



Diabetes myths and legends: the Iliad and the Odyssey

The 2010 Diabetes UK Arnold Bloom Lecture

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Introduction

Arnold Bloom was a respected and well loved physician who worked at the Whittington Hospital. His many accolades included Chairman of the British Diabetic Association (BDA) and Vice-President of the Royal College of Physicians. I never had the privilege of meeting Arnold Bloom, but from everything I've learned I know he was a man who delighted in translating complex medical concepts into easy and familiar images. This is something that sounds simple but which is so difficult to achieve that few have attempted it and even less have succeeded.

Myths and legends abound in diabetes care and I will explore some of them with regard to three specific aspects of type 2 diabetes mellitus (T2DM): structured education and self-management, prevention, and early detection.

Structured education and self-management

Structured education and self-management have been the focus of attention among health care professionals only relatively recently and yet it is an area which is already rich in myth. Here are two of the most common. It is not unusual to hear health care professionals say that they know how to educate patients because it's part of their job. Indeed, physicians' views on this whole area can be extremely negative as demonstrated in this quote: 'Second, we have what might be called macro-diabetes studies. They attempt to improve (or should that be control?) patients' lives with such things as DAFNE and DESMOND,

ABSTRACT

It is a myth that screening of type 2 diabetes is 'a given', that we provide adequate education for patients and that increasing physical activity by simply referring patients to a health trainer can prevent type 2 diabetes. Research in this area is often seen as an easy or soft option. On closer inspection, research of these 'complex' interventions requires rigorously conducted and well designed trials which are difficult to do and even harder to implement. The process of screening for type 2 diabetes is feasible and a number of practice level and self-assessment tools are effective in the multi-ethnic UK population; however, providing the evidence of whether a screening programme will lead to improved patient outcomes is more challenging.

Providing structured self-management education in type 2 diabetes can be effective in both biomedical and psychological outcomes, but the role of the educators is key. Such programmes can be cost effective, and can be implemented on an industrial scale whilst maintaining consistency and quality. Increasing physical activity and reducing sedentary behaviour to prevent type 2 diabetes are possible in the UK, and tailored strategies for younger and black/minority ethnic groups are being developed. Copyright © 2011 John Wiley & Sons.

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KEY WORDS

type 2 diabetes mellitus; structured education; prevention; screening; physical activity

but these projects do not lend themselves to the sort of research that would attract a physician with a scientific turn of mind. I don't know many young doctors who would elect to enter this field and in fact many of the investigators are quite senior and, perhaps, past their most creative phase.¹ However, we ignore structured education for our patients at our peril. In 1985, Assal *et al.* commented that 'the quality of diabetes care has, in general, remained poor, the widespread failure to acknowledge the impact of patient education appears to evolve as the primary reason for this unsatisfactory situation'.²

The Diabetes Education and Self Management for Ongoing and Newly Diagnosed (DESMOND) initiative started in 2002 when a number of like-minded colleagues discussed the implications of the forthcoming

National Institute for Clinical Excellence report.³ All shared a concern regarding lack of good, structured education for people with type 2 diabetes and from an informal beginning the momentum has grown.

What is important about this approach is that it is truly patient centred and derives from the work of Anderson and Funnell and is underpinned by a number of psychological theories of learning.^{4–7} The DESMOND newly diagnosed programme is delivered as a six-hour group programme with a formal written curriculum starting with the patient's story and finishing with facilitating people in developing a personal plan.

