

Structured education and digital learning for diabetes care in Scotland

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1. Introduction

Patient education plays a major role in the successful delivery of Health and Care services in Scotland. Well delivered education allows for health and care practitioners to have meaningful and in-depth discussions with their patients, allowing for the possibility of shared decision making to take place. Simultaneously it can help patients to better understand their own conditions and more effectively manage their own health and care.

Within NHS Scotland there are two specialist health boards with a specific remit towards the provision of health and care education: NHS Education for Scotland (NES) and NHS24 ^[1]. NES predominantly focuses on the development and delivery of education and training for NHS Scotland's workforce, whereas NHS24 operate as a source of health and care information for the citizen ^[1]. NHS24's offering includes the 111 service that provides urgent out of hours health advice out of hours (free of charge on both mobile and landline) and NHS Inform, a recently established national health information services, which provides quality-assured health information to Scottish citizens ^[2].

NHS Inform provides citizen's with access to a wealth of health and care information, for example ^[3]:

- Illnesses and conditions
- Symptoms and self-help
- Tests and treatments
- Healthy living
- Care, support and rights
- Scotland's Service directory

NHS Inform is a resource that can be used by citizens to educate themselves about their own health, their conditions and what they should expect in terms of health and care service delivery for said condition. In addition to the 111 and NHS inform services, NHS24 have also developed a musculoskeletal (MSK) Help app ^[2]. Designed with the help of patients, doctors and MSK therapists, the app provides advice on common MSK problems, exercise and video clips to show how to move safely, as well as information for employees, managers and employers to help with work, reminders for exercise and scheduled appointments, and a progress log. The information within the application is held within NHS inform as well ^[2].

2. Structured education

In 2003, NICE defined structured education for Scotland as ‘a planned and graded programme that is comprehensive in scope, flexible in content, responsive to an individual’s clinical and psychological needs and adaptable to their educational and cultural background’ [4]. When the service was being developed the Department of Health, NICE and Diabetes UK established the necessary criteria for structured education programmes, these should include [5]:

- A philosophy of education;
- An evidence-based curriculum meeting the needs of an individual;
- Aims and learning outcomes that support self-management;
- Delivered by a trained educator with an understanding of educational theory;
- Quality assured and audited.

However, these criteria are not directly applicable to Scottish diabetes care as only some of Scotland’s 14 autonomous health boards utilise UK wide programmes for diabetes education, with others having created their own regional patient education programmes [6]. Due to the differences between health boards a process has been developed that helps in the evaluation of education programmes and whether they meet the criteria for structured education programmes [7]. Education programmes that have passed this review are entered onto the Scottish Care Information – Diabetes system (SCI-Diabetes) [7].

In 2010, the Scottish government released its ‘Healthcare Quality Strategy’ establishing that NHS Scotland would develop a person-centred approach to health and care, with a focus on prevention and self-management [8, 9, 10]. This commitment has been reaffirmed in all subsequent Diabetes focused publications. Specifically, the Scottish ‘Diabetes Action Plan’ made the commitment that all diabetes patients in Scotland would ‘have access to structured education programmes that are quality assured, in line with the aforementioned NICE guidelines’ [5]. Despite this commitment at a strategic level the attendance rates for structured education programmes is poor. On average 16.7% of type 1 diabetes patients and 3.7% of type 2 diabetes patients attended structured education programmes in 2017, Table 1 depicts a breakdown of regional attendance rates [11].

NHS board	Type 1 diabetes			Type 2 diabetes		
	Achieving measure		All aged 18+	Achieving measure		All aged 18+
	People	%		People	%	
Ayrshire & Arran	348	16.6	2,092	709	3.3	21,678
Borders	42	6.7	625	406	6.6	6,130
Dumfries & Galloway	319	37.1	860	1,064	12.4	8,605
Fife	146	7.5	1,958	1,177	6.0	19,567
Forth Valley	405	24.5	1,650	722	4.7	15,399
Grampian	549	17.7	3,102	26	0.1	25,534
Greater Glasgow and Clyde	915	15.7	5,823	575	1.0	57,660
Highland	178	9.7	1,826	373	2.4	15,517
Lanarkshire	663	17.7	3,746	768	2.2	35,036
Lothian	793	18.1	4,377	152	0.4	36,757
Orkney	5	4.8	104	*	*	1,089
Shetland	11	9.2	119	50	5.0	999
Tayside	365	18.7	1,957	3,891	18.0	21,572
Western Isles	17	9.4	181	*	*	1,283
Scotland	4,756	16.7	28,420	9,918	3.7	266,826

Table 1. Health board statistics detailing structured education attendance rates, adapted from the 2017 Diabetes Group Survey [11].

