Expanded methods

AUSDRISK

The Australian Type 2 Diabetes Risk Assessment Tool (AUSDRISK) identifies patients at high risk of developing type 2 diabetes and consists of 10 items that assess risk factors including age, gender, country of birth, family history of diabetes, history of high blood glucose, hypertension, smoking status, fruit and vegetable intake, physical activity levels and waist circumference. Scores range from 0 to 38 and reflect the probability of developing diabetes within the next 5 year(1). The usual cut-off of 6 is associated with a sensitivity of 97.7% (95% ci 95.4-99.0) and specificity of 20.0% (95%CI 18.9-21.0)(2).

Identify intervention

Referred patients were provided with a GP referral pack which included a personalised referral letter, assessment proforma and a study information brochure for the GP. GPs were asked to continue with their usual clinical practice for the management of T2D, and to return the diabetes assessment results to the referring oral healthcare professionals

Model structure

The model captured various health states: normoglycaemia; pre-diabetes (either identified or not identified by the intervention); T2D and death. All patients started in the model as either normoglycaemic or pre-diabetic. Those with normoglycaemia could remain so, or transition to pre-diabetes but not T2D. Those starting with pre-diabetes could remain so, improve (normoglycaemia), or progress toT2D. As per disease progression, the model assumed that once a patient had developed T2D, the patient would remain in that state until death or the end of the modelled period.

The economic modelling set to ascertain the benefits from one-off screening using iDENTIFY (i.e., new people identified by such screening are not considered). Intervention reach of various levels (10%; 20%; 30% and 40%) was assessed within the intervention cohort. Data such as the proportion of patients in the intervention group identified as pre-diabetes and the costs of the intervention were drawn from the study and used in combination with other model inputs sourced from published literature.

Transition probabilities

Annual transition probabilities reflecting the natural disease progression (with no treatment) from normoglycaemia to pre-diabetes(3), pre-diabetes to normoglycaemia(4, 5), and pre-diabetes to type 2 diabetes(6) were sourced. In the intervention arm, the benefits of early identification of pre-diabetes and pragmatic lifestyle changes (relative risks) were applied to the transition probabilities for pre-diabetes to normoglycaemia(5, 7), and pre-

diabetes to type 2 diabetes (8). Patients in the intervention arm who successfully transitioned from pre-diabetes to normoglycaemia were assigned the same transition probabilities of remaining normoglycaemic or developing pre-diabetes as control participants. However, if these patients developed pre-diabetes again, the model assumed the same relative risks as previously applied, as patients could now acting on previous intervention to inform lifestyle changes.

Details of calculation

Patients in the intervention arm who successfully transitioned from pre-diabetes to normoglycaemia were assigned the same transition probabilities of remaining normoglycaemic or developing pre-diabetes as control participants. However, if these patients developed pre-diabetes again, the model assumed the same relative risks as previously applied, as patients could now acting on previous intervention to inform lifestyle changes.

Background mortality rate was calculated using age-dependent death rates in Australia for the period 2016-2018 (9). Increased mortality associated with pre-diabetes and T2D was applied in the model (10).

In each yearly cycle, the simulated cohort faces the risk of developing prediabetes or T2DM or staying non-diabetic. If no prediabetes or T2DM was developed in each cycle, that proportion of cohort did not incur any treatment/management cost related to these conditions and was thus assigned the utility value of the general population (i.e. living in a health state that was the same as the general people). For the proportion of cohort who developed prediabetes or T2DM, the management cost and utility value of being in the prediabetes or T2DM were then assigned. This process was replicated on a yearly basis to calculate the total costs and QALYs (the QALY is computed based on the utility value and time horizon). Owing to the effect of intervention that delays the progression from prediabetes to T2DM, the difference in costs and QALYs between the screened and non-screened people was driven by the proportion of people being identified as prediabetes by IDENTIFY (where the early intervention was initiated) since the management cost is lower and utility value is higher for patients with prediabetes than those with T2DM.

References

1. Wong K, Brown A, Li S. AUSDRISK Application in general practice. Australian Family Physician. 2011;40:524-6.
2. Chen L, Magliano DJ, Balkau B, Colagiuri S, Zimmet PZ, Tonkin AM, et al. AUSDRISK: an Australian Type 2 Diabetes Risk Assessment Tool based on demographic, lifestyle and simple anthropometric measures. Med J Aust. 2010;192(4):197-202.
3. Meigs JB, Muller DC, Nathan DM, Blake DR, Andres R. The natural history of progression from normal glucose tolerance to type 2 diabetes in the Baltimore Longitudinal Study of Aging. Diabetes. 2003;52(6):1475-84.

4. Balk EM, Earley A, Raman G, Avendano EA, Pittas AG, Remington PL. Combined Diet and Physical Activity Promotion Programs to Prevent Type 2 Diabetes Among Persons at Increased Risk: A Systematic Review for the Community Preventive Services Task Force. Ann Intern Med. 2015;163(6):437-51.
5. Roberts S, Craig D, Adler A, McPherson K, Greenhalgh T. Economic evaluation of type 2 diabetes prevention programmes: Markov model of low- and high-intensity lifestyle programmes and metformin in participants with different categories of intermediate hyperglycaemia. BMC Med. 2018;16(1):16.
6. Diabetes Prevention Program Research G, Knowler WC, Fowler SE, Hamman RF, Christophi CA, Hoffman HJ, et al. 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. Lancet. 2009;374(9702):1677-86.
7. Vermunt PW, Milder IE, Wielaard F, de Vries JH, Baan CA, van Oers JA, et al. A lifestyle intervention to reduce Type 2 diabetes risk in Dutch primary care: 2.5-year results of a randomized controlled trial. Diabet Med. 2012;29(8):e223-31.
8. Ashra N, Spong R, Carter P, Davies M, Dunkley A, Gillies C, et al. A systematic review and metaanalysis assessing the effectiveness of pragmatic lifestyle interventions for the prevention of type 2 diabetes mellitus in routine practice. In: Public Health England, editor. London2015.
9. Australian Bureau of Statistics. 3302.0.55.001 - Life Tables, States, Territories and Australia, 2016-2018 2019.
10. Stokes A, Mehta NK. Mortality and excess risk in US adults with pre-diabetes and diabetes: a comparison of two nationally representative cohorts, 1988-2006. Popul Health Metr. 2013;11(1):3-.