Clinical decision support systems to increase the detection of infections and other conditions in migrants

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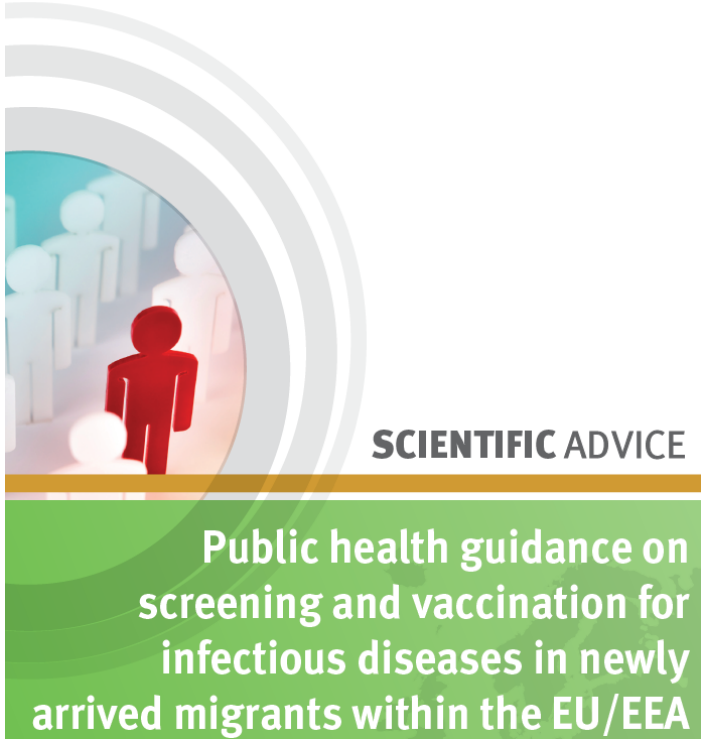
I have no potential conflict of interest to declare

Overview of infections in migrants

- Some infections low prevalent in Europe.
- Migrants disproportionately affected in most European countries
- Tuberculosis, HIV, HBV HCV
- Imported diseases not prevalent in European countries
  - Lack of knowledge
  - No research
  - Less evidence on how to screen, diagnose and manage these diseases in migrants
- Immunosuppression increases the risk of severe infection



Challenges in the implementation of screening strategies in migrants

Contents lists available at ScienceDirect

Travel Medicine and Infectious Disease

journal homepage: www.elsevier.com/locate/tmaid

Strengthening screening for infectious diseases and vaccination among migrants in Europe: What is needed to close the implementation gaps?

Important considerations when developing migrant screening and vaccination programmes.

- Programmes are developed in collaboration with front-line health professionals, public health experts and migrant communities
- Screening is voluntary and confidential, and not linked to immigration enforcement or employment opportunities
- Screening and vaccination is offered on arrival and throughout the settlement process
- Screening should be non-stigmatising and carried out for the benefit of the individual and the community
- Screening, treatment, and vaccination is free of charge
- Screening services are coordinated in a way that considers the unique needs and barriers to care faced by migrants, with a focus on ensuring linkage to care and treatment completion
- Tailored approaches may be most effective, including considering multi-disease testing, integrated care, and migrant-friendly services that address the linguistic and cultural context of migrant groups
- Front-line healthcare professionals require sufficient knowledge in epidemiology of infectious diseases, in particular from countries where migrants originate
- Community-based and primary care approaches may be the best approach to ensure high uptake to vaccination and screening
- Health care systems and policies need to be migrant friendly
- A universal medical record of screening and vaccination could be something to consider, with greater coordination required across Europe

Participatory approach

Migrant sensitive Health system

Access to care

Link to care

Individualized approach

Lack of knowledge parasitic infections

Commitment of professionals

Screening programmes targeting migrants in primary care

Advantages

- Formal screening of migrants in special clinics/hospital may miss migrant groups
- Primary care is ideally placed for the provision of healthcare for migrants
- PC screening can be opportunistically delivered

Implementation challenges

- Lack of knowledge of health professionals
  - Particularly parasitic infections
- Heterogeneity of migrant groups
- Lack of individualized approach
- Guidelines require the active commitment in the decision-making process
- Lack of time

EUROPEAN JOURNAL OF GENERAL PRACTICE, 2017
VOL. 23, NO. 1, 128–134
http://dx.doi.org/10.1080/13814788.2017.1307336

ORIGINAL ARTICLE

OPEN ACCESS Check for updates

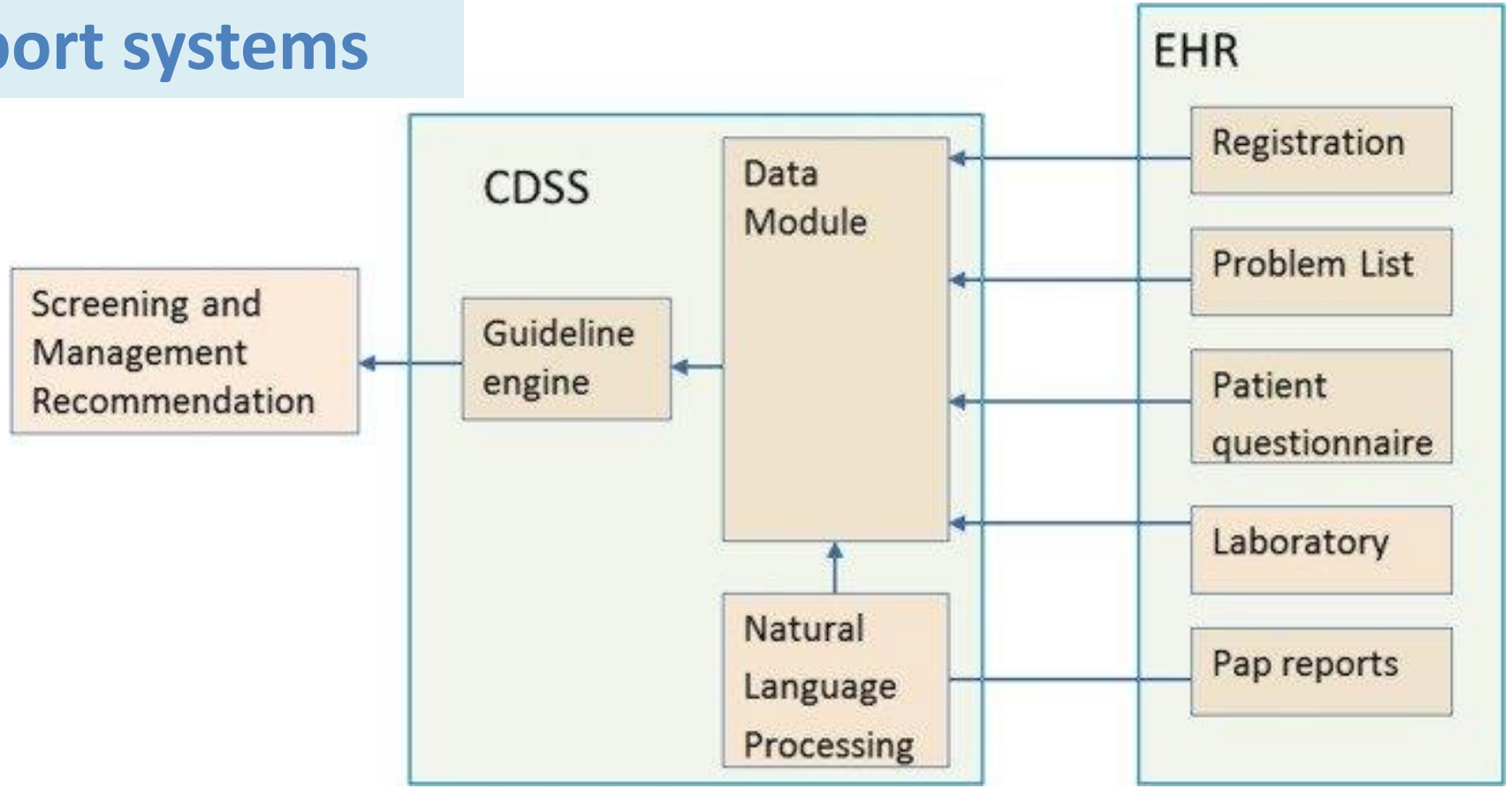
Exploring barriers to primary care for migrants in Greece in times of austerity: Perspectives of service providers