2.1 Structured education platforms

Previous work in support services for type 1 diabetics has identified three levels of patient education. These have been redesigned through consultation with patients, professionals and the SCI-Diabetes development team to address how education is delivered and be applicable to all forms of diabetes ^[6]. These three levels are as follow:

- Level 1 refers to education that is delivered on a one-to-one basis at diagnosis of diabetes.
- Level 2 refers to ongoing education. This may be delivered on a one-to-one basis or in a group context; however, the person with diabetes only attends the session that interests them as the entire programme is based on ongoing education. Examples of the curriculum content are in the Reviewer's Handbook.
- Level 3 refers to any education that is delivered to a group of people. Currently, DAFNE, DESMOND, and X-PERT Diabetes are examples. While the target audience of these programmes may be people newly diagnosed with diabetes, the programme is delivered to groups of people and so meets Level 3 criteria. Any group education programme is considered to be Level 3 and hence people with diabetes may undergo several Level 3 programmes, e.g. carbohydrate counting, weight reduction.

The two most well-known structured education programmes in the UK are the Dose Adjustment For Normal Eating (DAFNE) and the Diabetes Education and Self-Management for Ongoing and Newly Diagnosed (DESMOND) programmes, for type 1 and 2 respectively.

DAFNE is provided by a not for profit NHS governed consortium. It enables patients to self-manage their disease through a skills-based education programme. It is designed to be embedded within established NHS diabetes services. People applying DAFNE principles learn to stabilise their blood glucose which reduces the risk of complications, improves quality of life for them and their families, and reduces NHS costs ^[12].

DESMOND exists as several types of programmes, including tailored programmes for patients from minority groups. The newly diagnosed and foundation module consists of ^[13]:

- Six hours of structured self-management group education;
- Delivered by two trained health care professionals;
- In 1 day or 2 half-day formats;
- Newly Diagnosed Module – for those within first 12 months of diagnosis;
- Foundation Modules – for those with established diabetes;
- In groups of up to 10 participants who may wish to bring a partner/friend with them;
- Supported by specially developed resources;
- Deliverable in both health care settings or at local community venues.

Its contents include ^[13]:

- Thoughts and feelings of the participants around diabetes;
- Understanding diabetes and glucose: what happens in the body;
- Understanding the risk factors and complications associated with diabetes;
- Understanding more about monitoring and medication;
- How to take control – Food Choices – Physical Activity;
- Planning for the future.

DESMOND's newly diagnosed and foundation modules aims to help patients ^[13]:

- Lowers HbA1c;
- Improves other biomedical outcomes;
- Supports weight reduction;

- Improve levels of physical activity;
- Is an effective smoking cessation intervention;
- Improves understanding of diabetes;
- Reduces depression;
- Promotes positive behaviour change;
- Is administered in one dose and effective for 12 months.

Additionally, DESMOND offers the myDESMOND digital platform to support self-management. Built to provide on-going support to those that have attended DESMOND face-to-face, as well as supporting those for which group education isn't the first choice, MyDESMOND has been developed on the back of a robust bed of evidence and created based on the content of the original DESMOND programme. Its functions are ^[13]:

- Core interactive, educational material that mirrors the DESMOND face-to-face groups;
- 8-weekly educational booster sessions which build on the core material;
- A number of health trackers including HbA1c, weight/shape, healthy eating and blood pressure – where users can self-report their latest data and track their progress;
- A range of activity tracking options including steps and minutes, and the ability to link to wearable technology such as FitBit and Google Fit;
- Ask the Experts – where users have the multi-disciplinary team of the Leicester Diabetes Centre to help with their questions;
- Chat – users can talk with each other and ask questions about their successes and challenges relating to their diabetes management;
- Buddies – an innovative function where users can invite up to five of their family & friends to join their journey with them – as a team they will get to compete against each other in weekly/daily activity challenges, as well as the buddies being able to view a range of useful information to help them in their understanding of diabetes to provide better support for their friend/relative.

