



## Avant-garde liver function testing, leading a best practice charge from Dundee, Scotland

The University of Dundee and NHS Tayside Ninewells Hospital and Medical School are leading best practices for liver disease testing with innovation and implementation of an Intelligent Liver Function Test (iLFT). Their approach is novel and can be life-saving, especially since a large proportion of chronic liver diseases can be prevented or cured, if detected and acted upon early. According to Ewan Forrest MD (Consultant Hepatologist and Honorary Clinical Associate Professor, Glasgow Royal Infirmary and University of Glasgow), “Early detection of liver disease reduces patient risk of premature mortality with immediate treatment and early disease management.”

Their best practice for liver function testing involves IT-enabled algorithms as well as an integrated multi-disciplinary care team. Their integrated care team includes stakeholders from Laboratory Medicine (led by Drs. Ellie Dow, Jennifer Nobes and Elizabeth Furrie), Hepatology (Dr. Michael Miller and Dr. John Dillon), and Laboratory IT Services (Mr. Ian Kennedy). The interdisciplinary approach enables effective integration into the workflows of patient care and creates better care coordination throughout the patient experience.

Their team recognizes that liver function tests (LFTs) are often the first indication of liver dysfunction and are an “incidental” finding in studies that are performed in the exploration of undifferentiated illness or in monitoring of non-hepatic long-term health conditions. They appreciate that when abnormal LFT results are noted and action is taken, the next steps often involve non-invasive testing, such as ultrasound examinations. Unfortunately, such additional testing may leave the findings unresolved, causing patients undue stress and possibly failing to identify patients who are truly in a hepatic disease state.

Their solution leverages the capabilities of the laboratory information system with minimum diagnostic criteria, automated analyzers and liver fibrosis markers with high negative predictive values to create an intelligent response to abnormal LFT results. The algorithms were designed specifically to amplify clinical judgment in determination of both the etiology and appropriate clinical care pathway for patients who have findings of abnormal LFTs. The algorithms can trigger (reflex) additional testing upon finding abnormal results for the initial LFTs. Collectively, the results are used to identify a relevant diagnosis and management plan, which is then automatically sent to the general practitioner (GP) in real-time.

The interpretation of abnormal LFTs is challenging in the primary care setting where high workloads and comorbidities often obscure the



Pictured from Left to Right: Jennifer Nobes, Elizabeth Furrie, Ian Kennedy, Michael Hugh Miller, John Dillon, Ellie Dow

focus on a single condition clinical pathway. The iLFT solution delivers an answer to the pressing need to risk-stratify patients with abnormal LFTs, allowing effective escalation of care. It does this in a manner that minimizes the inconvenience to patients by performing the appropriate etiologic testing cascade automatically on the original sample, decreasing the need for the patient to receive multiple blood draws and multiple “touchpoints” with GPs. The

implementation of the iLFT reduces the number of avoidable visits to the GP due to abnormal LFT findings by 85%. Dr. John Dillon stated, “The benefit of predictive algorithms with real-time management plans enables rapid treatment for patients that may have previously been lost to care gaps without follow-up. It brings me great pleasure to know that we are giving our patients the best possible care.”

The use of iLFT is associated with an increase in detection of liver disease by 43% for patients with abnormal LFT results. This increased detection is associated with increases in appropriate escalation of care, from 41% (prior to iLFT implementation) to 100% (after iLFT implementation). Clinicians diagnose and implement treatment plans earlier, leading to cost savings in healthcare overall. Dr. Neil Greig comments “iLFT harnesses advances in laboratory automation and technologies to ensure that from a single request, clinicians are alerted to the fact that not only their patient may have liver dysfunction but what the cause of that dysfunction might be. The automation of this process not only has the potential to speed up diagnosis of liver disease but also to reduce unwarranted variation in clinical practice and test utilization.”

The measurable success of this team and program has led to improved healthcare and widespread interest across the globe. This site was also recognized as one of the three prestigious winners of the 2019 UNIVANTS of Healthcare Excellence Awards.

### THREE KEY TAKEAWAYS:

1. Opportunities exist for improving the detection and treatment of liver disease.
2. Best practices have begun to leverage the capabilities of laboratory information systems to appropriately reflex additional testing to drive transformative change to clinical care.
3. Key performance indicators of the iLFT algorithm included improved patient outcomes, increased clinician satisfaction, and better resource allocation.