

Service evaluation: A diabetes service in the non-alcoholic fatty liver disease and post-liver-transplant clinics

Angela Phillips

People with non-alcoholic fatty liver disease (NAFLD) and those who have undergone liver transplantation have complex diabetes care needs. The liver unit at University Hospitals Birmingham NHS Foundation Trust has developed its NAFLD and post-transplant clinics, taking a multidisciplinary approach with input from the diabetes team. Doing so has improved care and outcomes, as well as reducing the burden on patients, who have benefitted from fewer hospital appointments. In this article, the author reviews the two clinics and the developments that the multidisciplinary team continue to make.

Hyperglycaemia and diabetes are serious complications that are experienced by many patients following a solid organ transplant. They may lead to decreased survival of the transplanted liver and have been shown to contribute to increased mortality and morbidity. Early identification and treatment of hyperglycaemia, including impaired glucose control, can reduce the risk of it affecting graft function (Davidson et al, 2003).

Non-alcoholic fatty liver disease (NAFLD) is an accumulation of excess lipids in the liver. The liver damage that can occur is similar to that of alcoholic liver disease; however, when a history is taken, the alcohol intake in these patients is minimal. Damage can range from steatosis to fibrosis, cirrhosis and non-alcoholic steatohepatitis (NASH; Festi et al, 2004). Once liver function decreases, it may be that decompensated liver failure occurs, and some patients may go on to require a liver transplant. The prevalence of NAFLD is increasing and numbers are high in people with type 2 diabetes (Adams et al, 2010). It is predicted that cirrhosis from NAFLD will be the leading cause of liver transplantation in the future (Maurice and Manousou, 2018).

Both people with NAFLD and those who have undergone liver transplantation have complex diabetes care needs; they are asked to attend multiple clinics and require close collaboration between the liver and diabetes services. As the liver unit in University Hospitals Birmingham NHS Foundation Trust is a tertiary centre, patients can travel for miles to attend clinics. Originally the liver transplant clinic was a surgical clinic only, and diabetes was only assessed on venous blood glucose levels reviewed after the clinic; if glucose levels were found to be raised, local diabetes teams were asked to follow up or the patient was admitted to the local hospital, adding to hospital visits for these individuals and requiring cross-hospital care. Furthermore, waiting for referrals delayed treatment. The NAFLD clinic was infrequent and involved only the hepatologist, and diabetes care would be delivered by the patients' local services only.

The challenges discussed above led us to develop the two clinics and restructure them to include input from the diabetes team. This article explains the two clinics and the developments we continue to make as a team.

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Article points

1. People with non-alcoholic fatty liver disease (NAFLD) and those who have undergone liver transplantation have complex diabetes care needs.
2. A multidisciplinary approach to diabetes care in both NAFLD and post-liver-transplant patients is more efficient than separate clinics and can improve outcomes.

Key words

- Joined-up working
- Liver transplantation
- Non-alcoholic fatty liver disease
- Service delivery

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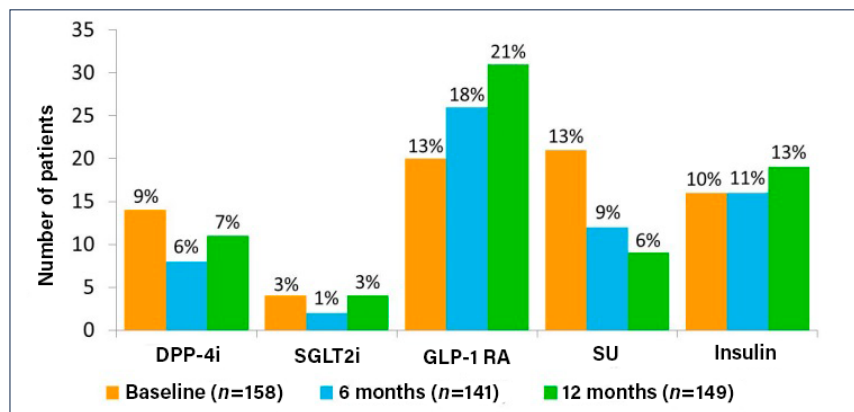


Figure 1. Diabetes treatment at baseline and changes at 6 and 12 months.

NAFLD clinic

Adams et al (2010) identified that not only is NAFLD common among people with type 2 diabetes but also it is associated with an increased mortality rate. This multidisciplinary clinic, which is led by hepatologists, was developed in 2009 to enable patients to have both conditions reviewed in a joint approach. There are four consultants and two registrars, with a diabetes consultant, a clinical nurse specialist (CNS) in diabetes and a dietitian attending.

