

Innovative Medical Technology Overview: *Number 008/2017*

This IMTO Review Document describes an impartial review of the strengths and weaknesses of the submission by Andrew Keen and Kirsty MacLennan (both NHS Grampian) regarding the following medical technology.

ACT Now!

Overview of technology

There are 3.3 million people who have been diagnosed with diabetes in the UK (259,986 in Scotland) and 90 per cent of people with diabetes have Type 2 diabetes.¹ The key issue with Type 2 diabetes is raised blood glucose, owing to the inability of the pancreas to produce sufficient insulin and for it to be used properly. The aim of treatment is to lower blood glucose to as near normal levels as possible. Poor glycaemic control increases the risks of various microvascular and macrovascular damage leading to complications such as stroke, amputations, renal failure, and heart attacks.²

Beyond the widespread use of drug therapy, education is key to successful day-to-day diabetes management and can be life-changing for people with diabetes. However, few people are offered high quality education courses. Recent data suggest that attendance at diabetes education courses remains far too low across the UK.³

Even where good quality education exists, many struggle to change important health behaviours that influence blood glucose levels and health outcomes. Furthermore, where clinical and subclinical anxiety and depression are present, this can adversely affect glycaemic control.^{4,5}

'ACTNow!' is a brief, manualised, guided self-help programme aimed at improving both glycaemic control and emotional well-being of people with type 2 diabetes.

The intervention is indicated for type 2 diabetes patients with poor glycaemic control even after prolonged access to routine services. It consists of six face-to-face appointments with a psychologist - alongside web-based supporting content – over the course of six months. Up to two additional appointments may be added if there is significant anxiety and/or depression. Web support consists of video, audio and text material. The web content reinforces the 1:1 meetings, provides expert advice, stories of others with Type 2 diabetes, and signposts sources of further information

The ACT Now! programme intends to encourage people to live the kinds of lives they want, and uses this, not health itself, as motivation to change health-related behaviours. For example, by identifying what is important in peoples' lives, and setting goals around these priorities, behaviour

change can be promoted which may have a positive indirect effect on individuals' diabetes risk factors. These behavioural outcomes are entangled with diabetes health outcomes.

Figure 1: Intervention modules and contact with therapist



Comparator(s) and use in pathway of care

ACT Now! represents an additional structured educational intervention for the management of type 2 diabetes. As such, the comparator is standard care without ACT Now!.

A range of primary and secondary care services are available to patients with type 2 diabetes within NHSScotland. The specific mix of services depends on their particular health needs. Many patients will have accessed structured education courses either at the time of diagnosis or later. Structured education courses can vary in length (from a few hours to days) and method of delivery (face-to-face, online, etc).

The developers of the ACT Now! programme state that, with the focus on psychology, their programme is different to existing educational interventions and is suitable for patients with prior experience of such existing interventions.

Clinical expert responses indicate that ACT Now! may be implemented after existing programmes have been tried (which is usually during 0-18 months after diagnosis) and therefore any time after it starts to become clear that a patient is struggling to manage their diabetes.

Existing SIGN⁶ guidelines note that structured education interventions for diabetes are complex and varied. A Patient Education Working Group convened by the Department of Health and Diabetes UK laid out criteria for the development of high quality patient education programmes;

- Any programme should have an underpinning philosophy, should be evidence based, and suit the needs of the individual. The programme should have specific aims and learning

objectives. It should support the development of self-management attitudes, beliefs, knowledge and skills for the learner and their family and carers.

- The programme should have a structured curriculum which is theory driven, evidence based, resource effective, have supporting materials and be written down.
- It should be delivered by trained educators who have an understanding of the educational theory appropriate to the age and needs of the programme learners, and be trained and competent in delivery of the principles and content of the specific programme they are offering.
- The programme should be quality assured, be reviewed by trained, competent, independent assessors and be assessed against key criteria to ensure sustained consistency.
- The outcomes from the programme should be regularly audited.

The ACT Now! programme appears to meet a number of these criteria.

Product performance

SIGN guidelines⁶ state that research in this area is difficult to carry out and does not lend itself well to traditional approaches such as randomised controlled trials.

