



Medical Advances and their impact on trauma insurance

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Munich Re

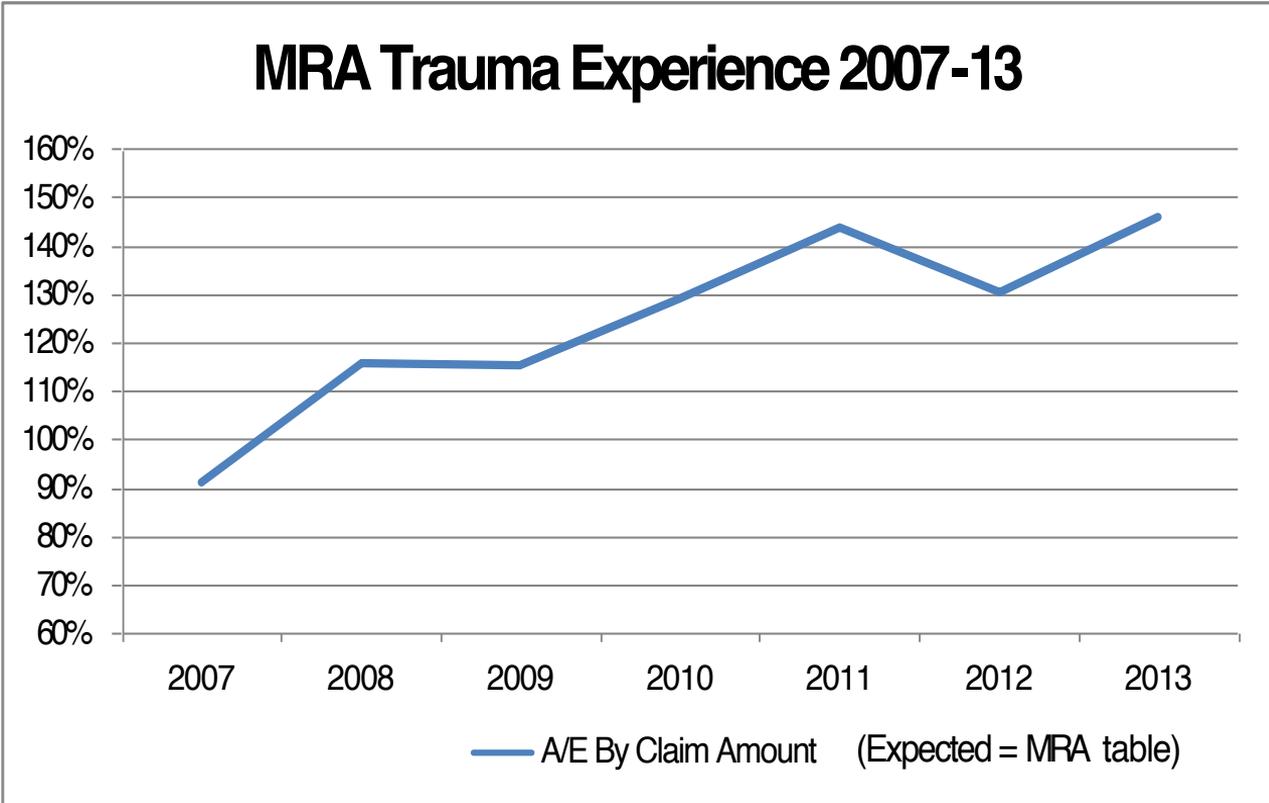
*This presentation has been prepared for the Actuaries Institute 2015
Actuaries Summit.*

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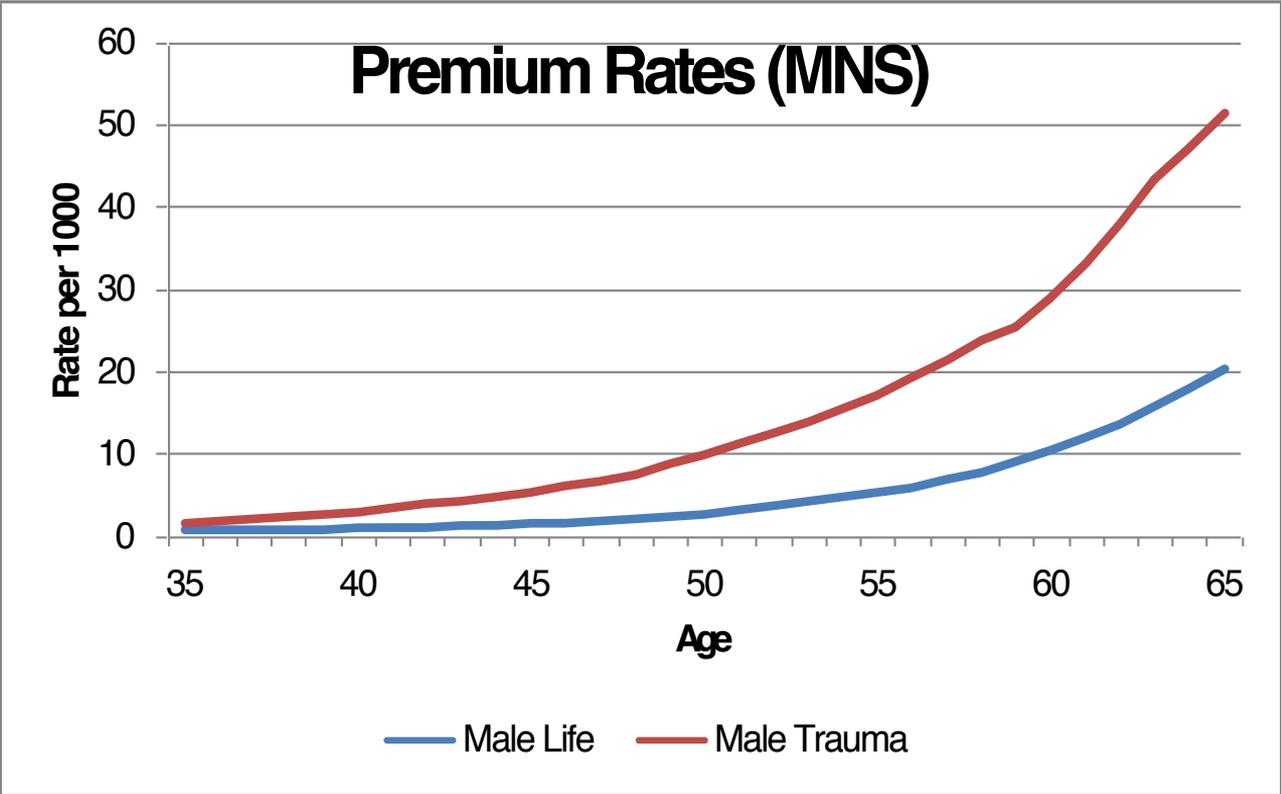
Topics

- Graham- Setting the scene
 - Recent experience and profitability
- Bill- Discussion around medical component
 - General advances in Medicine
 - Specific trauma related conditions
 - Genetics
 - Conclusion