The role of the diabetes team is to assess each patient’s diabetes control; this includes current medication, whether they are having regular eye screening and foot care, and weight management review. Diabetes treatment is reviewed and optimised, or alternatives are considered that will improve glycaemic control while considering the effects these will have on weight management; for example, glucagon-like peptide-1 (GLP-1) receptor agonists help to improve glycaemic control and reduce weight. The effects of these agents on NAFLD will be discussed later in this article.

Every patient in the clinic has their HbA_{1c} tested at each clinic visit, either to establish a diagnosis or for monitoring purposes. Those with pre-existing diabetes or where weight management services may be appropriate (weight management clinics are also offered within the Trust) are reviewed by the diabetes team for assessment. On average, between four to ten patients per week are seen in one clinic session (joint appointments or individual assessments ranging from 10 to 30 minutes in length), and this may then lead to recommendations for local service care providers or a referral to the

weight management clinic for further review and treatment initiation. Education, if required, will also be provided, especially on hypoglycaemia management and DVLA guidance if the individual is on medication that can cause hypoglycaemia. An assessment has been developed to ensure all aspects are considered; this includes HbA_{1c}, BMI, type of diabetes and present diabetes medication, as well as diabetes care provider. The assessment template is available in [Appendix 1](#). All aspects are documented clearly on our electronic notes system.

Audit

A review of the NAFLD clinic has been published previously (Armstrong et al, 2014). Although limitations were identified, in that this was only a short-term study, it showed that a multidisciplinary team (MDT) approach was achievable, and short-term outcomes were promising. A reduction was seen in weight, and those with an HbA_{1c} above 53 mmol/mol (7.0%) showed improvements at the next visit.

A more recent review assessing the management of the patients in the MDT clinic showed that, during the duration of the audit, the use of GLP-1 analogues had increased, as well as insulin, as seen in *Figure 1* (Susarla et al, 2018). The increase in GLP-1 analogues reflects the fact that, although no pharmacological therapies are currently licensed for NASH, liraglutide was found to have a therapeutic effect in the LEAN (Liraglutide Efficacy and Action in NASH) trial (Armstrong et al, 2016). This change to treatment is also supported by the NAFLD management pathway employed at University Hospitals Birmingham (*Figure 2*).

The study also showed that there was some improvement in weight and liver function, while fibroscan markers remained the same. The long-term effects of this multidisciplinary approach for managing NAFLD may become obvious after 5 years or more (Susarla et al, 2018).

Post-liver-transplant surgical clinic

In 2003, international consensus guidelines on new-onset diabetes after transplantation identified that the development of hyperglycaemia and diabetes following a solid organ transplant may lead to decreased survival of the transplanted liver and increased mortality and morbidity. The authors