In April 2018, approximately 25% of all diabetes treatment and care transformation funding for the 2018-19 period was allocated towards increasing patient uptake of structured education across the UK ^[13]. Other examples of type 2 diabetes structured education programmes available in Scotland can be seen below ^[14]:

Type 2, Level 1: Education to support people newly diagnosed

- Tayside offer the TDEP workbook (including My Diabetes My Way website) Type 2 New Diagnosis Information Pack, GP practices.
- The Western Isles offer WIDE 2: Western Isles diabetes education for people with type 2 diabetes.

Type 2, Level 2: Ongoing education

- The interactive diabetes website My Diabetes My Way hosts a variety of educational resources to support ongoing education.
- The self-management website My Condition My Life also hosts a variety of resources for people living with a long-term condition.
- Diabetes UK provide a variety of resources.
- Ayrshire and Arran offer Information sessions.
- The Borders provide 1:1 session with the Dietitian.
- Grampian provides One-off education sessions.
- Orkney provides One-off education sessions.

Type 2, Level 3: Group education

Ayrshire and Arran offer:

- Co-creating health – diabetes. A self-management programme for any person living with a long-term condition. It includes general aspects and disease specific elements. Further information can be obtained from the Health Foundation website.
- Conversation Maps
- GLP-1 initiation
- Insulin starts

Borders offer:

- GLP-1 initiation

Fife offer:

- X-PERT* Structured Patient Education programme for people with type 2 diabetes.
- Rolling Conversation Map programme for people newly diagnosed with type 2 Diabetes.
- Conversation Map Insulin Group Education programme for people with type 2 diabetes.
- Insulin group education programme for people with type 2 diabetes.
- Conversation Maps.
- Diabetes Footsteps. A discussion tool for people with either type1 or type 2 diabetes on foot care.

Forth Valley offer:

- GLP-1 initiation in groups with education based on Conversation Map.

Grampian offer:

- one-off group education sessions.

Greater Glasgow and Clyde offer:

- Conversation Map.
- DESMOND: Diabetes education and self-management for ongoing and newly diagnosed.
- DIALING: Dose of insulin adjustment learning in groups.

NHS Highland offer:

- Conversation Maps.
- Psychology in diabetes.

Lanarkshire offer:

- X-PERT* diabetes.

Lothian offer:

- RECLAIM: Royal Infirmary of Edinburgh Carbohydrate Learning And Insulin Management. For people with either Type 1 or Type 2 diabetes, using a basal bolus regimen, who need to learn carbohydrate counting and insulin management.

Tayside offers:

- Conversation Maps.

The number of available programmes weighed against the actual attendance rates for type 2 diabetes patients suggests that accessibility is not the barrier preventing patients from using these programmes. A 2015 study examined the reasons for non-attendance at structured education modules ^[15]. The report postulated that shame and stigma of diabetes played a large role in nonattendance. To combat the issue of nonattendance health professionals, need to reconsider their approach to communicating with their patients, offer alternatives to traditional modules and understand the stigma surrounding diabetes ^[15].

In 2012, researchers examined the effectiveness of DESMOND for 731 people newly diagnosed with type 2 diabetes ^[16]. After 3 years a single programme for newly diagnosed diabetics showed no difference in biomedical or lifestyle outcomes ^[16].

3. Adult learning

The principles of adult learning have been well established for some time. They need to be considered throughout the design and delivery of structured education resources to ensure resources have the correct impact upon the patient and are properly retained. These are as follows ^[17]:

