

Digital respiratory medicine – realism vs futurism

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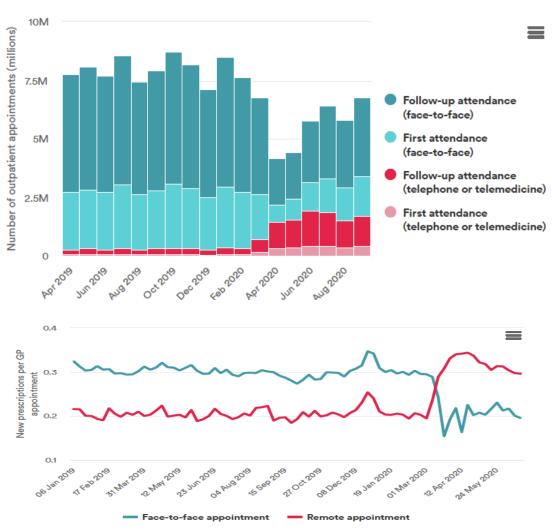
3rd-4th June 2021

What's the plan...

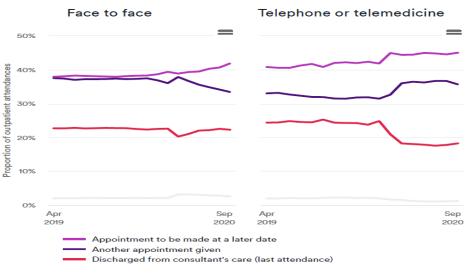
- Digital acceleration
- Evaluation
- Integration and new clinical pathways
- Access and equity
- Relevance to high and low resource settings

Digital acceleration – impact of covid-19



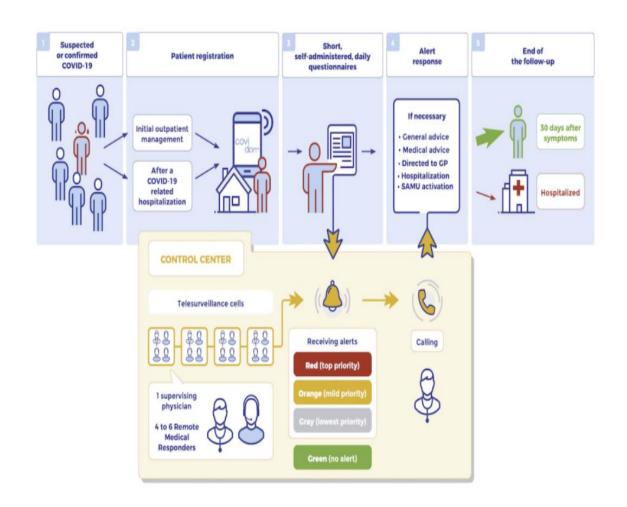






The Virtual world





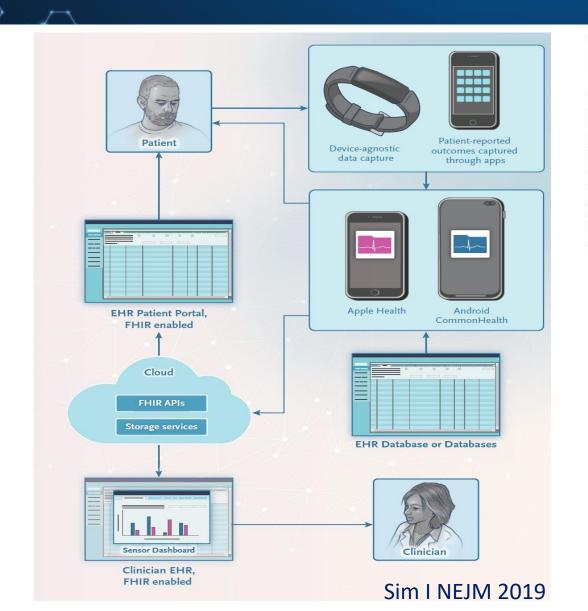


Covidom, France

Relevance to COPD, early discharge, post op care, clinical trials

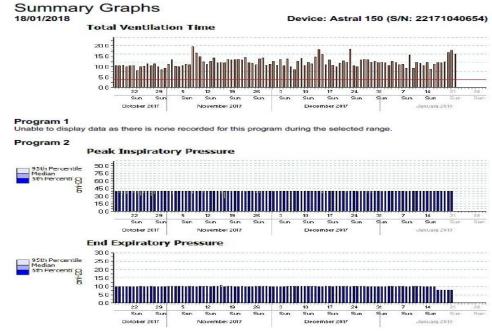
J_Med_Internet_Res._2020_Oct; 22(10): e20748.