Maria Papadakaki[a,b], Christos Lionis[a], Aristoula Saridaki[a], Christopher Dowrick[c], Tomas de Brún[d], Mary O'Reilly-de Brún[d], Catherine A O'Donnell[e], Nicola Burns[e,f], Evelyn van Weel-Baumgarten[g], Maria van den Muijsenbergh[g,h], Wolfgang Spiegel[i] and Anne MacFarlane[j]

KEY MESSAGES

- Discriminatory attitudes and other provider and system-related barriers are evident in the provision of primary healthcare to migrants in Greece.
- Providers feel unable to fulfil their role efficiently under limited system support and contribution to decision making.
- Training and guidelines promoting cultural competence are necessary in the Greek primary healthcare.

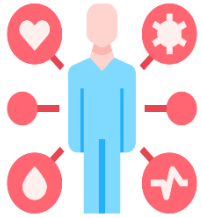
Clinical decision support systems



- CDSS developed for a variety of decision problems
  - Prevention of adverse events, diagnosis, risk estimation, and chronic disease management.
- CDSS have been found to improve health service delivery across diverse settings.
- Sparse evidence for their impact on clinical outcomes.
- Less integrated in the EHR as part of the routine care.
- Less evidence on migrant health related conditions

API ISMiHealth

Personalized screening digital tool



Identify migrants at risk of imported Diseases and other pathologies

Integrated in the Health information system

Tailored clinical decision Support system

sex

Country of birth

age

Previous test

Previous diagnosis

Prompt

Aten Primaria. 2020;52(3):193–205

Atención Primaria

www.elsevier.es/ap

Recomendaciones para el cribado de enfermedad infecciosa, salud mental y mutilación genital femenina en pacientes inmigrantes atendidos en Atención Primaria

Ethel Sequeira-Aymar[a,*], Ximena diLollo[c,d], Yolanda Osorio-Lopez[e], Alessandra Queiroga Gonçalves[f,g], Carme Subirà[b,d] y Ana Requena-Méndez[b,d]

- 9 conditions
- Introduction of **mental health** and **female genital mutilation** as migrant health needs
- Recommendations adapted to the context of **Primary care** in Catalonia

País origen	VIH	VHB	VHC	STR	SCH	Chagas	TB	SM	MGF
Guayana francesa						X			
Guam				X			X		
Guatemala		X		X		X			
Guinea	X	X	X	X	X		X		X
Guinea Bissau	X	X	X	X	X		X		X
Guinea Ecuatorial	X	X	X	X	X		X		
Guyana	X			X			X		
Haití	X	X		X			X	X	
Honduras				X		X			
Hong Kong		X					X		
India		X		X			X	X	
Indonesia		X		X	X		X		
Irán, República Islámica de		X						X	
Irak	X		X		X			X	
Israel			X	X				X	
Italia			X						
Jamaica	X	X		X			X		
Japón				X					
Jordania		X	X						
Kazajistán		X	X	X			X		

Chagas disease (PAHO)

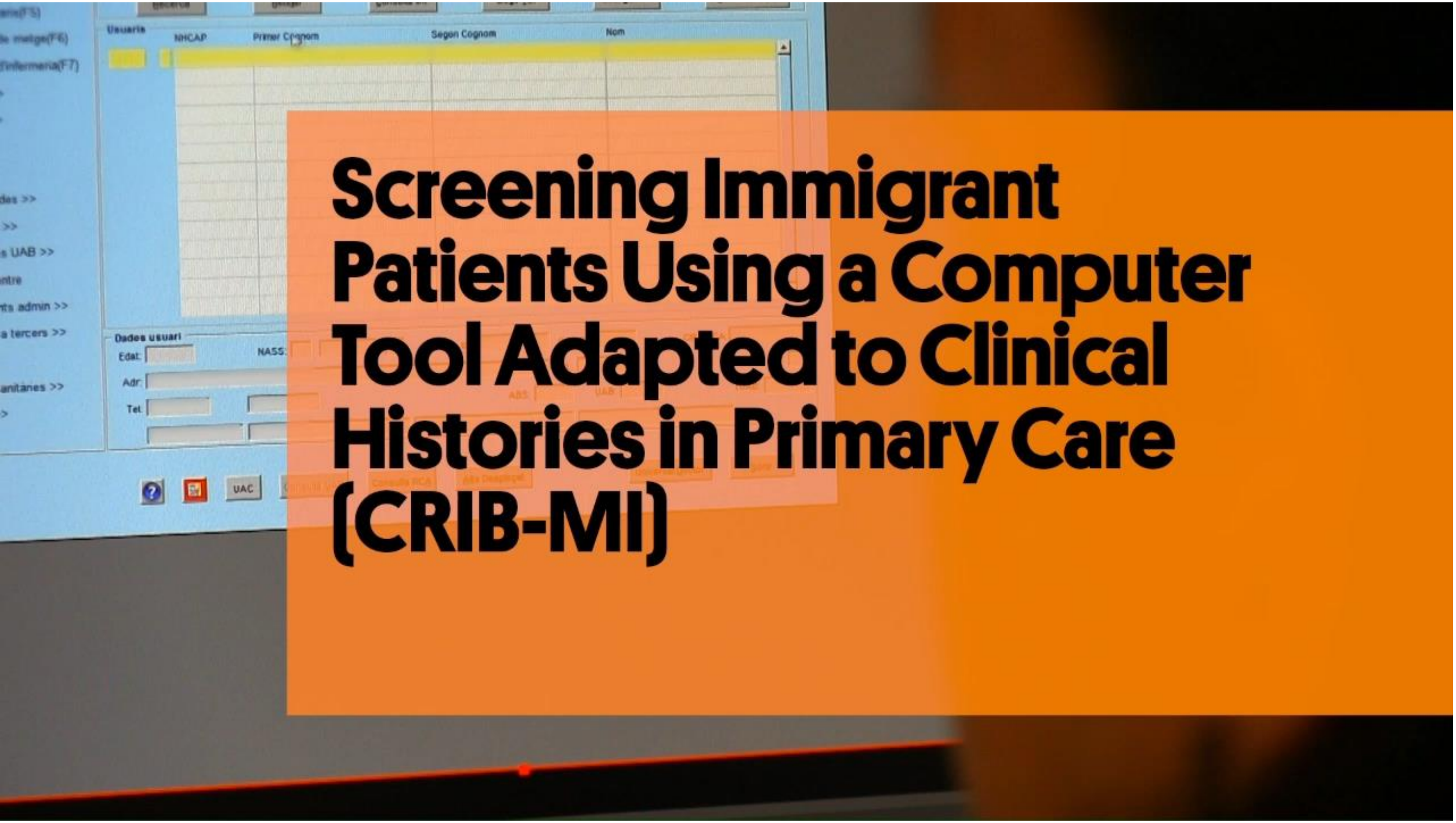
Strongyloidiasis – endemic countries (ECDC guidelines)

