The Leicester Diabetes Risk Assessment Tools: Translating Research into Practice

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Risk scores - Diabetes

- BMI or obesity (n = 24)
- Blood pressure (n = 8)
- GDB (n = 3)
- WHR (n = 3)
- Sex (n = 17)
- Height (n = 5)
- History of CVD (n = 4)
- Waist circumference (n = 21)
- HDL (n = 6)
- Smoking Status (n = 8)
- Triacylglyceride (n = 7)
- Hypertension (n = 24)
- Ethnicity (n = 10)
- Physical activity (n = 8)
- Fasting glucose (n = 10)
- Steroids (n = 3)

- Family history of diabetes (n = 28)

- 28 other risk predictors *
Risk Scores - UK

• Cambridge Risk Score (2000)
  – Prevalent T2DM
  – age, gender, BMI, steroids, antihypertensives, FHx diabetes and smoking
  – No ethnicity weighting

• QDScore (2009)
  – 10-year risk of developing diabetes
  – Same included variables as above with ethnicity, deprivation and vascular disease
  – Cannot be used as a paper-based tool

• To date there were no scores developed for use within multiethnic UK population for prevalent undiagnosed IGR/T2DM
Leicester Risk Scores

Self assessment score

1. How old are you?
   - 49 and younger: 0
   - 50 - 59: 5
   - 60 - 69: 9
   - 70 and older: 13

2. Are you male or female?
   - Male: 1
   - Female: 0

3. How would you describe your ethnicity?
   - White European: 0
   - Other Ethnic Group: 6

4. Do you have a father, mother, brother, sister and/or own child with Type 1 or Type 2 diabetes?
   - Yes: 5
   - No: 0

5. What is your waist circumference? (See instructions)
   - Less than 90 cm: 0
   - 90 - 99.9 cm: 4
   - 100 - 109.9 cm: 6
   - 110 cm & above: 9

6. What is your Body Mass Index (BMI)? (See instructions)
   - Less than 25: 0
   - 25 - 29: 3
   - 30 - 34: 5
   - 35 & above: 8

7. Has a doctor given you medicine for high blood pressure OR told you that you have high blood pressure?
   - Yes: 5
   - No: 0

Add up your score here -

Automated practice score

Score = 0.0408359*Age +
   0.1839942 if male, 0 otherwise +
   0.0820698*BMI +
   0.7565977 if BME, 0 otherwise +
   0.5498978 if taking anti HT, 0 otherwise +
   0.4770517 if family Hx DM, 0 otherwise

**Leicester Self-Assessment**

**How to measure your waist**

1. Find your bottom rib
2. Find the top of your hip bone
3. Place the tape halfway between your bottom rib and the top of your hip bone
4. Record your waist measurement

**Work out your Body Mass Index (BMI)**

Your BMI gives a general idea of how healthy your weight is for your height. You can work out your BMI using your height and weight using this table. For example, if you weighed 11 stone and had a height of 5 foot 9 inches, your BMI would be in the normal range. We have shown this example below.

![BMI Table]

**Notes**

- **Underweight**: BMI < 18.5
- **Normal**: 18.5 ≤ BMI < 25
- **Overweight**: 25 ≤ BMI < 30
- **Obese**: BMI ≥ 30

**DIABETES Know the Score**

You can do this risk score yourself and it only takes a few minutes. You may feel fine but Type 2 Diabetes can develop over a number of years without you feeling unwell. By the time the problem is found,

- Feeling very thirsty
- Going to the toilet a lot
- Extreme tiredness
- Blurred vision
- Weight loss and muscle pain
- Genital itching or regular episodes of thrush
- Slow healing of wounds

**HIGH RISK - 25 or more points**

You are at high risk which means you have a 7% or 1 in 14 chance of having diabetes right now and a 33% or 1 in 3 chance of having high blood glucose which puts you at high risk of diabetes in the next ten years. You need to see your GP for a blood test as soon as possible. The blood test is very important to confirm or rule out diabetes. Either way your GP will support you and DiabetesUK is there to help as well. However it is important for you to follow a healthy lifestyle regardless of whether you have diabetes or not.

**MODERATE RISK - 16 to 24 points**

You are at moderate risk which means you have a 3% or 1 in 33 chance of having diabetes right now AND a 15% or 1 in 7 chance of having high blood glucose which puts you at high risk of diabetes in the next ten years. You can reduce your risk through small changes to your lifestyle. You may want to identify certain aspects which could include reducing your weight, changing your diet and/or increasing the amount of physical activity that you do.

**INCREASED RISK - 7 to 15 points**

You are at increased risk which means you have a 2% or 1 in 50 chance of having diabetes right now AND a 10% or 1 in 10 chance of having high blood glucose which puts you at high risk of diabetes in the next ten years. You can make a difference to your diabetes risk through regular physical activity and eating a healthy well balanced diet.