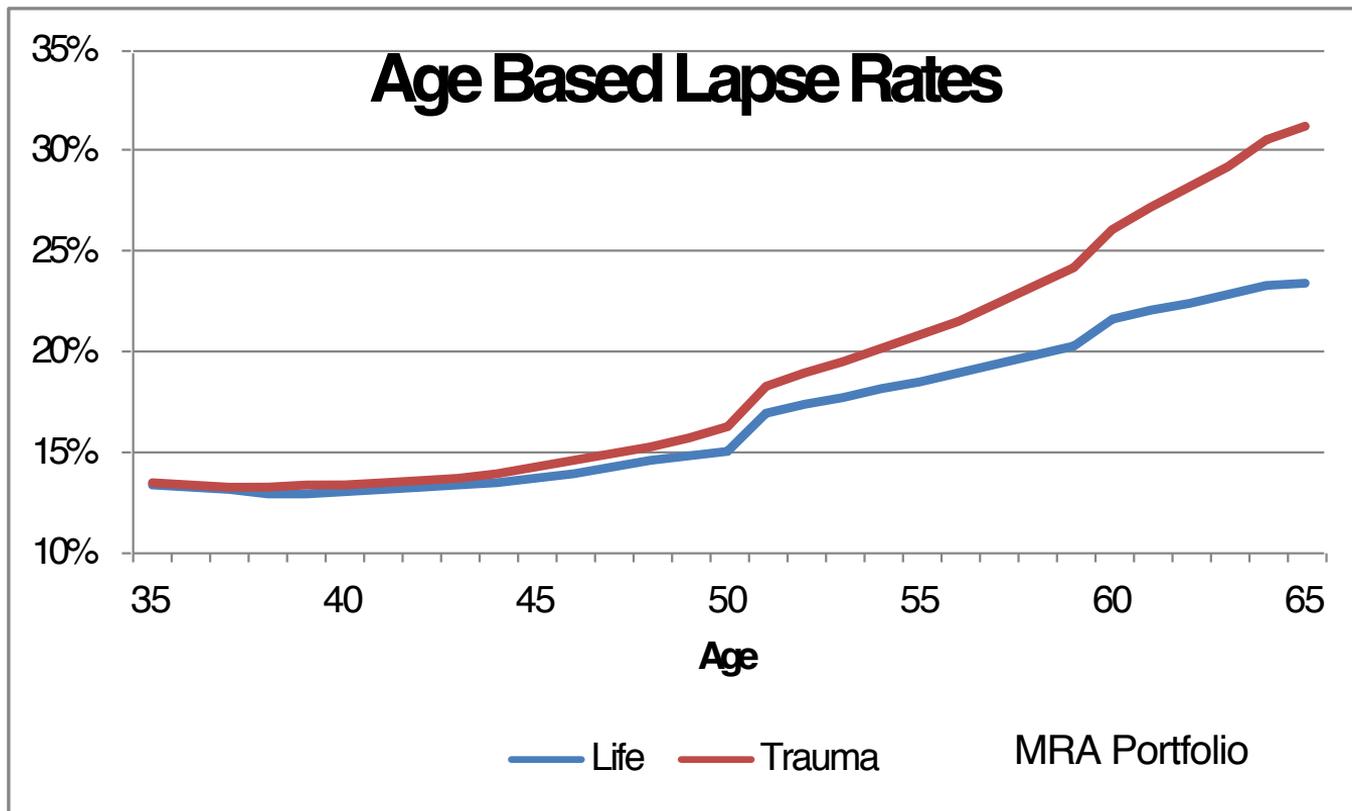
Recent experience



An expensive product



An expensive product (contd.)



Medical advances and impact on trauma experience



1983



1983

Discovery: First Disease Gene Mapped

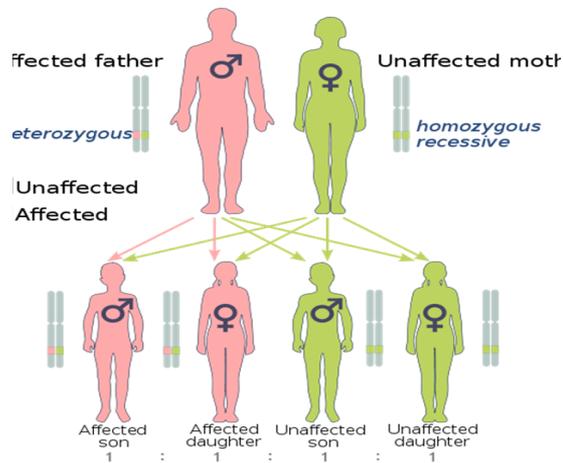
A genetic marker for Huntington's disease is found on chromosome 4.

Crusader life in Johannesburg sell a " Dread disease" accelerator rider benefit to cover heart attack, cancer, stroke and CABG to maximum cover of the equivalent of \$30,000

General advances in Medicine

- From diagnose and treat to predict and prevent. **Predictive Medicine**
- Lifestyle change, controlling risk factors, **wearable medical devices**
- Enhanced diagnostics and imaging
- Targeted therapy, polypills, vaccines, nanomedicine
- Genetics, genomics and **personalised medicine**
- **Big data**, electronic records, tele-medicine,
- Longevity, compression of ill health
- New surgical techniques (i.e Minimally invasive and Transcatheter surgery)
- Don't forget the old enemies still hiding in the wings-epidemics, emerging infectious diseases, **antibiotic resistance**

Enablers of Predictive Medicine - The “Omics”



Genetics:

The investigation of the roles, functions and patterns of inheritance of single genes

Genomics:

The investigation of the function and structure of an entire genome and its interaction with environmental or lifestyle factors

Pharmacogenomics:

How an individual's genetic makeup or inheritance affects the body's response to certain drugs

Questions to ask, points to consider

- With the tremendous acceleration in medical knowledge is it possible to future-proof critical illness against these advances?
- Impact on mortality, morbidity and incidence / prevalence?
- Building in trends
- Changing definitions
- Is the current product sustainable?
- New product design