- **Adults are autonomous and self-directed.** They need to be free to direct themselves. Their teachers must actively involve adult participants in the learning process and serve as facilitators for them. Specifically, they must get participants' perspectives about what topics to cover and let them work on projects that reflect their interests. They should allow the participants to assume responsibility for presentations and group leadership. They have to be sure to act as facilitators, guiding participants to their own knowledge rather than supplying them with facts. Finally, they must show participants how the class will help them reach their goals (e.g., via a personal goal sheet).
- Adults have **accumulated a foundation of life experiences and knowledge** that may include work-related activities, family responsibilities, and previous education. They need to connect learning to this knowledge/experience base. To help them do so, they should draw out participants' experience and knowledge which is relevant to the topic. They must relate theories and concepts to the participants and recognize the value of experience in learning.
- **Adults are goal-oriented.** Upon enrolling in a course, they usually know what goal they want to attain. They, therefore, appreciate an educational program that is organized and has clearly defined elements. Instructors must show participants how this class will help them attain their goals. This classification of goals and course objectives must be done early in the course.
- **Adults are relevancy-oriented.** They must see a reason for learning something. Learning has to be applicable to their work or other responsibilities to be of value to them. Therefore, instructors must identify objectives for adult participants before the course begins. This means, also, that theories and concepts must be related to a setting familiar to participants. This need can be fulfilled by letting participants choose projects that reflect their own interests.
- **Adults are practical,** focusing on the aspects of a lesson most useful to them in their work. They may not be interested in knowledge for its own sake. Instructors must tell participants explicitly how the lesson will be useful to them on the job.
- As do all learners, **adults need to be shown respect.** Instructors must acknowledge the wealth of experiences that adult participants bring to the classroom. These adults should be treated as equals in experience and knowledge and allowed to voice their opinions freely in class.

Another aspect of adult learning is motivation. At least six factors serve as sources of motivation for adult learning ^[17]:

- **Social relationships:** to make new friends, to meet a need for associations and friendships.
- **External expectations:** to comply with instructions from someone else; to fulfil the expectations or recommendations of someone with formal authority.
- **Social welfare:** to improve ability to serve mankind, prepare for service to the community, and improve ability to participate in community work.
- **Personal advancement:** to achieve higher status in a job, secure professional advancement, and stay abreast of competitors.

- **Escape/Stimulation:** to relieve boredom, provide a break in the routine of home or work, and provide a contrast to other exacting details of life.
- **Cognitive interest:** to learn for the sake of learning, seek knowledge for its own sake, and to satisfy an inquiring mind.

4. Virtual Learning and eLearning outside of Health and Care.

In July 2018 the Scottish government released its healthier futures 'Framework for the Prevention, Early Detection and Early Intervention of type 2 diabetes' [18]. An individual's weight is seen as the most adjustable risk factor for type 2 diabetes. However, currently 87% of those with type 2 diabetes in the age range of 18-54 are above their ideal weight [18]. Additionally, 65% of Scotland's adult population are classified as overweight with 29% being obese [18].

Prevention of diabetes was outlined as the number one priority in the 2014 improvement plan. The framework for prevention sets out a person-centred, value-based care approach to weight management, emphasising the co-production of services and resources to ensure the best value for the end user.

This new focus was mirrored by the DHI's design team findings during exploratory workshops with NHS Lanarkshire. Patient education is seen as the most effective method of preventing the onset of diabetes and improving patient's self-management of their diabetes. However, as mentioned above despite the wealth of well-established structured education platforms for diabetes that already exist, the uptake of these programmes and resources is limited in Scotland, with only 16.7% of type 1 diabetes patients and 3.7% of type 2 diabetes patients attending structured education programmes in 2017 [11].

To get a better understanding of why this is the case it is necessary to review the eLearning and virtual learning market. This allows for us to highlight alternative platforms that could be implemented within a Health and Care context. What methods work in other sectors outside of Health and Care. Are there best-case examples of successful learning platforms and programmes, that have proven methods that ensure retention of information and adherence to continuous learning.

4.1 The Market

The digital learning, or eLearning, market is rapidly growing. In the last few years estimations of the overall global value of the eLearning market have fluctuated. Conservative estimates predict that the market will be worth \$65.41 billion by 2022 [3], with seemingly more optimistic estimates predicting a value of over \$200 billion by 2024 [19] or \$275.1 billion by 2022 [20]. In 2019, GMI estimated that the global market for eLearning will surpass \$300 billion by 2025, with North America accounting for 40% of the entire market [19]. Despite this range in estimates all of these valuations are predicated on a growth of 7.0-7.5% Compound Annual Growth Rate (CAGR) [18, 19, 20]. This consistent CAGR suggests that the differences in valuations are not due to errors in the calculations, but instead are based on what technologies assessors consider the market to be made up of and/or the regions the market covers. Smaller estimates are likely based off of a smaller range of technologies and platforms, whilst the larger estimates are more liberal with what they include as part of their markets.

