

# An Efficiency Revolution

Siemens is helping a Scottish hospital's blood sciences laboratory meet the twin challenges of increasing demand and ever-tighter budgets. As the first hospital in Northern Europe to adopt Aptio Automation, Ninewells hospital in Dundee is already reaping the rewards of being at the cutting edge.

Text: Ed Targett Photos: Michelle McCarron







In the past, staff were running around in the lab; now it is a simple, calm process.

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**Dr. Bill Bartlett**, Joint Clinical Director of Diagnostics, NHS Tayside, Dundee, Scotland

Nestled on the eastern coast of Scotland and bisected by rolling hills, the city of Dundee seems an unlikely hotbed for innovation, but its history as a former industrial powerhouse and its thriving biomedical and biotechnology sectors belie its scenic allure. The historic city on the River Tay is undergoing a significant renaissance amid a major regeneration project. On its western edge, the well-regarded Ninewells Hospital is also looking to the future, as it seeks to balance a changing fiscal climate with quality patient care.

Run by NHS Tayside (one of 14 National Health Service regions in Scotland), the hospital is home to one of the country's top-ranked medical schools. Ninewells Hospital also has a hugely busy combined blood-sciences laboratory at its heart, providing diagnostic services for the area's 450,000 residents. Demand for Tayside laboratory services is growing by between five and seven percent annually; with the newly integrated laboratory conducting some 5.9 million biochemistry tests, 850,000 hematology tests, and 55,000 immunology tests each year.

The rising demand – caused by an ageing patient population, as well as protocol-driven increases in test volumes – has placed increasing strain both on lab staff and equip-

ment. This, along with a changing funding climate, has prompted a major review of laboratory services.

The review is headed by Joint Clinical Director of Diagnostics for NHS Tayside, Dr. Bill Bartlett, and it has resulted in changes that have placed Siemens' Aptio™ Automation at the centre of a groundbreaking shift in how the laboratory functions. It has also precipitated a significant geographical reconfiguration of workloads, with NHS Tayside relocating its microbiology and community general practitioner's orders from nearby Perth Royal Infirmary to Ninewells.

At the heart of its cutting-edge blood-sciences laboratory, the hospital has introduced Aptio Automation to provide a full complement of pre- and post-analytical sample processing modules, comprehensive analytics, and effective IT middleware. The ADVIA CentraLink® Data Management System provides a central software platform for automating workflows, as well as the consolidation of lab data and instruments.

Dr. Bartlett is a calmly articulate biochemistry expert, who took his own doctorate at the hospital's medical school in the late 1980s. He knows that early adopters can expect both challenges and opportunities. The first in northern Europe to deploy Aptio Automation, his blood-sciences laboratory is moving to adapt to those challenges and embrace the possibilities of automation.

He told *Medical Solutions*: "We're living in a changing environment in terms of delivery of healthcare, whether that is increasing workloads, new diagnostic technologies, or developments in IT. We really have to start to think smart to use our resources more effectively. This is vital because if you compromise diagnostic testing in any way, you have a major impact elsewhere in the system."

"What we have not been historically very good at doing in laboratories is identifying our impact in terms of a measurable or tangible outcome. But by being able to provide a bigger repertoire of tests in a shorter period of time, we can actually increase the flow of patients through the acute receiving wards. Those are highly pressurized areas. If you are running out of beds there, the whole system just bottlenecks – and we have massive workloads to process."

## Improving Efficiency

"You have to get the right investigations, taken in the right context; delivered to the right people, within the right time frame; with commentary that is contextually appropriate, because more than 70 percent of healthcare decisions made about patients depend on the outputs of diagnostics. We need to find ways to increase the effectiveness of that service – and we have a much smaller footprint to play with than we did 15 years ago."

"We went into the review saying we wanted to look at how we could reduce waste and variation in the use of the systems, so we could redirect ill-used resources into better-used resources. There is an ethical imperative on us to reduce waste in a publicly funded service. If we have the bulk [of our] workload delivered more efficiently by ►

## The National Health Service Region Tayside in Numbers

**3,800** square miles coverage  
(9,842 square kilometers)

**450,000** residents

**91** healthcare facilities **14,000** employees

**6,000** test tubes processed each day

**5.9** million biochemistry tests annually

**850,000** hematology tests per year

**55,000** immunology tests per year

**five to seven**  
percent annual growth in demand



Facing 6,000 test tubes every day, automation helps shorten turnaround times.



The heart of the lab is a single, oval track capable of loading more than 1,600 sample tubes per hour.

