Clinical and subclinical CAD – is there a difference?

Dr. John Schoonbee,
Chief Medical Officer, Swiss Re

With heart disease being one of the leading causes of death – more so in the developed world – the risks associated with having coronary artery disease is something that the insurance industry focuses on. This is not new, and is globally accepted as a key in medical risk selection of life insurance applicants.

Blood pressure, smoking habits, body mass index, lipid profile (cholesterol, triglycerides), glucose metabolism and cardiovascular disease history are all well-established risk markers used by the industry. Newer markers, or clinically established markers but new to insurance (in some, not necessarily all markets), include high sensitivity CRP (c-reactive protein), proBNP, calcium score, pulse wave velocity, and even heart rate variability.

Much can be written and debated about regarding the incremental value of adding additional tests and markers, particularly looking at cost benefit analysis, and also the potential impact on underwriting turnaround time and customer inconvenience. One of the challenges for the industry relates however not to a new test that looks at risk of someone getting CAD or a future heart attack per se, but determining the actual existence of CAD. This might seem a rather simple problem to solve at first thought, but the interesting complexities this presents to the life insurance industry are discussed further below.

Historically the industry has relied on exercise or treadmill ECGs (stress tests) as a screening test for CAD in higher risk applicants. High risk would usually refer to older applicants, often males, who might smoke, be overweight, have abnormal lipid profiles, strong family histories, and possibly some significant clinical history. The use of stress tests is still widespread, particularly due to the clinical use of these tests, and because as an industry, we have historically relied on these for a long time, and our mortality experience and pricing is premised on the use, interpretation, and rating of these stress tests. Exercise ECGs of course have notoriously significant false positives (and negatives), and hence a further test is often done to confirm the suspected CAD in the form of

an invasive angiogram. This is still considered the gold standard in terms of assessing the existence, extent and severity of CAD.

The definition of "obstructive" CAD is not universal, but most studies use a lumen narrowing of >50 % as the cut off for labelling someone as having obstructive disease. "Non-obstructive" would then typically refer to the balance of those angiograms that show some evidence of narrowing, but where that narrowing is less than 50 %. Those that show no evidence of lumen narrowing would be considered as not having disease. From a risk point of view, the extent of disease, as well as the degree of obstruction as highlighted above, has been shown to correlate with future cardiac events and mortality (Rana et al).

One of the questions we are faced with occasionally, is when we receive an application for life insurance from someone who has undergone angiography (assumed to be invasive) and the result shows no sign of CAD at all. Following the argument above, one would simply infer they have no CAD and rate them as such. Interestingly enough what to do with this, depends on where the angiogram was in fact performed. A negative invasive angiography is of course a negative lumenogram, showing us only the inside shape and form of the lumen of the coronary arteries, with no indication at all what is occurring in the walls of the coronary arteries.

We know that a substantial proportion of myocardial events occur in people who have what would be termed "normal" coronary arteries. The reason for this is pretty well established. The so called "glagov" remodeling process allows for the lumen to remain the same diameter in the face of growing plaque deposit by allowing the thickened wall to stretch outward, keeping the lumen unaffected. It is assumed that the myocardial infarctions that occur in the "normal angiography" sub-group occur due to the rupture of these plaques.

Since we cannot currently easily determine the state of the coronary arterial walls and the deposits within them, should all those with a negative invasive angiogram be assumed to be a standard insurance risk from a cardiovascular point of view, assuming all the tradi-

tional risk factors are within "normal" ranges?

Where angiograms are done very readily, almost as screening tests, and without the need for a high index of clinical suspicion, one could assume that those with negative invasive angiograms should be seen as standard risks. In fact an argument might even exist that when there is no evidence of CAD on invasive angiography in someone who is older and where one would almost at least some evidence of mild CAD in a significant number if not majority of cases, one should in fact even consider crediting them.

However, in many markets ignoring the simple fact that the doctor decided to perform an invasive angiogram may be missing an increased risk, as the usual higher index of suspicion that led the cardiologist to in fact do the "not risk-free" invasive angiogram shows us a different picture. This subgroup typically, although they have a better long term mortality outcome compared to those who have clear evidence of obstructive or non-obstructive CAD shows increased mortality risk compared to a matched group that had no angiography (Rana et al; Gulati et al; Jespersen et al).

Knowing the market, local practices and medical "culture" will help to determine what to do in these cases.

What will in future make it even more complex for us, is the increased use of CT angiograms, which seem to show really good comparative information compared to invasive angiograms (Van Velzen et al), and may well lead to more (CT) angiograms being done routinely as screening tests.

Literatur

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