

Cardiovascular risk factors. A calculated risk?

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Agenda

- Cardiovascular risk assessment
 - Evidence base
 - Clinical world
- CVS risk factor underwriting in practice
- Underwriting calculators
 - In general
 - CVS risk factors
- How can calculators help?
- Case studies
- So do we need CVS risk calculators?

The importance of cardiovascular risk factors

- Cardiovascular risk factors are important predictors of cardiovascular disease which accounts for between 30% and 50% of deaths
- Core critical illness cover includes CABG, stroke, MI, renal failure and MOT, which are all impacted by CVS risk factors
 - Up to 30% to 40% of pricing dependent on age and gender
- Circulatory disorders contribute up to 20% of IP claims

Cardiovascular risk factors (1)

CVS risk factors are well recognised and include:

- Increasing age
- Male gender
- Smoking
- Hypertension
- Dyslipidaemia
- Impaired glucose intolerance / Diabetes mellitus
- Obesity

Cardiovascular risk factors (2)

But we could add in a whole lot more

- Family history – circulatory disease
- Family history – diabetes
- ECG abnormalities
- CRP
- Homocysteine
- Abdominal obesity
- Exercise tolerance
- Etc
- Etc

The evidence base (1)

- Obesity increases the incidence of cancer and CVD
 - BMI is not an independent risk factor – some overlap with high blood pressure
- Systolic blood pressure probably more important than diastolic (especially over age 50)
 - Female lives less impacted by hypertension (probably)
- As cholesterol rises the risk of MI rises significantly
 - Relative risk decreases with age
- Smoking long recognised as a risk factor for CV disease (and cancer)
 - Some risk accounted for in basic pricing but some evidence to suggest that risk is increased in heavy smokers

The evidence base (2)

- Family history recognised as an independent risk factor
 - Risk depends on age of applicant and the number and age of affected relatives
- Impaired glucose tolerance increases the risk

And in general:

- The number of risk factors increases the risk
- Risk factors cluster
 - Abdominal obesity
 - Insulin resistance
- The effect may be multiplicative not additive

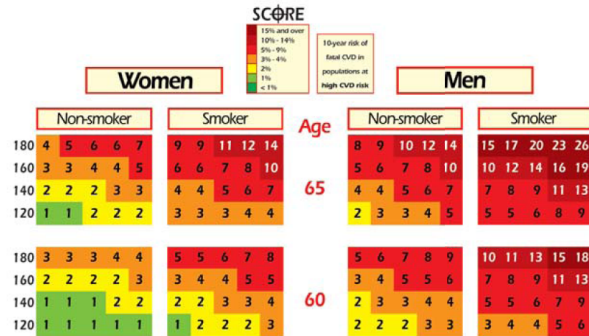
Risk assessment in the clinical world

- Framingham
 - Started in the 1940s and has produced several models for calculating the risk of IHD and stroke
 - Uses age, gender, SBP, DBP, cholesterol (total and HDL), smoking, absence or presence of DM
- PROCAM
 - Based on Munster heart study
 - Uses age, SBP, cholesterol, triglyceride, smoking, diabetes, family history of premature MI
- SCORE
 - Pools 12 European studies
 - Uses age, sex, total cholesterol, SBP, smoking

Risk calculators in the clinical world

SCORE - European Low Risk Chart

10 year risk of fatal CVD in low risk regions of Europe by gender, age, systolic blood pressure, total cholesterol and smoking status



