Modernising NHS staffing schedules with advanced rota optimisation

STFC Hartree® Centre worked with Alder Hey Children's NHS Foundation Trust through the Hartree National Centre for Digital Innovation (HNCDI) to develop a staff scheduling solution that reduces administrative burden on clinical staff whilst producing fair, balanced rotas that support staff wellbeing.

Challenge

Alder Hey Children's NHS Foundation Trust must provide safe clinical cover around the clock, balancing planned surgery with emergency demands. It's essential that the hospital has the appropriate skills and personnel available at all times, which requires senior clinicians to spend days each month managing rotas on outdated spreadsheets. These staff members have to balance preferences, annual leave, absences, and hospital requirements whilst taking care of employee wellbeing. This often leads to frustration, rota conflicts and interpersonal tension. As NHS pressures grow, the hospital needed a modern, reliable scheduling process that protects staff wellbeing and maintains consistent theatre capacity. Within the context of Alder Hey's AI Strategy, workforce planning was identified as a priority area where artificial intelligence or advanced computational methods could be applied safely and responsibly to support staff, improve resilience and release clinical time, without introducing risk to patient care.

Approach

Our HNCDI team worked with Alder Hey Children's NHS Foundation Trust to develop a mathematical optimisation model that automatically creates balanced on-call schedules. The system incorporates constraints such as annual leave, eligibility, preferred working days, on-call rules and individual contractual agreement requirements to produce fair, practical rotas. A user-friendly interface allows coordinators to generate schedules quickly, maintaining human oversight and control without relying on manual spreadsheets. This phased project currently supports on-call planning, with future development focused on full rota management and ongoing improvements based on hospital feedback.

> "Surgeons should be operating, not wrestling spreadsheets. The Hartree Centre has been using advanced technologies to put humans back in the care environment, which is exactly what we should be using high performance computing for."

Iain Hennessey
Alder Hey Children's
NHS Foundation Trust

Credit: Adobe Stock

Benefits

This advanced digital scheduling solution reduces the administrative workload for clinicians and removes much of the stress traditionally associated with rota creation. Staff benefit from clearer, more predictable patterns that support wellbeing, retention and performance. By replacing manual spreadsheets with data-driven optimisation, the solution supports safer, more efficient workforce planning. As the system develops further, it has the potential to be scaled more widely, contributing to improved operational efficiency across the wider NHS.

At a glance

- Reduced administrative burden on senior clinicians
- Decrease in personnel conflict through unbiased scheduling
- Staff wellbeing fostered through predictable and fair scheduling
- Potential for adoption through NHS, contributing to more efficient clinical services across the UK

The programme

The Hartree National Centre for Digital Innovation is a collaboration between the Hartree Centre and IBM which offers a safe and supportive environment for UK organisations to explore the latest digital technologies and skills, develop proofs-of-concept and apply them to industry and public sector challenges.

Who we are

The Hartree Centre was created by UK Government to help businesses and public sector organisations accelerate the adoption of high performance computing (HPC), big data analytics, artificial intelligence (AI) and quantum technologies. We play a key role in realising UK Government's Industrial Strategy by stimulating applied digital research and innovation, creating value for the organisations we work with and generating economic and societal impact for the UK. We are proud to be part of UK Research and Innovation.

What we do

- Boost productivity and innovation for industry
- Offer training and skills development
- Provide insights into future technologies
- Give tailored business development support