Schistosomiasis – endemic countries (ECDC guidelines)

HIV >1% - UNAIDS

HBV and HCV >2% -ECDC data

Active TB - >40 cases /100,000 pop WHO



Screening Immigrant Patients Using a Computer Tool Adapted to Clinical Histories in Primary Care (CRIB-MI)

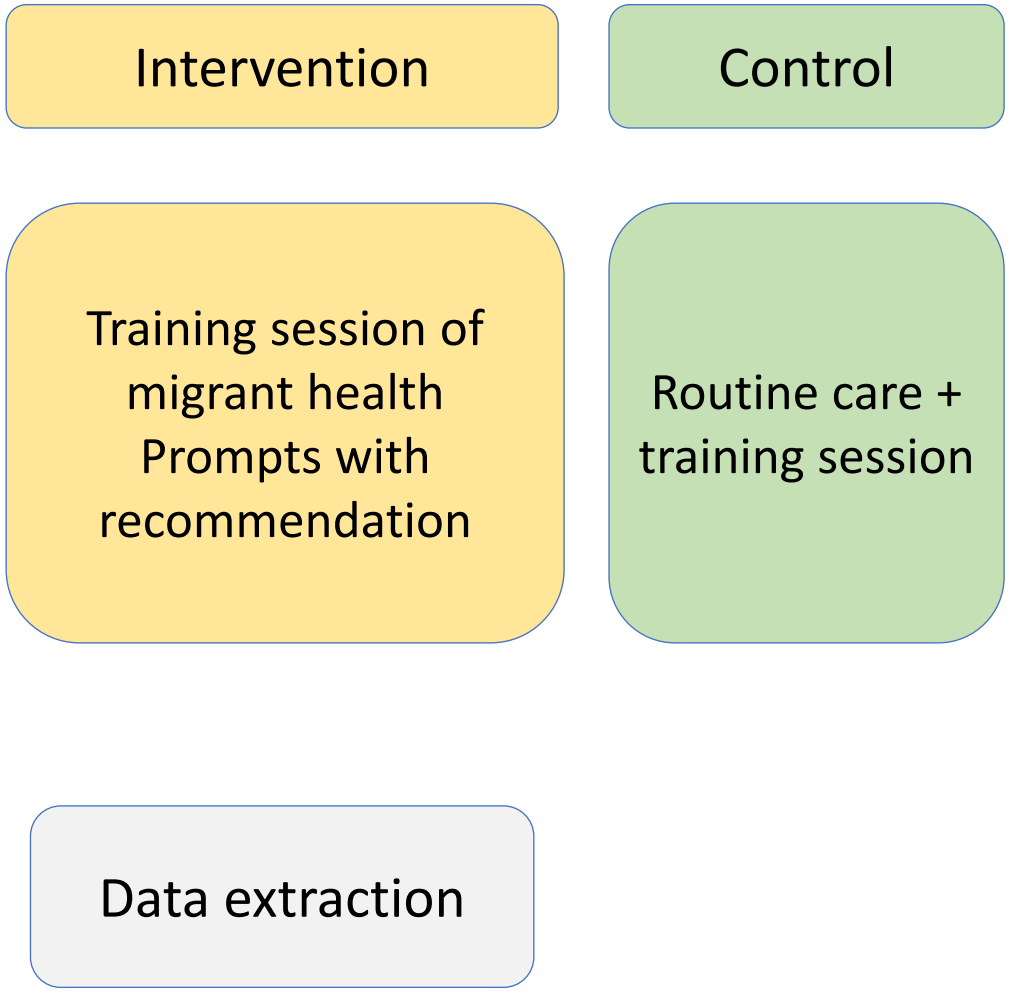
Methods

- Pilot cluster randomized controlled trial

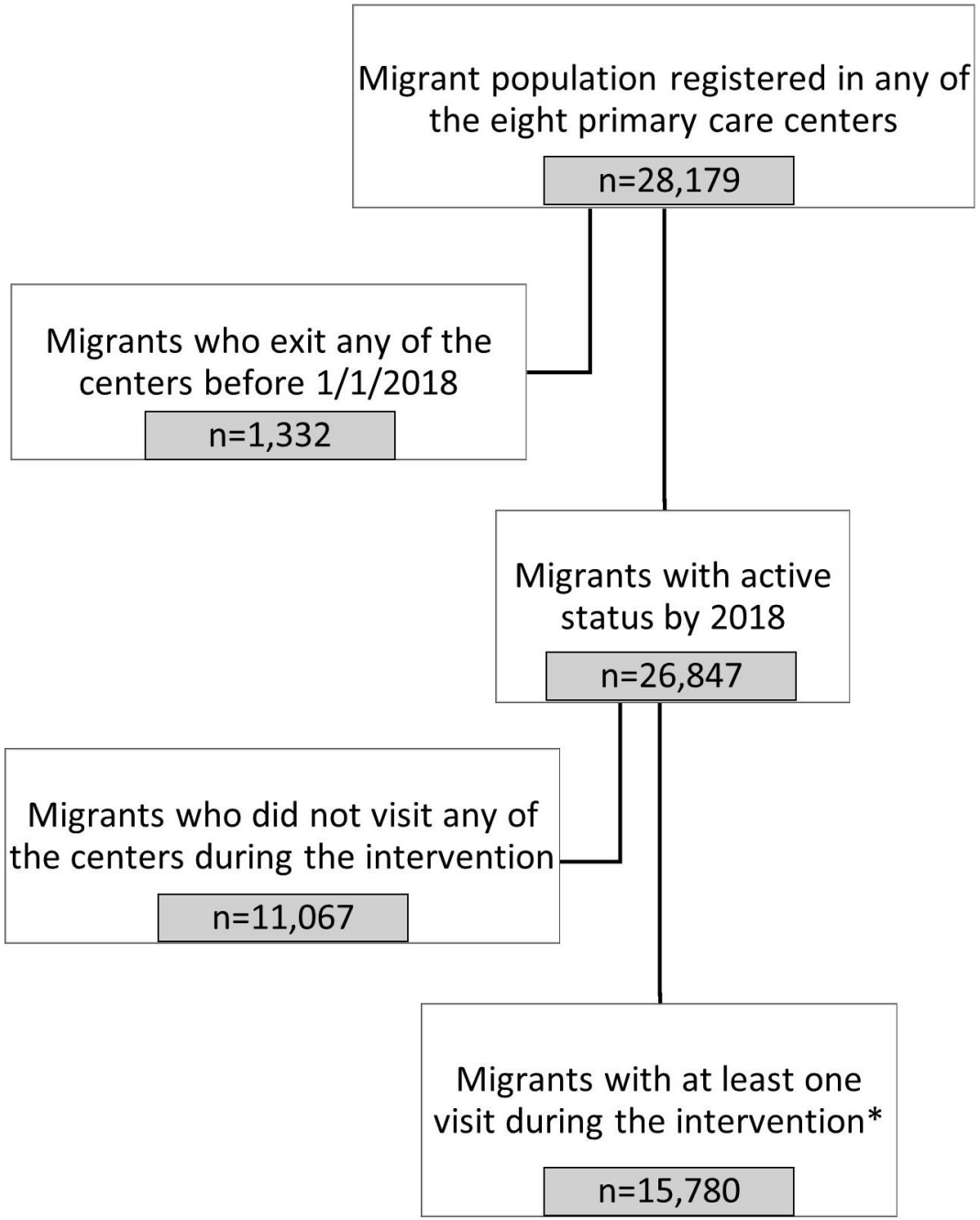
- 4 regions in Catalonia: Selection of 8 PCC
- Selection of 2 PCCs in each region
- Randomization of intervention and control