**LOW RISK - 0 to 6 points**

You are at low risk which means you have a less than 0.5% or 1 in 200 chance of having diabetes right now AND a 5% or 1 in 20 chance of having high blood glucose which puts you at high risk of diabetes in the next ten years. Keep up the good work with leading a healthy lifestyle, however as you get older your risk score will increase, so it is important for everyone to follow a healthy lifestyle in order to reduce their risk of diabetes in the future.
Leicester Practice Risk Score

Score = 0.0408359*Age + 0.1839942 if male, 0 otherwise + 0.0820698*BMI + 0.7565977 if BME, 0 otherwise + 0.5498978 if taking anti HT, 0 otherwise + 0.4770517 if family Hx DM, 0 otherwise

<table>
<thead>
<tr>
<th>RISK_SCORE</th>
<th>STATUS</th>
<th>PRACTICE</th>
<th>NHS_NUMBER</th>
<th>TITLE</th>
<th>FIRST</th>
<th>SURNAME</th>
<th>ADDRESS1</th>
<th>ADDRESS2</th>
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<tbody>
<tr>
<td>0.00</td>
<td>5) RBG suggests Diabetes on 20111222</td>
<td>Mr</td>
<td>James</td>
<td>Mr</td>
<td>Nicholas</td>
<td></td>
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<td></td>
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<tr>
<td>0.00</td>
<td>5) HBA suggests Diabetes on 20110909</td>
<td>Mrs.</td>
<td>Kathleen</td>
<td>Mrs</td>
<td>Maria</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5.64</td>
<td>4) HBA suggests IGT/R on 20070501</td>
<td>Mr.</td>
<td>David</td>
<td>Mr</td>
<td>David</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3.47</td>
<td>4) GTT suggests IGT/R on 20120110</td>
<td>Ms</td>
<td>Looiy</td>
<td>Mrs</td>
<td>Tina</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.14</td>
<td>4) GTT suggests IGT/R on 20050520</td>
<td>Ms</td>
<td>Jeanette</td>
<td>Ms</td>
<td>Lorraine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.90</td>
<td>3) GTT suggests IFG on 20111229</td>
<td>Ms</td>
<td>Louise</td>
<td>Ms</td>
<td>Louise</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>6.31</td>
<td>2) Normal HBA 20111216</td>
<td>Ms</td>
<td>Valerie</td>
<td>Mr</td>
<td>Robert</td>
<td></td>
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<tr>
<td>5.84</td>
<td>2) Normal GTT 20111129</td>
<td>Ms</td>
<td>Louise</td>
<td>Ms</td>
<td>Louise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.27</td>
<td>2) Normal FBG 20030902</td>
<td>Ms</td>
<td>Louise</td>
<td>Ms</td>
<td>Louise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.97</td>
<td>1) Non-diabetic RBG &lt;11.1 20120106</td>
<td>Ms</td>
<td>Louise</td>
<td>Ms</td>
<td>Louise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.49</td>
<td>7.07</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

The risk score is set to 0 for patients who look as if they already have diabetes.

These are the higher risk patients with no glucose data who may need screening.

RBG = Random Blood Glucose
HBA = HbA1c Result
FBG = Fasting Blood Glucose
GTT = Glucose Tolerance Test

The dates are in Mquest format YYYYMMDD.
NICE - Identification of those at risk

Stage 1

≥75 years
Use risk assessment tools and questionnaires

40-74 years
Use a validated risk assessment tool or validated self assessment questionnaire
Follow NHS Health Check process and protocols where possible

High risk groups
People aged 25-39 years of South Asian, Chinese, African Caribbean, black African and other high risk black and minority ethnic groups
People with conditions that increase the risk of type 2 diabetes
Use risk assessment tools and questionnaires

Consider a blood test for South Asian and Chinese people aged 25 and over with BMI ≥23

Low or intermediate risk score

High risk score

Translating Research into Practice

- Using risk scores in diabetes prevention programme
- Translating the risk score into Indian languages
- Smart phone apps for detecting diabetes
High Risk Identification

- Score has been used in two prevention studies

- Both invited top 10%
- LP: IGR->RCT, WA: Risk->RCT
- Low uptake rate – comparable to population based screening
- 12% attendees from non-white populations