Undertaking research and evaluating the impact of such interventions are a feat in themselves, and it

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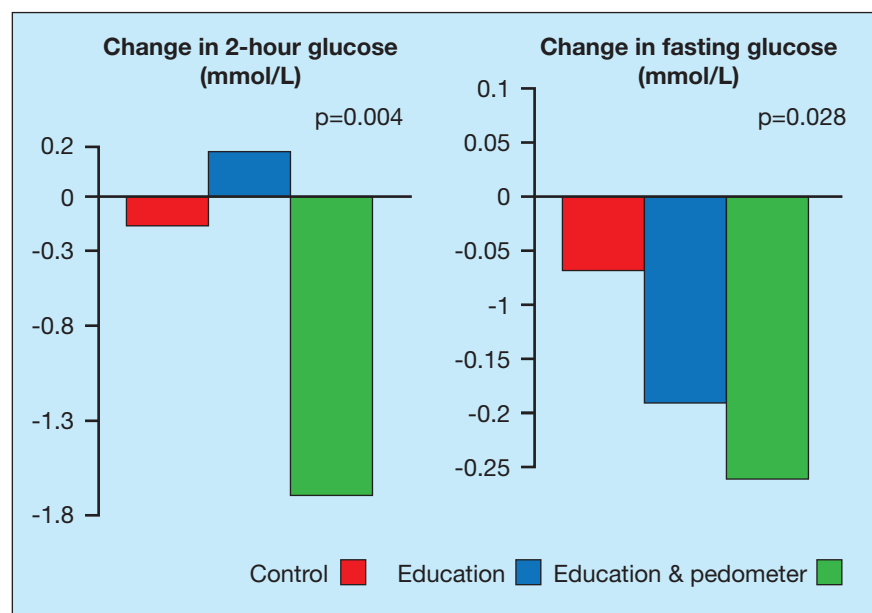


has been recognised for some time that we are very poor at both describing and evaluating such interventions, which means it is very difficult for them to be replicated and this results in a poor evidence base.⁸ Having developed a theory for the programme and modelling its effect on key components, an exploratory pilot study was performed and this informed a definitive randomised controlled trial (RCT). The results of this showed that, whilst all biomedical parameters improved, there was no significant effect of the intervention on HbA_{1c} in these newly diagnosed patients. However, there was a significant improvement in triglycerides at eight months and a significant improvement in self-reported physical activity at four months. There was a significant improvement in smoking status with a favourable odds ratio of 3.6, and there was a clinically significant reduction in body weight at four and 12 months. Using the UK Prospective Diabetes Study (UKPDS) risk engine, the intervention group showed a significantly greater improvement in 10-year risk status and a greater percentage having a less than 15% risk at 10 years. The psychological results showed a significant reduction in depression at 12 months and three of the key illness beliefs – illness coherence, timeline and seriousness – were all significantly improved at 12 months. This means that participants who received the DESMOND programme had a greater understanding of their illness and its seriousness, and a better perception of its duration.⁹

Furthermore, a robust cost-effectiveness assessment of the DESMOND intervention, both in the context of the trial and delivery in the current primary care setting, showed that the real world cost for delivering a DESMOND course in a typical primary care trust (PCT) was £82 compared to £209 in the trial.¹⁰ The more expensive costs in the trial setting were largely due to residential training courses and, now that DESMOND has been implemented, there are benefits from the economies of scale. Looking at the real world costs, the incremental costs per QALY is £2092.

These data were based on assumptions; however, three-year results will

Figure 1. Results at 12 months for two-hour and fasting glucose from the PREPARE trial which compared control to a structured education and education/pedometer intervention in subjects with impaired glucose tolerance. (Data for drawing this figure have been taken from: Yates T, *et al.* *Diabetes Care* 2009; **32**[8]: 1404–10)²⁰



help to further accurately predict cost effectiveness. At three years, differences in illness beliefs were maintained with now four domains being positive, including personal responsibility. In terms of HbA_{1c}, looking at the unadjusted HbA_{1c}, there is a significant fall in both groups with HbA_{1c} but a 0.5% difference in HbA_{1c} at three years between the two groups; however, once you adjust for the baseline HbA_{1c} and for cluster, the statistical significance is lost. The intervention group continue to have a lower body mass index; the other changes, whilst in the right direction, were not significant once adjusted for baseline and cluster. These data are encouraging based on the fact that this is a one-off intervention shortly after diagnosis, and to see significant changes in illness beliefs and weight three years down the line is an unexpected and actually quite unique finding.¹¹

