Hypertension

Dr. Elizabeth Swiggum,
Cardiologist
Dr. Anthony Nielsen,
Medical Lead CVRR

Mr. Hales

- Current age: 45
- BP 165/100 (on 2 consecutive visits)
- Smoker
- Wt 200 lbs
- BMI 28.7
- Family hx CVD, DM

Mr. Hales

- Other: married, sole breadwinner, low-paying job
- Infrequent visits to MD
- Physical exam normal (except wt & BP)
- Labs: FGB, lipids, GFR, ECG normal

Diabetes

Dr. Anton Rabien
Medical Lead DM

Mr. Hales

- Current age: 49
- PMHx: Hypertension
- Other: has managed to stop smoking
- Allergies: none
- Meds:
  - Metoprolol 100mg BID

Mr. Hales

- History:
  - No concerns
  - Review of systems non-contributory
- Exam:
  - BP: 145/80
  - Height: 5’10”
  - Weight: 225lb
  - BMI: 32.3
- Labs:
  - FPG: 8.5
  - TC: 5.14
  - LDL: 3.13
  - HDL: 1.08
  - TC/HDL: 4.76
  - TG: 1.32
  - GFR: 98
  - u-ACR: <2.0

Mr. Hales

- FPG: 8.5
- Question: Does Mr. Hales have diabetes?
  1. Yes, FBG ≥ 7.0 is diagnostic
  2. No, FPG ≥ 11.1 is diagnostic
  3. Maybe, but a confirmatory test is needed

Diagnosis of DM

- Classic symptoms (polyuria, polydipsia, unexplained weight loss) + casual PG ≥ 11.1
- Absence of classic symptoms + FPG ≥ 7.0 + confirmatory test on another day
  - Consider 2-hour post 75g OGTT for FPG between 5.7 and 6.9 in patients at risk for DM/IGT

Vascular Protection

- Lifestyle modifications
- Anti-platelet therapy: low dose ASA
- ACEi indicated for any of:
  - Age ≥ 55
  - Confirmed albuminuria
  - Hypertension
- Optimize BP
- Optimize glycemic control
- Optimize lipids

Mr. Hales

- BP: 145/80
- BMI: 32.3
- FPG: 8.5
- LDL: 3.13
- TC/HDL: 4.76
- GFR: 98
- u-ACR: <2.0

- Question: What intervention has the highest priority in prevention of complications?
  1. Optimize glycemic control
  2. Optimize BP
  3. Optimize lipids
  4. Exercise, lose weight, eat healthy

Result of systolic BP control & glucose control, 10-year NNT/NNH (UKPDS)

	Tight BP control[A]	Tight glycemic control[B]
Any DM endpoint	**8.9**	**13**
DM related death	**16**	*112*
All cause mortality	*23*	*125*
MI	*23*	*46*
Stroke	**23**	*169*
Peripheral vascular	*83*	*192*
Micro vascular	**17**	**41**

[A] Tight BP control: mean BP 144/82 vs. 154/87

[B] Tight glucose control: mean A1C 7.0% vs. 7.9%

Exerise in type 2 DM

- Primary prevention
  - review of RCTs: modest weight loss through diet and exercise reduced the incidence of DM among high-risk people by 40%–60% over 3–4 years[1]
- Secondary prevention
  - walking 2+ hours/week reduced the incidence of premature death by 39%–54% from any cause and by 34%–53% from cardiovascular disease in patients with DM[2]

1. Williamson DF, Vinicor F, Bowman BA. Primary prevention of type 2 diabetes mellitus by lifestyle intervention: implications for health policy. *Ann Intern Med* 2004;140:951-7
2. Gregg EW, Gerzoff RB, Caspersen CJ, et al. Relationship of walking to mortality among US adults with diabetes. Arch Intern Med 2003;163:1440-7

Mr. Hales

- BP: 145/80
- GFR: 98
- u-ACR: <2.0

- Question: What anti-hypertensive drug should he be started on first?
  1. ACEi/ARB
  2. Thiazide diuretic
  3. Beta blocker
  4. Calcium channel blocker