## High Risk Identification

<table>
<thead>
<tr>
<th>Glycaemic category</th>
<th>LPD</th>
<th>WAD</th>
<th>Total</th>
<th>$p$ value (LPD vs WAD)</th>
<th>ADDITION-Leicester</th>
<th>$p$ value (Total vs ADDITION-Leicester)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting glucose 5.5–6.9 mmol/l [8]</td>
<td>36.4 (34.8, 38.0)</td>
<td>35.9 (32.6, 39.1)</td>
<td>36.3 (34.9, 37.8)</td>
<td>0.76</td>
<td>22.2 (21.2, 23.2)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>IFG</td>
<td>7.8 (6.9, 8.7)</td>
<td>9.6 (7.6, 11.6)</td>
<td>8.2 (7.4, 9.0)</td>
<td>0.09</td>
<td>5.0 (4.5, 5.6)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>IGT</td>
<td>22.4 (21.0, 23.8)</td>
<td>21.4 (18.6, 24.2)</td>
<td>22.2 (21.0, 23.5)</td>
<td>0.54</td>
<td>13.3 (12.4, 14.1)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>IGR</td>
<td>25.5 (24.1, 27.0)</td>
<td>26.5 (23.5, 29.5)</td>
<td>25.7 (24.4, 27.0)</td>
<td>0.58</td>
<td>16.1 (15.2, 17.0)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Type 2 diabetes</td>
<td>4.5 (3.8, 5.2)</td>
<td>3.0 (1.8, 4.2)</td>
<td>4.2 (3.6, 4.8)</td>
<td>0.06</td>
<td>3.2 (2.8, 3.6)</td>
<td>0.01</td>
</tr>
<tr>
<td>Any abnormal glucose tolerance</td>
<td>30.1 (28.5, 31.6)</td>
<td>29.5 (26.4, 32.6)</td>
<td>30.0 (28.6, 31.3)</td>
<td>0.74</td>
<td>19.3 (18.3, 20.2)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Lessons learnt

• Using a risk score improved the pick-up rate
• Low level risk communication did not improve the response to invitation
  – In clinical practice you would expect to see 2*
  – More research needed into risk communication
• Due to the design of the projects we can only calculate PPV, i.e. we don’t know about those at lower risk

Translation of English version of Risk Score

- Higher rates of diabetes in minority ethnic groups
- To date the self assessment score is only available in English
  - Missing a high risk group
- We wanted to produce conceptually equivalent risk scores in the 4 main south Asian languages (Gujarati, Punjabi, Urdu and Hindi)
### Translations

**1. Удобное время для вас?**

<table>
<thead>
<tr>
<th>0</th>
<th>60 - 69</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
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<td>0</td>
</tr>
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</tr>
</tbody>
</table>

**2. Каким образом вы можете отправиться?**

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**3. Удобный маршрут в Румынии?**

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**4. Удобное время для вас?**

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**5. Удобное время для вас в Румынии?**

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**6. Удобное время для вас в Румынии?**

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**7. Удобное время для вас в Румынии?**

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<td>0</td>
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Focus Group Findings

• Conceptual understanding of the risk score as a whole was poor

• Participants struggled with both the understanding and measurement of BMI and WC

“what is BMI? that is what I want to ask you?”
(Punjabi female 55-60yrs)

• Unable to complete the risk score without a substantial amount of assistance
Findings

• Inaccuracies in the translations
• Poor understanding of risk categories and the implications of having a high risk score:

  “word ‘score’ a lot of people don’t know what the word is”  (Punjabi male 50-55yrs)

• Translation ‘pitched’ at too high a level:

  “it is best to use simple English and simple Punjabi…I am not posh…I speak simple Punjabi…I don’t know the difficult words….is same like English”  (Punjabi female 40-45yrs)
Lessons learnt

• Translated versions of risk scores not always suitable due to translation errors and low levels of conceptual equivalence
  – Term risk – urgent/emergency
• Highly likely that people from lower educational backgrounds will need assistance to complete self assessment risk scores
• Not sufficient to just translate and assume it will work!
Re-think!

- Funded by Diabetes UK - Gujarati
Smart phone apps for diabetes risk

• Paper based self assessments use a very simple scoring system which reduces discrimination and calibration
• Utilising a website/app may improve these
• To date the majority of websites use the paper based tool – Diabetes UK
• Apps allow personalised risk communication, alerts, updates over time

Systematic Review

• Medline up to July 2012
  – “Type 2 Diabetes” with combinations of the following:
    “smart-phone” or “telephone” or “mobile phone” or
    “android” or “iPhone”

• Google
  – App providers developing such apps

• Google Play (Android) & iTunes (Apple)
  – “Diabetes risk” and “Diabetes calculator”

Systematic Review

- Google Play (Android) & iTunes (Apple)
  - 11 apps identified
  - 7 free, 4 pay £0.61 (€0.76) up to £0.69 (€0.86)
  - 8 Android, 2 Apple, 1 both
  - 2 stated they used the validated FINDRISC score, 2 more used the FINDRISC without stating
  - 1 used the validated QDRisk score
  - Level of risk communication varied from none to generic lifestyle advice

Lessons learnt

• There are apps available for assessing diabetes risk – some using validated scores
• The apps available are based on simple paper scores (where you can tell!)
• Also limited in terms of advice and also functionality
• .......a lot of room for improvement!
• We hope to do something better
Impact of prognostic models

http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1001381
Thank you for your attention
Any questions???

Leicester Diabetes Centre
Committed to Growing International Research, Education & Innovation

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