

A Population Health Management (PHM) approach to the early detection of liver disease.

Introduction

The Integrated Diagnostics for Early Detection of Liver Disease (ID LIVER) project is a research and innovation endeavour that is being delivered by a consortium [1], made up of NHS clinicians, academics and industry leaders. Importantly, the project actively engages in a meaningful dialogue with both public and patients. All consortium partners are working together to develop solutions for the identification of early liver disease. Investigating patients for disease based on their risk factors at a population level in the community will identify its presence early when there is potential reversibility.

The project is funded by the UK Government's Innovate UK Industrial Strategy Challenge Fund. It is a three-year project and to-date the narrative has tended to centre around the research and innovation aspects of the venture. Given the source of the funding that is perhaps unsurprising; however, as the project has developed it is clear to all involved that, at its heart, it is also a Population Health Management (PHM) endeavour.

This blog identifies some PHM themes which we believe will serve as best practice for guiding the work of the consortium moving forward. In common with all well designed and robustly implemented PHM programmes, the project's aim is to help deliver better outcomes and experiences for the cohort in question which in this instance is the population of Greater Manchester.

The Problem

A well-designed PHM programme always starts with a clearly articulated description of the problem that you are trying to address. Most PHM Programmes seek to deliver on the goals of the Triple Aim; better patient outcomes and a better patient experience, whilst enabling a more effective use of financial resources. The ID LIVER programme has adopted these goals as a guiding principle.

In this instance the problem the project seeks to address is understood and is a matter of record.

Chronic liver disease (CLD) can rightly be described as an ignored epidemic. Premature mortality is considerable and in the United Kingdom (UK) liver disease is in the top three for inequitable healthcare alongside heart and respiratory disease. To illustrate; the median age of death for people with chronic liver disease (CLD) differs by nine (9) years in those residing in the most deprived quintile compared to the least deprived [2].

Liver disease is a significant health burden worldwide and is recognized as a leading cause of mortality and morbidity in the UK. In 2011 it was first highlighted that despite improving mortality rates in neighbouring Europe, deaths from liver disease continued to rise in England [3]. In the UK it is the fifth highest cause of death and standardized mortality rates for liver disease have risen by 400% since 1970, contrasting with improvements in mortality for other major diseases [4].

Greater Manchester (GM) and the North-West have some of the very worst UK mortality. A third (1 million) of the GM community has elements of biochemical liver dysfunction related to alcohol or non-alcoholic fatty liver disease (NAFLD), which is linked to co-morbidities obesity and/or type 2 diabetes.

There is a clear opportunity to do better.

Vision

Best practice PHM programmes always have innovation and transformation at their heart. They start from a premise/hypothesis that the current model of care is ripe for change and that service transformation can deliver better results.

For this programme the contention was that traditional models of care for liver disease have been based in secondary care when the need is at community level. The other observation was that models of care were reactive and not proactive.

The clinical care pathway in Greater Manchester is centred around the establishment of new liver assessment clinics rooted in the community. In this new model of care the traditional boundaries of primary and secondary care become blurred. Design is informed through close collaboration with emerging Integrated Care Systems (ICS) and established Primary Care Networks (PCNs).

Innovation is needed in three broad areas to improve clinical care:

- Better access to diagnostics within the community
- Integrating diagnostics across primary and secondary care
- Utilisation of digital healthcare to enhance patient care

The programme quickly identified three gaps where it was thought it could deliver on the primary goal of improving the identification of early liver disease. These were:

- How to improve the detection of liver disease at a stage that early intervention makes a difference
- Moving diagnostics and initial management from hospital-based care to community-based care
- Focus on diagnosis and intervention at the sites of need based on objective data and not historical needs

All of these have equal status and all speak to characteristics shared by all good PHM programmes in that a) early intervention and proactive care are to the fore b) solutions are sought outside of an acute care setting and are typically centred in primary & community settings c) decision making is data driven and evidence based.

Data, Data Science, Evidence

Managing the health of any population is made possible by transforming data into information, gleaning insights from that information and translating those insights into action. When we embark on a journey to improve patient outcomes, experiences and the best use of available resources we seek what Martha Sylvia and Ines Maria Vigil [5] refer to as *"evidence based action"*. PHM endeavours of this magnitude are marked by a relentless pursuit of evidence from a clinical and economic viewpoint.