PROCAM Risk Calculator

First name (optional)	<input type="text"/>
Family name (optional)	<input type="text"/>
What is your age (in years) ? permitted range: 40-65 Years	<input type="text" value="44"/>
What is your LDL-cholesterol level (in mg/dl) ? permitted range: 75-250 mg/dl	<input type="text" value="250"/>
What is your HDL-cholesterol level (in mg/dl) ? permitted range: 25-75 mg/dl	<input type="text" value="50"/>
What is your fasting triglyceride level (in mg/dl) ? permitted range: 50-400 mg/dl	<input type="text" value="150"/>
What is your systolic blood pressure ? permitted range: 100-225 mm Hg	<input type="text" value="150"/>
Do you smoke cigarettes ?	<input type="radio"/> No <input checked="" type="radio"/> Yes
Do you suffer from diabetes mellitus ?	<input type="radio"/> No <input type="radio"/> Yes
Did a first-degree relative (father, mother, brother, sister, son, daughter) suffer a heart attack (myocardial infarction) before the age of 60 years ?	<input type="radio"/> No <input checked="" type="radio"/> Yes
	<input type="button" value="Your risk"/> <input type="button" value="Reset"/>

Cardiovascular Risk Calculator For Primary Prevention

This calculator should not be used if patient has known CVD or Diabetes (already known to be at high risk)

Age (30-74)	<input type="text" value="44"/>	<input type="button" value="Calculate"/>	<input type="button" value="Clear Fields"/>
Sex	<input type="text" value="Male"/>	Smoking Status	<input type="text" value="Smoker"/>
Systolic BP	<input type="text" value="150"/>	Glucose	<input type="text" value="Normal"/>
Diastolic BP	<input type="text" value="92"/>	LVH	<input type="text" value="No LVH"/>
Total Cholesterol	<input type="text" value="6.7"/>	Central Obesity	<input type="text" value="No"/>
HDL Cholesterol	<input type="text" value="1"/>	South Asian Origin	<input type="text" value="No"/>
Total /HDL Ratio	<input type="text" value="6.7"/>	Family History of CVD (Men <55 and women <65 years)	<input type="text" value="Significant FH CVD"/>
Serum TG mmol/l	<input type="text"/>	Calculator version 5.5 (2008)	

Using Systolic BP prediction, the 10 year risk of JBS CVD Risk is %

Underwriting manuals and calculators (1)

Why were calculators developed?

- Speed up the process
- Provide consistency
- Provide an audit trail
- Ensure nothing gets missed

Underwriting manuals and calculators (2)

Now we have many different calculators

- Build
- BP
- Lipids
- Breast cancer
- Diabetes
- LFTs
- CAD
- PFTS
- EBCT
- Skin cancer
- Large intestine cancer
- eGFR
- CVS risk factors
- PSA doubling time
- Left ventricular mass

Underwriting manuals and calculators (3)

Why were CVS risk calculators developed?

- Speed up the process
- Provide consistency
- Provide an audit trail
- Because reinsurers were concerned from client audits?
- Give more transparency to the ratings
 - Has this one really worked?
- Tie in with the underlying evidence base

CV risk underwriting

The traditional approach

- Treat each risk factor independently
- Rating thresholds for each risk factor

Underwriting manuals gave minimal guidance

- Refer to notes in the rating section of the manual
- Rely on the experience of the underwriter
- Some 'rules' quite complex and not well understood

Why don't these approaches work any more?

- Sub clinical risks – under the radar
- Reinsurer audits highlighted problems
- Is it right to apply new principles to CI and not to life?
- Principles are the same but impact differs by product

CV risk underwriting today

Current thinking

- Mirror clinical approach
- Risk factors cluster
- Risk factors interact
- Use some sort of risk factor scoring (using Framingham or SCORE)

What is out there at the moment (not just in the UK)?

- Calculator(s)
- Worksheet(s)
- Some calculators that look like they might be a combined calculator
- Manuals with guidance notes
- Manuals with no guidance notes

CV risk underwriting today – in practice

So how are we currently underwriting these risks?