- Screening algorithm – Consensus with multiple stakeholders
- Formal training to PC practitioners on “migrant-sensitive” culture
- Access to specialized care : link to and treatment ensured

- Data extraction from EPR from 2012-2018:
- Diagnosis (ICD-10) and serological tests
- PO: Monthly diagnostic yield of all aggregated conditions
- Difference in difference approach



Results



Journal of Travel Medicine, 2021, 1–11
https://doi.org/10.1093/jtm/taab100
Original Article

Original Article

Improving the detection of infectious diseases in at-risk migrants with an innovative integrated multi-infection screening digital decision support tool (IS-MiHealth) in primary care: a pilot cluster-randomized-controlled trial

Ethel Sequeira-Aymar, MD[1,2,3], Angeline Cruz, MD[3], Miquel Serra-Burriel, PhD[4], Ximena di Lollo, MD[2], Alessandra Queiroga Gonçalves, PhD[5,6], Laura Camps-Vilà, Ana Requena-Mendez, PhD[3,17,*], and on behalf of the CRIBMI (IS-MiHealth) Working Group

	Total	
	Control	Intervention
	n (%)	n (%)
Total targeted population	7,609	8,171
Immunosuppression status in 2018	1,195 (15.7)	1,275 (15.6)
Region of origin		
Southern Europe	637 (8.4)	372 (4.6)
Eastern Europe	1,353 (17.8)	1,618 (19.8)
Northern Europe	381 (5.0)	211 (2.6)
Latin-America and the Caribbean	1,819 (23.9)	1,664 (20.4)
Northern Africa	1,957 (25.7)	2,630 (32.2)
Sub Saharan Africa	681 (9.0)	1,108 (13.6)
Middle East (Asia)	455 (6.0)	431 (5.3)
Eastern Asia	286 (3.8)	128 (1.6)
Sex (female)	4,179 (54.9)	4,086 (50.0)
Age in years (mean, SD)	39.03 (13.0)	39.56 (12.8)

Results

Table 2. Screening tests performed for infectious diseases included in the screening program among those who attended the PCC during the intervention.

	Control	Intervention	OR (95% CI)	p-value[2]
Total population	7,609	8,171		
Number of *T. cruzi* disease screening tests	24 (0.3)	102 (1.3)	4.14 (2.63-6.52)	<0.001
Screening number among those with screening criteria	20/1663 (1.2)	95/1454 (6.5)	5.26 (3.20-8.65)	<0.001
Number of *Strongyloides* screening tests	32/5695[1] (0.6)	375/6435[1] (5.8)	10.92[1] (7.58-15.74)	<0.001
Screening number among those with screening criteria	28/4635[1] (0.6)	373/5878[1] (6.4)	11.15[1] (7.58-16.40)	<0.001
Number of *Schistosoma* screening tests	2/5695[1] (0.04)	100/6435[1] (1.6)	39.34[1] (9.64-160.50)	<0.001
Screening number among those with screening criteria	1/685[1] (0.2)	82/1084[1] (7.6)	59.64[1] (8.25-431.36)	<0.001
Total screening number of any parasitic infection	49/5695[1] (0.9)	407/6435[1] (6.3)	7.78[1] (5.77-10.49)	<0.001
Screening number among those with screening criteria	44/4644[1] (1.0)	405/5886[1] (6.9)	7.73[1] (5.65-10.57)	<0.001
Number of HIV screening tests	403 (5.3)	726 (8.9)	1.40 (1.23-1.60)	<0.001
Screening number among those with screening criteria	84/948 (8.9)	201/1373 (14.6)	1.56 (1.18-2.06)	0.002
Number of HBV screening tests	639 (8.4)	827 (10.1)	1.16 (1.04-1.30)	0.009
Screening number among those with screening criteria	256/2784 (9.2)	406/3445 (11.8)	1.27 (1.07-1.51)	0.005
Number of HCV screening tests	628 (8.3)	790 (9.7)	1.13 (1.01-1.26)	0.038
Screening number among those with screening criteria	236/2644 (8.9)	413/3299 (12.5)	1.39 (1.17-1.65)	<0.001
Number of active TB screening tests	221 (2.9)	376 (4.6)	1.56 (1.31-1.85)	<0.001
Screening number among those with screening criteria	41/1215 (3.4)	59/1168 (5.1)	1.60 (1.06-2.42)	0.027
Number of screening tests for any condition	984/7609 (12.9)	1411/8171 (17.3)	1.34 (1.22-1.46)	<0.001
Screening number among those with screening criteria	885/6851 (12.9)	1359/7747 (17.5)	1.36 (1.24-1.50)	<0.001

1. The Tortosa region is excluded. 2. Multilevel mixed-effect logistic regression

Factors associated with being screened for any ID

	OR (95% CI)	p-value	aOR (95% CI)	p-value
Screening criteria	1.16 (0.96-1.38)	0.120	1.07 (0.88-1.31)	0.494
Group Intervention	1.34 (1.22-1.46)	<0.001	**1.35 (1.23-1.48)**	**<0.001**
Age	1.00 (0.99-1.00)	0.042	1.00 (0.99 -1.00)	0.007
Sex (female)	1.21 (1.10-1.32)	<0.001	**1.22 (1.11-1.33)**	**<0.001**
Continent				
Europe	Base		Base	
America	1.03 (0.91-1.17)	0.655	0.98 (0.86-1.13)	0.835
Africa	1.06 (0.95-1.18)	0.312	1.04 (0.93-1.18)	0.437
Asia	1.22 (1.03-1.46)	0.023	**1.22 (1.01-1.46)**	**0.035**
Oceania	6.24 (0.39-100)	0.196	5.76 (0.35-94.6)	0.219
Immunosupp in 2018	1.46 (1.31-1.63)	<0.001	**1.47 (1.32-1.65)**	**<0.001**