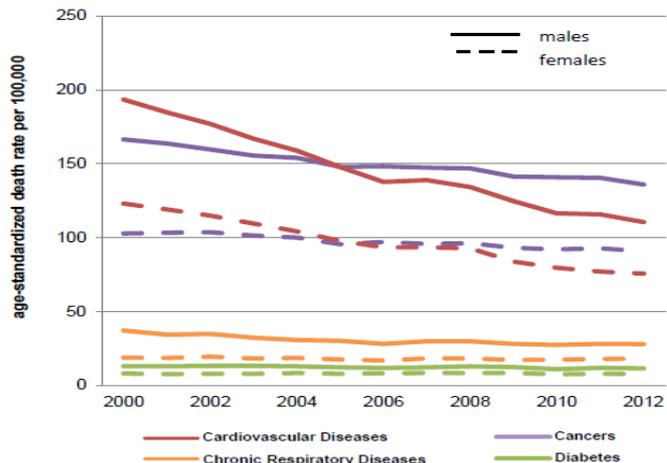
Cardiac component



Australia looking good ! Mortality rates dropping

Total population: 23 050 000
 Income Group: High

Age-standardized death rates



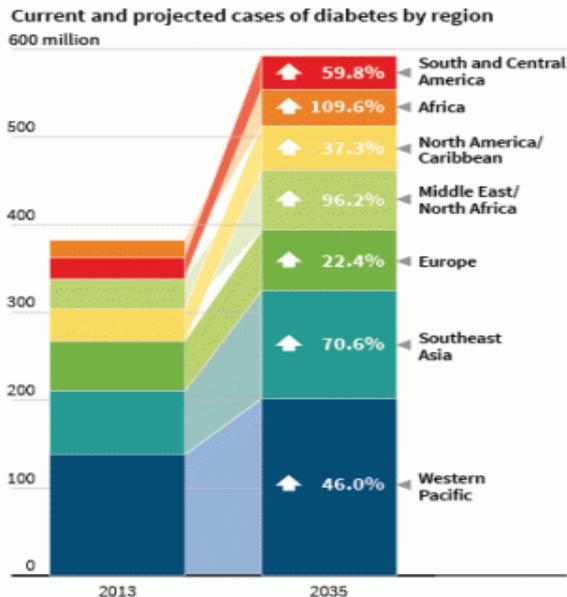
WHO data

Adult risk factors

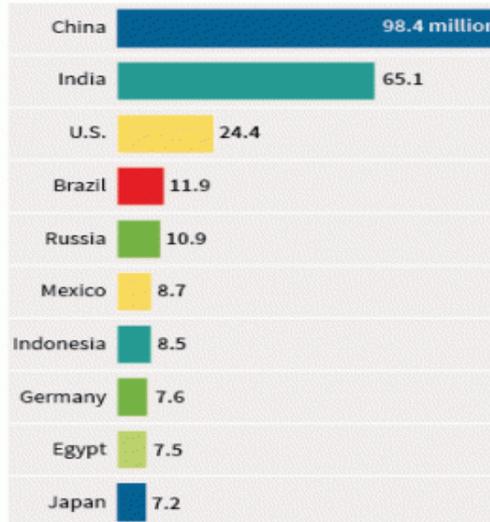
	males	females	total
Current tobacco smoking (2011)	21%	19%	20%
Total alcohol per capita consumption, in litres of pure alcohol (2010)	17.3	7.2	12.2
Raised blood pressure (2008)	25.5%	17.5%	21.4%
Obesity (2008)	26.4%	27.1%	26.8%

Diabetes projection to 2035

World diabetes cases expected to jump 55 percent by 2035



Top 10 countries by number of people with diabetes in 2013, ages 20 to 79

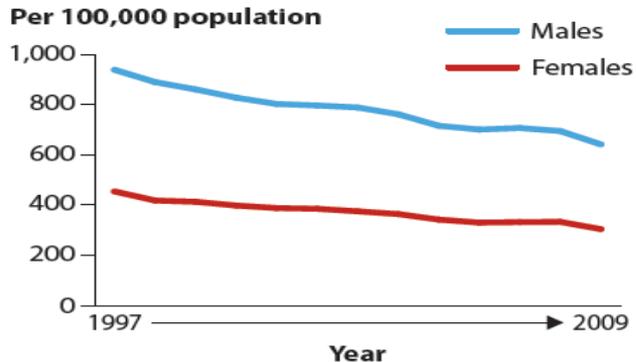


Myocardial infarction in Australia

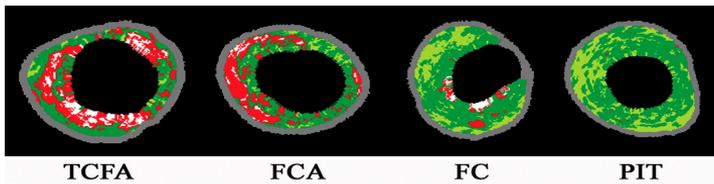
Incidence of heart attacks. The number of major coronary events among people aged 40–90; that is, the number of deaths from coronary heart disease (heart attacks) plus the number of non-fatal hospitalisations for heart attacks. Presented as an age-standardised number per 100,000 people.



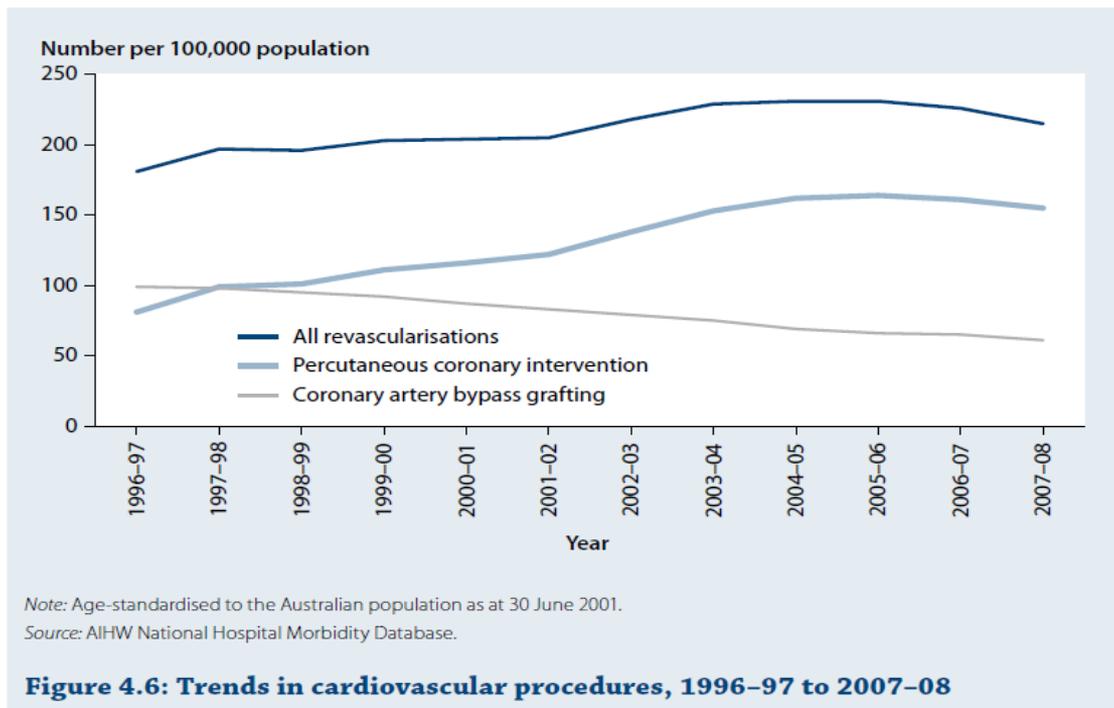
- There were about 47,700 coronary events in 2009—463 per 100,000 people.
- Coronary events were twice as common for males as for females.
- The rate fell by almost one-third between 1997 and 2009, despite increased use of more sensitive diagnostic tests that may have led to a rise in the number of less severe heart attacks being diagnosed over time.



