



THORNHILL HEALTHCARE EVENTS

Accessible and Affordable

# Point of Care: Innovations

The Bristol Hotel – Harbourside

Bristol, UK. 20<sup>th</sup> September 2022

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Provided by Thornhill Healthcare Events Ltd.  
in conjunction with [POCTInnovators.com](https://POCTInnovators.com)







# WELCOME TO THORNHILL HEALTHCARE EVENTS

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Accessible and Affordable Healthcare Events  
and Consultancy

Managing Director - Tony Cambridge  
Lead Biomedical Scientist

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# Point of Care: Innovations

The Bristol Hotel ☐ Harbourside - Bristol, UK. 20<sup>th</sup> September 2022

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## Agenda

### 9.15 Product Fair

9.50 Introduction from Chair – **Tony Cambridge** Lead Healthcare Scientist and Event Organiser

- 10.00 Point of Care Testing and Point of Need – **David Wells** Chief Executive IBMS
- 10.35 Developing Future POCT Talent – **Nathan Sharpe** POC Industry Specialist
- 11.10 Accreditation in Healthcare, the future ISO 15189 journey, and where next for ISO 22870 – **John Ringrow**, UKAS Senior Assessment Manager
- 11.45 Point of Care Testing in Primary Care – **Liz Cross** Advanced Nurse Practitioner
- 12.15 Lunch - Networking/Product Fair
- 13.30 Remote Monitoring of the Immune System: Opportunities and Challenges – **Kourosh Saeb-Parsy** Professor of Transplantation and Consultant Transplant Surgeon, University of Cambridge, Chief Medical Officer, Oxford Immune Algorithmics
- 14.00 Infection and Immunity in Sepsis: Can Host Response Diagnostics Improve Outcomes – **Charlotte Duncan** Scientific Director
- 14.30 Networking/Product Fair and Refreshments
- 15.30 Embedding Sustainability in the Clinical Laboratory – Partnerships, POCT and GIRFT – **Sheri Scott** Senior Lecturer in Biomedical Science, Nottingham Trent University
- 16.00 Syndromic Testing in the Community – **Dr Kay Roy** Consultant Respiratory Physician, University College London Hospitals NHS Foundation Trust
- 16.30 Closing remarks from the Chair

All topics and speakers are subject to change

**\*Free places available for NHS staff – visit [POCTInnovators.com](https://POCTInnovators.com), events to book your place**

\*On booking, the delegate will be asked to confirm that in the event of non-attendance a delegate charge will be applicable to cover costs

Vendor details for Procurement Departments: Thornhill Healthcare Events Ltd registered in England and Wales, company number 11323389, registered address 43 Thornhill Road, Mannamead, Plymouth, Devon. PL3 5NF.



## Speaker Biographies

### David Wells



David is recognised as being one of the 100 powerful advocates for pathology in the global community by the Pathologist magazine in 2018, 2019, 2020, 2021 and 2022. Until June 2021 David was leading the NHS England and Improvement Pathology consolidation programme, seeking to deliver efficient, high quality pathology services across England.

During the COVID 19 Pandemic David led NHS England's laboratory response across the country by managing technology deployment, capacity, funding and workforce to ensure that all capacity requirements were met. The role included advising ministers and healthcare leaders whilst providing policy and strategic direction as a subject matter expert.

In recognition of this work and the work in transforming England's pathology services, the Royal College of Pathologists awarded David Honorary fellowship of the college in 2020. David was also awarded honorary Doctor of Science by Anglia Ruskin University in recognition of his contribution to the national response during the pandemic. In 2021 David was awarded the CSO's Lifetime Achievement award again in recognition of his leadership of Pathology services during the Pandemic and Honorary Fellow of the Academy of Healthcare Science in 2022.

David has a diverse and almost unique experience of providing and leading pathology services to primary, secondary and tertiary care across all pathology disciplines and out into other areas of Healthcare science and diagnostics.

David has previously been an elected IBMS council member for the London Region. David has also represented the IBMS on NICE diagnostic advisory panels, and various national forums including an observer on the Royal College of Pathologist Council and in the Parliamentary and Science committee.

David was appointed Chief Executive of the Institute of Biomedical Science in June 2021 to lead this global professional body representing 21,000 members across 74 countries. Additionally, David was appointed the Scientific Lead for Pathology, for NHS London, in September 2021.

## **Nathan Sharpe**



Nathan works as a Business Manager across the Point-of-Care Diagnostics market on a global scale. He is fascinated by the way in which Point of Care testing is vitally affecting our everyday lives and is always looking to connect with innovative individuals and organisations working in this area. Nathan and the team at Charlton Morris provide recruitment and marketing services for projects on a global scale.

## **John Ringrow**



After gaining a degree in Biochemistry and Microbiology from Leeds University, John's first post was as a company microbiologist in a small scientific consultancy specialising in foods, waters, cosmetics and pharmaceuticals and sterile manufacture processes. His main interests however were in medical microbiology, so he joined Poole PHLS and hospital microbiology laboratories, where he completed the then IBMS Special exam.

John then moved to County Durham, developed an interest in management and quality, gained qualifications in such and held senior, management then quality management posts until the end of 2005.

John joined CPA (UK) Ltd as a full time Regional Assessor in January 2006. CPA is now a wholly owned subsidiary of the United Kingdom Accreditation Service (UKAS) and since June 2013 he was an Assessment Manager (AM) with UKAS and from November 2014, promoted to Senior Assessment Manager. John manages other AMs and is active in various projects, including training in ISO 15189:2012 and ISO 22870:2016 and training for new AMs. He also leads on promoting, marketing and communications for the Healthcare Section.

During John's professional career and in his many outside interests and activities, John has always developed his interest in teaching, training and biomedical science promotion and career development and been active in education and development of scientific and support staff. He has actively promoted pathology to a wider audience within the NHS and has been involved in both medical and nursing staff education.

John has been involved in and tutored on courses for the IBMS, been a training/portfolio assessor for the CPSM and then IBMS, panel member for the HCPC and been a lay board member for the Northern Deanery involved with post graduate medical education. John has presented at numerous local and national meetings on both scientific and management themes, and since working for CPA and then UKAS, he now presents regularly on quality and accreditation themes.

When not working, John has a passion for all things "trains, planes, automobiles and motorcycles" and can be found at heritage railways or practicing advanced driving techniques both in cars or on one of his growing collection of motorcycles. He has a private pilot's licence, although spiralling costs and time constraints have curtailed that pursuit for the time being. He is also currently planning to restore an MGF car.

### **Professor Kourosh Saeb-Parsy**



Kourosh Saeb-Parsy is Professor of Transplantation at the University of Cambridge UK and a kidney, pancreas and liver transplant surgeon in the NHS, UK. He leads a research group at the Department of Surgery, University of Cambridge, focused on the immune response to transplantation, cancer and regenerative cellular therapies. His program leverages unparalleled access to human tissue and comprehensive in vitro, ex vivo and in vivo experimental models and he has been the PI or Co-PI on several clinical trial.

Kourosh's research has resulted in >100 peer-reviewed publications (>25 in Nature or Science family journals) that have been cited >11,000 times. He has obtained >£35m in grant funding and has established major partnerships with big pharma, delivering millions of dollars of academic and commercial services and contracts. Kourosh has extensive commercial experience and network, including as Chief Medical Officer at Oxford Immune Algorithmics. Kourosh holds a B.A., a Ph.D. and an M.B., B.Chir., all from the University of Cambridge. He is a Fellow of the Royal College of Surgeons of England and has received numerous prizes and awards, including The Bulkley-Barry-Copper Professorship from the King's Health Partners in London.

## Charlotte Duncan



“After graduating from the University of Sheffield I joined Dynal Biotech working as a Research Scientist in HLA Transplant Diagnostics, and I have since worked in various roles within industry including quality assurance, manufacturing, sales, technical support and product management. More recently, after working for Pro-Lab Diagnostics for almost 11 years, I have taken on the role of Scientific Director. I have a passion for diagnostics and in ensuring the knowledge and dedication of all in our sector are recognised. I also firmly believe effective collaboration between industry, regulators and end users is vital to making the UK a world leader in healthcare related diagnostics. This is particularly so in infectious disease, where engagement with public health authorities is key to ensuring innovation is relevant and appropriate.”

## Liz Cross



Liz is the lead nurse at large GP practice in Watford, Hertfordshire. She has a special interest in diabetes and respiratory medicine. She is an advanced nurse practitioner and non-medical prescriber. She is currently the nurse representative on the NICE Indicator Advisory Committee and Beds and Herts RCGP. She was made a Queen's Nurse in 2016 and held a NIHR research fellowship in 2017 looking at a point of care testing for LRTI in general practice. Pre covid, Liz regularly presented on CRP point of care testing. To date she has presented to NHS Improvements, BBC R4, NICE, PHE/Antibiotic Guardian, universities and House of Commons to MPs and Peers. In 2020 she was part of NESTA's Longitude prize delegation speaking at AMR diagnostics events in Mumbai, India, California and Boston <https://longitudeprize.org/antimicrobial-resistance>

## **Sheri Scott**



Sheri Scott is a Senior Lecturer and course leader for the IBMS accredited BSc Applied Biomedical Science at Nottingham Trent University.

Sheri joined academia in January 2018 after a career covering 21 years working in Clinical Biochemistry in NHS laboratories. As a HCPC registered Biomedical Scientist professional and Chartered Scientist, Sheri is an advocate for continual professional development and champions for sustainability.

As part of her academic and professional practice roles, she leads on embedding sustainability into clinical laboratory practice on behalf of the Institute of Biomedical Science and The European Federation of Clinical Chemistry and Laboratory Medicine

## **Dr Fay Roy**



Dr Kay Roy graduated in medicine from the University of Manchester. She was subsequently awarded a PhD in 2008 for research on characterisation of patients with chronic obstructive pulmonary disease (COPD). Her specialist respiratory training was undertaken in the Cambridge deanery.

She was appointed as a consultant in West Hertfordshire before moving to lead the asthma service at UCLH. She is also Lead for UCLH's smoking cessation and sarcoidosis services and supports the complex infection service.

In her current role as an integrated respiratory physician, Dr Roy works closely with the community services involved in COPD care and is also a member of the respiratory focus group at North Central London leading on medicines management and sustainability.

Dr Roy has been the principal investigator on a number of multicentre clinical trials in COPD and asthma. Her current external duties include roles within the British Thoracic Society, in which she is a member of the quality improvement committee and the pulmonary infection specialist advisory group as well as a NICE committee member for asthma diagnosis and management.

In 2019-2020 she has been a finalist for awards from The British Thoracic Society, The Health Service Journal and The British Medical Journal, for work on community-based projects around COPD exacerbations and point of care testing for infection.

## Future of Diagnostics - POCT

## Diagnostic – POCT

POCT is increasingly being used in a range of settings that Laboratory Medicine needs to have input in.

The Pandemic and patient expectations have changed dramatically and we need to respond to this.

It is our task to ensure that diagnostic services truly benefit patients, clinicians and patient pathways.

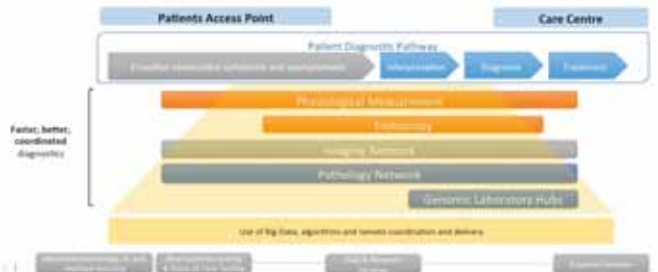
## Diagnostic – Current Reactive State

Diagnostic services are currently focussed on the traditional paradigm of reacting to patient symptoms as they present, largely delivered from services based in secondary care settings.