Technologies included in the eLearning market are:

- Virtual Classrooms;
- Rapid e-learning;
- Learning Content Management Systems;
- Learning Management Systems (LMS);
- Knowledge Management Systems;
- Application Simulation Tools;

- Mobile e-learning;
- Podcasts;
- Online learning platforms.

4.2 Learning Management Systems (LMS)

The global LMS market is expected to increase from \$9.2 billion in 2018 to \$22.4 billion in 2023 at a CAGR of 19.6% [21]. Market growth is being driven by a steady increase in the adoption of digital learning both in Academic and Corporate sectors, government initiatives that push for the growth of LMS, increased use and reliance on Artificial Intelligence and Machine learning and bring your own device policies (BYOD) [21]. BYOD policy refers to allowing employees to use personally owned devices in the workplace and use said devices to access company information, applications and platforms. The adoption of cloud based LMS is growing rapidly helping to increase the market size [21].

Historically LMS started out in the world of Academia but over time they began to focus more on the corporate sector, with the forecast increase in the market size the Academic sector. LMS software focus on the delivery of online learning, providing organisations with a digital space with multiple functions. These include documentation of learning resources, managing courses, user feedback, online assessments, and the tracking of users and online training provision.

Research and Markets identified key players in the LMS market these included [21]:

- Cornerstone Ondemand, Inc.
- Docebo
- IBM Corporation
- Netdimensions Ltd.
- SAP SE
- Blackboard Inc.
- SABA Software, Inc.
- Mcgraw-Hill Education, Inc.
- Pearson Plc
- D2L Corporation

These are the most widely used services in the Corporate sector; in the Academic sector the most used LMS are widely regarded as Blackboard Learn, Instructure Canvas LMS and Moodle LMS [22, 23].

4.2.1 Blackboard Learn

Blackboard is a well-known LMS in the Academic sector. It acts as a virtual learning environment for businesses and educators. It is a web-based software course management system, with a customisable open architecture, which enables users to merge the LMS with the student information systems in education institutions. Blackboard offers four module types for teaching in further education, higher education, Government and corporate markets [24, 25].

Blackboard is an English language platform, supported by Android, iPhone/iPad and web-based platforms, hosted in the cloud. It includes a number of features [24, 25]:

- Enhanced Cloud Profile
- Portfolio
- Student Preview
- SafeAssign

- Data Management
- Collaborate Integration
- Group Management
- Grading Enhancements
- Social Learning
- Blackboard Drive
- Calendar
- Content Editor
- Retention Centre
- Course Enrollments
- Active Collaboration
- Dynamic Content

4.2.2 Instructure's Canvas LMS

Instructure's Canvas LMS is another well-known system. It delivers a customisable architecture that allows educators or learner to work in their preferred way. The platform places an emphasis on communication between student and teacher aiming to streamline this process. For educators specifically, Canvas offers the opportunity to create the learning experience that they want to use: they can integrate mechanisms for feedback, videos, blogs, wikis and various channels of education while observing their students' progress. For the student or learner, Canvas lets them use their preferred device to access and interact with their learning materials [26, 27].

Canvas is an open source software that offers APIs and security audits. The open API allows users to plug in third-party applications allowing for the importing and exporting of data. The Canvas vendor has an app centre that offers users and user organisations the option of adding new technologies to their educational content [26, 27]. It offers a wide range of features as can be seen below [26, 27]:

- Collaborative workspaces;
- Students can record or upload audio and video;
- Integrated learning outcomes;
- Web-standard browser;
- Cut and paste links from a Web browser;
- LTI integrations;
- Canvas' content editor tool;
- Customizable user profiles;
- Open API;
- Audio and video messages;
- Integrated tools like Google Docs and Etherpad;
- Supports external service integrations, like Facebook, Google;
- share resources;
- RSS support;
- Web conferencing tools;
- Analytics;
- Canvas app centre;
- Robust course notifications;
- Graphic analytics reporting engine;
- Canvas mobile apps for iOS and Android;
- Integrated media reporting.

4.2.3 Moodle LMS

Moodle is a free online LMS that allows educators to create their own private portals for courses to be delivered anywhere at any time. The free version of the software has minimal features; as the price increases the more features become available. Moodle offers a user friendly LMS package that is open-sourced and features a modular configuration that facilitates quick and cost-effective software development [28, 29]. It is available in over 100 languages and as an online platform it is available on all devices with internet access and browsing features. It undergoes regular information and security updates; however, it is the responsibility of the user to host the platform in a secure server or cloud for greater data security [28, 29].