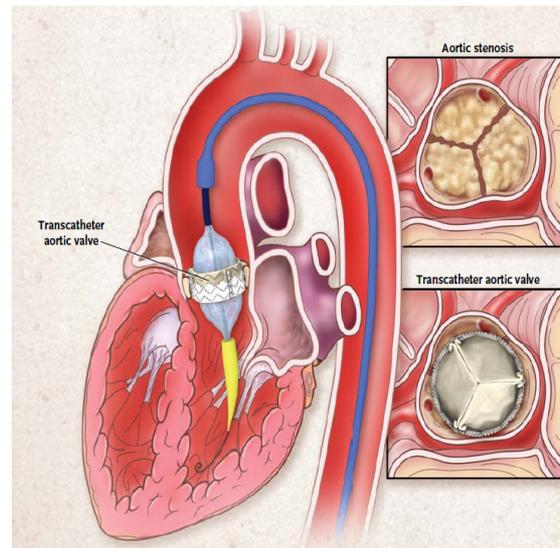
Sources: AIHW National Hospital Morbidity Database, AIHW National Mortality Database, AIHW analysis of ABS unpublished confidentialised data.



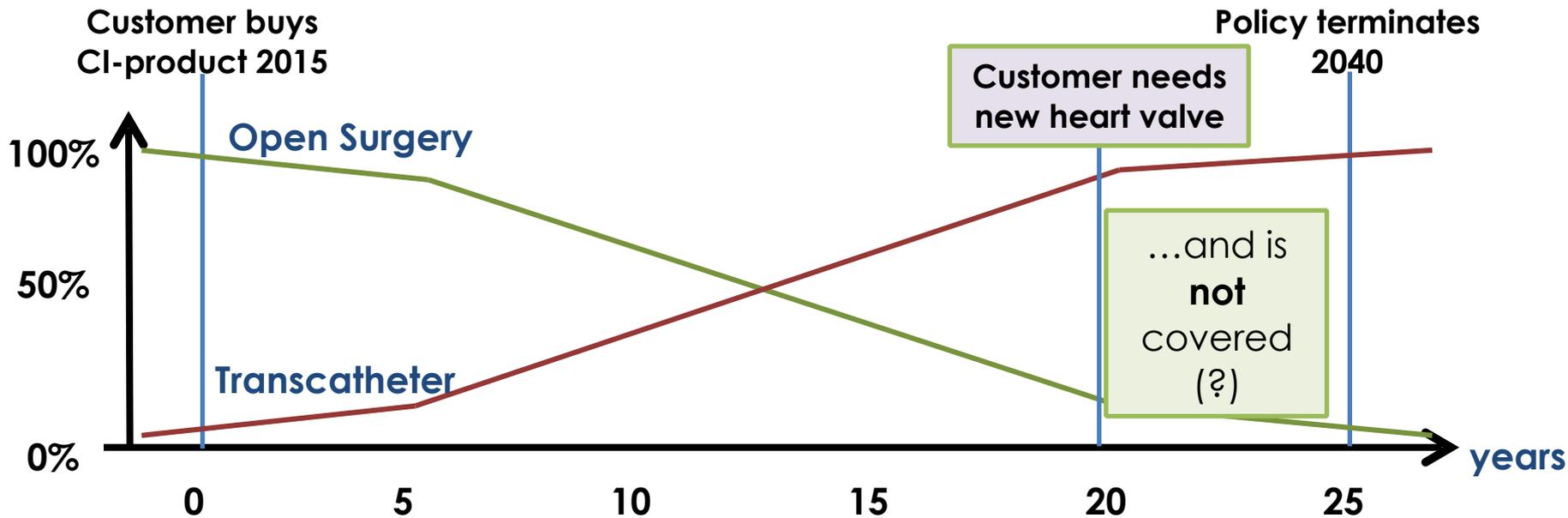
Trends in Interventional Cardiology



- CABG's decreasing
- Stenting increasing
- Multiple stenting increasing at 6% per annum



Changing definitions



Insurance companies will (need to) pay out „transcatheter“ claims sooner or later