Factors associated with parasitic infections (Chagas disease, strongyloidiasis, schistosomiasis

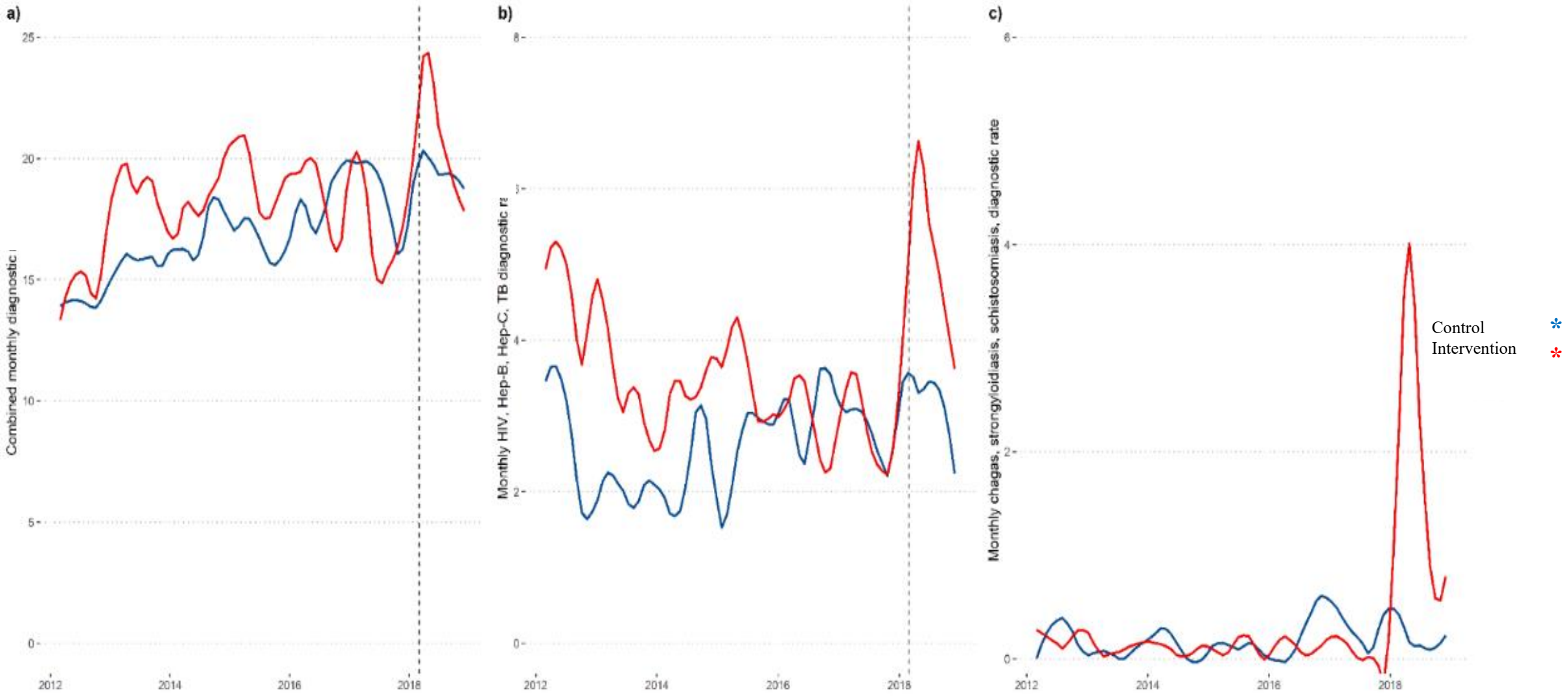
	OR (95% CI)	p-value	aOR (95% CI)	p-value
Screening criteria	17.13 (4.24-69.12)	<0.001	**5.92 (2.72-12.88)**	**<0.001**
Group Intervention	7.78 (5.77-10.49)	<0.001	**7.51 (5.56-10.15)**	**<0.001**
Age	1.01(1.00-1.02)	0.005	1.01 (1.00-1.02)	0.012
Sex (female)	1.14 (0.94--1.38)	0.183	1.18 (0.97-1.44)	0.098
Continent				
Europe	Base		Base	
America	2.50 (1.88-3.31)	<0.001	**1.61 (1.20-2.16)**	**0.001**
Africa	1.55 (1.18-2.04)	0.002	1.10 (0.83-1.46)	0.393
Asia	2.70 (1.80-4.02)	<0.001	**1.77 (1.18-2.66)**	**0.004**
Oceania	Empty	---	Empty	---
Immunosup pr in 2018	1.59 (1.26-2.00)	<0.001	**1.53 (1.22-1.94)**	**<0.001**

Monthly diagnostic rates of the intervention and control PCC, before and after implementation.

Combined monthly diagnostic rate

HIV, TB, viral hepatitis

***T.cruzi, S.stercoralis*, *Schistosoma* spp.**



Key discussion points

- The tool appears to modify the clinician behavior on routinely screening for infections in migrants
- Guidelines or education alone are insufficient to influence practice.
- A multi-disease approach may reduce the cost impact on health system.

- The low numbers from this pilot study prevented to have conclusive results about the detection yield differences for each infection
- No data analysis on treatments and follow-up,
- The date of arrival to the country was not collected in the e-CAP system
- Missing values of key variables such as the country of origin for some migrant individuals although this percentage was estimated to be below 5%.

Acceptability of the tool

A **qualitative study design** using FG using a pragmatic utilitarianism approach with GP recruited using **purposive sam**pling and **thematic analysis**

- Usefulness and limitations of the training on migrant health;
- Usefulness of guidelines for PC on migrant screening;
- Use of the innovative digital tool (ISMiHealth tool) in daily clinical practice

Training on migrant health well valued in general.

- It broadened their knowledge about the health problems of migrants (ie. Imported diseases)
- Type of training not usually offered in PC centres
- Limitation: Absence of a guide to support health care provision for migrants (cultural competence aspects)

Usefulness of **ISMiHealth**

"Without the tool I would have not screened most patients, in particular parasitic infections"

- Follow-up visits after screening
- High % loss to follow up
- Few resources/time allocated to the reception of migrants at PC

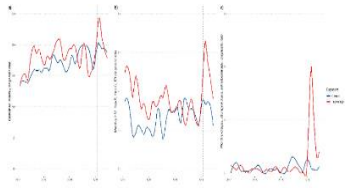
Innovation approach

Electronic Patient Records

Structured information (automatic extraction)