## Freeing Up Skills As Shortages Loom

A shrinking labor force is among the many factors influencing a turn toward automation among clinical laboratories. As demand grows for in-vitro diagnostic testing, recruitment budgets do not always keep pace.

Approximately 16 percent of laboratory professionals are expected to retire over the next five years; while, by 2014, it is estimated that the United States alone will need 81,000 new medical technologists.

A recent survey of more than 4,500 people by the Coordinating Council on the Clinical Laboratory Workforce (CCCLW) found that 75 percent of respondents working within the sector had been completely unaware of the profession when they graduated from high school. Meanwhile, the number of educational pro-

grams available has dropped sharply.

With many laboratories finding they have highly skilled staff tied up in mundane assay processing procedures, the move to automation is an opportunity to free up underutilized capabilities in a team.

Joint Clinical Director at NHS Tayside, Dr. Bill Bartlett said: “The challenge now is to use this instrumentation to deliver the goals of turnaround time and quality, as well as making available the maximum amount of repertoire in the shortest period of time. This can release the knowledge and skills of staff tied up in the old processes to focus on new value-added processes – which will enable us to start increasing the impact of our services as far as the user is concerned.

“The older ways of working required large numbers of HPC-registered (Healthcare Professions Council) staff managing just about every aspect of the analytic delivery. The way things have developed, we ended up with very highly qualified people undertaking tasks that could be better undertaken by other groups of non-registered staff. Automation allows us to start looking at shifting skills through the system.”

“The registered staff team members have very significant training in the pathophysiology, the clinical side of things, and they are not being allowed to use that knowledge because they have been totally focused on delivering the numbers. Here, automation is about redeployment, not disinvestment.”

*“More than 70 percent of the decisions made in healthcare around patients depend on the outputs of diagnostics.”*

**Dr. Bill Bartlett**, Joint Clinical Director of Diagnostics, NHS Tayside, Dundee, Scotland



automated systems, it frees up time to focus more on the quality aspects of the service, and at value-added levels. Siemens' Aptio Automation is the building block for that."

Putting down his coffee, Dr. Bartlett steps out of his office and dons a lab coat. He is an enthusiastic and erudite guide to the hospital's newly designed laboratory. The center of the facility is defined by a single, oval track for the Aptio Automation system, which runs multidisciplinary tests capable of loading more than 1,600 sample tubes per hour. "Before, we would have had several separate rooms here," he explains. "We knocked numerous walls out to leave us with a room to contain the tracked systems, which measures 75 feet from one end to the other, and also houses our sample reception areas. Previously, hematology would have had a line of instruments down one side, biochemistry down the other, with flocks of people loading the machines."

"We get work in bursts here, as community surgeries work from 9 a.m. to 6 p.m. producing specimens that arrive in batches at various points through the day; then we get phlebotomy clinics and so on. In the past, we would have had people running around, but now it is a simple, calm process. Siemens looked at our processes, looked at what we were trying to achieve, then – working with our staff – they helped us design the laboratory. The aim was to get all this workload processed as efficiently and effectively as possible, minimizing the waste and ensuring that the information flows through correctly."

The projected efficiency increase is not simply a matter of abstract metrics for hospital staff. Picking up a test tube from a rack of samples to be tested, Dr. Bartlett glances quickly at its label: "Here someone is going to have their thyroid function looked at, along with their urea and electrolytes, which can give you a whole range of information. Now, Terri here zaps the bar code and puts it into the Aptio track, and off it goes. Every instrument within the laboratory now knows that there is a specimen coming in that will require specialist investigations."

## Speeding up the Patient's Journey

Watching a rack of test tubes being lifted onto RFID-tagged pucks, before being carried down the track for a raft of tests, Dr. Bartlett muses: "Every tube going around the track is a patient journey, and with Aptio Automation, we've started to get some insight into the speeds at which that journey can be achieved. It's clear that when the system is fully configured, we can start thinking about moving away from classifying some samples as stat samples – which means they have to be managed faster – to saying, 'well, turnaround times on the system are such that [these samples] no longer have to be managed any differently'."

"We are developing the metrics now: looking at things like turnaround time; the number of investigations that can be produced per whole-time equivalent; looking at the range of tests that can be provided within a time window. It's not just about the turnaround time for an individual test, but also about the range of tests that can be provided within a time window."

"We are also about to undertake a project to look at how we start building on the flexibility within the Aptio system to redirect critical workloads and prioritize them to improve turnaround times for particular areas in the hospital. As I said earlier, we have an acute receiving ward, the role of which is to triage patients and get a good idea of what's going on with them. The faster they get our results, the faster we can redirect them to another part of the organization; we don't want to be the people who cause the waits that distress patients." ■

## Further Information

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