Wearables, apps and telemonitoring





Choi J Clin Sleep Med 2018



Artificial intelligence, data - uses and counterbalances

Development dataset (n=143 768)

Pneumothorax Pneumoperitoneum 4936 Mediastinal widening 471 Nodule 13 004 Consolidation Pleural effusion 11 089 Atelectasis 3856 **Fibrosis** 2840 Calcification Cardiomegaly 3399





Internal validation dataset (n=2523)

Pneumothorax	384
Pneumoperitoneum	152
Mediastinal widening	86
Nodule	507
Consolidation	414
Pleural effusion	164
Atelectasis	208
Fibrosis	218
Calcification	208
Cardiomegaly	215
Normal	747

Performance validation and threshold selection

Reference standard



Labelling group (20 radiologists

External validation tests

Pneumothorax	23
Pneumoperitoneum	19
Mediastinal widening	18
Nodule	23
Consolidation	34
Pleural effusion	37
Atelectasis	28
Fibrosis	19
Calcification	21

SNUH dataset

Cardiomegaly

Normal

PadChest open-source dataset					
	Pneumothorax	11			
		24			
	Mediastinal widening				
	Nodule	32			
	Consolidation	119			
	Pleural effusion	54			
	Atelectasis	58			
	Fibrosis	29			
	Calcification	37			
	Cardiomegaly	90			

n=673



55

Same-day CT

Labelling group

Reference standard

Simulated reading test (emergency department)

Disease distribution	on	Study design
Pneumothorax Pneumoperitoneum Aortic dissection	2 1 1	Thoracic radiologists 4-week interval Reader 1 With DLAD-10 → Without DLAD-10 Reader 2 Without DLAD-10 → With DLAD-10
Pneumonia Pulmonary oedema Active tuberculosis II D	20 6 4 3	General radiologists Reader 3 With DLAD-10 → Without DLAD-10 Reader 4 Without DLAD-10 → With DLAD-10
Nodule Pleural effusion Mediastinal mass	10 7 1	Radiology residents Reader 5 With DLAD-10 Without DLAD-10
Rib fracture Nonurgent/normal	1 146	Reader 6 Without DLAD-10 - With DLAD-10

Same-day CT

Reference standard

n=202

- Narrow AI and then.....
- Clinical algorithms
- Deep learning
- Problems with data, ethics
- Whose data?



Nam et al ERJ 2021

Observer May 30 2021

Global relevance

- EU data space, regulations, barriers and ways forward
- Disease surveillance, real time data ECDC
- Pharmacovigilance EMA, diagnostics
- Digital inclusion, learning from patients, real world data
- Digital approaches in low resource settings

Integrated, patient-centred care and prevention	Video-observed therapy	Edible microchips transmitting to mobile electronic devices; registering the gesture of a specific patient taking a given pill
	Databasing laboratory results and patient parameters	Connected diagnostics Tracking disease biomarkers via 'wearables'
	Point of care testing	Digitisation of biological material (genome, chemistry), integration of data from multiple sources and remote consultation of experts
	Standardising anti-TB medication	Intimate monitoring of biomarkers to optimise care
	Internet-based reference and eLearning content	Decision aids informed by Big Data; advanced machine learning techniques Alerting people of exposure risks from real-time analysis of environmental and other data

Falzon D & Raviglioni M BMJ Global Health 2016

Digital exceptionalism?



Is digital medicine different?

patients to make appointments, order repeat prescriptions, dissemination of digital innovations, and, in May this year, collect a wealth of data in real time, and other methods

To coincide with the 70th anniversary of the National risk. Randomised controlled trials, the gold standard Health Service (NHS) on July 5, a new NHS app enabling of evidence, are rarely used in digital medicine, partly because the current classification of clinical trials does access their general practitioner (GP) records, and make not fit with the iterative nature of product design and urgent medical gueries was announced by Jeremy Hunt, because the cost of such trials is high compared with then UK Secretary for Health and Social Care. The app, the product's perceived level of risk. The relatively low developed by NHS England and NHS Digital, will be freely barriers to market entry have encouraged innovative available from December, 2018. Hunt acknowledged small and medium sized companies, often new to the that while technology has transformed many sectors, the health market. Research, especially for Al work, remains health sector has remained comparatively unchanged. centred on machine learning outcomes, and the shift to The UK, with its single predominant state-level health clinical outcomes has not kept pace with the products' system, should be a strong candidate for rapid large-scale move into clinical practice. Inherently, digital products





Without a clear framework to differentiate efficacious digital products from commercial opportunism, companies, clinicians, and policy makers will struggle to provide the required level of evidence to realise the potential of digital medicine. The risks of digital medicine, particularly use of Al in health interventions, are concerning. Continuing to argue for digital exceptionalism and failing to robustly evaluate digital health interventions presents the greatest risk for patients and health systems. ■ The Lancet

From: Lancet 2018



Prof Thierry Troosters, Past President, ERS