## Diagnostic – Future Pro-active Vision

The future of Diagnostic services will be much more proactive, supported by analysis of healthcare data harvested from a much wider population, enabled by machine learning & AI technology. This new diagnostic paradigm will deliver improved clinical outcomes and significant downstream savings through early identification of disease and more services based in primary care.



## POCT into the future

POCT is increasingly being used in a range of settings that Laboratory Medicine needs to have input in. **These are no longer in areas that traditionally fall under the influence of the laboratory.**

- Self testing – In-hospital, Self monitoring
- Home testing – COVID-19, Pregnancy, Sexual Health
- Clinical setting – GPs, Outpatients
- Hospital setting – ED, ICU, Acute care



## POCT demands



- There is a patient safety imperative that quality standards and governance are maintained.
- Lessons learned from the pandemic highlight the need for a clear use case for the type of technology.
- We need to consider the types of uses of POCT to ensure the correct advice, technology and performance is deployed.
  - Testing to diagnose or support a clinical pathway
  - Testing to support a care pathway or intervention

## POCT demands

- A need to consider the impact of expert patients, and long term conditions on technology use.
- A need to consider the workforce. Those operating, those monitoring, those training and educating users and those selecting and deploying the equipment.



## POCT Policy

- NHS England have published community based guidance
- Produced in conjunction with Pharmacy teams.
- Not clear whether this guidance was produced in conjunction with Laboratory based scientists



## POCT Policy

The effective management of medical devices involves three principles:

- **Buy it right:** equipment must be fit for its intended purpose
- **Use it right:** equipment function and operation must be understood by the user.
- **Keep it right:** equipment must be maintained in a safe and reliable condition.



## POCT Policy

### Recommendations:

- Identify best practice in the **selection of equipment** that ensures adequate safety and quality to optimise cost and minimise risk.
- Describe an **operational management system** applicable to community pharmacy that ensures POCT technology is efficiently maintained and competently used by trained operators, risks are effectively addressed, medical device performance is optimised, and a high standard of service is delivered.
- Establish a model of good **clinical governance** that satisfies independent regulators and meets applicable quality standards.



## POCT Policy needs to go further

- POCT to be defined and policy directed to support the application within the care setting.
- Set out clear principles to govern the use and application of POCT.
- Define the quality standards to be met and the road map to introduction proposed. (ISO15189 vs ISO22870).
- The needs and demands of the workforce.

## POCT Policy needs to go further

- Policy should set out the method to define the use case and from there the requirements and expectations of the technology.
- To resolve the question of whether a candidate list of tests or range of tests that can be used should be developed.
- The level of IT connectivity required, and whether this is dependent upon care setting.
- Policy should be in consensus and agreement of the NHS and professional bodies on POCT going forward.

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## POCT: Testing for better care



### Equality of access

All patients able to access diagnostics in a timely way, able to access diagnostics needed to facilitate their care



### Clinically or operationally appropriate

Access to testing that speeds and improves their access to healthcare



### Accreditation and quality assurance

Pathology in the UK has led the way in clinical accreditation for more than 20 years.



### True integration and interoperability

Removing duplication, sharing testing output

## Discussion – All in a name?

- Does Point of Care Testing adequately describe what we are doing, or is it Point of Need Testing?

- Self testing
- Home testing
- Clinical setting
- Hospital setting





## Building an **Impactful Talent Strategy** within POC Diagnostics.

CM LifeScience.

### Introductions.



Nathan Sharpe.  
Business Manager

CM LifeScience.

Building an Impactful Talent Strategy:

Step 1: **Strategise**

Step 2: **Talent attraction**

Step 3: **Supercharging your hiring**

CM LifeScience.

Step 1: **Strategise**

# Who do you need?

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Step 1: **Strategise**

Be open to diversifying your team.  
**What skillsets are you missing?**



CM LifeScience.

Step 1: **Strategise**

# Today's **talent market**

CM LifeScience.

Step 1: **Strategise**

## Where do you stand compared to the competition?

CM LifeScience.

Step 1: **Strategise**

What are you doing?  
**What aren't you doing?**

Think about:

Benefits  
Reputation

Culture  
Brand  
Employer Brand  
Technology

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Step 1: Strategise

# Communicate your long-term plan



# Step 2: Talent Attraction



Step 2: Talent Attraction

# First impressions matter...



Step 2: Strategise

# Brand Vs Employer Brand



Step 2: Talent Attraction (Employer Brand)



Step 2: Talent Attraction (Employer Brand)

# People trust people.



Step 2: Talent Attraction (Employer Brand)



-  Company Pages
-  Personal Pages



Step 2: Talent Attraction

# Job Adverts Vs Job Descriptions

Which do you do?



Step 3: Hiring

## Step 3: Hiring



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Step 3: Hiring

Your process should  
**mirror** your culture

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Step 3: Hiring

Be honest



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Step 3: Hiring

Aftercare



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Building an Impactful Talent Strategy for Your Life Science Start-Up  
In summary:

Step 1: Strategise

Step 2: Talent attraction

Step 3: Supercharging your hiring

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Questions?

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Thank You

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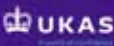


## Accreditation in Healthcare, the future ISO 15189 journey, and where next for ISO 22870



John Ringrow  
Senior Assessment Manager - Healthcare

[www.ukas.com](http://www.ukas.com)



## Over two years since the first lockdown...

UKAS, the pandemic, an update on the last two years, recent changes within the Healthcare Section and projects on the horizon.



### UKAS Update

- + Accreditation to support the pandemic response
  - + Background to this project
  - + During the pandemic
  - + What next?
- + ISO 22870:2016
  - + Current Standard
  - + Where does 22870 fit in going forwards
  - + Considerations when planning POCT services (regardless of Standards)
- + Changes within the Healthcare section
- + UKAS projects on horizon



### + Accreditation to support the pandemic response

Private providers of covid 19 sampling and testing



### Background

- + December 2020. Legislation introduced, mandating UKAS accreditation to ISO 15189:2012, 17025:2017, and/or 22870:2016 for all private sector providers of COVID-19 testing.
- + Private providers include
  - + Sampling providers
  - + Testing Laboratories
  - + POCT providers
  - + Front end providers (No accreditation needed, but did need to submit a self-declaration to DHSC)
- + Different workstreams were activated in response to changing need;
  - + General Population
  - + Test to Release
  - + Day 2 & 8 PCR
  - + Day 2 UFD





### Challenges and Opportunities for UKAS

- + Volume of work
- + Lack of assessors for sampling/POCT activities
- + Provision of ongoing accreditation service to existing customers
- + New customers being very unfamiliar with accreditation requirements. Large number of findings raised, additional effort needed to support customers clearing findings
- + Changing DHSC requirements due to changing impact of COVID-19
- + CTDA approved/protocol assay lists
- + Remote assessments
- + First time accreditation has been mandated in UK law for healthcare
- + Opportunity to support the national response to COVID-19
- + Opportunity to develop new assessment skills and tools





## ISO:22870 and it's relationship with ISO:15189 now...

## Going Forwards...

### Point of Care Testing

“analytical patient testing activities provided within the institution (responsibility of the accredited entity) but performed outside the physical facilities of the clinical laboratories. It does not require permanent dedicated space, but instead includes kits and instruments, which are either hand carried or transported to the vicinity of the patient for immediate testing at that site”.

### Definitions

ISO:22870:2016

3.1  
**point-of-care testing (POCT)**  
**near-patient testing**

“testing that is performed near or at the site of a patient with the result leading to possible change in the care of the patient”

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## Why ISO 22870 in the first place?

- + Point of care testing (or near patient testing) not in traditional laboratory setting
- + Remote delivery and management
- + Increased risk points due to this setting.

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## Why ISO 22870?

Patient and facility risk can be managed by a well-designed, fully implemented QMS that facilitates:

- + evaluation of new or alternative POCT instruments and systems,
- + evaluation and approval of end-user proposals and protocols,
- + purchase, installation and maintenance of equipment,
- + maintenance of consumable supplies and reagents,
- + training, certification and recertification of POCT system operators, and
- + quality control and quality assurance.

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## Why ISO 22870?

Still relevant and provides a framework for services offering POCT, although will become part of ISO 15189:20XX.

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## Current ISO 22870 management system clauses – beyond ISO 15189

### + 4.1 Organization and management

- + Development of processes for PoCT
- + Professional and PoCT group responsibilities

### + 4.2 Quality management system

- + Document PoCT process across organisation
- + Evaluation and monitoring of PoCT
- + Laboratory director responsibility for the integrity of the QMS
- + Quality manual integration with PoCT

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## Current ISO 22870 management system clauses – beyond ISO 15189

### + 4.5 Examination by referral laboratories

- + Does anybody know the differences?
- + Remainder until 4.9 are the same
- + **Non-conformities & actions** (4.9, 4.10, 4.11)
  - + Specific capture of PoCT issues
  - + Are these processes impacting continual improvements
  - + Specific data input into NCs

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## ISO 22870 management system clauses – beyond ISO 15189

### + 4.12 Continual improvement

- + Specific PoCT inputs to review benefits
- + **4.13 Quality and technical records**
  - + More detail on all records for PoCT
- + **4.14 Internal audits**
  - + Focus on QA and improvements to embed into process
- + **4.15 Management review**
  - + PoCT specific to effectiveness and laboratory director responsibilities

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## What is ISO 15189?

*"...a medical laboratory's fulfilment of the requirements of this International Standard means the laboratory meets both the technical competence requirements and the management system requirements that are necessary for it to consistently deliver technically valid results."*

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## ISO 15189:20XX

ISO 17025 (2017) is the parent document for ISO 15189

ISO 17025 is a normative reference document for ISO 15189 so the revision mirrors the structure of ISO 17025 (and other ISO standards).

The way Standards are written is governed by ISO directives

Input and contributions by through international accrediting body community through a Draft International Standard (DIS) process.

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ISO 15189:20XX

- Patient Focused
- Risk based
- Support for laboratories through other ISO Standards
  - +ISO 22367:2020 Medical Laboratories – Application of risk management to medical laboratories
  - +ISO 35001:2019 – Biorisk management for laboratories and other related organisations

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ISO 15189:20XX

- Deliberately not too prescriptive
- Need to read it carefully and think about how to implement within your own laboratory
- Other linked documents

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ISO 15189:20XX

- Quality Manual - Y or N?
- Quality Managers - Y or N?
- Service agreements, especially for POCT
- A Normative annex for POCT, if you include POCT in your scope the requirements of the annex must be followed.

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ISO 15189:20XX

- Other considerations
- Pre-analytical
- Quality Control
- Contingency
- A Standard for all disciplines

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ISO:22870 and it's relationship with ISO:15189 now...

Going Forwards...

Timescales?

Scope of Application

- Scope of application is up to you!
- May want to start with e.g. just glucose meters or blood gas machines. Then expand with extensions to scope later.
- Let us know if you want to be assessed/accredited for sampling as well (goes on schedule)
- Pre-assessment – an option – but useful

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ISO 17011:2017 Sampling

7.4.5 The procedures shall ensure that the assessment team assesses the performance of a sample of the conformity assessment activities representative of the scope of accreditation. The assessment shall cover a sample of locations and personnel to determine the competence of the conformity assessment body to perform the activities covered by its scope of accreditation.

7.4.6 In selecting the activities to be assessed the accreditation body shall consider the risk associated with the activities, locations and personnel covered by the scope of accreditation.

7.4.7 The accreditation body shall develop an assessment plan to cover the activities to be assessed, the locations at which activities will be assessed, the personnel to be assessed where applicable and the assessment techniques to be utilized including witnessing where appropriate or applicable. The accreditation body shall justify where witnessing is not appropriate or applicable.