Case studies

- Asked nine reinsurers to underwrite four case studies using their current manual
- Decisions were requested for term assurance and for standalone critical illness to age 65
- By the book
 - No variation of the decision produced by documented guidelines in their manual or the output of any calculator or worksheet
- Decisions were not to be varied using their judgement and experience

Thank you

- Gen Re
- Hannover Life Re
- Munich Re
- Pacific Life Re
- Partner Re
- RGA Re
- SCOR Global Life Re
- Swiss Re
- XL Re

Case study health warning

- Select X will ensure the confidentiality of individual company information and disclose results only in an anonymised and / or aggregated format. Participants and attendees at today's presentation should keep their individual company information confidential and not communicate or discuss their contribution to the review or its output with each other.
- This review exercise and report are not, and should not be taken to be, any form of recommendation or suggestion that particular rating practices or pricing methodology are followed.

Case study 1

- Male life aged 44
 - BMI 31 (Height 6'. Weight 16 st 7lbs)
 - Blood pressure 150/92
 - Smoking 10 c.p.d.
 - Family history 1 first degree relative with IHD at 55
 - Cholesterol 6.7
-
- No history of IGT, DM or history of CVD
 - No other medical history of note and no treatment for BP

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Company	1	2	3	4	5	6	7	8	9
Life	75	25	50	125	75	0	25	125	25
CI	125	50	50	D	125	50	D	D	D

Case study 2

- Female life aged 44
 - BMI 31 (Height 5' 6". Weight 13 st 9lbs)
 - Blood pressure 150/92
 - Smoking 10 c.p.d.
 - Family history 1 first degree relative with IHD at 55
 - Cholesterol 6.7
-
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 - No other medical history of note and no treatment for BP

Company	1	2	3	4	5	6	7	8	9
Life	75	25	50	125	75	0	25	100	25
CI	125	75	50	D	125	50	D	D	D

Case study 3

- Male life aged 44
- BMI 29 (Height 6'. Weight 15 st 6lbs)
-
- Blood pressure 140/90
- Smoking 20 c.p.d
- Family history 1 first degree relative with IHD at 50
- Cholesterol 6.0

- No history of IGT, DM or history of CVD
- No other medical history of note and no treatment for BP

Case study 3

- Male life aged 44
 - BMI 29 (Height 6'. Weight 15 st 6lbs)
 -
 - Blood pressure 140/90
 - Smoking 20 c.p.d
 - Family history 1 first degree relative with IHD at 50
 - Cholesterol 6.0
-
- No history of IGT, DM or history of CVD
 - No other medical history of note and no treatment for BP

Company	1	2	3	4	5	6	7	8	9
Life	25	25	25	0	0	0	0	25	0
CI	50	25	25	25	50	75	25	75	50

Case study 4

- Male life aged 58
 - BMI 31 (Height 6'. Weight 16 st 7lbs)
 - Blood pressure 150/92
 - Smoking 10 c.p.d.
 - Family history 1 first degree relative with IHD at 55
 - Cholesterol 6.7
-
- No history of IGT, DM or history of CVD
 - No other medical history of note and no treatment for BP

Case study 4

- Male life aged 58
 - BMI 31 (Height 6'. Weight 16 st 7lbs)
 - Blood pressure 150/92
 - Smoking 10 c.p.d.
 - Family history 1 first degree relative with IHD at 55
 - Cholesterol 6.7
-
- No history of IGT, DM or history of CVD
 - No other medical history of note and no treatment for BP

Company	1	2	3	4	5	6	7	8	9
Life	25	0	25	50	0	0	0	25	0
CI	50	0	25	100	50	0	50	100	125

Observations

- Wide range of decisions
 - Case study 3 showed most agreement
 - Life +0 / +25
 - CI +25 to +75
 - Case study 4 CI ranged from +0 to +125
 - Case study 1 CI ranged from +50 to Decline
- Only two reinsurers gave different decisions based on gender as evidenced by case 2
- At least five companies use some sort of combined calculator or worksheet
- What would an IFA or applicant make of all this?

Analysis of case studies

So what did I expect?

