## Addressing COVID Clinical and Translational Challenges via Multidiscipline Integrated Diagnostics Networks



## Warwick Medical School & UHCW NHS Trust | Coventry, United Kingdom



Left to Right: Sarojini Pandey, research and development coordinator, CWPS; Lisa Berry, consultant virologist, CWPS; Dimitris Grammatopoulos, professor consultant in molecular medicine and clinical diagnostics, CWPS and Warwick Medical School; Dr. Harpal Randeva, professor of endocrinology, head of COVID clinical pathway, UHCW NHS Trust; Dr. Asad Ali, consultant respiratory physician, lead of service, UHCW NHS Trust; Neil Anderson, clinical director, CWPS; Emma Braybrook, senior biomedical scientist in biochemistry, UHCW NHS Trust

he COVID-19 pandemic has presented a formidable challenge to health systems globally due to the volume and complexity of managing patients with severe respiratory symptoms and high risk of death. The pandemic required healthcare professionals to quickly collaborate in order to establish new protocols, and rapidly implement these adaptations into clinical practice. The expertise and agility of diagnostic teams proved critical to providing uninterrupted care, while ensuring patient and worker safety.

At the University Hospitals Coventry and Warwickshire (UHCW) NHS Trust, the Coventry and Warwickshire Pathology Services (CWPS) partnered with clinical teams to establish transformative clinical and scientific protocols.

First, due to high volume associated with COVID-19 sampling, delays in sample processing at referral laboratories created bottlenecks in managing increased patient flow. The team established an in-house, high-throughput laboratory dedicated to swab testing for healthcare workers and individuals with clinical need to enable fast-tracked admissions. The laboratory also supported home testing, regional hospital COVID-19 testing requirements, and testing in partnership with local public health teams.

Amid elevated demand, more than 3,000 United Kingdom Accreditation Service (UKAS)-standard PCR tests were administered daily, meeting a strict turnaround time of less than 24 hours for hospital admissions and care homes across South Midlands and Coventry and Warwickshire.

Successful introduction of the COVID-19 laboratory had a substantial impact on patient care, bed management and expediting COVID-19 diagnoses during the pandemic's first wave.

"Exemplar service by pathology and diagnostics enabled us to identify and implement mitigation plans to minimize risks for our staff and patients," said Glen Burley, CEO for the Foundation Group of South Warwickshire NHS Foundation Trust, Wye Valley NHS Trust and George Eliot Hospital NHS Trust. A distinct advantage of this initiative was the adoption of a point-of-care testing multiplex assay capable of screening for several common respiratory viruses, including SARS-CoV-2. This enabled immediate triage and earlier confirmation of COVID-19 infection, reducing turnaround time for emergency assessment unit results from 8 hours to 45 minutes, despite increased acute volume.

This multi-faceted initiative provided invaluable diagnostic information, enabling a reduction in wait times and expedited care. For example, one emergency department patient quickly received a negative result, and therefore safely forwent isolation and was transferred directly to the stroke ward to receive time-sensitive care.

Since its implementation, the laboratory has processed over half a million SARS-CoV-2 PCR requests, while also offering COVID-19 serology services, sequencing services and LAMP testing (loop-mediated isothermal amplification, a single-tube technique and low-cost alternative to PCR technology).

The collaborative efforts between the CWPS and clinical teams has enabled ease of test ordering through novel IT solutions and immediate transmission of results through electronic health records. The subsequent reduction in turnaround time from four days to under 24 hours has reduced patient risk of hospital-acquired infection, while also improving management of patient isolation.

Another powerful element of the laboratory-led initiative was the introduction of an inpatient variant detection service, which involved innovative PCR methods for screening prevalence of variants of concern. Used to investigate suspected possible re-infection in over 330 admissions, the service enabled better disease characterization, improving clinician confidence and allowing clinicians to monitor variant admission trends in accordance with national policies.

Extending its impact further, as a member of the COVID-19 Genomics UK consortium, CWPS Diagnostics supported national disease surveillance and investigated transmission patterns during local outbreaks. According to Dr. Kiran Patel, consultant cardiologist and UHCW NHS Trust chief medical officer, one of the department's most outstanding contributions was the development of new routine blood markers. As COVID-19 was a novel virus without evidence-based markers for progression and severity, CWPS worked with clinical teams to introduce a novel biomarker panel into the patient pathway. The panel included interleukin-6, a biomarker correlating with COVID-19 severity, informing patient risk stratification as well as treatment prioritization. Over 8,000 requests have been processed in all, with over 2,000 leveraged to monitor disease development and to establish baseline values for future follow-up on long COVID-19.

"This biomarker panel proved to be a valuable monitoring tool," Dr. Patel said. "Our clinical teams were reassured they had access to the most cutting-edge diagnostic biomarker tools, and the standard of service was consistently of the highest level."

Additionally, the laboratory collaborated with Research & Development to establish a COVID-19 biorepository of over 40,000 samples from nearly 7,000 COVID-19 patients. Fully explorable, this UHCW Biobank made samples available for multiple COVID-19 research projects in academia and the biotech sector, and with further funding ultimately expanded into a Regional Biobank.

"CWPS Diagnostics spearheaded research efforts that had far-reaching benefits for patients and our healthcare services locally and nationally," said Ceri Jones, head of R&D. "[This] provided the blueprint for the future engagement of diagnostics with clinical departments and other healthcare stakeholders."

CWPS Diagnostics participated in the NHS Test & Tracing Technical Validation Group, and in establishing a sequencing service, improved national and international understanding of variants, lineage and transmission patterns – including across healthcare sites. The service enabled Trusts to re-evaluate patient pathways and personal protective equipment measures accordingly, reducing staff absence and risk for staff and patients.

For its innovative leadership in the national COVID-19 response, including critical testing capabilities and foundational research, the initiative earned recognition from the 2021 UNIVANTS of Healthcare Excellence award program.

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