For the ACT Now! programme, product performance data was available from a single arm cohort study (n=59) conducted in a primary care setting in NHS Grampian health board.

Recruitment into the study was based on self-referral. Potential participants had to be over 18 years old, have had diabetes for longer than 12 months, and be experiencing poor glycaemic control (HbA1c \geq 61mmol/mol). Participants were invited to self-refer using leaflets and posters in five general practices and one secondary care clinic in Aberdeenshire. Additionally, participating GPs were asked to identify suitable patients for an invitation letter. Based on the number of invitation letters sent uptake was approximately 10%. Baseline age, gender, time since diagnosis and (Scottish Index of Multiple Deprivation) SIMD scores were recorded.

The primary outcomes of the study were blood HbA1c concentration (mmol/l) and the Hospital Anxiety and Depression Scale (HADS). HADS is a 14 item psychometric scale with 7 anxiety items and 7 depression items. Each item is scored on a 0 to 3 scale. Supplemental secondary outcomes recorded in the study included pedometer step counts, the Problem Areas in Diabetes (PAID) questionnaire and the numbers of GP and nurse visits.

Outcome data were collected at recruitment to the study (baseline) and at routine time points following completion of the intervention (HbA1c measurements were collected from routine diabetes care rather than set points in recruitment/follow up process). There was some variation in the period of time between measurements; the mean time between baseline and follow-up HbA1c measurements was 14.4 months.

In addition, a retrospectively collected control group was created from a local patient database by selection of only patients with poor glycaemic control (HbA1c \geq 61 mmol/mol, n=343). For the primary outcome measures - HbA1c, HADS Anxiety and HADS Depression - the baseline characteristics of the ACT Now! and control groups were 80.3 (SD 17.6) versus 81.6 (25.1), 5.7 (2.9) versus 5.8 (4.2) and 4.1 (3.2) versus 4.5 (3.6) respectively. It should also be noted that there was no significant difference between the ACT Now! cohort and the local diabetes population in

terms of age, duration of diagnosis and deprivation profile (measure using Scottish Index of Multiple Deprivation).

Two comparisons were made to analyse the outcomes data. Firstly, a before-and-after comparison within the ACT Now! group. Secondly, a comparison with the retrospectively collected control group.

In the before-after comparison, HbA1c declined by 9.3mmol/mol from a baseline mean of 80.3 to 71.0 at follow-up ($p<0.001$). This appears to represent a clinically important difference in outcome. Improvement was also observed for psychological outcomes; mean HADS Anxiety decreased from 5.6 to 4.2 ($p<0.001$) and mean HADS Depression decreased from 4.5 to 2.6 ($p=0.001$).

The historical control group comparison also reported better outcomes for the ACT Now! group. The mean difference in HbA1c in the active group of -9.3 compared favourably with a -2.4 ($p=0.06$) reduction in the control group. Median time from baseline to follow-up was 12.7 months for the control group.

Comparison of secondary outcomes before and within the 3-month period after the intervention reported that pedometer step counts increased from 33,177 to 46,265 per week ($p<0.001$), and the PAID diabetes-related distress decreased from 44.8 to 37.1 ($p<0.001$). There was some indication that healthcare use after the intervention decreased compared to the 3 months prior to the start of the intervention but this did not reach statistical significance. The mean number of GP visits over the previous three months was 1.3 before compared to 0.98 ($p=0.133$) after, and practice nurse visits were 1.5 before compared to 1.2 ($p=0.199$) after.

Safety

There are no known safety issues related to ACT Now!.

Strengths and limitations of the evidence

A reported strength of the ACT Now! pilot intervention was a single arm trial which gave sufficient detail to assess the generated data. The selected primary outcomes are relevant and important. Important differences in outcomes were observed in favour of the intervention and these were statistically significant.

Key limitations were the relatively small sample size ($n=66$) and design of the pilot study. The study used an observational design without randomisation raising concerns of selection bias in the estimated treatment effects. The use of retrospectively selected controls adds additional concern of bias arising from different recording of outcomes in the control and active treatment groups, temporal trends and possible regression to the mean effects. No power calculation was reported. The study had enough participants to detect moderately large difference in the primary outcomes.