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Sampling of activities

**Site** = Trust/legal entity/Building e.g. NHS Trust, Hospital

**Cluster** = Wards, clinics, GP surgeries, Critical care units, Theatres

**Delivery Point** = ITU, Ward 1-12, Labour ward, INR clinic, Theatres 1-4, GP surgery X

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## Sampling of activities

Policy for sampling at Initial Assessment/over 4 year cycle

Review key differences

Witness a representative portion

Witness all key activities

Witness all different types of site/cluster/delivery point

Consider overall risk



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Specific Requirements & key areas to still consider – with reference to current ISO 22870

## The POCT Provider – Laboratory & Legal Entity

- + What happens if the entity that is providing the service is not a medical laboratory?
- + What are the possible implications?
- + UKAS, as an accrediting body, needs to establish that the applicant entity is responsible for results not just POCT management



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## Arrangements and considerations

Operators (potentially) may not be employed by applicant entity or department

Contract between applicant entity/department and 'owners' of the 'delivery points' is critical and should be requested prior to the assessment for review

What happens if there is a mistake? Who is liable?

Operators (and others) need to follow and be trained in POCT providers' policies and procedures

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## Management and 'groups' – 4.1



RESPONSIBILITIES



COMMUNICATION OF ROLES AND RESPONSIBILITIES



EVALUATION AND INTRODUCTION OF POCT DEVICES

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## Management and 'groups' – Summary



- + Composition of groups
- + Output – Reports AND actions
- + Implementation as described
- + Overall effectiveness of these groups

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## Personnel

Another clause attributed to the laboratory director (or delegate)

### 5.1.4

- + Includes reference to a training manager (sort of)

Who is ultimately responsible for defining someone as competent at performing POCT?

How, by way of evidence, would a POCT provider demonstrate this?



## Personnel considerations – 5.1



- + POCT coordinator generally has operator training responsibilities – these may or may not be directly employed by provider
- + Programme must be carefully assessed and in depth to ensure there can be no drift in competence due to cascade of training
- + Records, CPD – responsibility of provider

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+ Training must capture management system aspects such as nonconforming work, booking in, induction into the Management system, complaints etc.

+ What controls are in place to ensure that only authorized users have access to providing POCT?

+ Passwords can be used for automated systems but what about more manual processes?

**Personnel considerations – 5.1**



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**Conformance considerations and common issues**

**Common ISO 22870 issues – Pre-examination**



+ Pre-examination issues  
 + Accommodation and Environment  
 + Reagents and Consumables  
 + Equipment  
 + Examination processes and procedures  
 + Quality Control  
 + Quality Assurance  
 + Post examination issues

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**Future**

+ Significant changes & communication with UKAS  
 + Flexible scope if change is common  
 + ISO 15189 and ISO 22870 and then ISO 15189:20xx

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**+ UKAS Healthcare Section**



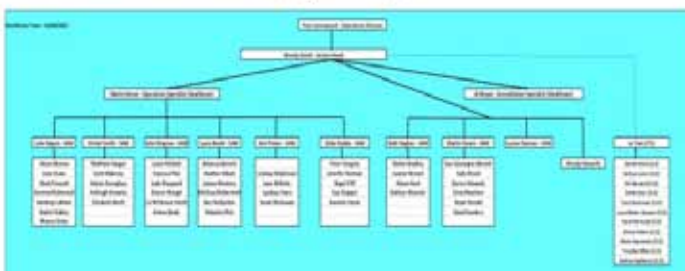
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**UKAS Healthcare Section**

+ Prior to pandemic – Healthcare section – merger of Medical Laboratories, QSI and IQIPS  
 + Summer 2021  
 + Assistance from other areas within UKAS, and assistance within the section management team  
 + November 2021 – Ben Courtney left UKAS. Wendy Smith takes over as new Section Head. Two further management posts created  
 + Healthcare Accreditation Specialist  
 + Operations Accreditation Specialist  
 + Recruitment of new Assessment Managers  
 + Recruitment of Senior Assessment Managers  
 + Recruitment of Customer Liaison Officers (at UKAS Office)

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**UKAS Healthcare Section (August 2022)**



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**+ Future projects and improvements to process**





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## UKAS projects on horizon



### Future Projects and Improvements to Processes

- Advanced Booking – further ahead
- Technical Focus Persons within each discipline
  - Regular meetings for Technical Assessors to discuss current topics and assessment issues
- Focus of assessment documentation
- Ways of file sharing
- Previous information on particular customers
- Participation at openmindedness meetings
- Feedback to customers
- Information sharing during split assessments

## UKAS projects on horizon



### Future Projects and Improvements to Processes

- Risk based approaches to assessments
- Enhanced Assessment Reporting mechanisms and AuditComply
- UKAS Portal
  - Pilot and post launch
  - Roll out to all sections within UKAS
- Impact upon laboratories and UKAS of the R C Path GIFT Report

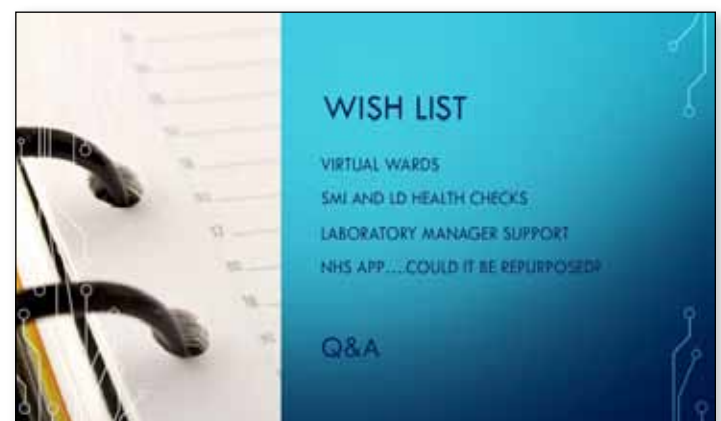
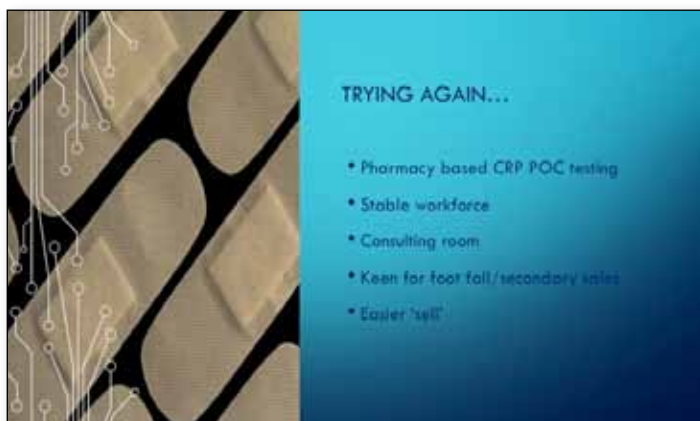
## What next?

- Private providers: extend scope to include additional services – as markets and requirements of organisations change and adapt/respond
- UKAS:
  - remain responsive to changes in testing requirements, both private and NHS
  - Return to “business as usual” for all customers
- ISO 15189:20XX – Transition project – for all Laboratories accredited to ISO15189:2012
- ISO/IEC 17043:2010 – also a Transition to expect once revision of Standard completed.
- WHO 6<sup>th</sup> Edition of Laboratory Manual for the examination and processing of Human Semen – also a Transition for Andrology services to using the new edition.



Thank you

[www.ukas.com](https://www.ukas.com)



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## Personalised Immune Monitoring

**Kourosh Saeb-Parsy MA MB BChir PhD FRCS**  
 Professor of Transplantation, University of Cambridge  
 CMO Oxford Immune Algorithmics

[kourosh.saeb-parsy@algocyte.ai](mailto:kourosh.saeb-parsy@algocyte.ai)

**Immune Algorithmics**

## Introducing the Immune System

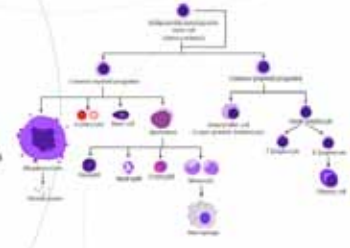
A complex biological defence system

Evolves to **protect** the host against infections

Active in **all organs** and tissues

Broad range of specialised **cells, proteins & chemicals**

Central role for **white blood cells**



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## One Biological System to Rule Them All

The Immune system is integral to human health and disease [See Appendix]

- **Infections** (bacterial, viruses, fungi)
- **Autoimmune diseases** (e.g., diabetes, rheumatoid arthritis)
- **Cancers**
- **Neurodegenerative conditions** (e.g., Alzheimer's, multiple sclerosis)
- **Mental disorders** (e.g., depression)
- **Cardiovascular disorders** (e.g., myocardial infarction, vascular disease)
- **Injury and repair**



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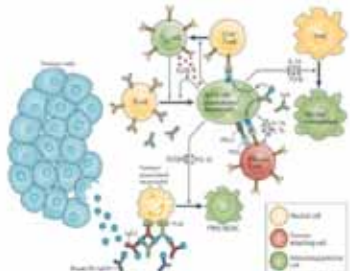
## Immune System & Cancer

The immune system recognises and eliminates abnormal cancer cells

Abnormalities can lead to the development of cancer

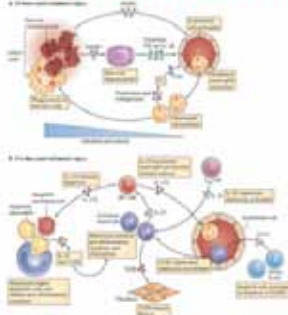
Many treatments interact with the immune system

Adverse effects of treatment are often mediated by the immune system



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## Immune System & Cardiovascular Disease



The immune system has a critical role in driving the acute inflammatory and regenerative responses after myocardial infarction

Soluble mediators and both **innate and adaptive immune cells** mediate the response to cardiac injury

Suppression of excessive inflammation and enhancing regeneration is a novel therapeutic opportunity

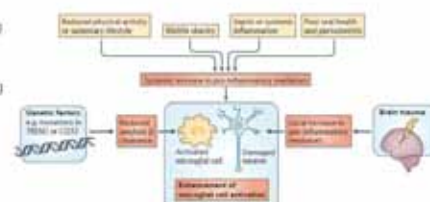
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## Immune System & Neurodegeneration

Immune signalling is implicated in neurodegenerative diseases including Alzheimer's and Parkinson's

Chronic **neuroinflammation** involving microglia key in triggering and propagating injury

Amelioration of neuroinflammation represents an attractive therapeutic target



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## Immune System & Depression



**Crosstalk** between inflammatory pathways and neurocircuits affect behavioural responses

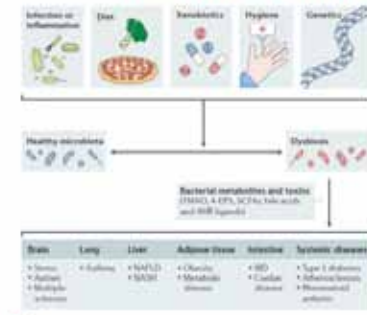
The immune system interacts with neurotransmitters and neurocircuits to influence the **risk of mental disorders** such as depression

The immune system mediated **stress-induced** signals to the brain

Manipulation of the immune system is a promising **therapeutic modality** for treatment of depression

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## Immune System & Dysbiosis



The **microbiome** consist of the micro-organisms that live within or on the human body

