



**INNOVATION AGENCY**  
Academic Health Science Network  
for the North West Coast

## PRECISION MEDICINE WITH GENOTYPE GUIDED DOSING

### Summary

Personalising medicine has the potential to completely transform the way we deliver health care. In Cheshire and Merseyside, gene testing has been used to prescribe individualised dosages of warfarin for patients with atrial fibrillation - a heart flutter which causes an irregular heartbeat and can lead to strokes.

Genotype guided dosing of warfarin has brought personalised medicine to more than 130 residents, establishing the correct dosage at the outset of treatment – avoiding repeat outpatient appointments as usually happens with new patients with AF.

### The challenge

In the North West Coast, there is a disproportionately high number of people suffering strokes, which is devastating to both the patients and their families.

Many are prescribed warfarin, a commonly used, lifesaving drug, which is used to thin the blood and prevent clots which can lead to stroke.

In the UK, it has been estimated that at least one per cent of the population and eight per cent of those aged over 80 years, are taking warfarin. The problem with warfarin is that if the dosage is wrong, the risk of bleeding or a blood clot...



Royal Liverpool research nurse Clare Prince  
& Warrington Hospital specialist  
anticoagulant nurse Janet Dearden with Paul  
Downie & the genotype testing equipment.

increases. But the process for attaining the correct warfarin dosage for patients is lengthy and involves a 'trial and error' approach. Commonly, a patient will attend a clinic six to eight times before the correct dosage is established.

Genotype guided dosing involves examining specific genes which influence the body's response to warfarin in order to prescribe individualised dosages of the drug meaning that patients receive the right dose much sooner – cutting out side effects and improving outcomes.

## Actions taken

The implementation was led by the Innovation Agency and funded by NIHR CLAHRC NWC. The University of Liverpool's Wolfson Centre for Personalised Medicine provided staff support and training; LGC loaned Para-DNA equipment and software and six North West hospital anticoagulation clinics participated.

Gene testing was carried out by a simple mouth swab which is analysed within minutes, using desktop equipment provided by LGC, a life sciences measurement and testing company. The company offer their ParaDNA equipment which can give genotyping results from a saliva sample in 45 minutes. The dose was then calculated using an evidence based algorithm.

## Impacts / benefits

The pilot project proved to be highly accurate and clinics in the Royal Liverpool University Hospital, Warrington Hospital and the Countess of Chester Hospital were genotyping new patients with atrial fibrillation before prescribing warfarin. Three comparator sites also took part.

Paul Downie, 56, of Grappenhall in Warrington was referred to the anticoagulation clinic at Warrington Hospital following treatment for an irregular heart rate.

He said: "My mum went on warfarin eight months ago and she was back and forward to the clinic at least four times on a weekly basis before they got the dose right whereas I went back just once.

"The old way of prescribing warfarin is more hit and miss; this is bespoke medication, calculated on my gene type which meant I could go back to work quicker, feeling well enough to go back to normal life. I think this a win-win for me and for the health service."

## Which national clinical or policy priorities does this address?

The NHS aims to become the first health service in the world to truly embrace personalised medicine.

In 2016, NHS England published its vision for Personalised Medicine, which explained how the NHS could use cutting-edge advances to tailor treatment to an individual's makeup, helping to improve outcomes for our patients, and reduce pressures on the NHS by giving individuals the treatments that they will respond to sooner.

## Plans for the future

The aim was to establish if the genotype guided dosing approach is acceptable to patients and staff, improve patient outcomes and demonstrate cost effectiveness. It is hoped to introduce this method and other similar techniques throughout the UK.

Leading the work is Professor Sir Munir Pirmohamed, Director of the University of Liverpool's Wolfson Centre for Personalised Medicine, who said: "This is innovation and it is disruptive; it is a way of personalising care which can be replicated in many areas of medicine, creating a major paradigm shift in how we diagnose and treat people. This is how we get patients onto the right drugs at the right doses – using 'precision dosing' so that they are effective. This improves the treatment of patients and improves the efficiency of existing and new drugs."

A number of academic publications will arise from the programme.

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