There is additional uncertainty surrounding the performance of the technology in other settings. The pilot study was conducted in a single location with only one psychologist delivering the programme. This raises concerns that the performance may not be generalisable if rolled-out across other health boards.

Although ACT Now! is a manualised intervention, with manuals provided for both therapists and participants to ensure the integrity and reproducibility of the programme; the developers note that delivery does require a certain level of psychological skill. The level required is in-keeping with

those who have an undergraduate degree and further postgraduate level training in psychological therapy skills. In Scotland, this pool would commonly be called clinical associates in applied psychology. The developers of the programme go on to note that the psychological skill aspect is more important than in-depth knowledge of diabetes - although some orientation to the clinical area would be advisable.

It should also be noted that the mean time since diagnosis was approximately 10 years for the ACT Now! treatment group. Owing to the natural disease progression of diabetes – where HbA1c levels may be relatively unreceptive after 10 years – the ACT Now! intervention may be more effectively positioned earlier in the treatment pathway.

Economic considerations

Good diabetes management reduces the risk of longer term complications.^{7,8} However, when diabetes is not well managed, it may lead to serious complications including heart disease, stroke, blindness, kidney disease and amputations leading to disability and premature mortality. There is also a substantial financial cost to diabetes care as well as costs to the lives of people with diabetes.¹

With this in mind, important economic considerations for this type of intervention include not only the resources needed to deliver the ACT Now! programme, but also the effects on long-term outcomes from diabetes. These include the effect on patient’s health related quality-of-life and the costs associated with future complications of diabetes.

Health care resources used in the ACT Now! pilot study were used as a basis for assessing the resource requirements for replicating the ACT Now! programme in other boards. Resources included a clinical associate applied psychologist (Band 6), access fee for web materials, patient recruitment materials, staff training costs, printed patient manuals and pedometers. Costs for each resource are displayed in Table 2. It is perhaps worth noting that one expert noted that predicted resources may be optimistic.

The total cost of the service is £46,750 – the majority of which incorporates an annual salary cost. The total cost per patient enrolled in the programme, assuming a single psychologist and recruitment of 170 patients in each service was £275.08.

Table 2 – Costs of delivering ACT Now! programme

Resource	Cost (£), <i>Capacity of 170 patients per service per year</i>
Clinical associate applied psychologist, band 6	37,713; per service per year
Web materials access	100; per service per year
Patient recruitment materials (flyers, posters, etc)	1000; per service per year
Staff training	300; (annualized) per service per year
Printed patient manual	5; per patient
Pedometer	40; per patient
Total:	275.08; per patient

Data were provided to HIS researchers to allow an exploration of the cost effectiveness of the intervention. In total, 69 patients have now participated in the ACT Now! programme. Although some patients dropped out before completing the programme these patients are included in the analysis.

To extrapolate over a longer period of time the UK Prospective Diabetes Study (UKPDS) outcomes model was used to simulate the longer-term outcomes of patients participating in ACT Now!. The model outputs are life expectancy, quality-adjusted life-years (QALYs) and costs of diabetes complications. Inputs to the UKPDS model obtained from the data included ethnicity, gender, age, duration of diabetes, date of diagnosis of diabetes, height, weight, atrial fibrillation (AF), peripheral vascular disease (PVD), smoking status, albuminuria, plasma HDL cholesterol concentration, plasma LDL cholesterol concentration, systolic blood pressure, HBA1c concentration and eGFR.

The comparison of pre-intervention and post-intervention risk factor measurements were used to simulate two separate cohorts over a life-time horizon as this comparison was viewed to be more robust than the comparison with historical controls. These cohorts represent one group who have participated in the ACT Now! programme and one group who have received only standard care.

Simulated life expectancy and life-time QALYs were higher in the ACT Now! post intervention group than the pre-intervention group. The model predicted a 0.22 year gain in life-expectancy and a 0.21 gain in QALYs. Life-time cost of diabetes complications were £248 lower for the ACT Now! group. The costs of the programme and the difference in life-time costs of complications can be combined to calculate the life-time incremental cost per patient of £27. The incremental cost-effectiveness ratio (ICER) for the ACT Now! intervention given the QALY gains estimated using the UKPDS is £128.60 per QALY gained. This figure represents a highly cost-effective intervention and the ICER is far below commonly used thresholds for cost effectiveness (£20,000-30,000 per QALY).