Disturbance of the microbiome is called **Dysbiosis**

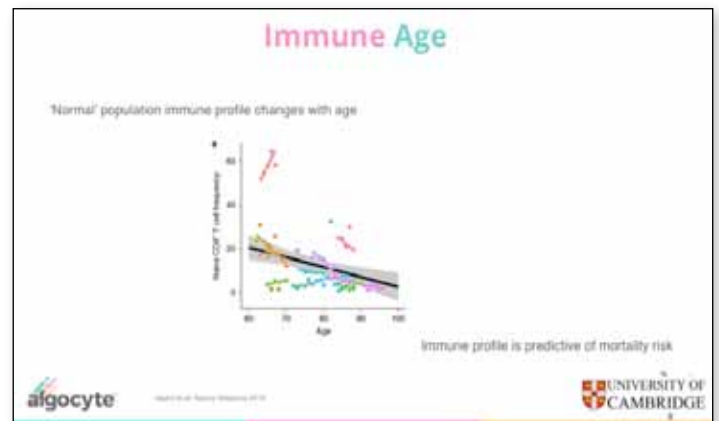
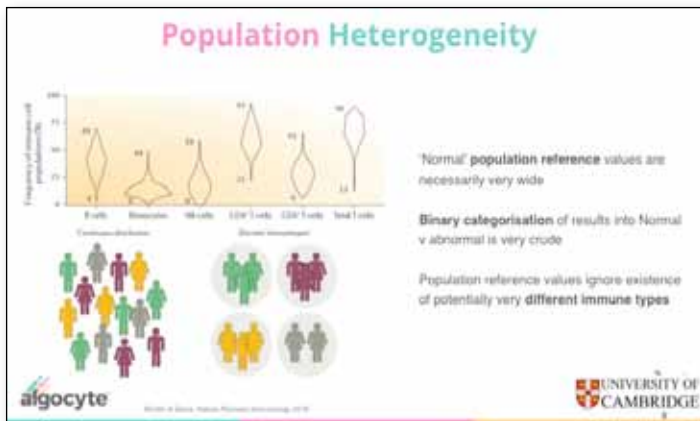
Dysbiosis is linked to the pathogenesis of a broad range of **disorders**

The **immune system** mediates the causes and consequences of Dysbiosis

| Brain                                        | Lung               | Liver                                     | Adaptive Immune                   | Innate Immune                                 | Systemic diseases                                                    |
|----------------------------------------------|--------------------|-------------------------------------------|-----------------------------------|-----------------------------------------------|----------------------------------------------------------------------|
| • Stress<br>• Autism<br>• Multiple sclerosis | • COPD<br>• Asthma | • NAFLD<br>• NASH<br>• Metabolic diseases | • Chronic<br>• Metabolic diseases | • SIRS<br>• Cardiac<br>• Rheumatoid arthritis | • Type 1 diabetes<br>• Infectious diseases<br>• Rheumatoid arthritis |

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### Key Messages

- 3: Immune Health is not a Binary Variable
- 4: Definition of Immune 'Normality' Should be Personalised

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### Advanced Immune Monitoring

To harness the predictive power of the immune system, we must:

- Generate longitudinal personalised immune data
- Identify deviations from 'personalised' norms
- Integrate data related to the individual's internal and external environment
- Analyse data for diagnosis, monitoring, risk stratification, response to treatment, etc

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### The OIA Solution: Mobile Health Station

Democratise access to personalised monitoring of the immune system

- Safe
- Cheap
- Rapid
- Reliable
- Accessible

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### Introducing the Immune Score

Distance and Colour-based Score for Blood Test Risk Stratification

Distance and colour-based method for communicating deviations in immune parameters

Adaptive score based on 'learning' from personalised longitudinal data

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### Key Messages

- 5: Personalised Immune Monitoring Offers a Paradigm Shift
- 6: Enabled by Responsible AI and Causal Diagnostics
- 7: Will Democratise Clinician-led Remote Immune Monitoring

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### Path to Vision

Path to Vision 2021 - 2022

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**Speaker: Kourosh Saeb-Parsy**

## Beyond Immune Monitoring

Algocyte can be used for personalised and sophisticated monitoring of all blood analytes, including:

- Renal function
- Liver function
- Thyroid function
- Bone metabolism
- Blood gas analysis
- And others

Data can be input into the Algocyte platform by direct connection with hospital or third party laboratories



  
**algocyte**  
THANK YOU

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Dr Hector Zenil CEO  
[hector.zenil@algocyte.ai](mailto:hector.zenil@algocyte.ai)  
<http://immunealgorithmics.com>

## INFECTION AND IMMUNITY:

### CAN HOST RESPONSE DIAGNOSTICS IMPROVE OUTCOMES

- CURRENT CHALLENGES IN DIAGNOSING SEPSIS
- HOST RESPONSE DIAGNOSTICS
- ONGOING CONSIDERATIONS

CHARLOTTE DUNCAN  
SCIENTIFIC DIRECTOR



## History of Sepsis

...it is our response [...] that makes the disease."  
Lewis Thomas, NEJM (1972)

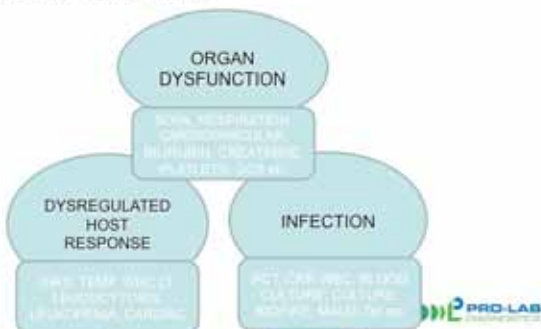
"Sepsis is defined as an invasion of microorganisms and/or their toxins into the bloodstream in combination with the response of the organism to this invasion."

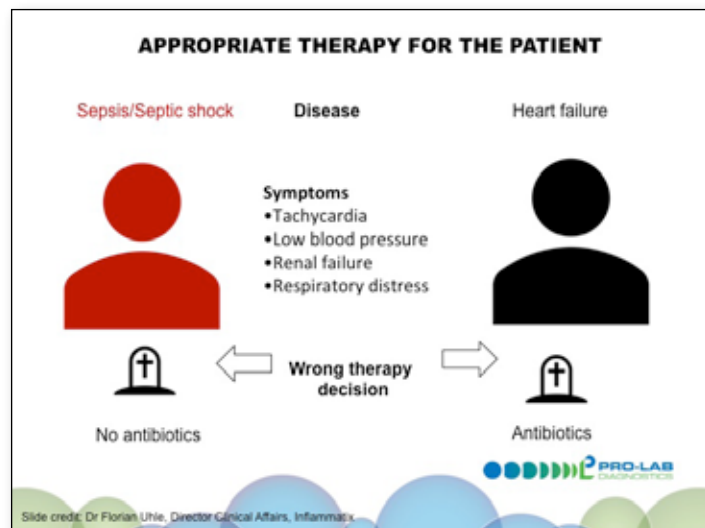


## SEPSIS

Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.

Singer M et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA. 2016;315(8):801-810. doi:10.1001/jama.2016.0287





### Chart 1: The NEWS scoring system

| Physiological parameter        | 3     | 2      | 1         | Score 0   | 1               | 2               | 3             |
|--------------------------------|-------|--------|-----------|-----------|-----------------|-----------------|---------------|
| Respiration rate (per minute)  | ≥8    |        | 9–11      | 12–20     |                 | 21–26           | ≥25           |
| SpO <sub>2</sub> Scale 1 (%)   | ≤91   | 92–93  | 94–95     | ≥96       |                 |                 |               |
| SpO <sub>2</sub> Scale 2 (%)   | ≤81   | 84–85  | 86–87     | 88–92     | 93–94 on oxygen | 95–96 on oxygen | ≥97 on oxygen |
| Air or oxygen?                 |       | Oxygen |           | Air       |                 |                 |               |
| Systolic blood pressure (mmHg) | ≤90   | 91–100 | 101–110   | 111–219   |                 |                 | ≥220          |
| Pulse (per minute)             | ≤40   |        | 41–50     | 51–90     | 91–110          | 111–130         | ≥131          |
| Consciousness                  |       |        |           | Alert     |                 |                 | CVPU          |
| Temperature (°C)               | ≤35.0 |        | 35.1–36.0 | 36.1–38.0 | 38.1–39.0       | ≥39.1           |               |

Reproduced from the [Royal College of Physicians website](http://www.rcplondon.ac.uk/resources/publications/news-scoring-system)  
<http://www.rcplondon.ac.uk/resources/publications/news-scoring-system>

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### SOFA

| System                 | Score                                          | 0            | 1                 | 2                 | 3                  | 4                                   |
|------------------------|------------------------------------------------|--------------|-------------------|-------------------|--------------------|-------------------------------------|
| Respiration            | Pao <sub>2</sub> /Fio <sub>2</sub> ratio (kPa) | ≥400 (33.3)  | 300–399 (25.0)    | 200–299 (16.7)    | 100–199 (8.3)      | <100 (8.3) with respiratory support |
| Congestive             | Fluids, <10 <sup>3</sup> g/L                   | ≤150         | 151–350           | 351–500           | 501–1000           | >1000                               |
| Liver                  | Bilirubin, mg/dL (mmol/L)                      | ≤1.2 (20)    | 1.3–3.0 (20–50)   | 3.1–6.0 (50–100)  | 6.1–12.0 (100–200) | >12.0 (200)                         |
| Cardiovascular         | MAP ≥70 mmHg                                   | MAP ≥70 mmHg | MAP 60–69 mmHg    | MAP 50–59 mmHg    | MAP 40–49 mmHg     | MAP <40 mmHg                        |
| Central nervous system | Glasgow Coma Scale score                       | 15           | 13–14             | 10–12             | 8–9                | ≤7                                  |
| Renal                  | Creatinine, mg/dL (mmol/L)                     | ≤1.2 (100)   | 1.3–3.0 (100–200) | 3.1–6.0 (200–400) | 6.1–12.0 (400–800) | >12.0 (800)                         |

Modified from: Vincent et al. The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure. On behalf of the Working Group on Sepsis-Related Problems of the European Society of Intensive Care Medicine. *Intensive Care Med.* 1996

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### CURRENT DIAGNOSTICS

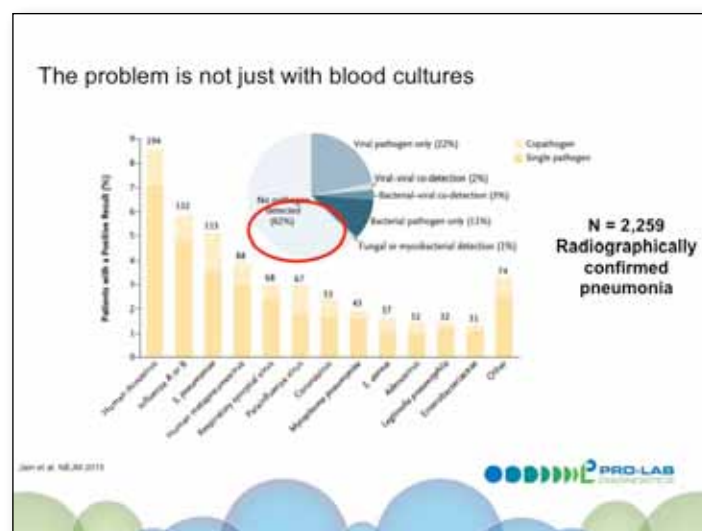
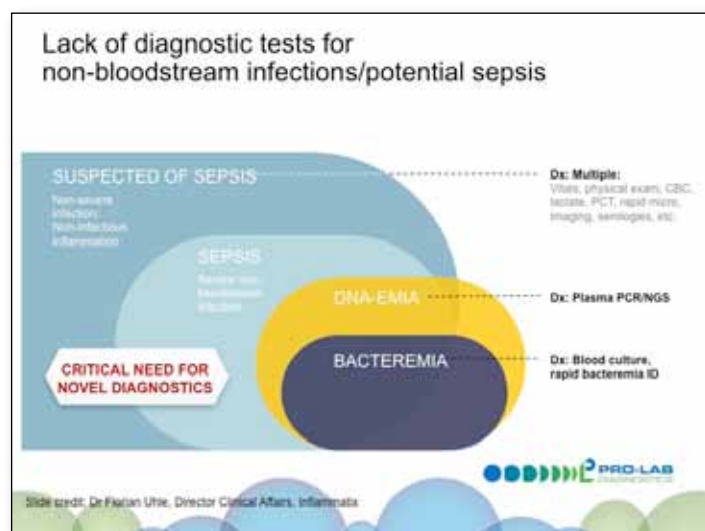
- Blood culture
- ESR
- CRP
- PCT

(PROcalcitonin and NEWS2 evaluation for Timely identification of sepsis and Optimal use of antibiotics in the Emergency Department.)