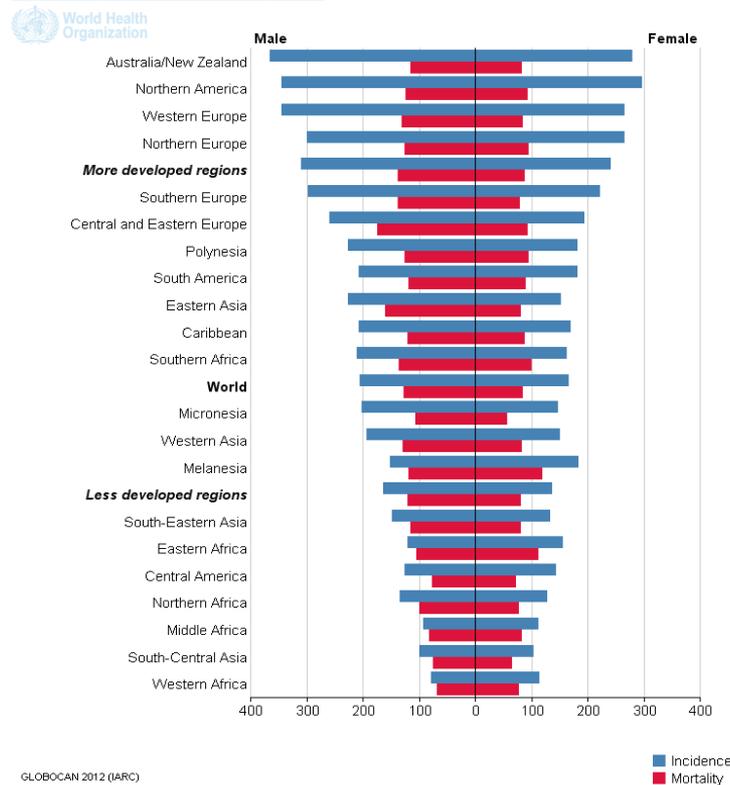
Cancer

Australia Tops World Cancer Charts

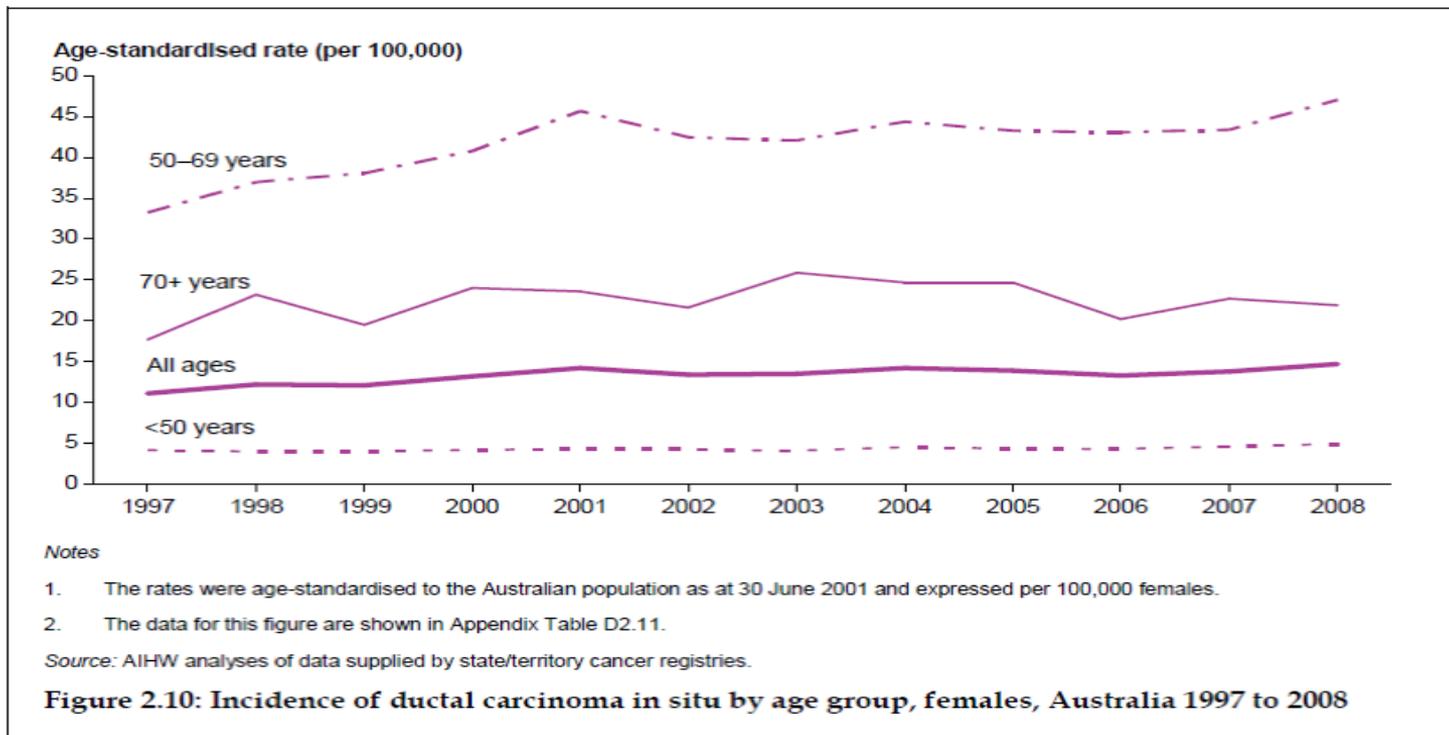
The cancer agency of the World Health Organization has revealed that Australian men have the highest incidence of cancer in the world.

Aus Science Magazine 2014

International Agency for Research on Cancer



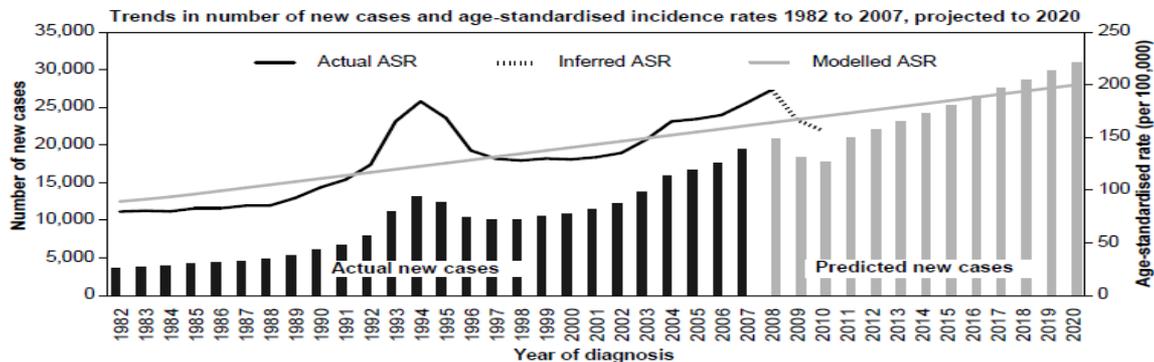
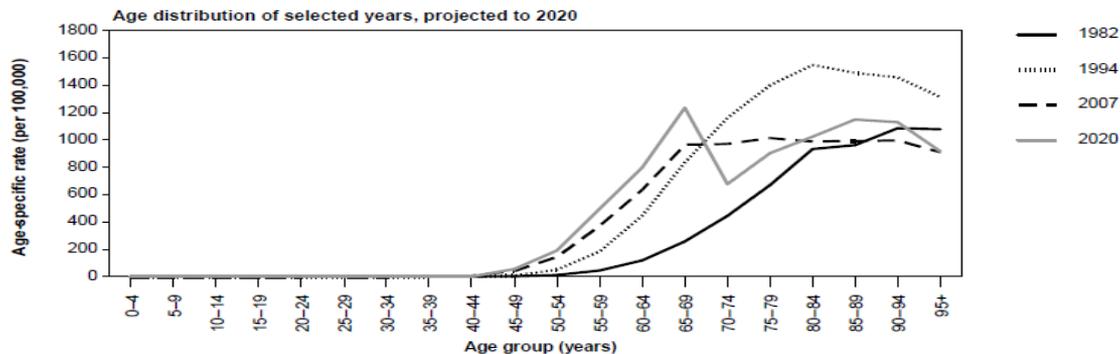
DCIS- on the rise



Screening



Incidence rate peaked in 1994 with introduction of PSA*.