In their seminal work on Population Health Analytics [5] - Sylvia and Vigil identify talk of PHM following a structured process that is built on an evidence-based practice (EBP) framework. They speak of EBP as being *"the conscientious, explicit and judicious use of best evidence available to make decisions about the care of patients and populations"* (Sackett, Rosenberg, Gray, Haynes and Richardson – 2007)



Figure 1: EBP Process, Population Health Analytics – Martha L Sylvia & Ines Maria Vigil

The ID LIVER project has adapted this process in order that it might help deliver better outcomes for those populations most at risk of liver disease.

This project is marked by an understanding that the endeavour should be data driven.

For the purposes of the initial analysis the project requires access to an aggregated and pseudonymised linked primary care and secondary care data set. These data are the starting point for the initial data science endeavours as these concern:

- Segmentation
- Stratification
- Risk modelling (to include actuarial analysis)

These data also support some key aspects of the analytics ‘ask’ of the programme namely:

The geographical location for the clinical interactions for the community liver assessment clinics is an ongoing deliberation for ID LIVER. Working with a population health analytics platform – Sollis™ Clarity - the intention is to understand the context of population health.

The starting point is to understand where the risk profiles for liver disease are located geographically through disease “heat maps”. This insight will then help inform the establishment of new community liver assessment clinics in these areas. The clinics can be located according to higher disease burden, disproportionate liver mortality or liver-related outcomes. This will work toward addressing referral bias and improve equitability of the delivered service.

We are addressing these on ID LIVER by working with another consortium partner, NorthWest Ehealth, using their established digital tool FARSITE. This is being used to search, find, contact and recruit a diverse and representative cohort of patients at risk of liver disease in the Greater Manchester region using their primary care electronic health data, whilst still preserving their confidentiality.

A fundamental step to inform the impact of roll-out to a larger population is the development of economic evidence to understand the indicative health care resource use and costs of implementing a liver-disease one-stop clinic compared with current practice. Crucially the process of diagnosing liver disease is heavily reliant on staff with the relevant skills and time to see sufficient numbers of patients. Therefore, the impact of introducing a liver-disease one-stop clinic on capacity constraints within the system will be a key piece of information to be considered before rolling out the service across the NHS.

Another crucial line of enquiry is investigations into the relationship between liver disease and multi-morbidity. Work is on-going in order to describe the scope and nature of multi-morbidity across the Greater Manchester geography and thus provide insight as to the relationship between co-morbidities and chronic liver disease (e.g. Obesity / Diabetes).

Optimising delivery of resources to individuals with the greatest risk of liver related outcomes is imperative. It is therefore critical to identify those with advanced liver disease or those with early disease and high risk of disease progression. To this end data is to the fore and the consortium are deploying Artificial Intelligence (AI) so that stratification can be carried out on a larger scale than previously established pathways.

Predictive analytics will be powered by AI, and the project is developing an algorithmic tool to predict risk of liver disease. Using a carefully phenotyped cohort previously recruited as part of the Scarred Liver Project in Nottingham, new diagnostic models are being developed and will be validated using the prospective Manchester cohort. Following on from the development of the risk-prediction tool, ID LIVER will use early economic analysis to understand the indicative healthcare costs and health consequences of using the tool in the healthcare system to inform the targeted use of prevention strategies to ameliorate the emergence of chronic liver disease.

Patient & Public Involvement/Engagement

The health & care system in the UK is often criticized – rightly in many instances – for its paternalistic approach to service design and delivery. Far too often health & care is seen as something that is done to people and not with them.

However, in recent years a culture of developing meaningful collaborations between the public, health researchers and practitioners (patient and public involvement, PPI) has been gaining momentum in the UK. The National Institute for Health and Care Research (NIHR) introduced [UK standards for PPI](#), in 2019. There is now more emphasis on research teams to meaningfully involve the public throughout the research process (from designing the research to sharing its results). This has served to change the dynamics in the relationships between the public and other members of the research teams to a more equal partnership.

From the outset the project was determined to address this issue ‘head on’.

To support this aim, the consortium includes Vocal, a not-for-profit organisation that specialises in bringing people and health research together for everyone’s benefit.

As a result, Patient and Public Involvement/Engagement has been ‘baked’ into the heart of the project. All stakeholders are committed to consult with people with lived experience, with their carers and with people who are at risk of developing liver disease.

Establishing principles of an equal partnership with the public, the project has recruited public governance advisers to the team and is undertaking a program of conversations with a larger, diverse public group to help shape the work.

As well as speaking to people with liver disease, a focus of the conversations is with people who may not be aware of the very common things that can increase our risk for developing liver disease (for example diabetes and high body mass index). With the focus of the project being the early diagnosis of liver disease to gain improved health outcomes, this group is important to consider.

Care is taken to communicate the projects aims and desired outcomes in an accessible and meaningful way; this with the express purpose of eliciting feedback that will help inform and shape service design and delivery.