- WBC Differential with LS neutrophils
- Urinalysis and Culture
- Molecular methods

### RAPID DIRECT FROM SAMPLE

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## MEMED

TRAIL: protein involved in apoptosis, increase in viral infections, decrease in bacterial infections

IP-10: infection marker plus vial induced lung injury

CRP: increase in bacterial infection

15 minutes (serum)



External double-blind prospective validation

We recently completed a decade long journey that included screening of >20,000 biomarkers, signature construction and initial validation [PLoS, Oued et al. 2015], followed by a series of external validation studies, making **MeMed BV** the first blood test to accurately distinguish bacterial from viral infection that is validated in a double-blind manner. External double-blind validation studies included **PainFinder** (Pediatrics, Srugo et al. 2017), and the **Opportunity Study** (Lancet ID, Van Houten et al. 2016). Taken together the diagnostic performance of MeMed BV™ is 91% sensitivity, 94% specificity, with a negative predictive value of 96%.

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## MDW BECKMAN COULTER

NPV PPV

20

MDW VALUES BELOW CUT OFF DECREASE PROBABILITY OF SEPSIS IN PATIENTS AT RISK OF SEPSIS

MDW 20A elevated out of value

MDW VALUES OVER CUT OFF INCREASE PROBABILITY OF SEPSIS IN PATIENTS AT RISK OF SEPSIS

CONCENTRATION OF GLOBULIN ELEVATED MDW, RISING PROBABILITY

ACTIVATED MONOCYTES

Septic MDW-26

Hausfater et al. Monocyte distribution width (MDW) performance as an early sepsis indicator in the emergency department: comparison with CRP and procalcitonin in a multicenter international European prospective study. *Crit Care* 25, 227 (2021). <https://doi.org/10.1186/s13054-021-03622-5>

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## HOSTDx READS THE IMMUNE RESPONSE mRNA PATTERNS TO DELIVER CLINICALLY RELEVANT RESULTS

Pathogens

Immune Response

Expression of key immune related mRNAs

(Fixed Algorithm)

Patient & Results

Treatment

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## CONVERGENCE OF TECHNOLOGIES

Data acquisition (LAMP) + machine learning classifier + results interpretation



Each score is broken into actionable bands

| TEST LABEL  | Threshold 1 | Threshold 2 | Threshold 3 | TEST LABEL |
|-------------|-------------|-------------|-------------|------------|
| LR < 0.05   | LR < 0.3    | LR < 1.0    | LR > 10     |            |
| Sens 97-98% | Sens 88-94% |             | Spec 93-99% |            |

Products in development and features may change during the development process. These products are not for sale and do not have marketing approval or clearance from regulatory authorities in any jurisdiction.

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## EMBRACING HETEROGENEITY DURING BIOMARKER DISCOVERY LEADS TO GENERALIZABLE RESULTS

Single cohort

- Biological and clinical homogeneity
- Minimize technical variance
- Internal validation

Multi-cohort approach

- Biological and clinical heterogeneity (multiple ages, severities, infection types, sampling times, geographies, etc.)
- Different treatments and technologies

Results don't generalize  
Don't capture broad disease spectrum

Generalizable results  
Better performance

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## A DIAGNOSTIC TOOL NEVER GOES ALONE: INTEGRATION IS KEY

Combining NEWS2 and SEVERITY-3 to boost information

Mortality (%)

Pre-test Probability

NEWS2

SEV3

Sequential post-test probabilities

Mortality

NEWS < 5: 1.6% mortality (2/128)

Risk boosting

Risk confirmation

De-risking

Slide credit: Dr Florian Uhle, Director Clinical Affairs, Inflammix

PRO-LAB

Speaker: *Charlotte Duncan*

## GUIDANCE AND REVIEWS

**Improving the blood culture pathway – Executive summary**

A national Review of blood culture pathway processes to support better antimicrobial stewardship and improved patient safety.

From: [JGIM Health Services Agency](#)  
Published: 10 November 2021

[Find articles about this topic](#)

**We are analysing your feedback**

Visit this page again soon to download the outcome to this public feedback.

**Guidance**  
**UK SMI B 37: investigation of blood cultures (for organisms other than Mycobacterium species)**

Information on UK Standards for Microbiology Investigations for blood cultures.



## ACADEMY OF MEDICAL ROYAL COLLEGES

[https://www.asmerc.org.uk/wp-content/uploads/2022/05/Statement\\_on\\_the\\_initial\\_antimicrobial\\_treatment\\_of\\_sepsis\\_0522.pdf](https://www.asmerc.org.uk/wp-content/uploads/2022/05/Statement_on_the_initial_antimicrobial_treatment_of_sepsis_0522.pdf)

May 2022

**Statement on the initial antimicrobial treatment of sepsis**



**Contents**

Plain English summary: 3 Pages  
Executive summary: 9 pages

- 00 Introduction
- 01 Plain English summary
- 02 Executive summary
- 03 Background
- 04 Aims
- 05 Methods



## UK Critical Care Genomics



[HOME](#) [FOR RESEARCHERS](#) [FOR INVESTIGATORS](#) [FOR PATIENTS AND RELATIVES](#) [THE UKCCG GENOMICS PROJECT](#)

[PUBLICATIONS](#) [PEOPLE](#) [NEWS](#)

**Home**

The genome, inherited in Sepsis (and) study, was launched in 2020 by the UK Critical Care Genomics group (established in 2020 to coordinate genomic research on susceptibility and outcome from sepsis. Sepsis is a life-threatening complication of infection caused by a dysregulated host response leading to organ failure. This condition affects an estimated 20 million people worldwide each year, and is recognised as a global health priority by the World Health Organisation.

<https://ukccggains.com/>



## EMPIR SEPTIMET

# SEPTIMET

**Background**

Today's physicians do not have sufficiently fast or accurate diagnostic tools to identify and manage septic patients. Faster and more accurate tests are needed to diagnose and guide treatment of sepsis. Microbiological support is needed to improve the performance of existing methods and enable the efficient transition of new test patient solutions.

**Overview**

The overall aim of [European Clinical Sepsis](#) project SEPTIMET is to improve the speed, accuracy and reproducibility of diagnostic tests for the identification and treatment of sepsis. Sepsis is a life-threatening condition where time to diagnosis is critical to patient outcome. This clinically driven project will develop and characterise reference systems to support confident application of existing tests and investigate microbiological support required by new innovative approaches that offer the next generation of diagnostic solutions. Moreover, the outcomes of the project will also support IVD manufacturers in meeting developments in EU diagnostic regulation.

<https://www.lgcgroup.com/our-programmes/empir-septimet/>



## THANKS FOR LISTENING!

## ANY QUESTIONS?





Point of Care: Innovations - 20<sup>th</sup> September 2022



## My background



- Biomedical Scientist - 21 years laboratory experience, working in NHS clinical laboratories (Clinical Chemistry)
- Course Lead, Senior Lecturer and Biosciences Sustainability Education Lead at NTU
- Centers for Sustainable Healthcare Clinical Labs Susnet Lead
- EFLM Green Labs Taskforce Core member
- IBMS council and Clinical Chemistry advisory panel member

## Learning Outcomes

- 1 What is Sustainability
- 2 Utilising POCT and Reducing Waste - do we really need a sample for the lab
- 3 -Going green in the POCT setting
- 4 -Partnerships - Working with suppliers to make a difference

## What is Sustainability?

Sustainability is the balance between the environment, equity, and economy.

The most often quoted definition comes from the UN World Commission on Environment and Development: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

The United Nations **Sustainable Development Goals** are 17 global goals that replaced the Millennium Development Goals in September 2015. These goals are a part of the United Nations' new **Sustainable Development Agenda**, and aim to end poverty, protect the planet and ensure prosperity for all. Each goal has specific targets to be achieved over the next 15 years.



## So why consider sustainability?

- Climate change is becoming more apparent from real life events!
- Regulatory bodies and Organizations are declaring health emergencies
- Sustainability is featuring more and more in professional practice through policies, professional registration standards and education through QAA benchmarks, university initiatives and NHS Green plans.
- It is recognised that by embedding sustainability education into our practice, professionals will learn to adopt new ways of thinking, practicing and being and sustainability values and competencies will be learned and shared.



## Environmental impact of healthcare 1

- Carbon footprint:** this refers to the amount of greenhouse gases (GHG) emitted directly or indirectly attributable to a process, product or organisation usually expressed in kg CO<sub>2</sub> equivalents. Elements of healthcare activity with a measurable carbon footprint include:
  - Energy use on site (burning fuel for heating, electricity use for lighting, cooking and cleaning etc)
  - Release of anaesthetic gases / nitrous oxide
  - Travel (staff, patients, carers)
  - Pharmaceuticals and medical equipment (supply chain emissions - from manufacture and distribution)
  - Non-medical equipment and supplies (supply chain emissions for furniture, IT equipment, laundry, etc.)
  - Food production
  - Waste disposal

## Environmental impact of healthcare 2

- Non-carbon impacts:** A Carbon footprint is an important measure of environmental impact, but it is not the only one. Consider whether any of the following environmental impact categories apply to the Quality Improvement project, too:
  - Air pollution:** non-carbon pollutants from fossil fuel use or waste incineration (nitrogen oxides, particulate matter)
  - Deforestation, landscape degradation, loss of biodiversity** (mining and plantations for supply chains)
  - Depletion of scarce natural resources**, including fresh water
  - Bio-accumulation and toxicity** of chemicals entering the environment, often through water pollution (antibiotics, antidepressants, contraceptives, propofol)
  - Plastic pollution** from inadequate waste disposal systems / littering

## Four principles of SUSTAINABLE HEALTHCARE



- 1. PREVENTION**  
Promoting health and preventing disease by tackling the causes of illness and inequalities.
- 2. PATIENT SELF-CARE**  
Empowering patients to take a greater role in managing their own health and healthcare
- 3. LEAN SERVICE DELIVERY**  
Streamlining care systems to minimise wasteful activities
- 4. LOW CARBON ALTERNATIVES**  
Prioritising treatments and technologies with a lower environmental impact

Source: © The Sustainable Pharmacy Clin Med 10(2), April 1, 2015, 2016-211

## Why is Laboratory Sustainability Important?



## GIRFT and Sustainability

- In a study by (McAllister et al, 2020) the carbon footprint of five common hospital pathology tests: full blood examination; urea and electrolyte levels; coagulation profile; C-reactive protein concentration; and arterial blood gases was reviewed.
- This study concluded that sample collection and phlebotomy dominated the carbon footprint of these pathology tests.
- The Getting it Right First Time (GIRFT) agenda. This is a national programme designed to improve the treatment and care of patients through reviewing services, benchmarking practices, and using data-driven evidence base practice to support changes.
- One of these objectives is to look at reducing unnecessary tests.
- If we can reduce unnecessary testing or utilise POCT we can reduce plastic usage, water consumption and energy use.
- This will also impact on a reduction for the need for patient travel.