There has been some concern regarding the lack of difference in HbA_{1c} with the newly diagnosed DESMOND programme, but this is not unexpected if we consider data in those with newly diagnosed diabetes in the UKPDS which show that, after diagnosis, A_{1c} generally improves.¹² In patients with established diabetes,

both the XPERT and the Turin studies did see significant differences in HbA_{1c} but showed either modest or, in fact, maintenance of HbA_{1c} in the intervention group compared to an increase of HbA_{1c} in the control groups.^{13,14}

Since 2003, the momentum of DESMOND has been maintained; 2009 saw the beginning of a five-year research programme to finalise development and begin a trial of the DESMOND Ongoing model – integrating life-long learning, care planning and treatment optimisation. The training and quality development for health care professionals is a key component of the programme's success; very briefly, it integrates professional development with objective assessment, develops reflective practitioners, monitors reliability and ensures that the programme is of a consistently high quality wherever it is delivered.¹⁵ This programme of work has fundamentally influenced national guidelines and standards for structured education and has highlighted the importance of health care professionals' training.^{16,17} It is important that research leads to change in practice and now 104 primary care organisations are delivering DESMOND across the UK

and Ireland with 747 trained educators and 77 training courses since 2005.¹⁸ The black and minority ethnic (BME) DESMOND programme is now up and running with 16 PCTs delivering it.