Clinical decision support system ISMiHealth

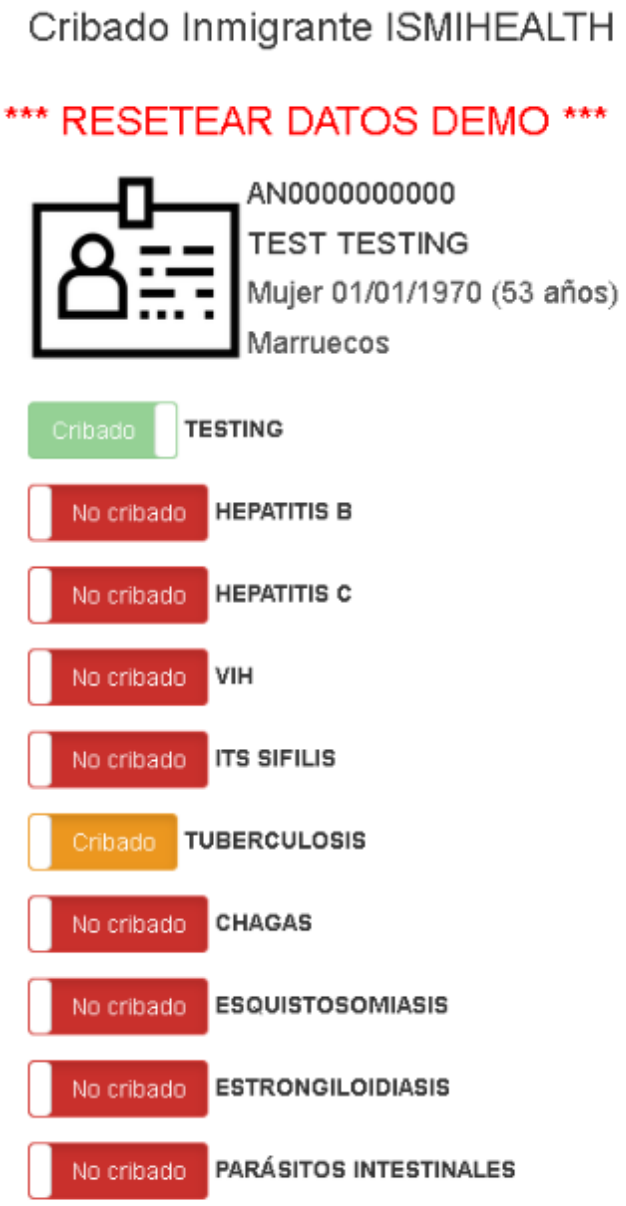
- IP registered
- Contract signed



EPR –other HIS

Validating the tool at larger scale

Mental Health FGM



New sites:

Canary island

Valencia

New levels of care:

Hospital level – Units attending immunosuppressed patients

- Karolinska University Hospital

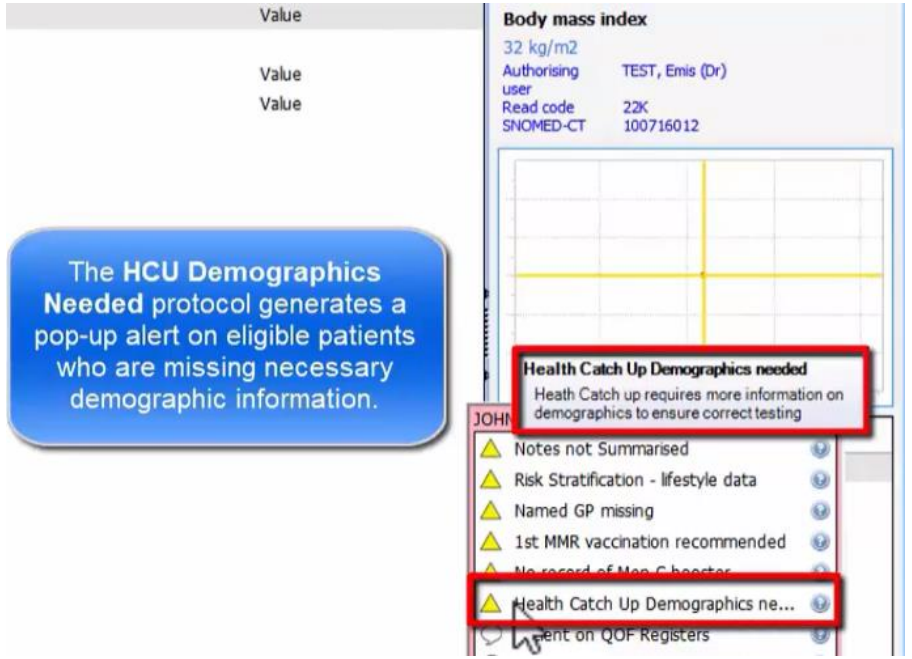
Community-based:

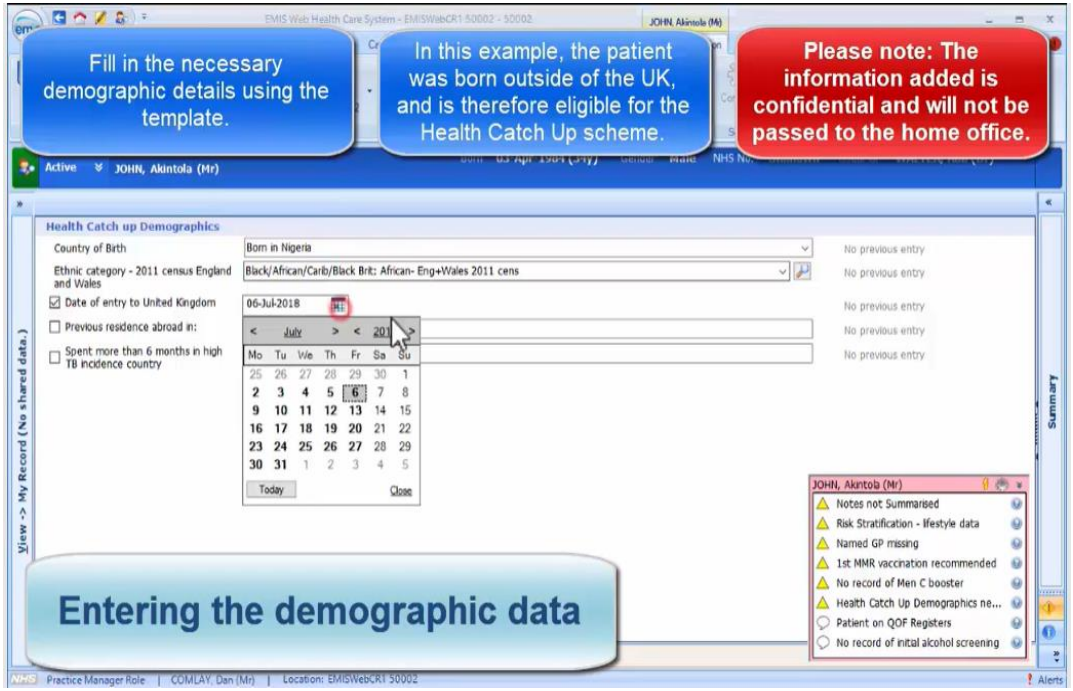
Mobile clinics – Apulia (Italy)

HEALTH Catch-UP!