## Unnecessary Testing

- A considerable proportion of pathology tests ordered are thought to be unnecessary – between 12% and 44% according to Zhi et al, 2013.
- Muskens et al, 2022, systematic review, shows that there is substantial overuse of diagnostic testing across all healthcare settings, with much variation among similar diagnostic services.
- Interestingly preoperative testing and imaging for non-specific low back pain were the most frequently assessed and overused low-value diagnostic tests.
- Effective strategies to tackle the overuse of diagnostic testing must be developed and implemented by health systems, providers, policymakers and others.
- Additionally, more uniform definitions and assessments of low-value diagnostic tests are required in order to obtain a better understanding of the magnitude of diagnostic testing overuse.

## Research - The carbon footprint of pathology testing

McAllister et al, 2020

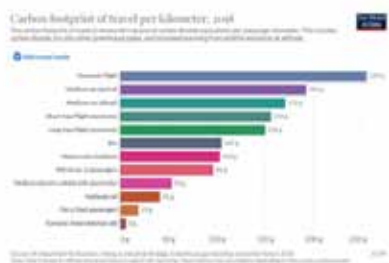
### Objectives

- To estimate the carbon footprint of five common hospital pathology tests: full blood examination; urea and electrolyte levels; coagulation profile; C-reactive protein concentration; and arterial blood gases.

### Results

- CO<sub>2</sub>e emissions for haematology tests were 62 g/test (95% CI, 78-91 g/test) for coagulation profile and 136 g/test (95% CI, 103-155 g/test) for full blood examination.
- CO<sub>2</sub>e emissions for biochemical tests were 0.5 g/test CO<sub>2</sub>e (95% CI, 0.4-0.6 g/test) for C-reactive protein (low because typically ordered with urea and electrolyte assessment).
- At 6 g/test (95% CI, 45-5.0 g/test) for arterial blood gas assessment, and 38 g/test (95% CI, 34-43 g/test) for urea and electrolyte assessment.
- Most CO<sub>2</sub>e emissions were associated with sample collection (range, 60% for full blood examination to 96% for coagulation profile).
- Emissions attributable to laboratory reagents and power use were much smaller.

## The carbon footprint of travel



## The Benefits of POCT

|                       |                                                                                                                                                                     |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Efficiency            | Tests performed at the point of care allow for more efficient workflow processes.                                                                                   |
| Speed                 | Point-of-care testing enables rapid decision-making and treatment.                                                                                                  |
| Expanded Capabilities | Testing is possible at a wide range of sites, including under-served populations, rural areas, and disaster zones.                                                  |
| Stability & Handling  | Reduced possibility of sample deterioration, in some cases a reduction in the specimen volume required to perform the test for patients requiring frequent testing. |
| Storage/Proced        | Fewer steps are necessary, including no transportation of samples and no refrigeration of samples.                                                                  |
| Portability           | Portable devices meet fewer space requirements and a flexibility to move the testing to either the patient's lab or to the patient's room.                          |
| Patient Outcomes      | Immediate availability of results allows patients to be treated and on their way to recovery.                                                                       |

<https://blog.sekiscagnostics.com/dialogue/point-of-care-testing/2019/02/11/point-of-care-testing-do-the-benefits-outweigh-the-challenges>

## POCT and Sustainability– A case example 1

- Antibiotics are over-prescribed for lower respiratory tract infections (LRTI) in nursing home residents due to diagnostic uncertainty.
- Inappropriate antibiotic use is undesirable both on patient level, considering their exposure to side effects and drug interactions, and on societal level, given the development of antibiotic resistance.
- C-reactive protein (CRP) point-of-care testing (POCT) may be a promising diagnostic tool to reduce antibiotic prescribing for LRTI in nursing homes.
- CRP-measurement via laboratory assessment differs from CRP POCT with regard to the type of blood collection (venipuncture respectively finger prick), location (the blood is taken to an external lab respectively the measurement is performed on-site), time-to-results (hours-days versus minutes), and potential frequency of measurements (once-twice a week on average versus 24/7).



## POCT and Sustainability– A case example 2

- Patient X is Diabetic
  - They have poor glycaemic control
  - They do not monitor their blood glucose levels and rely 3 monthly routine lab bloods
- Patient X acquires an infection in his foot
  - This goes untreated
  - Patient X ends up with DKA and osteomyelitis
  - This requires a 4 week hospital stay and 6 weeks post discharge IV antibiotics with weekly visits to hospital, plus home visits.
  - Routine bloods are required to monitor Renal Function and CRP



## POCT and Sustainability – Case example 3

- We can identify positive and negative social impacts of our current system and our proposed change idea to ensure we are maximising positive social outcomes. This is important because it allows us to identify unintended negative social impacts on particular patients, staff or population groups.
- Example: Setting up an intervention which involves frequent paediatric outpatients at a tertiary centre far from a patient's home leads to frequent time off school for the child (that can negatively affect the child's educational progress) and time out of work for a parent/carer (that could impact on how much the parent can work). This will likely have a negative social impact on all groups, but might have a disproportionate impact on parents with less financial or employment security.
- Overall, if an improvement idea does not meet a patient's social needs, or has unintended negative social impacts this may outweigh any intended health benefit.
- It is important to consider the wider social impacts of our systems and processes. What we purchase, use and dispose of can have long lasting impacts on global communities. This is particularly true of our supply chains. If a department or service requires a great deal of equipment it is important to consider the impact of the pattern of procurement of the healthcare organisation and the working conditions of the people in the supply chain.

## How can POCT Help?

- C-reactive protein (CRP) point-of-care testing (POCT) is increasingly being promoted to reduce diagnostic uncertainty and enhance antibiotic stewardship.
- U&E POCT can prevent Pseudohyponkalaemia
- POCT can prevent the development of serious complications.
- POCT reduces carbon footprint through reduction in the need for travel, reduction in energy consumption in test processing and reduction in plastics.



## Embedding sustainability into practice - SusQI

**INTEGRATING SUSTAINABILITY INTO QUALITY IMPROVEMENT**

To create a more ethical, and sustainable, health care system

**The SusQI framework**

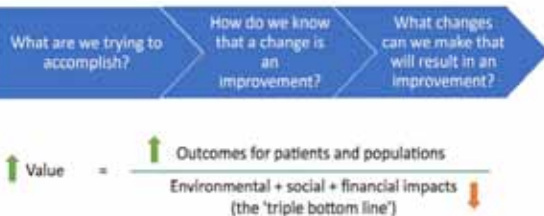
Sustainable Quality Improvement (SusQI) is an approach to improving healthcare in a holistic way by ensuring quality and value through the lens of a triple bottom line. At SusQI, the health outcomes of a service are measured against its environmental, social and economic needs and impacts to determine its 'sustainable value'. The framework was developed in collaboration with patients, including the Royal College of Physicians.

## Embedding the principles of sustainable healthcare into change ideas



Worthington F. The Sustainable Physician. Clinical Medicine 2020; 20(2): 120-23

## Sustainable Quality Improvement (SusQI)



## Scenario

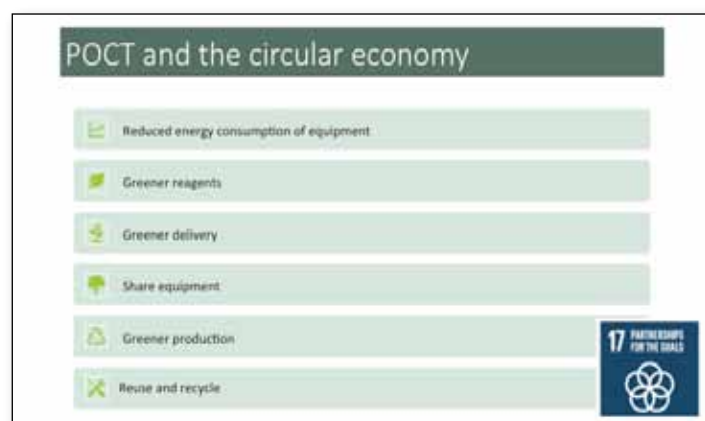
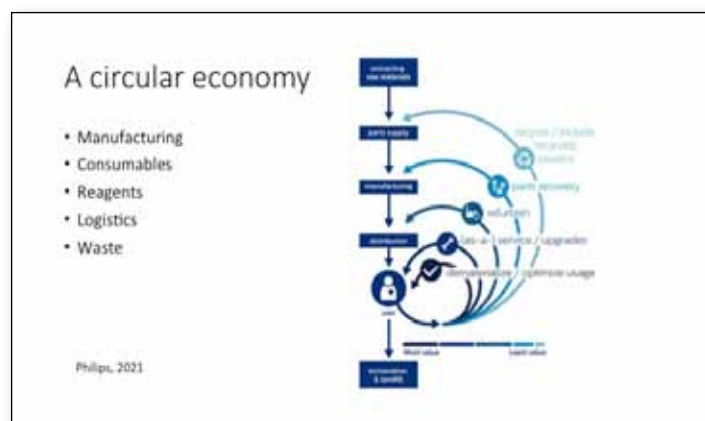
- Elizabeth is 83 years old. She is admitted to hospital via ambulance with rapid onset of worsening breathlessness. She is treated in ED for acute exacerbation of Chronic Obstructive Pulmonary Disease (COPD). She has a medical history of COPD and is a current smoker. In the Emergency Department, she is treated with nebulised salbutamol and ipratropium, oral antibiotics and oral steroids. Elizabeth is then admitted to the Care of the Elderly Ward. She will have two Blood Gases while in ED and one per day for each stay. She will have a minimum of a U&E and FBC in ED. Her eGFR was a little low and required daily checks for her U&E.
- She is discharged after 4 days after requiring only minimal therapy and is encouraged to continue her current regular medications. She is sent home by taxi. She has a follow-up appointment with her COPD nurse in her GP practice shortly after discharge to review her regular and she was advised to repeat her U&E, FBC.
- The potassium was high due to contamination which required a repeat test. The phlebotomy clinic at her GP was full and she needed to reattend the hospital for the repeat bloods via taxi.

POCT Sustainability - Working towards Greener Practice



## A circular economy

- Most economies discard raw materials as waste after use.
- A circular carbon economy is a framework for managing and reducing emissions. It is a closed loop system involving 4Rs: reduce, reuse, recycle, and remove.
- A circular carbon economy framework as a way to reduce their carbon footprints.



### Healthcare Procurers

- Healthcare procurers can play a crucial role in stimulating innovation to reduce healthcare's plastic consumption and environmental burden, whilst ensuring both resilience and maintaining a high standard of patient safety and quality of care.
- Procurers can transform procurement practices and make choices based on the zero-waste hierarchy - progressively eliminating/substituting harmful or unnecessary plastics and prioritising toxic-free items that can be reused or reprocessed.
- Where products cannot be safely reused or reprocessed and local waste management allows, recyclable products should be considered as well, increasing recycling capacity when necessary.

### EFLM Green Labs Taskforce – Waste Recommendations

- **Packaging:** Much of the excess waste seen today is due to packing. This cannot be changed without going through due regulatory process. EFLM Green Lab Taskforce are calling for an amnesty period agreed by all the regulatory authorities globally to allow companies to review and refine their packaging strategies to minimize waste through a simplified documentation process.
- We also call on manufacturers to consider the volume of waste cardboard and plastic that is incorporated in each kit.

**Hardware:** Consideration should be given to extending the life of equipment whether through a refurbish/recycle model on site with longer replacement times and/or through cannibalization initiatives that use at the minimum the skins of pre-used instruments.

**Software:** Obsolete software often leads to the introduction of new hardware. The Taskforce call on manufacturers to look at future proofing their products that will allow new software with AI (machine learning) to be used without replacing the total instrument.

