstation-vorgestellt>.
- ¹⁰ Deutsches Ärzteblatt. “COVID-19: Lehrvideo zur Versorgung auf Intensivstation vorgestellt.” *Deutsches Ärzteblatt*, January 11, 2021. <https://www.aerzteblatt.de/nachrichten/120028/COVID-19-Lehrvideo-zur-Versorgung-auf-Intensivstation-vorgestellt>.

CORONASYS INNOVATION SHEET 42

SAFEZONE

Background

Over the course of the pandemic, several approaches have been discussed with regard to infection prevention. Social distancing is one of the measures that are provenly effective in containing the spread of SARS-CoV-2¹². But particularly in the work environment where ones mind is occupied with other things, people tend to forget to keep the distance required to effectively prevent transmission. The SafeZone is one example of proximity detectors invented or augmented in the last months to meet the requirements of the pandemic.

Features

The German start-up Kinexon³ has developed a sensor system called SafeZone. The sensors are smart and can be integrated into wristbands. The technology tracks distance using ultra-broadband signals and gives an acoustic and visual alarm when the set distance of 1.5m is not maintained⁴

Potentials

The technology is helpful to encourage employees to maintain the appropriate distance and currently used by more than 200 companies worldwide⁵. The system could also have a behavioural aspect: through the acoustic warning tones, the sensors "punish" violations of social distancing, which could change people's behaviour in the long run.

Points to consider

As often with movement tracking devices, there are some concerns regarding data safety and privacy issues⁶. Not only do the sensors track who engages with whom but they theoretically enable the managements to constantly keep tabs on their employees' movements⁷.

Conclusion

The sensors might be helpful in ensuring adherence to social distancing guidelines, but companies should make sure to consider the privacy rights of their employees with regard to the data used.

State of information: 01/13/2021

Launch : 2020

Country: Germany

Focus area: Prevention

Developers: Kinexon

Beneficiaries: Employees at offices or factories

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³ Kinexon. “Präzise Echtzeit-Lokalisierung Kombiniert Mit Innovativen Analysen,” 2021. <https://kinexon.com/de>.

⁴ Schuetze, Christopher F. “On Factory Floors, a Chime and Flashing Light to Maintain Distance - The New York Times,” January 12, 2021. <https://www.nytimes.com/2021/01/12/business/kinexon-safezone-wearable-tech.html>.

⁵ Kinexon. “COVID-19 eindämmen.” KINEXON, 2021. <https://kinexon.com/de/safezone>.

⁶ Singer, Natascha. “The Hot New Covid Tech Is Wearable and Constantly Tracks You - The New York Times,” November 15, 2020. <https://www.nytimes.com/2020/11/15/technology/virus-wearable-tracker-privacy.html>.

⁷ Schuetze, Christopher F. “On Factory Floors, a Chime and Flashing Light to Maintain Distance - The New York Times,” January 12, 2021. <https://www.nytimes.com/2021/01/12/business/kinexon-safezone-wearable-tech.html>.

CORONASYS INNOVATION SHEET 43

PROJECT HAZEL

Background

Mask wearing (if done right) belongs to the prevention approaches that are scientifically proven to be effective¹². But some people claim that the masks make them uncomfortable and that they have difficulty speaking and breathing. The computer and gaming hardware manufacturer Razer³ has now developed a mask that aims at solving these issues.

Features

The mask developed under the catchy name Project Hazel⁴ uses an N95 medical-grade respirator as well as detachable and rechargeable ventilators and air flow regulators. The ventilators can be disinfected and recharged by using a UV-sanitization device that comes with the mask. Inbuilt microphones amplify muffled speech. The mask is transparent so that the face is visible and lip-reading possible. Also, it is made of recyclable plastics⁵.

Potentials

The reusable mask might be an addition to existing community masks, especially for those who appreciate an added aesthetic value. The company also has distributed free face masks earlier in the pandemic and converted one of its production sites for mask production⁶.

Points to consider

At the moment, the mask is still in development and not for sale. Moreover, it is to be expected that such a technologically and aesthetically sophisticated design will not come all too cheap.

Conclusion

The masks might be a nice addition for fashionable mask users who also appreciate environmental friendliness and sustainability. But they are certainly not a game changer in the fight against the pandemic.