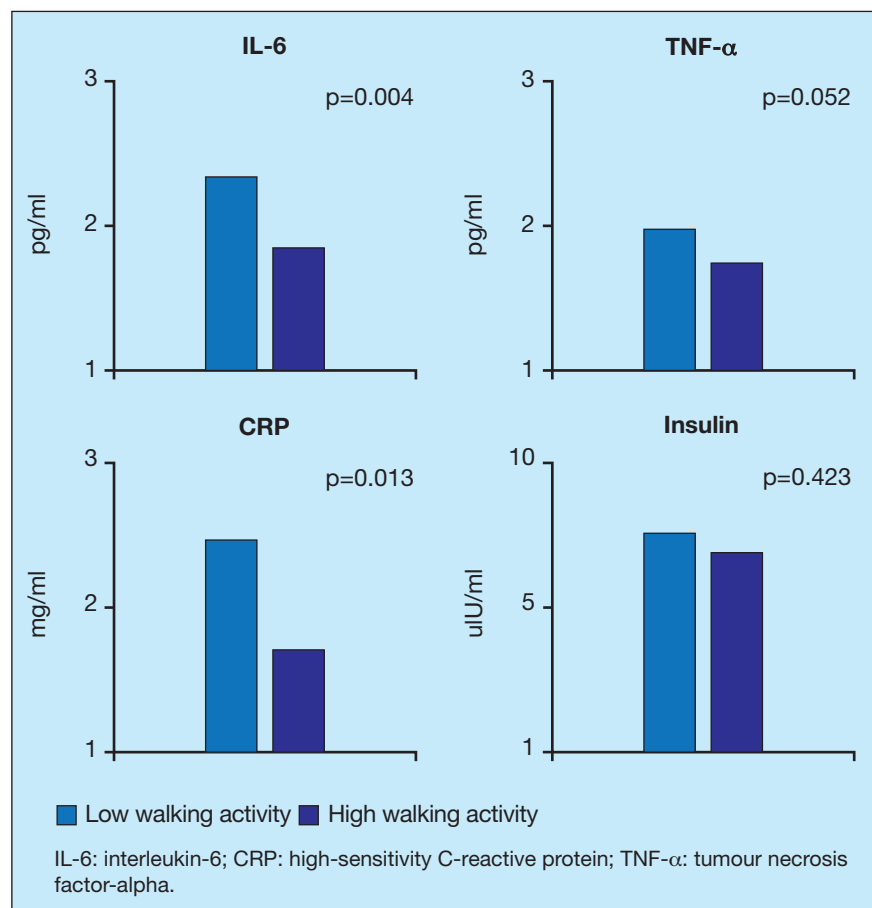
Prevention of type 2 diabetes

A commonly held myth is that exercise prevents diabetes. In fact, if you look on Google, you will find over 1 600 000 hits for exercise and diabetes prevention. This is not unexpected as we know that exercise and increase in physical activity are strongly and adversely associated with the incidence of T2DM, and this association is independent of body weight and other lifestyle behaviours.

A review of this topic showed that, whilst lifestyle interventions reduced diabetes by 50%, it was unclear whether it was the dietary intervention or the exercise component, as actual change in physical activity when measured was minimal. Thus, the conclusion was that the evidence for the independent effect of increasing physical activity on reducing progression to T2DM was equivocal.¹⁹ In the PREPARE study, we investigated whether promoting walking through structured education and pedometer use improves glucose regulation in those with impaired glucose tolerance.²⁰ At 12 months, there were changes in perceived knowledge and self-efficacy and physical activity data, with increases in step count and self-reported physical activity with both structured education and a combination of structured education and pedometer use. In terms of glucose control, there was no significant change between two-hour or fasting glucose between the control group and the education-alone group. However, in the education and pedometer group there was a significant reduction in both two-hour glucose and fasting glucose (Figure 1).²⁰

What are the other potential effects of increasing physical activity, particularly walking, on other aspects of health? It is increasingly recognised that adipose tissue is not just an inner mass of cells that stores triglycerides, but is in fact an active

Figure 2. Cross sectional data on levels of interleukin-6, C-reactive protein, tumour necrosis factor-alpha and insulin from 400 subjects grouped into 'high' and 'low' walking activity based on current exercise recommendations. (Adapted from: Yates T, *et al. Prev Med* 2008; **47**[4]: 417–21)²⁴



endocrine organ in its own right producing an array of adipokines which have both endocrine and immunomodulatory effects.²¹ It is known that physical activity is independently inversely associated with both markers of inflammation and the risk of developing T2DM, and therefore inflammation could be a mediating link between physical activity levels and chronic disease, including T2DM.^{22,23} Using cross-sectional analysis of 400 participants recruited from a population-based screening programme and prospective data from PREPARE, we tested the hypothesis that walking at levels that are consistent with current exercise recommendations would be independently associated with lower levels of chronic, low-grade inflammation. Figure 2 shows interleukin-6, C-reactive protein, tumour necrosis factor-alpha and insulin in the low walking activity group. In the group

reporting high walking activity, there were significantly lower levels of interleukin-6 and C-reactive protein, and there was a trend for lower levels of tumour necrosis factor-alpha.²⁴ Furthermore, from the prospective data from PREPARE, we see a significant relationship between increasing walking activity and lower levels of interleukin-6.²⁵

Thus, walking is associated with lower circulating levels of two recognised biological markers of inflammation independent of other modes of physical activity, demographic variables, smoking status, waist circumference and use of statins and blood pressure medication. Promoting walking activity in sedentary populations could have a large impact on reducing the development of chronic disease.

A definitive RCT of a walking intervention (Walking Away) based on the PREPARE programme