### Sustainability in Healthcare: Perspectives and Reflections Regarding Laboratory Medicine

Molero, et al, 2021

|                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reduction of test ordering and reduction of test redundancy                                                                                                   |
| Reduction of tubes and materials for collecting body fluids                                                                                                   |
| Policy of reuse                                                                                                                                               |
| On-site recycling of organic solvents                                                                                                                         |
| Reduction of solid waste                                                                                                                                      |
| Green purchasing                                                                                                                                              |
| Paper-less policy                                                                                                                                             |
| Reduction of energy and water consumption                                                                                                                     |
| Encouragement of reduction of gasoline consumption by laboratory logistics and staff (encourage and reward use of public transport, carpooling, and bicycles) |
| Usage of energy-efficient and environment-friendly design recommendations for buildings                                                                       |
| Use of renewable energy sources, including wind, solar photovoltaics, and solar thermal energy                                                                |
| Increased collaboration for resource sharing (opportunities for cooperation between hospital buildings and laboratory networks)                               |

### Plastics

#### 10 ways to reduce plastics in laboratories

1. Don't over-packaging the stuff (reduces)
2. Don't use excessive glassware (reduces)
3. Bring on: Reusable bottles (reduces)
4. Do you require gloves? (reduces)
5. Avoid your labware plastic (reduces)
6. Avoid your labware plastic (reduces)
7. Reusable labware items (reduces)
8. The better, the more (reduces)
9. Reusable labware items (reduces)
10. The better, the more (reduces)

### Greener Chemistry

<https://www.ucl.ac.uk/chem/2015/09/24/greener-chemistry/>

### Top 9 Actions to Take in the Lab to Improve Energy Efficiency

1. Close fume hood sashes when not in use
2. Put vacuulaves to standby mode when not in use (if any run when full)
3. Set ultra low temperature freezers to -70C
4. Turn off equipment when not in use
5. Properly maintain acid storage
6. Reuse equipment among labs & turn off/empty duplicate equipment
7. Turn off lights on nights and weekends
8. Utilize green chemistry techniques
9. Making good inventory/stock efforts and encourage others to change their behavior

My Green Academy

## Reducing Energy

## What can we do - 1

### Office Activities

- Promoting the policy of the 'paperless office' to use less paper by adopting electronic means such as scanning documents for filing and sending committee papers by email.
- Recycling general office waste where possible.
- Using publishers/printers for publications who supply paper from sustainable sources and/or have Forest Stewardship Council accreditation.
- Using photocopiers that incorporate copying, scanning, faxing and printing facilities, thus avoiding the need for separate, additional machines.
- Photocopying and printing on both sides of the paper.
- Recycling PCs at the end of their useful life.
- Exploring the feasibility of setting computers to 'sleep' mode (i.e. to switch off after a certain time when not in use).

## What can we do - 2

### Meetings

- Encouraging those attending meetings to travel by public transport in favour of cars, planes, taxis.
- Offering alternatives such as tele/video conferencing for meetings and expediting committee business by email.
- Reviewing the frequency of meetings and the number of committee members attending.
- Using motion sensitive lighting in office and meetings rooms.
- Ensuring that low-energy light bulbs are used where appropriate.
- Turning off computers, computer screens, photocopiers and printers at night.

## What can we do - 3

### Kitchen waste

- Placing food waste and non recyclables into the designated waste bins situated in the kitchen.
- Dedicated bins for recyclables.
- Using filtered tap water instead of bottled water.
- Monitoring water leaks.

## Working Together



## Circular, 2022 – It's a Partnership

| WHO                                                                                                                                                           | Suppliers                                                                                                                                                                    | Regulators                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Endorse Circular Economy Business models through financing and enabling upstream supply chain partners.                                                       | Suppliers need to move beyond energy efficiency and incremental innovation to systemic innovation that embeds Circular Economy business models and long-term value creation. | Continuously adapt policy and regulation to incentives and nudge the SME and to regulate closer to the delivery of Circular Economy principles in practice SME set standards. |
| Use government as a driver of systemic reduction by ordering Circular Economy compliance into the procurement process.                                        | Suppliers should align their products and services to the SME European framework, showing Circular Economy compliance and evidence of reducing Greenhouse Gas emissions.     | Policy and regulation should fund and provide a cross-industry platform for pre-competitive systems to meet the innovation and ensure quality is assured.                     |
| Become a leader for Circular Economy and green technology and driving carbon and financial savings over time across a range of Circular Economy stakeholders. | Secure strategic progress on Scope 1 and 2 emissions through clean energy, powertrain manufacturing and designing out greenhouse gases.                                      | Improve certification and the enforcement of Circular Economy standards to ensure quality and ensure quality is assured.                                                      |



Clinical Labs susnet

CSH Networks

Clinical Labs susnet

Clinical Labs susnet is an online sustainability networking space for clinical laboratory professionals, that is accessible to industry, educators and students across biomedical and healthcare sectors globally.

It is a space for like-minded individuals with a passion for sustainability to come together, share ideas, expertise and collaborate to embed sustainable practice into pathways and associated healthcare education.

Share this page

## The EFLM Green Lab Task Force



- The mission of the EFLM TASK-FORCE GREEN LABS is to help laboratories in achieving environmental targets. In this current climate health emergency Laboratory Medicine should contribute to a sustainable healthcare system ensuring that resources are used efficiently from ecological, social, and economical perspectives, while providing high-quality services to patients and physicians.
- Led by Prof. Torsten Dobos, EFLM President and Chair of the EFLM Task Force Green Labs, the EFLM G.L. TaskForce's main aim is to provide guidance and education via national professional bodies to support medical laboratory professionals to achieve greener and more sustainable practices.
- From reducing waste to carbon reduction, these guidelines are designed to help laboratories become more environmentally sound. Please visit the EFLM G.L. TaskForce homepage for an overview of further plans.

## Laboratory sustainability LEAF



- LEAF is a standard for sustainable laboratory operations.
- Laboratory based research is essential for advancing society but it is also extremely energy and resource intensive.
- Laboratories typically consume 3-10 times more energy per meter squared than typical academic spaces.
- UCL have developed a new programme to improve the sustainability and efficiency of laboratories.
- The Laboratory Efficiency Assessment Framework.
- LEAF contains actions which lab users can take to save plastics, water, energy and other resources.
- By taking part in the programme, laboratories will reduce their carbon emissions and create an environment that supports research quality.
- Laboratories are awarded either a Bronze, Silver or Gold level depending on how many sustainability actions they take.
- A key feature of LEAF is that it allows participants to estimate the impact of changes in financial and carbon terms with user-friendly calculations.
- LEAF is open to both staff and students working in laboratories, including research or teaching facilities across biology, chemistry and medicine.

## Laboratory sustainability Lab Conscious



- Labconscious is an open resource and blog for the life science community to reduce laboratory waste, use green chemistry, conserve water and save energy.
- Blog
- Green Lab Tips
- Resources
- Green Lab Groups
- Videos
- Equipment guides



## Laboratory sustainability – My Green Lab










## Resources

- Boone T M, van Buul L W, Hopstaken R M, van Tulder M W, Tanik J W M R, Verheij T J M et al. Effect of C reactive protein point-of-care testing on antibiotic prescribing for lower respiratory tract infections in nursing home residents: cluster randomised controlled trial BMJ 2021; 374 :n2198 doi:10.1136/bmj.n2198
- [Guidelines a Wet Zoono Zoono Service](#)
- EFQM Taskforce GL, 2022 EU/M guidelines for green and sustainable medical laboratories. <https://www.efqm.eu/Libraries/Docs/EFQM-GREEN-LAB-BOOKLET.pdf>
- Ugolet, Joseph B. and Badrick, Simon. "Proposals for the mitigation of the environmental impact of clinical laboratories." Clinical Chemistry and Laboratory Medicine (CCLM), vol. 50, no. 9, 2012, pp. 1559-1564. <https://doi.org/10.1016/j.cclm.2012.09.012>
- Mukhopadhyay S, Banerjee A, Bell P, McGee J. The carbon footprint of pathology testing. Med J Aust. 2010 May 21;192(10):177-181. doi: 10.1016/j.maj.2010.05.003. Epub 2010 Apr 18. PMID: 21261280.
- Sustainable Development Goals
- Sustainable Development Goals

## Any Questions



## Respiratory point of care testing: from ED to the community

**Kay Roy**  
Respiratory Physician  
University College London Hospitals NHS Trust

## NHS winter pressures : A local and a national problem

The impact of respiratory infection



Patients spending longer than four hours in hospital accident & emergency departments each winter



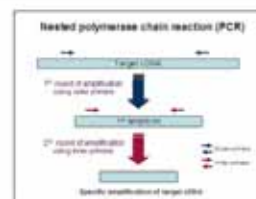
## WHO and antimicrobial stewardship

- Antimicrobial resistance (AMR) threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi.
- AMR is an increasingly serious threat to global public health that requires action across all government sectors and society.
- Without effective antibiotics, the success of major surgery and cancer chemotherapy would be compromised.
- The cost of health care for patients with resistant infections is higher than care for patients with non-resistant infections due to longer duration of illness, additional tests and use of more expensive drugs.
- In 2016, 490 000 people developed multi-drug resistant TB globally, and drug resistance is starting to complicate the fight against HIV and malaria, as well.

## AIMS

To investigate whether initiation of a POCT service in the Acute Medical Departments (ED and AAU) in a UK district hospital setting would result in

1. Earlier definitive microbiological diagnosis
2. Avoidance of unnecessary antibiotic use
3. Early safe discharge (in appropriate cases)
4. Reduced nosocomial infection and bed closures for infection control indications



## FilmArray® Respiratory Panel (RP2plus)

### Viruses:

Adenovirus  
Coronavirus HKU1  
Coronavirus NL63  
Coronavirus 229E  
Coronavirus OC43  
Human metapneumovirus  
Human rhinovirus/enterovirus  
Influenza A  
Influenza A/H1 (pre 2009 H1N1)  
Influenza A/H3  
Influenza A/H1-2009  
Influenza B

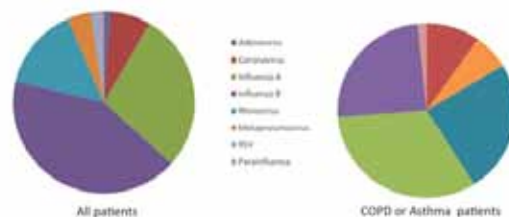
Parainfluenza 1  
Parainfluenza 2  
Parainfluenza 3  
Parainfluenza 4  
Respiratory Syncytial Virus  
MERS CoV

### Bacteria:

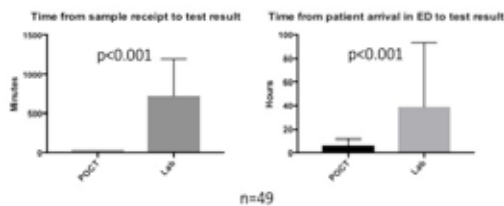
Bordetella pertussis  
Chlamydia pneumoniae  
Mycoplasma pneumoniae  
Bordetella parapertussis

**43 mins**

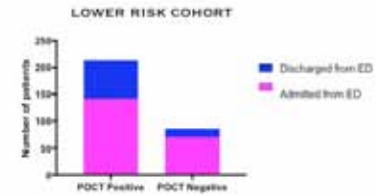
Positive viral result in 61% of all tests of which 56% were positive for Influenza and 54% for all other viruses



**Time to Diagnosis is significantly shorter with POCT than when the analysis is undertaken in the Microbiology Department of the Trust (using the same Film Array platform).**