When we talk about Population Health Management (PHM) there is a tendency to focus on the word population. In doing so there is a danger that we forget that populations are made up of people; individuals with very distinct wants, needs and desires. We lose sight of this fact at our peril. There is strength in working collaboratively to develop more relevant research that is more likely to be used.

Our mantra is Population Health Management...one person at a time.

Monitoring and Optimisation

The project is acutely aware of the importance of monitoring and optimisation. As we move through the design phase to delivery, routine and monitoring will be required in order to ensure that the intervention is being delivered as envisioned and that it is achieving the outcomes that were intended.

It is therefore vital that the approach to monitoring is routine and robust and that we are constantly reviewing process and outcomes metrics on a regular basis. Optimisation is the means by which better outcomes are assured. Optimisation involves the systematic review of working practices to ensure that patients and citizens needs are fully met.

Local meets National

Improving equity of healthcare provision and proactive case finding to prevent long term morbidity and mortality is a key priority for UK healthcare. Indeed, these goals sit at the heart of current national health policy as this concerns Population Health Management (PHM).

NHS England and NHS Improvement (NHSEI) are investing heavily in Population Health Management (PHM) to support Integrated Care Systems (ICS) and Neighbourhoods (Places) within these Systems. The current NHSEI Place Based Development Programme (PDP) is an excellent example of this commitment/investment

Whilst the ID LIVER project started life as a research and innovation project - and indeed remains just that - over time it has evolved and adopted many of the best practice processes of a classic Population Health Management (PHM) programme.

In the end analysis the labels we place on projects are unimportant. What matters is that projects deliver on their stated aims. In this case the clear end point is the implementation of innovative new care models/pathways that deliver better outcomes and experiences for the patients and citizens they are designed to serve. It is this goal that drives the work of everyone involved in ID LIVER.

The Power of Stories

My concluding observation relates to the power of storytelling. Stories have been told throughout human history and they are one of the easiest ways for humans to convey and transfer ideas. The ID LIVER project – by its nature – boasts technical features which are at times as complex as they are undoubtedly clever. Data linkage, data normalisation, Artificial Intelligence and Machine Learning are technical concepts that will not necessarily engage and excite all stakeholders. Fair to say that such themes might not necessarily pique the interest of the ‘man’ on the Clapham omnibusor for that matter the Manchester tram.

The ID LIVER consortium understands this which is why everyone sets such store on the Patient and Public Involvement (PPI) aspects of the project. If the project is to succeed it will need to involve ‘ordinary’ people and local communities in the planning, commissioning, delivery and evaluation of the services they receive. Stories can help here. As Martha & Ines correctly state: *“a well-crafted and well-told story has the capacity to extend the reach and the impact of science and analytics”* [5]. It is by stories that we capture imaginations; it is through stories that we win hearts and minds.

The ID LIVER Project is a story worth telling.

Get this right and we have the potential to change the lives of very large numbers of patients and citizens for the better.

This blog is merely the opening chapter of the story.

Other chapters will unfold, and I intend to write them.

Nigel Slone

Chief Executive Officer

Sollis

nigel@sollis.co.uk

@Nigel_Slone 

<https://sites.manchester.ac.uk/id-liver/>

[1] Member organisations of the ID LIVER consortium, in alphabetical order, are: the British Liver Trust, GE Healthcare, Health Innovation Manchester, Jiva.ai, Manchester University NHS Foundation Trust, NorthWest EHealth, Nottingham University Hospitals NHS Trust, Octopus Ventures, Perspectum Diagnostics, Roche Diagnostics, Sectra, Sollis, The University of Manchester, University of Nottingham, TRUSTECH and Vocal.

[2] The 2nd Atlas of Variation in Risk Factors and Healthcare for Liver Disease in England; Reducing Unwarranted Variation to Improve health Outcomes and Value. Public Health England, NHS Rightcare, London (2017).

[3] *Davies SC. Annual Report of the Chief Medical Officer, Volume One, 2011, On the State of the Public's Health.* Department of Health, London (2012).

[4] Williams R, Aspinall R, Bellis M, Camps-Walsh G, Cramp M, Dhawan A, et al. Addressing liver disease in the UK: a blueprint for attaining excellence in health care and reducing premature mortality from lifestyle issues of excess consumption of alcohol, obesity, and viral hepatitis. *Lancet.* (2014) 384:1953–97. doi: 10.1016/S0140-6736(14)61838-9

[5] Sylvia, M.L. and Vigil, I.M. (2021) *Population Health Analytics.* Jones & Bartlett Learning