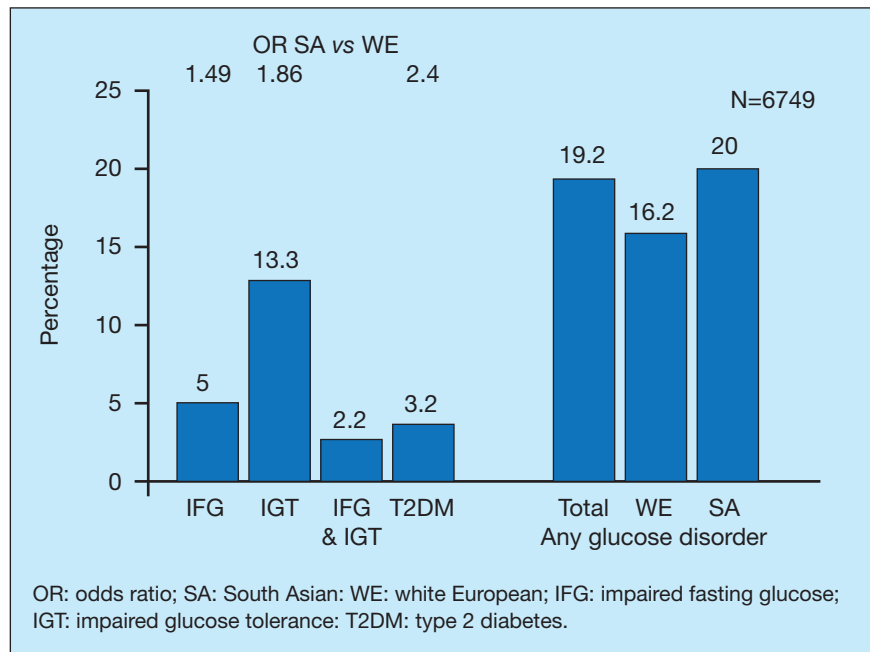
recruiting 1000 participants is ongoing. We have developed a pragmatic and effective intervention which appears to work in the UK setting in a multi-ethnic population, and have helped to explain the mechanism for how walking can improve glucose intolerance and also reduce systemic inflammation.

Screening and early detection of type 2 diabetes

One could argue that there should already be a national screening programme specifically for T2DM as the prevalence is increasing, it contributes significantly to health inequalities within countries, and leads to significant morbidity and mortality which can be reduced by effective treatment. However, there is as yet no evidence that screening and earlier interventions improve patient outcomes and reduce mortality; this is the subject of a large RCT.²⁶

In Leicester, patients aged between 40 and 75, and 25–75 if they are South Asian, from 28 practices have been systematically screened for diabetes using an oral glucose tolerance test.²⁷ Figure 3 shows the prevalence of impaired glucose regulation and T2DM. Follow up of 850 subjects with impaired glucose regulation has shown progression rates to T2DM in 12 months to be three-fold higher in South Asian compared to white European subjects.²⁸ We have used the data collected in order to develop a simple and easy way in which to try to identify those at risk of T2DM. The end product is a simple questionnaire which includes seven questions. The score was derived by multiplying the coefficients by 10 and the scores are between 0 to 47. This score with a cut off of ≥ 16 has a sensitivity for detecting both diabetes and impaired glucose regulation of 80% and a specificity of 45%. This tool can be used to identify those at high risk of impaired glucose regulation and T2DM.²⁹ It is simple, non-invasive and inexpensive and we hope that it will increase the uptake to screening programmes; indeed, a web-based version is now available via the Diabetes UK website and has already been used by over 20 000 people within the first six weeks.³⁰

Figure 3. The prevalence of impaired glucose regulation and type 2 diabetes in the Leicester ADDITION study of 6749 subjects screened for glucose intolerance from a multi-ethnic primary care population. (From: Webb DR, *et al. Trials* 2010; **11**: 16.²⁷ Permission to reproduce the figure has been granted by the authors; © Webb DR, *et al.*)



Summary

I have come to the end of one odyssey here, but any experienced traveller knows that the end of one journey is only the beginning of another. In the process of this one, I have tried to show that, while some myths about diabetes do contain important truths, others need to be shown as the frauds that they are. Indeed, it is this process of continual myth making and myth breaking which creates a legacy of improved patient care and management of diabetes that is not just focused on biomedical outcomes but also addresses the beliefs and behaviours of patients and health care professionals.

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Conflict of interest statement

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