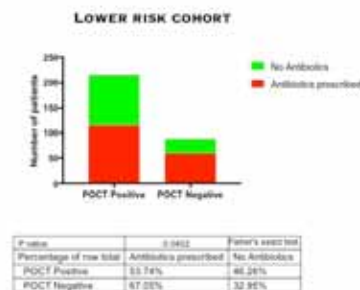


### Decisions in ED on admission versus discharge -

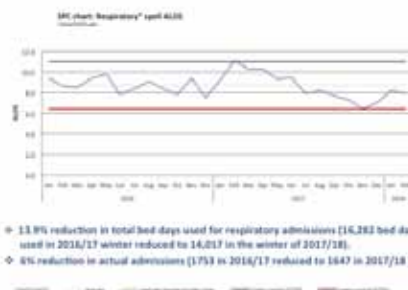
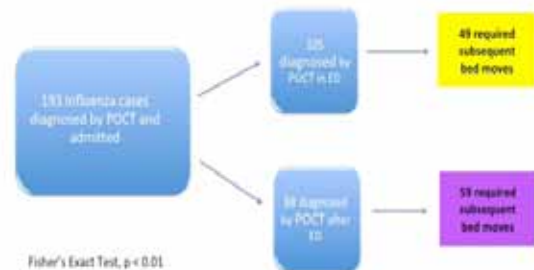


| P value                 | 0.003            | Fisher's exact test |
|-------------------------|------------------|---------------------|
| Percentage of row total | Admitted from ED | Discharged from ED  |
| POCT Positive           | 66.20%           | 33.80%              |
| POCT Negative           | 80.23%           | 19.77%              |

### Decisions on antibiotic prescribing -



POCT in ED associated with **significantly fewer number of subsequent in-patient bed moves.**

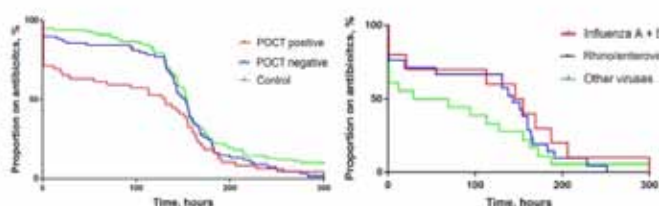


### Future Directions

- Development of an integrated care plan document, to optimise clinical record keeping, highlight agreed pathways (incorporating POCT results) and facilitate audit
- Education to ensure earlier use of POCT in ED and AAU and more consistent use of POCT out-of-hours
- A randomised clinical trial to focus on testing in ED with particular attention to patients with chronic respiratory diseases
- Formal health-economic analyses to evaluate the financial impact and potential benefits from POCT use in ED and AAU

### Impact of point-of-care testing for respiratory viruses on antibiotic use in adults with exacerbation of airways disease

Nathan J. Beckett, Samuel Mills, Susan Watkins, Thibaut de Clerk  
 Journal of Infection  
 Volume 76, Issue 4, Pages 357-362 (October 2018)  
 DOI: 10.1093/infdis/jiy285



COPD exacerbations: How can we improve the quality of patient care....



**RightCare Pathway: COPD**

RightCare Pathways provide a national case for change and a set of resources to support Local Health Economies to concentrate their improvement efforts where there is greatest opportunity to address variation and improve population health.

**Commissioners responsible for COPD for their population should:**

- ✓ focus on the key components for COPD care across a system:
  - Ensuring **early detection with accurate diagnosis**
  - Optimising **long-term management** to reduce exacerbations, hospital admissions and premature mortality
- ✓ work across the system to ensure that all **priorities to optimisation** are in place including the cross cutting themes:
  - **Multidisciplinary** supportive care approach
  - **Signposting** and care navigation
  - **Psychological support**, including for lightening breathlessness
  - **Community activation** to overcome social isolation and stay physically active, including peer support
  - **Self-management plan** supported by good information and patient training

**COPD (acute exacerbation): antimicrobial prescribing** NICE

**Antibiotics for COPD acute exacerbation**

**When to prescribe antibiotics**

- Prescribe antibiotics only when there is evidence of a bacterial infection, such as:
  - a yellow or green sputum
  - a high temperature
  - a high white cell count
  - a high CRP

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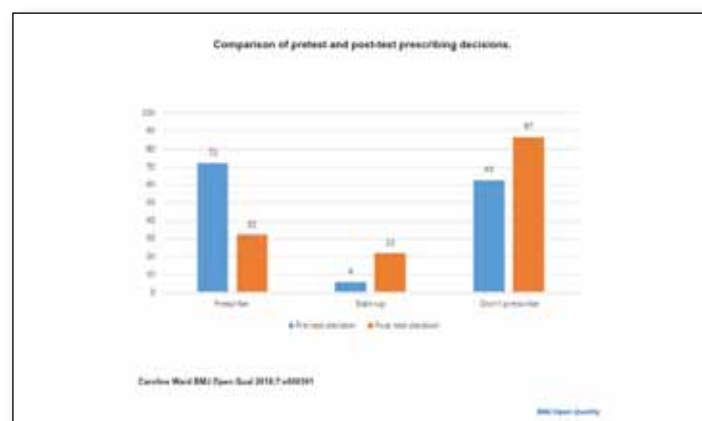
**Antibiotics for COPD acute exacerbation**

**When to prescribe antibiotics**

- Prescribe antibiotics only when there is evidence of a bacterial infection, such as:
  - a yellow or green sputum
  - a high temperature
  - a high white cell count
  - a high CRP

**Point-of-care C-reactive protein testing in community pharmacy to deliver appropriate interventions in respiratory tract infections**

This pilot study sought to evaluate the potential use of point-of-care (POC) C-reactive protein (CRP) testing for respiratory tract infections (RTIs) in a rural community pharmacy in North Staffordshire, UK, in conjunction with local GP practices. The study found that the use of POC CRP testing in community pharmacies has the potential to reduce the number of GP appointments caused by RTIs and, therefore, may help reduce unnecessary antibiotic prescribing.



**AIMS**

To determine if R-POCT is associated with:

- (i) Reduction in inappropriate Abx prescribing
- (ii) Reduced hospital admission
- (iii) Improved quality of life (QOL): patient reported outcome measures (PROMs)
- (iv) Improved patient experience : qualitative analyses and patient reported experience measures (PREMs)

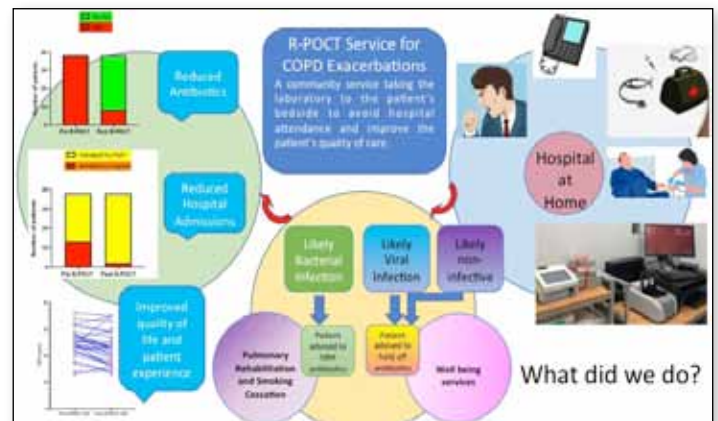


**Qualitative analyses of semi structured interviews**

- The recordings were sent to a third-party organisation (The Typing Works) for transcription. All transcripts were analysed using TA by conducting line-by-line coding, developing subthemes and themes.

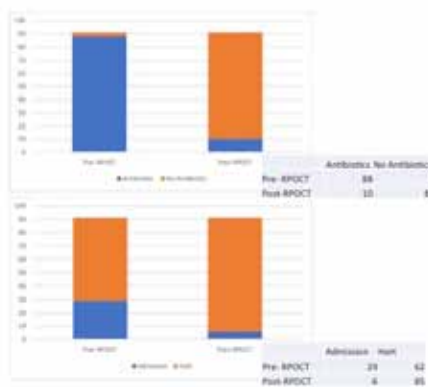
## Results

- 91 patients who underwent the R-POCT service were tested for CRP, procalcitonin (PCT) (Finecare) and an extensive panel of 12 respiratory viruses and 4 atypical pathogens (BioFire Film Array, Biomerieux Inc.)
- Outcomes in the same patient group were compared before and after the implementation of the R-POCT service
- Data around health economic modelling, patient reported experience measures (PREMs) and the health anxiety and QOL questionnaires are collected longitudinally.
- Samples taken by the community nurses in the patients' homes are delivered to Hemel Hempstead community respiratory service



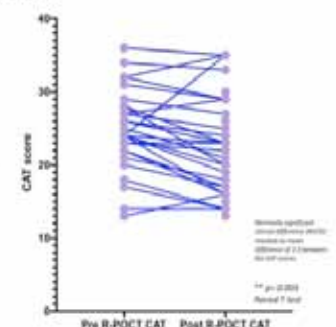
## Value to patients

- Reduced risk and improved safety
- Better quality of care and at home
- Personalised treatment



## A Patient Focused approach

- Patients' thoughts and experiences
- Education and Empowerment
- Working in partnership with patients to improve services
- Working with other HCPs and organisations in the community to deliver an holistic approach



## Value to acute and community trusts

- Teams working across boundaries to reduce ED wait times, attendance and admissions as well as readmissions.
- Infection control: patients tested at home only
- Delivery of an integrated service with HaH and admission avoidance
- Working towards the NHS Long Term Plan



## Running an efficient and cost-effective service

- Cost of COPD: NHS ...4 billion
- Herts Valley:
  - Acute admissions
  - Hospital appointments
- Reduction of ED attendances and non elective admissions of COPD at a cost saving of over £100K

### Mind at ease

All of the participants discussed how the information given by the COPD team made them feel more at ease. This covered confirming that there is no infection present in the system and being able to have the information about infections quickly available leading to less worrying.

"I prefer having the information rather than just wondering" (P3, 84)

"...you know you've got an infection most of the time, anyway, so there is the relief of knowing that something is being done about it" (P4, 145)

Furthermore, knowledge that the antibiotic prescribed would be the right ones to clear out the pathogen has been seen as an important factor and allowed for less worrying thoughts.

"It's nice to know one way or the other, and to know that if you do start antibiotics and steroids you're going to feel better..." (P2, 124)

Having the right medication also allowed the patients to have positive feelings about the future and confirmation that they are feeling poorly due to the infection but which will improve.

"...it makes me think I'm not going to be like that all the time, tablets or antibiotics or whatever will help and I will feel better again." (P1, 74)

| Theme     | Positive medical experience | Theme     | Experience of service model |
|-----------|-----------------------------|-----------|-----------------------------|
| Sub-theme | Efficient service           | Sub-theme | Experiences at home         |
|           | Testing for viruses         |           | Personal services           |
|           | GP's attitude to COPD       |           | Good advice and support     |
|           |                             |           | Reassurance                 |
|           |                             |           | Support from COPD team      |

Patient feedback by patient stories assessed qualitatively as well as PREMs demonstrated support for the service and its value in the community and hospital integrated service model and QOL was objectively better in this group whose condition has quite a high impact on lifestyle. Patients, who are mostly severe COPD in our service, found the support and care provided at home without resorting to another hospital admission allowed a faster recovery from the exacerbation. Making decisions with a personalised approach gave reassurance to both the patient and the nurse and involvement of the patient in this process provided empowerment, education and understanding about their disease.

Speaker: *Dr Kay Roy*

- R-POCT improves quality of care in severe COPD by delivering a safe, personalised approach, enhancing the patient experience and patient journey by home testing, and reducing risks of inappropriate antibiotic prescribing. This has an important impact on **improving antimicrobial stewardship** and reducing antibiotic resistance in a population who often take several course of antibiotics a year.
- In our COPD group, some of whom encounter frequent acute admissions, we have demonstrated that R-POCT may help **avoid hospital attendance and admission**. From our local COPD audit data, we are already aware that some of these patients can be managed adequately at home within the integrated service.
- This has also reduced the stress imposed on family members or friends who had previously taken time off work to accompany patients to the GP surgery or hospital and the service has also lessened the burden on primary care.
- More patients were referred to well being and psychological services as a result of making a more confident diagnosis of a non infective exacerbation.

Thank You!

