

The great enabler: how technology is helping to improve patient outcomes in paediatric diabetes

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Abstract

UK management and control of paediatric type 1 diabetes remains amongst the poorest in Europe. An integrated strategy being implemented in north-west England shows that the effective use of technology can improve the management of paediatric diabetes. The adoption of a diabetes information management system is helping the multidisciplinary diabetes team identify trends and tailor individualised patient solutions, while monthly audit and data analyses of patients' HbA_{1c} is enabling the easy identification of patients requiring intervention.

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Introduction

The UK has the fifth biggest population of CYP with T1DM in the world.¹ Despite a wide range of initiatives and guidelines²⁻⁵ aimed at improving services and driving outcomes, UK management and control of T1DM in CYP remains amongst the poorest in Europe. The most recent NPDA⁶ showed that CYP in England and Wales continue to have very poor glycaemic control and the incidence of emergency admissions for DKA has increased. The findings of the 2012/13 national audit, which were published earlier this year,⁷ highlight that, although the introduction of the BPT for paediatric diabetes along with the National Paediatric Diabetes Service Improvement Delivery Plan⁸ has had a positive impact, there remains much work to be done to optimise diabetes management for CYP in the UK.

The 2013–2018 Delivery Plan⁸ aims to drive a reduction in the proportion of children in DKA at diagnosis, a decrease in admissions for diabetes-related acute complications (DKA and hypoglycaemia) and a reduction in HbA_{1c} over the next decade. To

Abbreviations and acronyms

BPT	best practice tariff
CCG	Clinical Commissioning Group
CSV	comma separated values (data file)
CYP	children and young people (with diabetes)
DKA	diabetic ketoacidosis
HbA _{1c}	glycated haemoglobin
ICO	Integrated Care Organisation
MDT	multidisciplinary team
NPDA	National Paediatric Diabetes Audit
T1DM	type 1 diabetes mellitus

achieve this, NHS organisations are being urged to redesign diabetes services to include greater communication with CYP, families and MDTs, improve measurement and benchmarking of clinical and psychosocial outcomes and share best practice across regional networks to drive continuous improvement.⁸

This paper examines how one NHS Trust is leveraging technology across the paediatric diabetes pathway to improve patient outcomes in line with both local and national objectives; it follows on from a previous article which provided the rationale for the use of electronic management systems.⁹

The Trust

Southport and Ormskirk Hospital NHS Trust is an ICO and the principal healthcare provider to 350,000 people across Southport, Formby and West Lancashire. The principal Commissioners are Sefton and West Lancashire CCGs. The ICO has a strong track record in delivering children's services across integrated pathways in acute and community settings, adopting an underlying principle of *Care Closer to Home*.

In terms of population health, Southport and Ormskirk, like many other parts of the UK, is seeing a steady rise in younger children diagnosed with T1DM.^{10,11} As such, the paediatric diabetes service has explored ways of engaging young people and adolescents to drive greater control of the condition.

Paediatric diabetes service

In the past three years, Southport and Ormskirk Hospital NHS Trust has significantly restructured its paediatric diabetes service, part of the North West Paediatric Diabetes Network – the largest network in the country. The Southport and Ormskirk service, led by a specialist MDT, has evolved from patients having twice-daily treatment regimes to the delivery of individualised care pathways supported by a comprehensive programme of real-time education.

The total number of patients using the service increased from

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116 in 2012 to 125 in 2014. The outcomes for these patients have improved. A component in this success is considered to be the Trust's integrated use of technology across the care pathway.

The paediatric diabetes service has been strengthened by the combined introduction of:

- An information management system designed to support the management of paediatric diabetes and capture data required for mandatory audit submission
- A monitoring system to download patients' blood glucose meters in outpatient clinics, and empower patients with greater understanding of their day-to-day diabetes management
- A social media presence via Facebook, improving engagement between patients, parents and the MDT and providing high-value educational resources and materials.

Technology as an enabler

As outlined in the Department of Health NHS Information Strategy,¹² the ability of the NHS to harness information and new technologies will be critical to achieving its goal of delivering quality care and improving patient outcomes. Moreover, the National Service Framework for Diabetes compels clinicians to achieve current targets by providing high-quality care using minimal additional resources.¹³ Novel digital and technology strategies are widely recognised as being among the most effective means of driving change.

As such, in 2012 Southport and Ormskirk Hospital NHS Trust established the use of two systems in its outpatient paediatric diabetes clinics: Twinkle.NET, an electronic paediatric diabetes information management system, and Diasend®, a monitoring system allowing the routine uploading of patients' glucose meters and insulin pumps. Key objectives for the initiative, designed to optimise paediatric diabetes management, were to:

- Reduce HbA_{1c} levels
- Decrease emergency admissions, reduce diabetes-related complications and minimise the length of hospital stays
- Help with patient satisfaction
- Improve efficiencies with mandatory audit submissions
- Empower patients, parents and the MDT with accurate, real-time information

The monitoring system currently allows for information to be uploaded manually. In the near future these data will be available through automatic updates, which will of course help with efficiencies, patient satisfaction and enable information to be accessed in a more timely way.