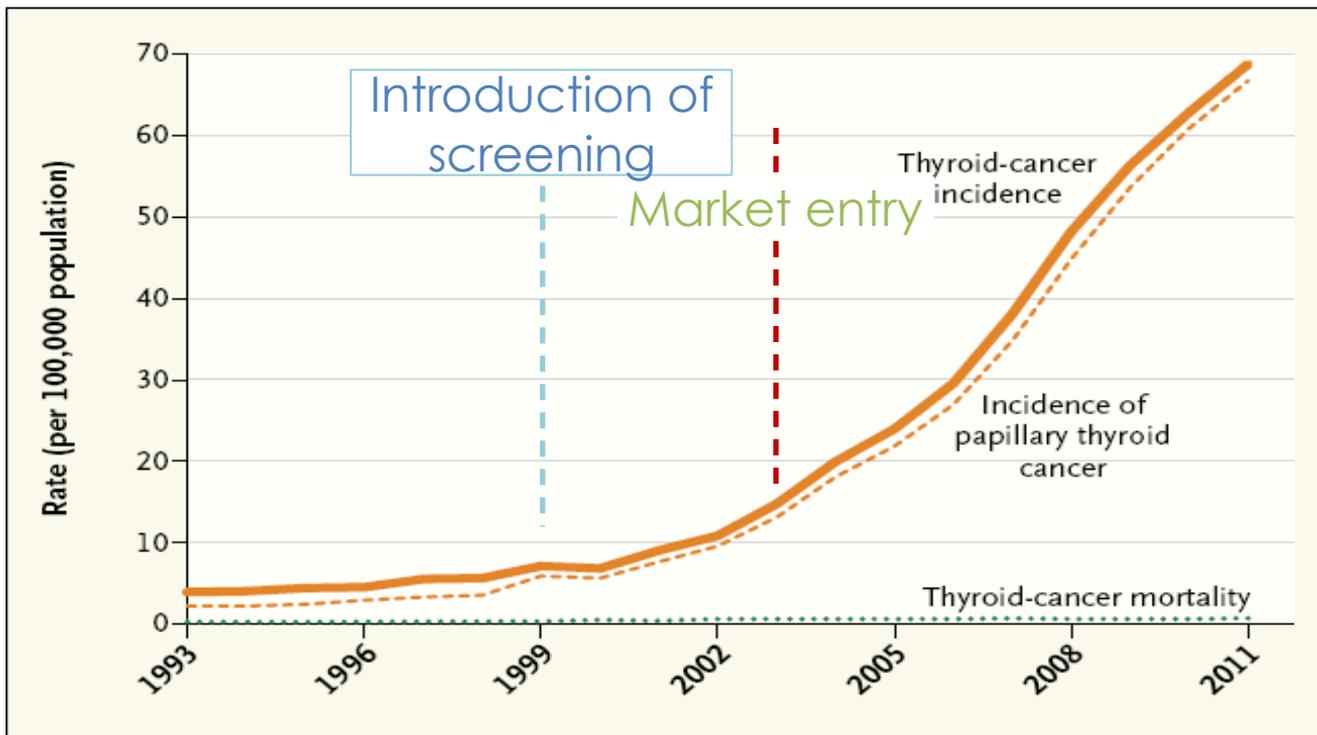


* AIHW- Cancer incidence projections, Australia 2011-2020

Screening: Critical Illness- The Korean experience

Year	Critical Illness in-force business	
	Male	Female
2002	52,000	76,000
2003	310,000	443,000
2004	1,025,000	1,439,000
2005	1,608,000	2,193,000
2006	2,125,000	2,843,000

Critical Illness - Risk of change -



From: Hyeong Sik Ahn et al: „Korea's Thyroid-Cancer “Epidemic” — Screening and Overdiagnosis“, N Engl J Med 371;19 November 6, 2014

Critical Illness - Risk of change -

One third of all claims in women and 10% of all claims in men were due to early stage thyroid cancer!

Pricing was based on pre-screening numbers ...

... and insurance companies were facing losses.

Survival in early stage thyroid cancer is 100%

Tumour Markers- It's not boring at all.....

Colleague,
wake up, this is so
important



Tumour markers

- More genetic – looking at proteins produced as a consequence of specific mutations caused by cancer.



Prostate Cancer foundation

September 25, 2013 -- A new **urine test for prostate cancer** that measures minute fragments of **RNA** is now commercially available to men nationwide through the University of Michigan MLabs. The new test—Mi-Prostate Score (MiPS)—improves the utility of the PSA blood test, increases physicians' ability to pick out high-risk prostate tumors from low-risk tumors in patients, and may help tens of thousands of men avoid unnecessary biopsies.

Changes in chromosomes years before cancer diagnosis could yield biomarker to predict cancer.



A distinct pattern in the changing length of blood telomeres, the protective end caps on our DNA strands, can predict cancer many years before actual diagnosis, according to a new study from Northwestern Medicine in collaboration with Harvard University*.

* Oncology news Australia May 5th 2015

“Salivaomics”



Saliva used for biomarker development and personalised medicine

Potential to detect oral cancer, pancreatic cancer, lung cancer, ovarian cancer and breast cancer

*The Landscape of MicroRNA, PIWI-Interacting RNA and Circular RNA in Human Saliva Jae Hood Bahn et al Clinical Chemistry 61:1 221-230 (2015)

Frankie the dog sniffs out thyroid cancer! BBC news March 8th 2015

Tests on 34 patients showed an 88% success rate in finding tumours
“Whilst using dogs is impractical ☹, discovering chemicals the dogs can smell could lead to new tests”
Cancer cells have their own unique chemistry and release **volatile organic compounds**

BBC News April 2015

“ A simple breath test could help predict whether people with gut problems are at high risk of developing stomach cancer” Research involving thousands of Europeans is now under way

Uses a Nanno-array breath test and the Idea that people with cancer may have unique breath signatures containing minute chemical compounds



Stages of cancer- Example of male distribution (SEER data)

Age	20-39	40-49	50-59	60-69	70+
Stage I	42%	48%	46%	38%	32%
Stage II	17%	14%	15%	17%	15%
Stage III	18%	18%	18%	22%	24%
Stage IV	23%	20%	21%	23%	27%
	100%	100%	100%	100%	100%

Most cancers are detected at an early stage and with all the new technology coming through, early cancer detection will increase further

Cancer treatment- Times are changing

Surgery
Slash



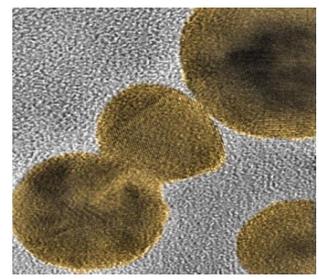
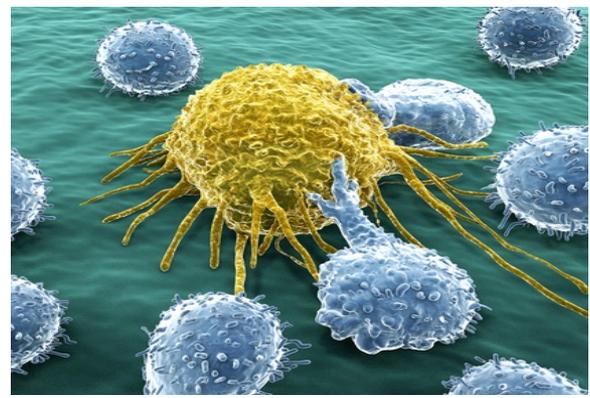
Radiotherapy
Burn