Included Tests & Vaccines:

- HIV
- Hep B and C
- Haemoglobinopathy screening
- Diabetes
- Cholesterol
- Latent TB
- Chagas
- Strongyloidiasis and schistosomiasis
- Catch-up vaccines (MMR, Td/IPV, MenACWY, HPV)





Courtesy by Sally Hargreaves

https://emishealth.vids.io/videos/a49ad1bb1a18e4c72c/health-catch-up-with-requested-edits-mp4

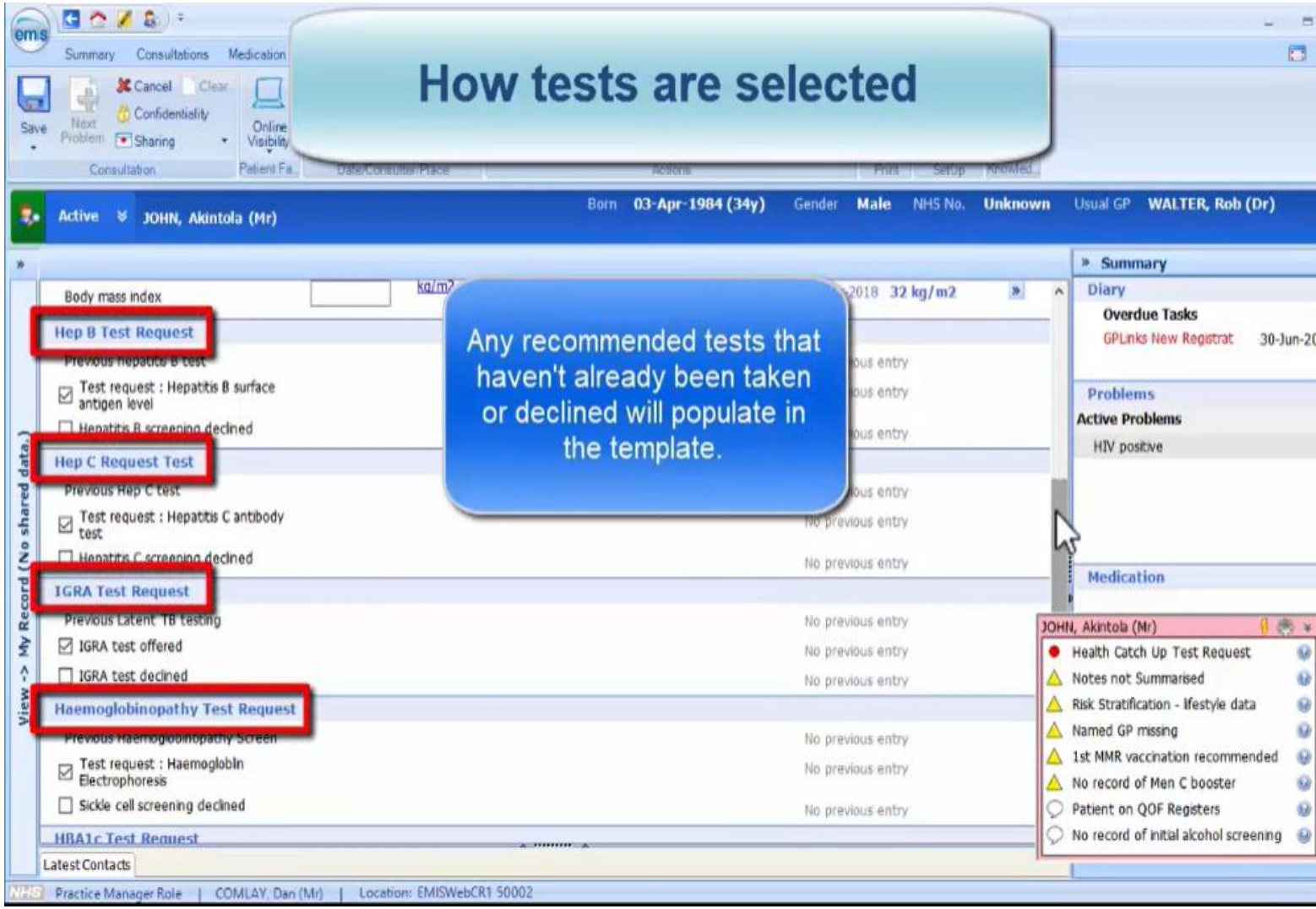
St George's University of London

HEALTH Catch-UP!

...and next time the patient's record is accessed a new alert shows.

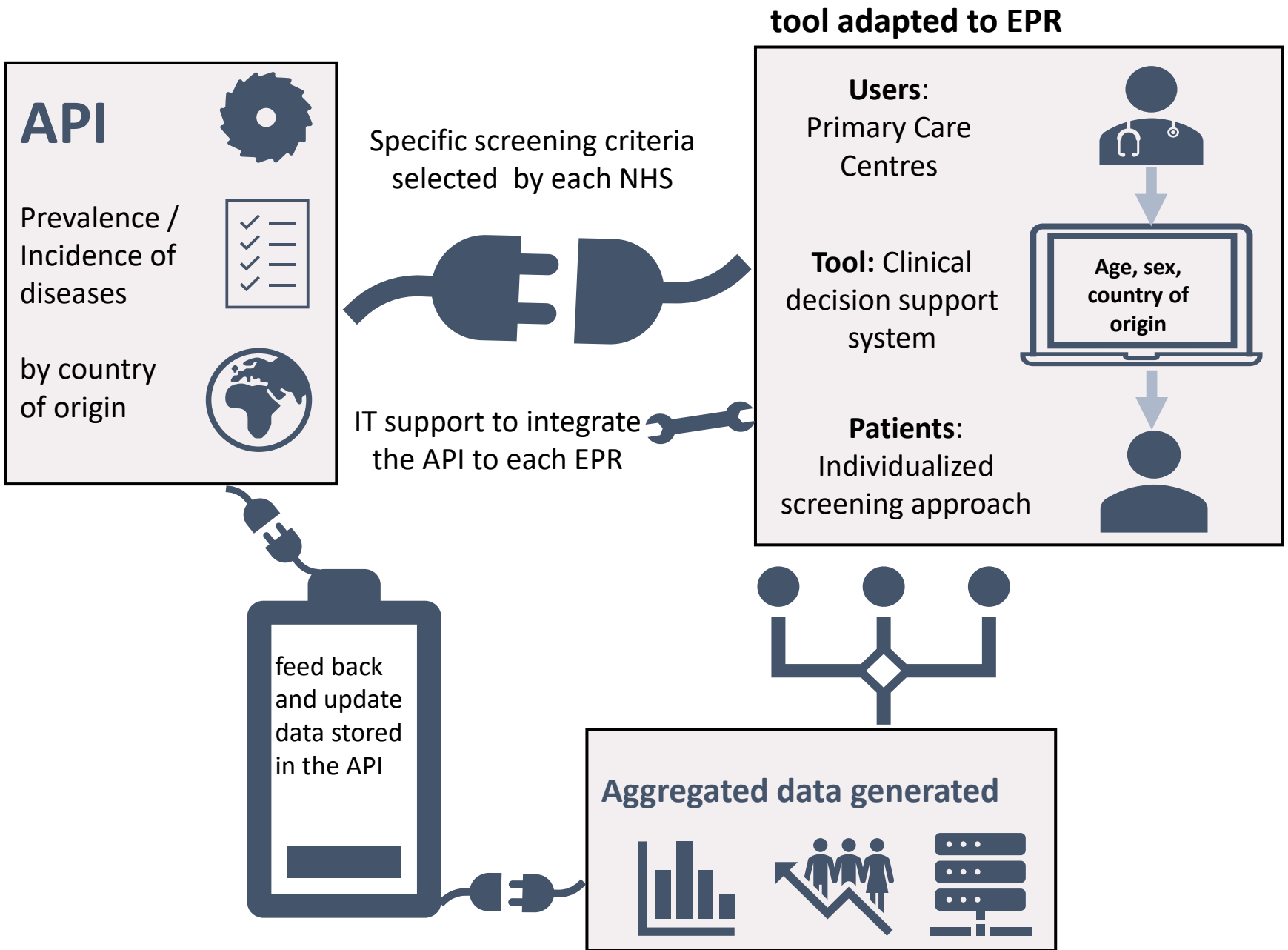
How tests are selected

Any recommended tests that haven't already been taken or declined will populate in the template.



