Liver disease: New intelligent testing could save thousands of lives

22 August 2019, by John Dillon

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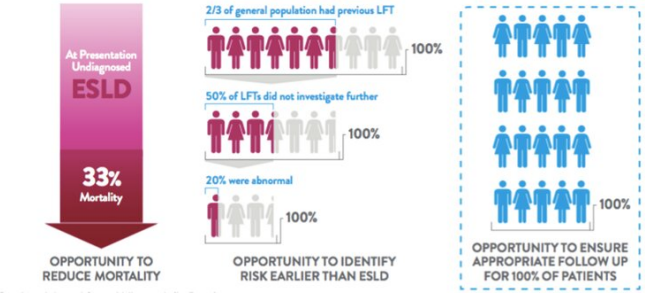
Since the 1970s, liver disease in the UK has increased by more than 400%, particularly in people under 65—in marked contrast to all other major causes of death which have been decreasing in younger age groups. This epidemic has been driven by alcohol, obesity and hepatitis C .

The liver is the factory of the body, making vital proteins and breaking down waste products or excreting them. Liver disease is usually a silent disease in its early stages. Liver function tests (LFTs) are routinely available blood tests associated with liver damage, so should be able to detect liver problems early on. Millions of these tests are performed each year in the UK by doctors and nurses for a multitude of symptoms and problems ranging from feelings of tiredness, to yellowing of skin (in white people) or the whites of the eyes, due to jaundice.

LFTs are commonly abnormal due to a variety of reasons, such as drinking too much, fatty liver caused by obesity, infections, rare liver diseases and some cancers—but they can be a sign of curable potentially fatal liver disease.

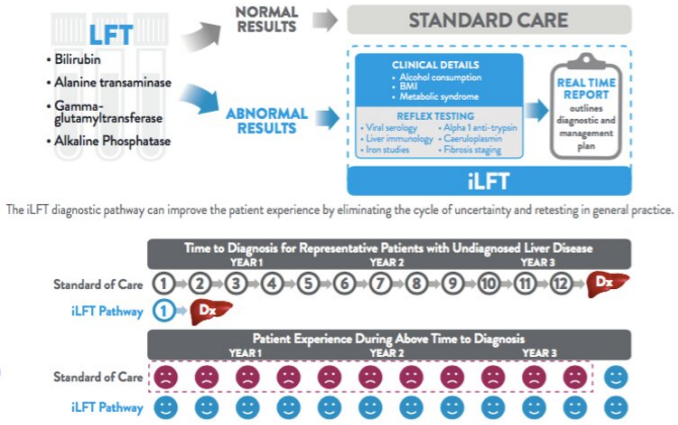
But it is complex to sort out what to do about them—many people with abnormal LFTs are not investigated because of the complex pattern of investigation. In those who are, current care is geared to find an explanation via a lengthy process of investigation and ruling things out, with costs to patients and the NHS in terms of money and time—many people drop out along the way.



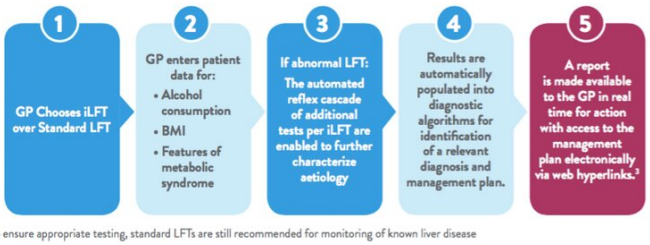
This misses an opportunity to diagnose and treat liver disease at an early stage. With the dramatic rise in the rate of testing and the number of resulting abnormalities, this is not sustainable. So how do we investigate the abnormal LFTs to maximize health gain and minimize health costs?

Rules, clinical facts and algorithms

We use a smarter application of existing knowledge and technology. To solve the problem, we developed a set of rules for the diagnosis of many liver diseases using only blood results—for both the cause of the liver damage as well the severity of it—combined with simple clinical facts, such as alcohol intake and body mass index.



The iLFT diagnostic pathway can improve the patient experience by eliminating the cycle of uncertainty and retesting in general practice.



To ensure appropriate testing, standard LFTs are still recommended for monitoring of known liver disease

In effect, we reduced what a liver specialist does when they see a patient to a set of rules that could be used to create algorithms that would give a specific diagnosis to many patients, and a helpful management plan to the rest who may need to manage lifestyle factors. We went on and tested this set of rules to show that they did work as well as actually consulting a liver specialist.

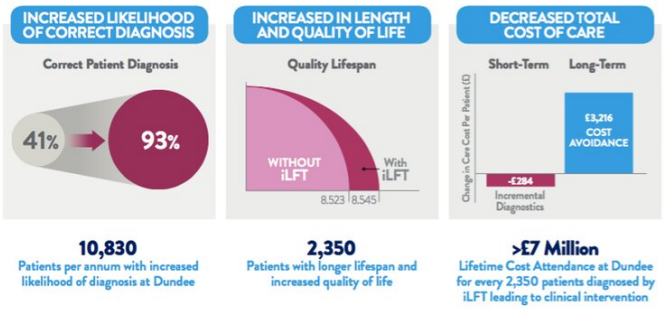
The other component that allows our new system to work is in the blood sciences laboratory. When a blood sample arrives in the lab, it has a bar code and is placed on a large track system, like a model train track. A computer directs the sample to all the machines it needs to go through to have all the required tests performed. The computer also has the ability to change what happens to the sample depending on the first results.

So we created "intelligent liver function testing" or "iLFT." In the new system the GPs who suspected liver disease in a patient selected the intelligent LFT pathway in the lab test requesting system and entered clinical details—BMI, alcohol intake and presence of high blood pressure, high cholesterol or diabetes. The algorithm was integrated with the lab's information management system, allowing appropriate biochemistry, hematology, virology and immunology tests to cascade if the initial LFTs were abnormal.

The iLFT algorithm then combined the clinical information, test results and fibrosis (the extent to which tissue is damaged) scores to generate a diagnosis and/or management plan available as a web link for quick access on the GPs computer. The system generates 32 outcomes, varying from a clear cut diagnosis to a description of what has been found and suggestions for further investigation. This maximizes the diagnosis of early liver disease. iLFT uses a synthesis of existing evidence combined with new algorithms that can be integrated into current lab biochemical analyzers and technology to produce a diagnosis in many patients.

So on any sample sent for LFTs it would be possible to generate a diagnosis or prognosis. The system was trialled and showed that all patients can be investigated, increasing diagnosis of liver disease by 44%, and over an average patient lifetime this is an average saving of £3,216 per head.

In a system that is currently failing to offer a diagnosis to all patients with abnormal results on their liver function tests, iLFT increases diagnosis, improves quality of care and is cost effective. A switch to this new system could be achieved with minor changes to working practices and existing lab systems. iLFT has won multiple awards and is now the standard care in NHS Tayside—and other units and hospitals across the UK are now exploring its potential for their own patients.



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