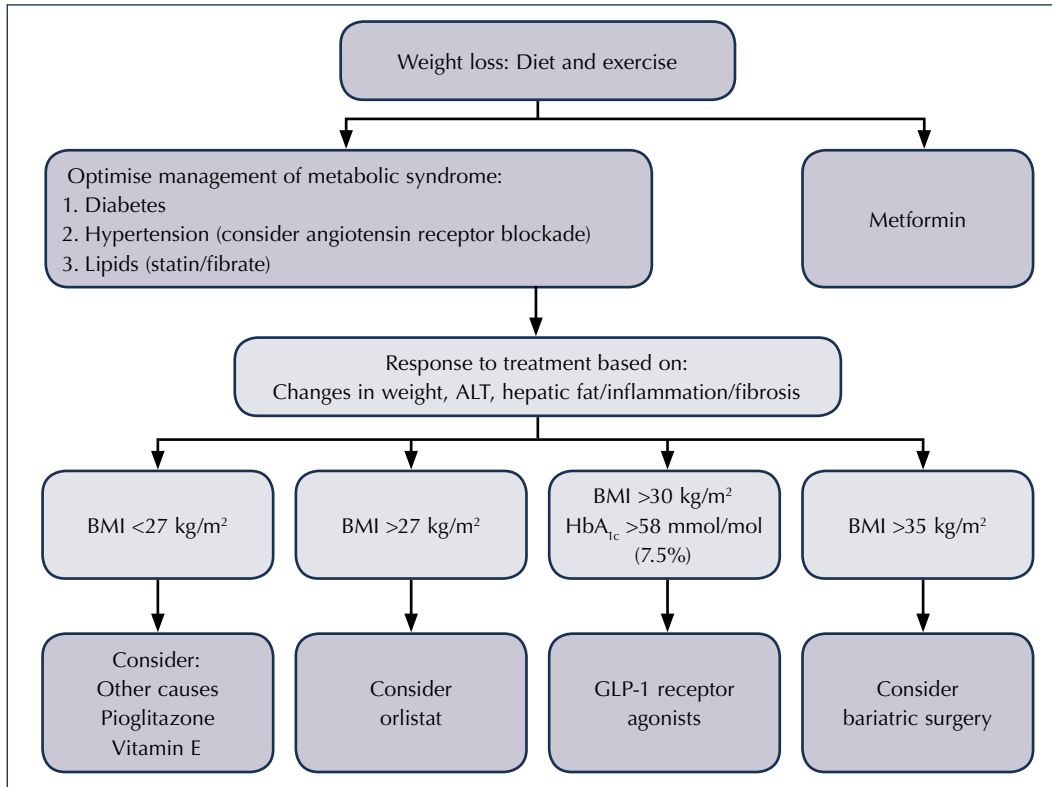


Figure 2. NAFLD management pathway at University Hospitals Birmingham (Dowman et al, 2011).

identified that diabetes specialist involvement could be important to help improve all patient outcomes (Davidson et al, 2003).

Within the liver transplant services at University Hospitals Birmingham, both the liver and diabetes teams acknowledged that gaps in the service needed to be addressed. Initially a CNS in diabetes was employed by the liver team, but this was changed so that the diabetes team provided the CNS, ensuring a full service for both inpatients and outpatients. From this the present clinic was formed, wherein a CNS attends the post-liver-transplant clinic to work alongside the liver transplant surgical consultants and transplant coordinators.

Patients requiring diabetes input can be identified either as an inpatient or outpatient. If still an inpatient, a referral will be made to the inpatient diabetes team, while outpatients are identified to the diabetes CNS attending the post-transplant clinic. Routinely, all patients have a random venous blood glucose measurement taken at each clinic visit. The CNS then screens all patients before the clinic to identify those who require review, by establishing whether they have diabetes or if they have any raised

glucose levels. If the glucose level is found to be raised, patients are then investigated further to see if hyperglycaemia post-transplant has developed. HbA_{1c} used in the early phase post-transplant could be misleading due to postoperative anaemia (Sharif and Baboolal, 2010). Patients with pre-existing diabetes are asked to monitor their capillary blood glucose regularly and bring the results to clinic so they can be reviewed.

Having a CNS within this clinic allows patients to be assessed on a regular basis; this can be weekly in clinic as well as more frequently through a telephone consultation to optimise control. These patients require corticosteroids (prednisolone) post-transplant for immunosuppression, the dose of which is reduced throughout the 3 months post-transplant; therefore, the glycaemic control can change frequently.

The number of patients seen each week varies but ranges from four to ten. The care provided can vary from dose titration to blood glucose management education and full insulin initiation, all done in clinic to prevent extra visits for the patients. The latter point is especially important as this is a



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“It was identified that a multidisciplinary approach in both non-alcoholic fatty liver disease and post-liver-transplant patients was more effective. The two clinics were developed and now continue to run effectively, providing a joint approach to care.”

tertiary centre and patients may need to travel long distances. Treatment is decided on an individual basis from oral therapy to insulin.

The patients remain in this clinic for 3 months and then return to the referring hepatologists for continuing follow-up. At this point, the diabetes care will return to either the original secondary care provider or, if treatment is discontinued as the hyperglycaemia is resolved, the GP is asked to review.

Audit

Our experience in clinics suggested that patients receiving a non-heart-beating liver appeared to have higher incidences of new-onset hyperglycaemia post-transplant. In 2014, a study was performed following 430 liver transplant recipients who did not have diabetes pre-transplant, in order to compare the incidences of post-transplant diabetes (Hartog et al, 2015). It was found that the risk of hyperglycaemia was higher in those who received a non-heart-beating liver, confirming the suspected raised risk in these patients.

Conclusion

It was identified that a multidisciplinary approach in both NAFLD and post-liver-transplant patients

was more effective. The two clinics were developed and now continue to run effectively, providing a joint approach to care. The treatments used for diabetes care have been found to be effective in the treatment of NAFLD, and it is predicted that others will continue to develop in the future. ■

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