Electronic diabetes information management

The 2012 deployment of Twinkle.NET coincided with the introduction of a mandatory national audit for paediatric diabetes and the BPT. The tool, designed to help trusts capture data required for annual audit, has significantly improved the unit's audit submissions; prior to this it was routinely failing to submit all of the data required for audit. In 2011/12, when the Trust's NPDA data submission was dependent on a manual CSV file, 49 out of 117 patients submitted were excluded due to incomplete data. The MDT also noted 43% incomplete record of care processes, except for HbA_{1c} – again due to manual data entry

procedures. The 2012/13 audit, submitted in January 2014, was managed via Twinkle.NET and enjoyed substantial gains in efficiency and data integrity. Moreover, the unit achieved 100% submission for the first time.

The MDT also uses the diabetes management system to undertake monthly audits to identify patients who have either been admitted as inpatients, have poor metabolic control or frequently do not attend clinics. These patients are subsequently targeted for more intensive contact, education with a diabetes nurse specialist or dietician, and, where appropriate, a higher frequency of follow-up in outpatient clinics. The tool is also used for quarterly BPT audits to identify patients who need more intensive contact at home, HbA_{1c} reviews or annual psychology assessment.

Monitoring technology in clinics and at home

The introduction of Diasend®, also in 2012, was in response to an NHS Diabetes¹⁴ recommendation that blood glucose monitoring had the potential to provide considerable benefits to diabetic patients. Its 2010 Factsheet argues that monitoring helps patients establish the relationship between their physical symptoms and their blood sugar, understand the effects of specific behaviours and empowers them for self-management. The implementation of monitoring technology followed a restructure of the unit's paediatric diabetes service, which had seen an incremental increase in the use of insulin pumps.

Diasend® allows patients and the MDT to download insulin pumps and blood glucose from a variety of manufacturers' glucose meters or insulin pumps, in 2–3 minutes, at home or within outpatient clinics. It allows the MDT to access and analyse effectively patients' glucose readings, to understand factors that may have impacted on HbA_{1c}, and to individualise treatment regimes. The visualisation of the system provides a tangible outcome for children who collect data as part of their day-to-day management and also helps the MDT identify patients who test their blood infrequently or who falsify their records. Significantly, in the management of paediatric diabetes, the system enables praise to be given when distinct improvements have been made.

The social network

In 2013, Southport and Ormskirk Hospital NHS Trust approved a business case to establish a Paediatric Diabetes Facebook page to create an interactive communications channel for CYP with T1DM. The page also maintains frequent updates on diabetes education for patients and parents, and provides service-users and their families with direct access to the MDT. The initiative made the unit the first within the Trust to develop a Facebook presence, having satisfied the full range of Information Governance requirements. The rationale behind the business case was not only the importance of patient engagement, but also the need to enable it using the most effective media for CYP. The approach was supported by the local children and families with diabetes support group, Southport, Formby & Ormskirk Children's Diabetes Club – 'the Lancelots'¹⁵ – who are affiliated to Diabetes UK.

Outcomes

The paediatric diabetes service at Southport and Ormskirk Hospital

NHS Trust continues to make significant progress. Clinical indicators such as HbA_{1c} and DKA admission rates are enjoying steady improvements, whilst regular patient engagement is helping CYP progress towards effective self-management.

Metabolic outcomes for CYP diabetes, using HbA_{1c} as a clinical indicator, are improving. In 2012, mean HbA_{1c} in the preceding 12 months prior to the initiatives was 74±8.1 mol/mol and, in 2013, mean HbA_{1c} was reduced to 65±9.5 mmol/mol ($p < 0.05$). Moreover, 27.9% of CYP are currently achieving an HbA_{1c} of less than 7.5%, compared with 23.7% in 2011.

Hospital admissions and length of stay have also improved. Admission rates were 28% in 2012, but have fallen to 19% in 2013. Furthermore, the median hospital length of stay in 2013 is down from 2.7 days to 1.8 days over the same period.

A patient satisfaction survey conducted within the outpatient clinic in 2013 showed that the unit's use of technology has been positively received. The survey showed that 81% of respondents felt they had benefited from the download technology for glucose meters and insulin pumps, based on a survey completion rate of 79%. In addition, 87% believed that the technology has enhanced patient management decisions in clinic.

There is consensus across the MDT that the use of integrated technologies has helped the unit identify trends and tailor individual responses as well as supporting collaborative efforts to solve patients' problems.

Conclusion

The initiatives and subsequent outcomes at Southport and Ormskirk Hospital NHS Trust provide strong evidence that the effective use of information technology and digital media can significantly improve patient care. The Trust's integrated approach, combining information management systems, patient monitoring and social media, has helped restructure its paediatric diabetes service and played a major part in improving patient outcomes.

Ongoing engagement and education is vital in establishing successful self-management, long-term glycaemic control and a complication-free future for all people with diabetes. It is essential that CYP with T1DM are properly supported to manage their condition effectively. The optimal use of innovative technologies¹⁶ can help the NHS improve the quality of care for paediatric patients with T1DM and, in the process, ensure that diabetes management and control in England and Wales is no longer among the poorest in Europe.

Conflict of interest Hicom is the software developer for the diabetes patient management systems Twinkle.NET and Diamond.NET.

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Key messages

- The ability of the National Health Service to harness information and new technologies will be critical to achieving its goal of delivering quality care and improving patient outcomes.
- An integrated approach combined with information management systems, patient monitoring and social media can help restructure a paediatric diabetes service and play a major part in improving patient outcomes.
- The effective use of information technology and digital media can improve patient outcomes in type 1 diabetes.

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