Hypertension in DM

- Target BP: ≤130/80
- Initial therapy:
  - Diabetes with albuminuria:
    - ACEi (ARB if ACEi intolerant)
  - Diabetes without albuminuria:
    - Thiazide diuretic
    - ACEi (ARB if ACEi intolerant)
    - DHP-CCB
      - Felodipine (Renedil)
      - Nifedipine (Adalat XL)
      - Amlodipine (Norvasc)

Lower systolic BP reduces mortality in type 2 DM (UKPDS – observational)

- For every 10 mm Hg elevation in mean systolic BP above 120 mm Hg, there was approximately a 15% increase in:
  - **all-cause mortality** (95% CI 9%–16%, p < 0.0001)
  - **deaths related to diabetes** (95% CI 13%–21%, p < 0.0001)
  - **complications related to diabetes** (95% CI 9%–14%, p < 0.0001)
  - **myocardial infarction** (95% CI 7%–16%, p < 0.0001)
  - **stroke** (95% CI 14%–24%, p < 0.0001)
  - **amputation or death from peripheral vascular disease** (95% CI 9%–23%, p < 0.0001)
  - **microvascular complications** (95% CI 9%–26%, p < 0.0001)
  - **heart failure** (95% CI 4%–19%, p < 0.0001)

Optimize Glycemic Control

- Blood glucose targets:
  - Pre-meal: 4.0 – 7.0 (4.0 – 6.0)*
  - 2h post-meal: 5.0 – 10.0 (5.0 – 8.0)*
- Hb A1c every three months:
  - ≤ 7.0 (≤ 6.0)*

* For patients in whom it can be safely achieved

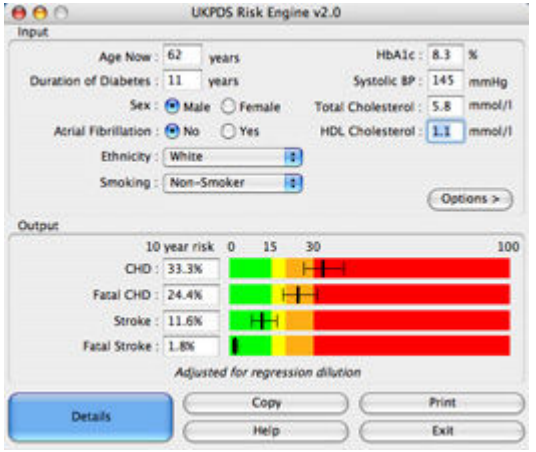
Mr. Hales

- BP: 145/80
- LDL: 3.13
- TC/HDL: 4.76
- GFR: 98
- u-ACR: <2.0
- Hb A1c: 8.2

- Question: How do we calculate his 10 year CHD risk? And what is it?
  1. Framingham calculator. Moderate.
  2. Framingham calculator. High.
  3. UKPDS calculator. Moderate.
  4. UKPDS calculator. High.

Mr. Hales

- UKPDS calculator
- Paper version included in Diabetes Care Guideline
  - www.BCGuidelines.ca
- Downloadable application
  - www.dtu.ox.ac.uk



- Mr. Hales 10 year CHD risk = 12%

Optimize Lipids

- Lipid targets based on UKPDS 10 year risk
- Moderate Risk (<20%):
  - LDL <3.5
  - TC/HDL <5.0
- High Risk (≥20%):
  - LDL <2.5 (≤2.0)
  - TC/HDL <4.0

10-year risk (%) of CHD for patients with five-year history of diabetes compared to baseline risk*

These Risk Charts are adapted from the UKPDS Risk Engine version 2.0. It should be used in preference to the Framingham Calculator. It does not include calculations based on non-white populations nor for those with atrial fibrillation. For patients with additional risk factors, download the full version at www.dtu.ox.ac.uk

0-14%
15-19%
20-29%
≥30%

Derived from: The UKPDS risk engine: a model for the risk of coronary heart disease in Type 2 diabetes (UKPDS 56) Stevens RJ et al. Clinical Science 2001; 101:671-679.

BP: Systolic Blood Pressure
TC/HDL: Ratio of Total Cholesterol (TC)/High Density Lipoprotein Cholesterol (HDL-C)
HbA1C: Glycosylated Hemoglobin (Hemoglobin A1c)
N= normal HbA1C

To estimate CHD risk for 10-year history of diabetes, add 10% (multiply x 1.1).