A breakdown of Moodle's features can be seen below [28, 29]:

- All-in-one calendar;
- Bulk course creation and easy backup;
- Collaborative tools and activities;
- Convenient file management;
- Customizable site design and layout;
- Detailed reporting and logs;
- Embed external resources;
- Manage user roles and permissions;
- Multilingual capability;
- Multimedia integration;
- Multiple progress tracking options;
- Notifications and automatic alerts;
- Outcomes and rubrics;
- Peer and self-assessment;
- Personalized dashboard;
- Regular security updates;
- Secure authentication and mass enrolment;
- Simple add-ons and plugin management;
- Simple and intuitive text editor;
- Supports open standard.

4.3 Online learning platforms

In the current digital age, the majority of Higher and Further Education institutions offer some form of online education as part of their distance learning initiatives. These are predominantly in the form of online undergraduate and postgraduate degrees, however institutions and bodies within them offer smaller Massive Open Online Courses (MOOCs) as part of their online learning offering.

Online learning platforms are exactly as described above. They are both open access or paid for platforms that are available to any person with access to an internet connection and device such as laptop, tablet or smartphone. MOOCs are usually free online courses and provide education in the form of video lectures of around 8-15 minutes. These are developed across the University sector and allow for the delivery of education in remote areas where the availability of specialist skills is low [30].

There is a massive amount of paid for online learning platforms some of the most popular are listed below [30]:

- **Coursera**

Coursera is an online education platform that partners with universities and organisations worldwide. It typically provides immediate feedback for students. Many institutions have incorporated courses offered on Coursera into their regular curriculum to provide a blended learning experience for their students [31]. Coursera has several (19) diabetes related courses, ranging from basic education in the facts surrounding Diabetes to understanding how to manage diabetes as a long-term condition [31]. Due to Coursera's policy, these are all university accredited courses, with content meeting said university standards [31]. The same policy means that courses can only be hosted by universities, and Coursera users are not able to upload their own courses to the platform. Other platforms with a similar offering as Coursera, such as Udemy provide course building tools for its users [32].

- **Udacity**

Udacity provides courses based on skills required by industries, focussing predominantly on computer sciences, programming and digital skills provision. Nanodegree programmes offered on this platform are co-created by industry giants such as Google, Facebook, Twitter, NVIDIA, Amazon web services and more [33]. Udacity develop their courses in house, often in partnership with corporate sponsors, which affords them the opportunity to advertise their courses as being recognised and approved by industry leaders [33].

- **FutureLearn**

FutureLearn provides free courses for everyone in the area of language, culture, business, management, science, technology, health, psychology and many more [34]. FutureLearn offers an online degree in Diabetes Education and nine other diabetes related courses focusing on living well with diabetes and a range of diabetes-based subjects [34]. To create courses on FutureLearn an organisation must become a FutureLearn partner, while simultaneously evidencing expertise in your specific field, including strong academic research and a commitment to advancing education [34].

These platforms offer a range of features, for most audiences, see table 2 for more details.

		Coursera	Udacity	FutureLearn
Learning Methods	Video with audio	✓	✓	✓
	Audio only	X	X	X
	Articles	✓	X	✓
	Projects	X	✓	✓
	Discussions	✓	✓	✓
	Assignments	✓	✓	✓
	Quiz/Tests	✓	✓	✓
	Transcripts	X	✓	✓
	Video with interactive transcripts	X	X	X
	Peer assessment	✓	X	X
	Adaptive Learning	X	X	X

Table 2. A summary of features supported by online learning platforms, adapted from [30]

4.4 My Diabetes My Way eLearning

As part of their service provision the My Diabetes My Way have developed an eLearning platform in the image of these aforementioned online learning platforms. The platform offers six structured online education courses [35]:

- My Insulin Pump: The Online Education Course.
- My Gestational Diabetes: The Online Education Course.
- Are you Considering an Insulin Pump?
- Understanding Type 1 Diabetes.
- Growing Up with Type 1 Diabetes.
- My Type 2 Diabetes: The Online Education Course.