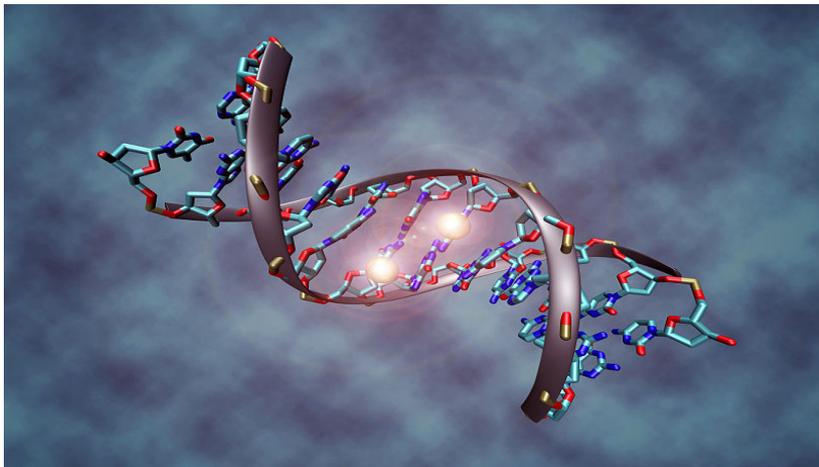
Chemotherapy
Poison



Targeted therapy- Smart bombs have arrived



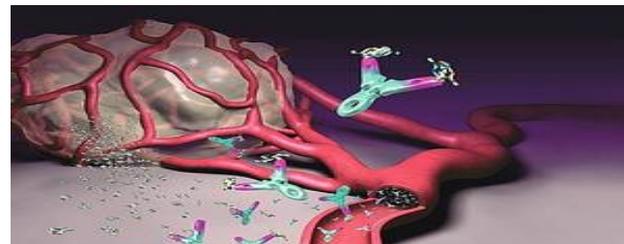
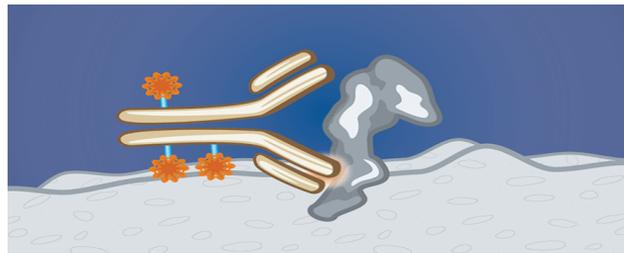
Cancer Epigenetics



- Involves the study of the genome of cancer cells that does not involve the genes themselves but the area between the genes that modifies the expression of genes.
- It can involve silencing or down-regulation of tumour suppressor genes or perhaps the activation of oncogenes.
- Understanding epigenetic mechanisms holds great promise for cancer prevention detection and therapy

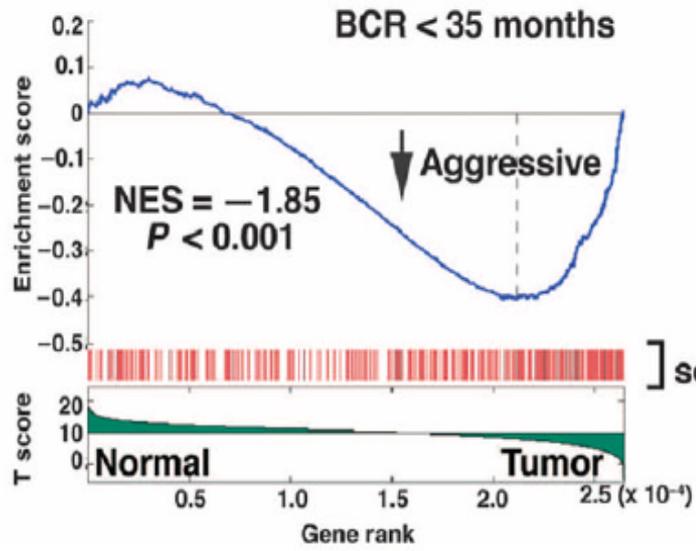
New drug therapies – target therapies

- HER 2-antibody + chemotherapy
Drug attached to an antibody, releasing the drug at the location of interest
- Anti-angiogenesis
Drugs in particular interacting with vascular endothelial growth factors

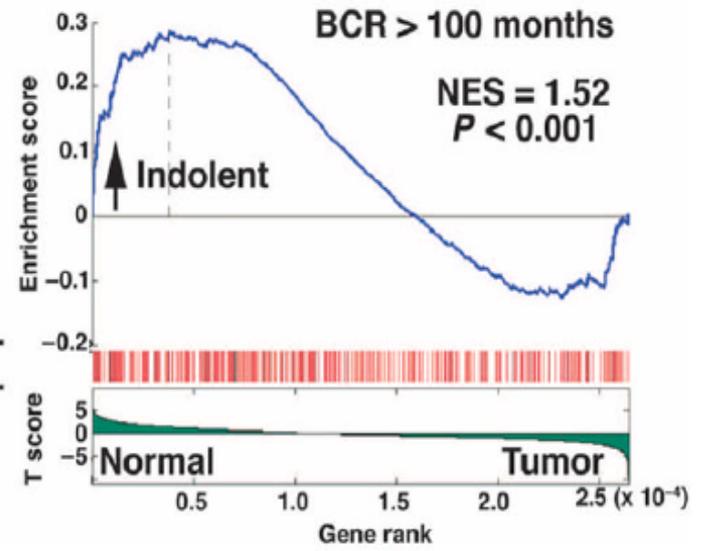


Predictive Medicine and Prognosis- Indolent Prostate Cancer -

Aggressiveness of Low Gleason Score Prostate Cancer

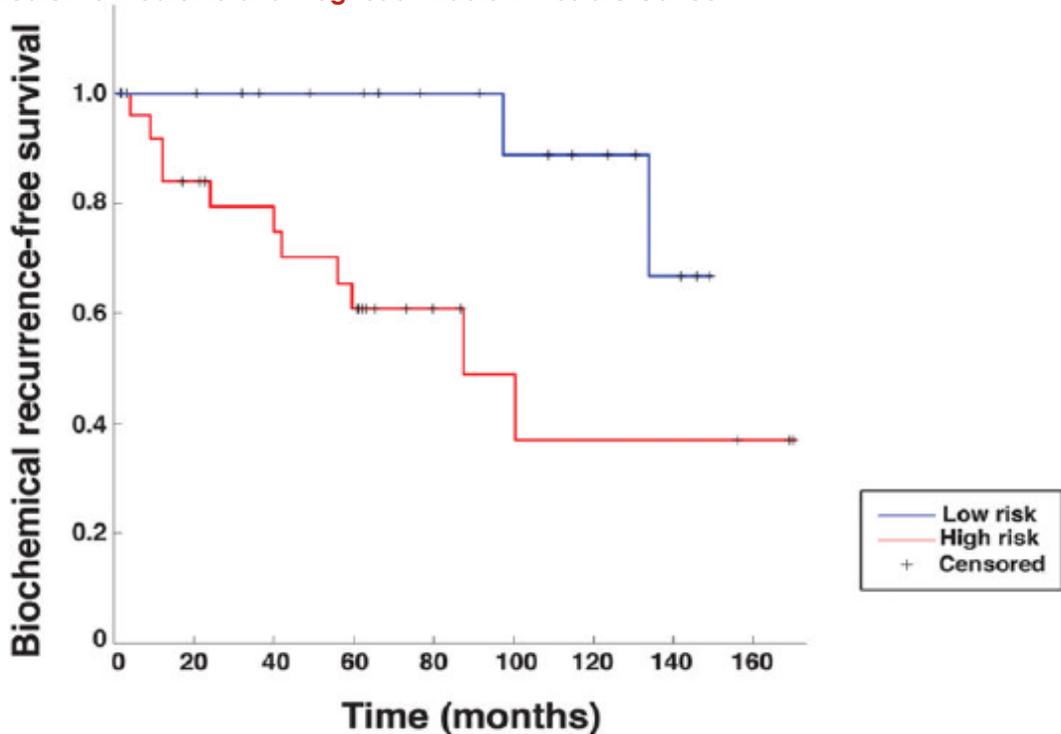


Aging and senescence signature (377-gene set)