Courtesy by Sally Hargreaves

New perspectives



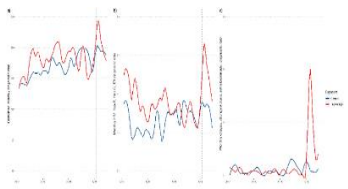
Innovation approach

Electronic Patient Records

Structured information (automatic extraction)

Clinical decision support system CRIBMI

- IP registered
- Contract signed



EPR –other HIS

Validating the tool at larger scale

Mental Health FGM

Unstructured free text (humans reading/extracting)

Natural Language Processing (NLP) Text Mining automatically extraction

Automated screening algorithms

Decision support system to identify individuals at high-risk of certain infections

Research dataset

Sociodemographic data

Medications

Health care episodes

Patients

± 7 million patients

Medical notes

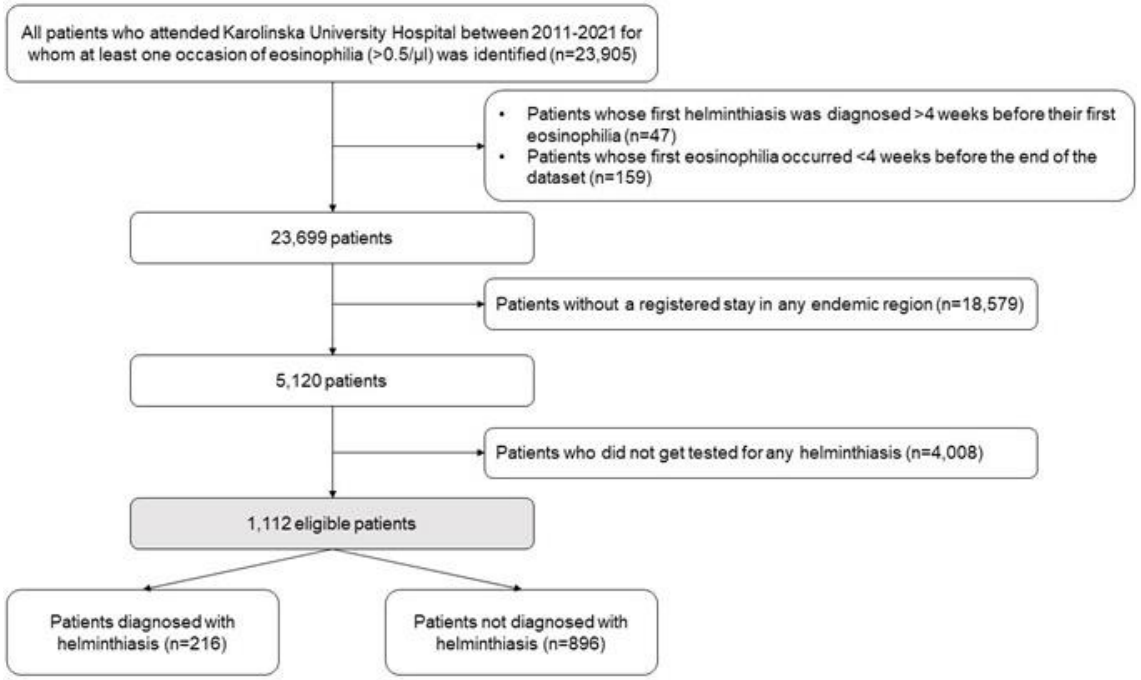
Emergency admissions

Complementary tests

Measurement values

Referrals, bookings

Prediction of helminthiases in travellers and migrants with eosinophilia in Stockholm – a cohort study



Variables	OR (95% CI)	p-value	aOR (95% CI)	p-value
Sex				
Female	0.83 (0.61-1.12)	0.222	0.87 (0.6-1.2)	0.395
Age	1.00 (0.99-1.00)	0.212	1.00 (0.99-1.0)	0.744
Region of origin				
EE	Ref		Ref	
LA	2.67 (0.71-9.95)	0.144	2.97 (0.7-11.4)	0.111
MENA	1.72 (0.50-5.90)	0.388	1.95 (0.6-6.8)	0.294
SSA	8.33 (2.5-27.3)	**<0.001**	7.88 (2.4-26.3)	**0.001**
Asia	2.59 (0.77-8.67)	0.123	2.58 (0.8-8.8)	0.131
Multiple Regions	4.57 (0.7-32.4)	0.128	4.71 (0.6-36.7)	0.139
Predictors				
Malaise & fatigue	3.17 (1.1-9.2)	**0.034**	2.93 (0.9-9.4)	0.071
Eosinophilia category				
High (>1500 cells/µl)	2.02 (1.43-2.86)	**<0.001**	2.14 (1.5-3.1)	**<0.001**
Malnutrition	4.16 (0.3-66.8)	0.314	9.1 (0.5-168.4)	0.138

Unpublished data

IMPREDICT

Data in additional systems
Social security data

Data warehouse with all EPR data

Secure research database - **anonymized** copy of data from data warehouse

EPR Primary Care

EPR for research purposes

Rare infections with diagnosis delay

Burden of imported diseases

Risk factors

NLP simple techniques:
Symptoms
Clinical findings
Travels

Structured variables

Development of screening & detection predictive algorithms

Validation of algorithms

Decision support tool

Integration in the EPR

Pilot study

Users
Health professionals

Software device
Clinical decision support system

Patients:
Individualized screening approach

Defined parameters

Other CDSS

CDSS to predict migrants at risk of under-immunization

Hypothesis: Official guidelines generally recommend catch-up vaccination in migrants when there is no evidence of previous vaccination records, but there are no tools to individualize the vaccine recommendation.

Seroprevalence studies are needed to generate more evidence on immunization status in migrants.

- The inclusion of socio-demographic and clinical data in the algorithm may improve the accuracy of the vaccination recommendations, better utilizing scarce health care resources

Conclusions

- Suggestive evidence for the increased detection of ID in migrant populations, specially for imported parasitic diseases, following the implementation of a screening decision support system in PC.
- Our results support integrated multi-disease screening programmes based on an individual risk assessment.
- Further studies should aim at validating these tools at a larger scale and assess its efficacy as a previous step before the implementation in the routine care.
- We can use routine data from EHR to develop CDSS
- Other CDSS could support clinicians to improve the detection of IDs in migrants

LEAVE NO ONE BEHIND

Thanks!

The ISMiHealth project is funded by ISCIII, co-financed by the FEDER from the EU, (FIS PI21/00651)

GOBIERNO DE ESPAÑA MINISTERIO DE SANIDAD

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Fundación "la Caixa"