- Less variation between decisions
- How many reinsurers have an evidence base for these ratings?
- CI would always be greater than life
- Females might receive less of a rating than males
- Older ages treated more leniently
- Did not believe any of these case were standard risks – especially for CI

Comments

- Importance of age when assessing impact of risk factors
- Importance of gender
 - Gender-differentiated ratings justified?
- Importance of the underlying pricing
- How does the underlying pricing affect the rating?
 - By product
 - Life
 - CI – greater than life?
 - Disability
 - Less than CI
 - More than life?

Redefining the standard rate

Back when I started underwriting...

- Percentage of cases accepted standard
 - Life 95%
 - Critical illness 92%

Redefining the standard rate

Back when I started underwriting...

- Percentage of cases accepted standard
 - Life 95%
 - Critical illness 92%

The picture today

- Percentage of cases accepted standard
 - Life 82%
 - Critical illness 75%

Redefining the standard rate

Back when I started underwriting...

- Percentage of cases accepted standard
 - Life 95%
 - Critical illness 92%

The picture today

- Percentage of cases accepted standard
 - Life 82%
 - Critical illness 75%
- Is this preferred by another name?

Considerations for developing a CVS risk assessment tool (1)

How to develop a CVS calculator?

- Define objectives
- Rating thresholds
 - Where is the std rate cut off for each risk factor?
 - Should these be different for single or multiple risk factors?
- What percentage of cases should ultimately be rated?
 - What data do we have?
- Rating approaches for different products
- How to deal with sub clinical risk factors
- How to deal with multiple risk factors

Considerations for developing a CVS risk assessment tool (2)

- What sort of algorithm?
 - Complex
 - Simple
- Use clinical algorithm
- Develop your own
 - Use base ratings and 'round' up
 - Risk factor counting
 - If risk factor counting, then how does this make a difference?
 - At what point does it make a difference? 2 RF? 3 4 or 5?
- Impact on rules engines
- Can the underwriter still come up with the same rating without using the calculator?

Advantages of calculators

- Able to deal with complex interactions and combinations
- Consistent decision making
- An audit trail of the decision making process
- Note – seems odd if there is no decision being made!
- Can be aligned with an evidence base
- Easier to justify your decisions with your evidence base
- Similarities with the clinical approach

Disadvantages of calculators

- Black box
- Underwriter disengages brain
 - Mercedes Benz syndrome
 - Calculator 'garbage in garbage out'
- Underwriting is not a perfect science
- Impact on the standard rate band

The best case scenario

The calculator assists the underwriter to make a decision

- Easy to use
- Minimise compulsory fields
- Speeds up decision making on multiple product lines
- Consistent decision making
- The decision-making process is documented
- Flexibility
 - Not prescriptive
 - Underwriter can vary the decision
- The process is transparent
- Has a robust supporting evidence base

And the worst...

The calculator assists the underwriter to make a decision, but

- Decisions don't make sense intuitively
- Decision making takes place inside the 'black box'
- The calculator is complicated to use
 - Lots of fields to fill in
 - Some information is unknown
- Decisions could have been made much quicker manually

So do we really need CVS risk calculators (1)?

- They need to be developed properly
 - In line with underwriting philosophy
 - In line with the evidence
- Define objectives
 - Rating thresholds
 - Percentage of cases rated
- Think about the outcomes
- Understand the drawbacks

So do we really need CVS risk calculators (2)?

- They need to be tested properly
 - In the real world
 - With real cases
 - The more complex they are the more you need to test them
 - Incredible number of permutations

So do we really need CVS risk calculators (3)?

- They need to be used properly
 - By users who have their brains engaged
 - By people who know what they are doing
 - By people with the confidence to challenge the result if the output doesn't feel right

Take away messages

- Can we underwrite combination risks without a calculator to help us?
- Are some of the tools too complicated?
- To what extent can your rules engine replicate the algorithm?
- Black box syndrome
- Role of the underwriter
- The user still needs to have their brain switched on
- Are we treating our customers fairly?
- Is this preferred lives by another name?

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