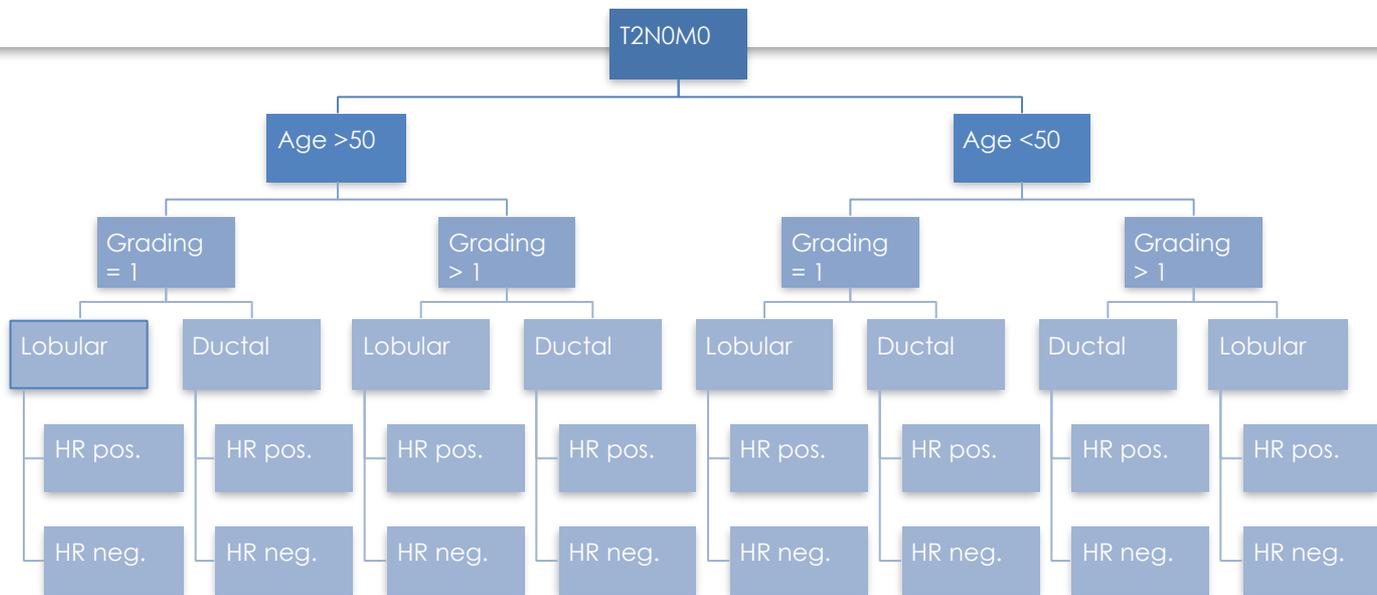
Irshad et al. " A Molecular Signature Predictive of Indolent Prostate Cancer", Sci Transl Med. 2013 September 11; 5(202): 202ra122

Predictive Medicine and Prognosis- Indolent Prostate Cancer



- Kaplan-Meier analysis for patients with Gleason 6/7
- Study population was separated into high-risk and low-risk cancers by expression of FGFR1, PMP22, and CDKN1A proteins
- Recurrence-free survival after 10 years was significantly better in the molecular low risk group

Gene expression adding to future prognostication.....



2013 Onwards- next tier of prognostic factors based on Molecular subtypes, Gene expression scoring and so forth

Cancer Vaccines



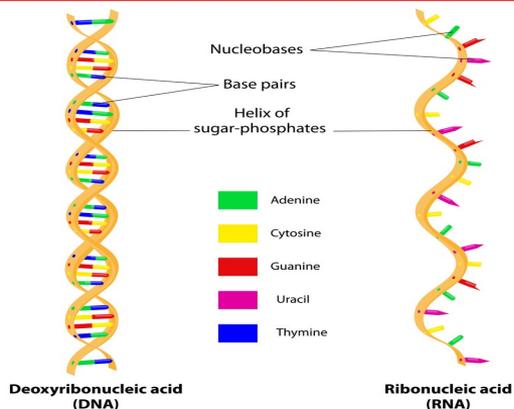
- Training the immune system to fight cancer.
- Teaches the immune system to identify and destroy tumour cells by identifying unique proteins produced by the mutated cancer cells
- A trial began in 2013 on patients with advanced melanoma.
- By looking at your genetic make up you could one day receive a personalised vaccine based on your own genetic susceptibility to cancer

The cost

- Spending on Prescription drugs in the USA rose by \$43.4 Bn in 2014 to reach \$373.9Bn a 13.1 % increase from 2013
- New drugs to treat Hepatitis C, cancer, Multiple sclerosis and diabetes contributed to most of the growth.
- \$11.3 bn went to pay for 4 new Hep C drugs. A 12 week course of one such drug, Sofosbuvir typically costs \$80,000 a patient
- Speciality medicines now account for one third of prescription drug spending in the USA

From SNP's to Who Genome sequencing

Structure of DNA & RNA



- Genetic tests for > 2200 diseases have been developed with 2000 available for clinical testing <http://www.cdc.gov/genomics/gtesting/>
- 1st Human Genome mapped 2002 at a cost of \$100 000 000
- 2014- cost of mapping a genome \$1000

“Whole genome sequencing
We found 13 labs offering this service
with prices from \$795.00 to \$3,000.00 per
sample. 100% positive ratings across 6
reviews.”



Evaluation of Genomic Applications in Practice and Prevention (EGAPP)

The goal of this body is to establish and evaluate a systematic, evidence based process for assessing genetic tests and other applications of genomic technology in transition from research to clinical and public health practice

<http://www.egappreviews.org/about.htm>

Does Genomic profiling to assess Type 2 diabetes risk improve health outcomes? **No**

Does Genomic profiling to assess cardiovascular risk improve cardiovascular health? **No**

Can testing tumour tissue for mutations in EGFR effector genes with metastatic colorectal cancer improve health outcomes ?- **Yes**

DTC Genetic testing



- DTC genetic testing- public awareness has increased from 29% to 37% in a study from the US.
- Awareness higher in those aged 50-64 and 65-74, college graduates, those with healthcare, those with a prior cancer diagnosis, internet use and living in urban areas

Summary

- Deterioration in trauma experience
- The trauma product is exposed to advances in medicine (both positively and negatively)
- Cancer most affected
- Screening and new diagnostics will increase the incidence of cancer detection and shift the stage at diagnosis to the left (earlier stage)
- Genetic testing will become more important
- Anti-selection risk may well increase
- New surgical techniques etc require that definitions be regularly reviewed
- The sustainability of the product if left as is under serious threat.....

Thank you for your kind attention