4.4.1 My Insulin Pump

This course is aimed at those starting out with their insulin pump or as a refresher for those that are already well into their insulin pump therapy ^[20]. The course covers ^[35]:

- Getting started with the insulin pump;
- Calculating your doses;
- Managing complications;
- Living with an insulin pump;
- Interpreting your results.

4.4.2 My Gestational Diabetes

This course provides information surrounding diabetes and is designed for woman diagnosed with this condition. However, if you are related to, or are a carer for, someone diagnosed with gestational diabetes the course will help you understand this form of diabetes better ^[35]. The course covers ^[35]:

- What is gestational diabetes?
- Diagnosing gestational diabetes.
- What to expect?
- Managing diabetes with lifestyle.
- Managing diabetes with medication.
- Monitoring diabetes.
- Gestational diabetes and labour.
- Living with gestational diabetes.
- After pregnancy.

4.4.3 Are you Considering an Insulin Pump

This course is designed to help those transitioning from insulin injectors to an insulin pump. The course provides an introductory guide to insulin pump therapy aimed at those with type 1 diabetes who are considering switching from injections to an insulin pump ^[35].

4.4.4 Understanding Type 1 Diabetes

This is the first in a two-part series that aims to provide information about life with diabetes. The course is targeted towards anyone living with type 1 diabetes, focusing on what diabetes is, how it is treated, what complications can arise and what can be done to live a healthy life with diabetes.

4.4.5 Growing Up with Type 1 Diabetes

This is the second in a two-part series that provides information about living with diabetes. This part of the series is aimed at young people with diabetes, specifically teens, who may be concerned about how their diabetes may affect them as they enter adulthood and leave home ^[35]. The course covers certain scenarios that youngsters living with diabetes might experience, such as ^[35]:

- How managing their diabetes might change when they leave home?
- How having diabetes might affect their weight?
- How to manage their diabetes at events like festivals or concerts?
- How diabetes may affect getting tattoos or piercings?
- What they may have to keep in mind when considering sex and contraception?
- The effect it may have when drinking, smoking or taking drugs.

Whilst not all of these courses will be relevant to every user, the information should give an all-around better understanding of what can be affected by diabetes and how these can be managed to help lead a healthy life. The goal for My Diabetes My Way is to show how having diabetes doesn't stop you from having fun and experiencing what you want as a young adult ^[34]. The information provided in this course was created with the help of other people living with type 1 diabetes who have experienced the situations in which the course is based upon ^[35].

4.4.6 My Type 2 Diabetes: The Online Education Course

This course is aimed at those who are at risk of developing or have already been diagnosed with type 2 diabetes. The course aims to provide the information needed to understand what type 2 diabetes is, what it might mean for the individuals health and what you have to and can do to manage it. The goal for My Diabetes My Way is for the course to build confidence in managing you own condition and support decision making that will lead to the best health outcomes for the individual ^[35]. While not all of the content provided will be relevant to everyone, the course will provide a thorough understanding of type 2 diabetes and has been developed in collaboration with those living with type 2 diabetes. The course has 7 sections for the user to work through, these are ^[35]:

- What is diabetes?
- Diagnosing diabetes
- Managing diabetes with lifestyle
- Managing diabetes with medication
- Monitoring diabetes
- Complications of diabetes
- Living with diabetes

4.4.7 How are courses delivered?

The methods by which courses are delivered by My Diabetes My Way directly mirror those used by commercial online learning platforms such as Coursera and FutureLearn. The platform offers short video lectures and reading exercises that are accompanied by discussion boards for shared learning to take place. There is not yet a feature that assesses users' retention through online assessment. Instead the users progress is recorded based on the number of completed exercises within the individual module. This is coupled with a feedback form as My Diabetes My Way continuously look to improve their eLearning resources.

5. Conclusion

The nature of the principles for adult learning coupled with the poor uptake of structured education for diabetes, suggests that the opportunity to improve the impact of structured education lies in how it is introduced and delivered to patients. The content of the various resources themselves is sound and does not require alteration, instead NHS Scotland should look towards employing innovative solutions to improve the delivery of its programmes. As well as an overhaul of the medium in which they are delivered. The market of online learning can act as a resource or a blueprint for developing new programmes. However, the patients themselves must be involved in the development process to ensure the best end product with the most benefit for the user.

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