It is important to note that the economic results are exploratory; the analysis is based on a comparison of pre-intervention and post-intervention measurements and therefore is subject to the same limitations noted above in relation to product performance.

The developers of ACT Now! also made reference to the possibility that the outcomes demonstrated following the ACT Now! programme may lead to the avoidance – or at least delaying – of drug intensification. For example, a reduction in the use of DPP-4 inhibitors may lead to important cost savings. Clinical expert responses noted that there would likely be a reduction in the medication cost burden based on successful outcomes such as those seen here.

Organisational and patient issues

There is some uncertainty about whether it would be possible to find sufficient clinical applied associate psychologists staff to conduct the programme if ACT Now! was to be rolled-out nationally. This concern was noted within the expert responses. Furthermore, it is not clear if there would be uptake by a sufficient volume of patients to allow these staff to operate at capacity.

Qualitative data demonstrated that people liked that the programme was endorsed by their GP. They also felt as if they otherwise had limited resources available to them, and were pleased that the intervention changed their lives. The programme trial included semi-structured interviews

(n=12) exploring the knowledge and experience of participating patients. Overall, although patients did not always have a good understanding of what 'ACT Now!' was about, in assessing their experience of the programme, all participants indicated that they felt the time and effort they had invested was worthwhile. The letter of invitation from their own GP seemed to be a key driver for recruitment. Furthermore, most participants said that they would recommend 'ACT Now!' to others in similar situations.

Clinical experts noted the importance of diabetes interventions such as Act Now! in areas of unmet need. Reference was also made more generally to the lack of mental health support for long term conditions across health boards.

Summary

A single arm observational pilot study investigated the effect of the ACT Now! programme on surrogate outcomes of diabetes. Results suggest that ACT Now! may offer an additional tool to improve diabetes control and lead to better psychological outcomes. An exploratory economic analysis suggests that ACT Now! may improve long-term outcomes, reduce costs of diabetes complications and has the potential to be a cost-effective use of resources. Conclusions regarding both performance and economic outcomes are limited by the small sample size and observational design of the pilot study.

Further research - perhaps in the form of a randomised controlled trial – should be encouraged to determine the true clinical and cost effectiveness of the ACT Now! programme.

References

1. Diabetes UK. Diabetes: Stats and facts. 2015 [cited 2017 Feb 13]; Available from: <https://www.diabetes.org.uk/Documents/Position%20statements/Facts%20and%20stats%20June%202015.pdf>
2. National Institute for Health and Care Excellence. Type 2 diabetes in adults: management. 2015 [cited 2017 Feb 13]; Available from: www.nice.org.uk/guidance/ng28
3. Diabetes UK. Diabetes education: the big missed opportunity in diabetes care. 2016 [cited 2017 Feb 13]; Available from: https://www.diabetes.org.uk/Upload/Get%20involved/campaigning/Taking%20Control/Diabetes%20UK_Diabetes%20education%20-%20the%20big%20missed%20opportunity_updated%20June%202016.pdf
4. Anderson RJ, Grigsby AB, Freedland KE, De Groot M, McGill JB, Clouse RE, et al. Anxiety and poor glycemic control: a meta-analytic review of the literature. *Int J Psychiatry Med.* 2002;32(3):235-47.
5. De Groot M, Anderson R, Freedland KE, Clouse RE, Lustman PJ. Association of depression and diabetes complications: a meta-analysis. *Psychosom Med.* 2001;63(4):619-30.
6. Scottish Intercollegiate Guidelines Network. Management of diabetes: A national clinical guideline. 2010 [cited 2017 Feb 13]; Available from: <http://www.sign.ac.uk/pdf/sign116.pdf>
7. Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, Cull CA, et al. Association of glycaemia with macrovascular and microvascular complications of Type 2 diabetes (UKPDS 35): prospective observational study. *BMJ.* 2000;321(7258):405–412.
8. Epidemiology of Diabetes Interventions and Complications Trial (EDIC). Publications. 2017 [cited 2017 Feb 13]; Available from: <https://edic.bsc.gwu.edu/web/edic/publications>