State of information: 01/13/2021

Launch: not yet determined

Country: USA, Singapore

Focus area: Prevention

Developers: Razer

Beneficiaries: General population

¹ Chu, Derek K., Elie A. Akl, Stephanie Duda, Karla Solo, Sally Yaacoub, Holger J. Schünemann, and COVID-19 Systematic Urgent Review Group Effort (SURGE) study authors. “Physical Distancing, Face Masks, and Eye Protection to Prevent Person-to-Person Transmission of SARS-CoV-2 and COVID-19: A Systematic Review and Meta-Analysis.” *Lancet* (London, England) 395, no. 10242 (June 27, 2020): 1973–87. [https://doi.org/10.1016/S0140-6736\(20\)31142-9](https://doi.org/10.1016/S0140-6736(20)31142-9).

² Matuschek, Christiane, Friedrich Moll, Heiner Fangerau, Johannes C. Fischer, Kurt Zänker, Martijn van Griensven, Marion Schneider, et al. “Face Masks: Benefits and Risks during the COVID-19 Crisis.” *European Journal of Medical Research* 25, no. 1 (August 12, 2020): 32. <https://doi.org/10.1186/s40001-020-00430-5>.

³ Razer. “Razer United States | For Gamers. By Gamers.,” 2021. <https://www.razer.com>.

⁴ Razer. “The World’s Smartest Mask - Project Hazel,” 2021. <https://www.razer.com/concepts/razer-project-hazel>.

⁵ Guy, Jack. “Razer’s Reusable Face Mask Ventilates the Air and Amplifies Your Voice - CNN.” CNN, January 13, 2021. <https://edition.cnn.com/2021/01/13/americas/razer-smart-face-mask-scli-intl-wellness/index.html>.

⁶ Toh, Michelle. “Razer Singapore: Vending Machines to Provide Millions of Free Face Masks to Residents - CNN,” May 12, 2020. <https://edition.cnn.com/2020/05/12/tech/razer-singapore-masks-intl-hnk-scli/index.html>.

CORONASYS INNOVATION SHEET 44

VIRAL ESCAPE MODELLING

Background

Newly emerged mutations of the coronavirus are causing great concern. Not only do they seem to be more infectious¹² and therefore put even more strain on already heavily burdened health systems. Some researchers are also concerned that the new variants (and other mutations of SARS-CoV-2 that may emerge in the future) could temporarily or permanently compromise the effectiveness of some vaccines.

Features

Some viruses, like for example SARS-CoV-2 but also influenza and HIV, can mutate quite quickly, which makes it very difficult to produce effective vaccines against them. The mutation allows them to bypass the antibodies produced by a particular vaccine, through a process known as "viral escape". Researchers from the Massachusetts Institute of Technology³ have developed an AI (Artificial Intelligence) model that aims at predicting which parts of the viral surface are likely to mutate and which are not⁴. The model is based on models that were originally designed to analyse language⁵. It "identified escape mutations as those that preserve viral infectivity but cause a virus to look different to the immune system, akin to word changes that preserve a sentence's grammaticality but change its meaning" (Hie et al., 2021)⁶.

State of information: 01/15/2021

Publication: 01/14/2021

Country: USA

Focus areas: AI, Research, Prediction

Developers: Massachusetts Institute of Technology (MIT)

Beneficiaries:

- Scientists
- Vaccine developers

Potentials

The identification of viral surface structures that are not likely to mutate could help vaccine developers to identify possible targets for new vaccines. The researchers aim to apply their model not only on SARS-CoV-2, HIV, and Influenza but also on the production of the so-called cancer vaccines⁷. The technique also lays the foundation for even more complex modelling⁸.

Points to consider

The researchers have also applied their model to the new variants of SARS-CoV-2 that have recently emerged in the UK and South Africa after their paper was accepted for publication. Those results have not been published yet⁹.

Conclusion

The model might contribute to future efforts to control viral spread and provide effective vaccines against a variety of different pathogens.

¹ Deutsches Ärzteblatt. “Studie: Neue SARS-CoV-2-Variante Aus England Zu 56 % Ansteckender,” December 28, 2020. <https://www.aerzteblatt.de/nachrichten/119733/Studie-Neue-SARS-CoV-2-Variante-aus-England-zu-56-ansteckender>.

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⁴ Hie, Brian, Ellen D. Zhong, Bonnie Berger, and Bryan Bryson. “Learning the Language of Viral Evolution and Escape.” *Science* 371, no. 6526 (January 15, 2021): 284–88. <https://doi.org/10.1126/science.abd7331>.

⁵ Massachusetts Institute of Technology. “Model Analyzes How Viruses Escape the Immune System,” January 14, 2021. <https://phys.org/news/2021-01-viruses-immune.html>.