*Baseline risk = HbA1C <6%

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♂ MALE

Smoking	BP	TC/HDL	AGE 55 HbA1c(%) N	6	7	8	AGE 60 HbA1c(%) N	6	7	8	AGE 65 HbA1c(%) N	6	7	8
No	120	4	10	11	13	14	13	15	16	19	17	19	21	24
		5	12	14	16	18	15	18	21	23	21	24	27	30
		6	15	17	19	22	18	22	25	28	25	28	32	35
	140	4	11	12	14	16	14	16	18	20	18	20	23	26
		5	14	15	17	20	16	20	22	25	23	25	28	32
		6	16	18	21	23	20	24	27	30	27	30	34	38
	160	4	12	13	15	17	15	17	19	22	19	22	25	28
		5	15	17	19	21	19	21	24	27	24	27	31	34
		6	18	20	22	25	23	26	29	32	29	32	36	40
Yes	120	4	13	15	17	19	17	19	22	24	22	25	28	31
		5	16	19	21	24	21	24	27	30	27	30	34	38
		6	20	22	25	28	25	29	32	36	32	36	40	44
	140	4	14	16	18	20	18	21	23	26	24	26	30	33
		5	18	20	23	25	23	26	29	32	27	33	37	40
		6	21	24	27	30	27	31	34	38	32	39	43	47
	160	4	15	17	19	22	20	22	25	28	25	28	32	35
		5	19	22	24	27	25	28	31	35	29	35	39	43
		6	23	26	29	32	29	33	37	41	35	41	45	50

♀ FEMALE

Smoking	BP	TC/HDL	AGE 55 HbA1c(%) N	6	7	8	AGE 60 HbA1c(%) N	6	7	8	AGE 65 HbA1c(%) N	6	7	8
No	120	4	5	6	7	8	7	8	9	10	9	10	12	13
		5	7	8	9	10	9	10	11	13	12	13	15	17
		6	8	9	11	12	11	12	14	16	14	16	18	20
	140	4	6	7	7	8	8	9	10	11	10	11	13	14
		5	7	8	9	11	10	11	12	14	13	14	16	18
		6	9	10	12	13	12	13	15	17	15	17	19	22
	160	4	6	7	8	9	8	9	11	12	11	12	14	16
		5	8	9	10	12	10	12	13	15	14	15	17	20
		6	10	11	12	14	13	14	16	18	16	19	21	24
Yes	120	4	7	8	9	10	9	11	12	14	12	14	16	18
		5	9	10	12	13	12	13	15	17	15	17	20	22
		6	11	12	14	16	14	16	18	21	19	21	24	26
	140	4	8	9	10	11	10	11	13	15	13	15	17	19
		5	10	11	13	14	13	14	16	18	17	19	21	24
		6	12	13	15	17	15	17	20	22	20	23	25	28
	160	4	8	9	11	12	11	12	14	16	14	16	18	21
		5	11	12	14	15	14	16	18	20	18	20	23	26
		6	13	15	16	19	17	19	21	24	22	24	27	30

Mr. Hales

- 6 months later:
  - Medications:
    - ASA 81mg OD
    - Metformin 500mg TID
    - HCTZ 25mg OD
    - Metoprolol 100mg BID
    - Ramipril 5mg OD
  - BP: 125/70
  - Hb A1c: 6.6
  - Has had teaching from DEC
  - Is working on lifestyle changes

Mr. Hales

Dr. Gaylene Hargrove,
Nephrologist
Dr. Nancy Craven,
Medical Lead CKD

Mr. Hales

- Current Age: 57
- BP 140/85
- Smoking: quit
- Weight: 203 lbs
- BMI: 29.1
- A1C 6.7
- eGFR 53, ACR 38

Reverend Stephen Hales

- 1677 –1761
- English physiologist, chemist and inventor
- In 1727, first to measure arterial blood pressure
- Inserted brass tube into carotid artery of a horse
- Somewhat invasive, rather uncomfortable, and uniformly fatal

- Mercury sphygmomanometer developed in 1896 by Scipione Riva-Rocci