⁶ Hie, Brian, Ellen D. Zhong, Bonnie Berger, and Bryan Bryson. “Learning the Language of Viral Evolution and Escape.” *Science* 371, no. 6526 (January 15, 2021): 284–88. <https://doi.org/10.1126/science.abd7331>.

⁷ Massachusetts Institute of Technology. “Model Analyzes How Viruses Escape the Immune System,” January 14, 2021. <https://phys.org/news/2021-01-viruses-immune.html>

⁸ Hie, Brian, Ellen D. Zhong, Bonnie Berger, and Bryan Bryson. “Learning the Language of Viral Evolution and Escape.” *Science* 371, no. 6526 (January 15, 2021): 284–88. <https://doi.org/10.1126/science.abd7331>.

⁹ Massachusetts Institute of Technology. “Model Analyzes How Viruses Escape the Immune System,” January 14, 2021. <https://phys.org/news/2021-01-viruses-immune.html>

CORONASYS INNOVATION SHEET 45

VACCINATION COMMUNICATION HANDBOOK

Background

Since December 2020, vaccination campaigns are underway in many countries¹. But apart from logistical and medical challenges^{2,3} that need to be overcome, the authorities also have to convince people to get the shot. This is complicated by a large amount of misinformation, fake news and outright conspiracy theories circulating among the population. A team of scientists and volunteers from different academic disciplines⁴ has produced a [handbook](#) to help educate people about the Covid-19 vaccine.

Features

The 16-page manual draws on information from the World Health Organization (WHO), UNICEF, the U.S. Food and Drug Administration (FDA), the Royal Society and other agencies and scientific organisations. It provides information on vaccination in general and Covid-19 vaccination in particular, as well as factors that promote vaccination readiness within the population. In addition, it devotes several sections to the topic of communication, providing basic information on risk communication as well as practical advice on how to deal with or prevent misinformation^{5,6}.

Potentials

The Handbook might be a valuable help for everybody who deals with informing people about vaccination. Many of the sections in the manual contain links to a wiki with more in-depth information. This wiki is continuously updated by the team of authors⁷.

Points to consider

The handbook can only provide assistance in conducting informational interviews and must be adapted to the respective situation. Continuous updating is crucial to ensure that the information is up to date.

Conclusion

The handbook might be helpful for professionals who conduct talks on the topic of vaccination and educate the public. It can also help laypeople who want to take action against fake news and lack of vaccination hesitancy in their environment.

State of information: 01/15/2021

Publication: January 2021

Country: International

Focus areas: Prevention, Communication

Developers: SciBeh Research collaboration

Beneficiaries: Doctors, journalists, nurses, policy makers, local and national health officials, researchers, teachers, students and parents,...

¹ Our World in Data. “Coronavirus (COVID-19) Vaccinations - Statistics and Research.” Our World in Data, January 15, 2021. <https://ourworldindata.org/covid-vaccinations>.

² Newcastle Systems. “The Complex Logistical Challenges of Vaccine Distribution.” Vertex Supply Chain Solutions (blog), January 7, 2021. <https://vertexsupplychain.com/the-complex-logistical-challenges-of-vaccine-distribution/>.

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⁴ SciBeh. “Authors and acknowledgements.” HackMD, 2021. <https://hackmd.io/@scibehC19vax/contributors>.

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⁶ Lewandowsky, S., Cook, J., Schmid, P., Holford, D. L., Finn, A., Leask, J., Thomson, A., Lombardi, D., Al-Rawi, A. K., Amazeen, M. A., Anderson, E. C., Armaos, K. D., Betsch, C., Bruns, H. H. B., Ecker, U. K. H., Garavuzzi, T., Hahn, U., Herzog, S., Juanchich, M., Kendeou, P., Newman, E. J., Pennycook, G., Rapp, D. N., Sah, S., Sinatra, G. M., Tapper, K., Vraga, E. K. “The COVID-19 Vaccine Communication Handbook. A Practical Guide for Improving Vaccine Communication and Fighting Misinformation.” 2021. <https://sks.to/c19vax>.

⁷ Deutsches Ärzteblatt. “Impfmythen begegnen: Handbuch bietet Kommunikationsleitfaden.” Deutsches Ärzteblatt, January 13, 2021. <https://www.aerzteblatt.de/nachrichten/120035/Impfmythen-begegnen-Handbuch-bietet-Kommunikationsleitfaden>.

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