

The Role of Pathology in Preventive Health and Chronic Disease Management.¹

Introduction

One of the greatest challenges facing Australia's health system is the increasing prevalence of chronic diseases in the community. Like most other developed countries over the past 20-30 years, Australia has experienced a relative reduction in the levels of acute illnesses and an increase in longer term chronic conditions. Currently, according to the Australian Institute of Health and Welfare, the top 10 causes of disease burden in Australia are chronic diseases. These diseases alone account for nearly 43% of the total disease burden in Australia. This trend is likely to continue into the future; in fact the World Health Organisation has predicted that by 2020 three quarters of all deaths will be due to chronic diseases.

This change in the health care needs of the Australian community is placing increased pressure on our health system. Other factors which are adding to this pressure include the ageing of our population (which also results in higher chronic disease levels) and global workforce shortages which mean that we need to increase the efficiency of our health workforce. It is imperative that we continue to focus our health care efforts on reducing the chronic disease burden and keeping people healthier for longer. Unless we change the way in which our health system operates we will not be able to continue to meet the health care needs of our population in the future.

Re-orienting our health system towards illness prevention and chronic disease management has had, and will continue to have, a profound impact on the delivery of health care in the community. For example, compared with a generation ago, GPs now focus more on preventing illness and managing chronic conditions and less on treating short-term acute problems. This, in turn, has had a major impact upon other areas of health care with a role to play in preventive health, particularly pathology. This section outlines the crucial role of pathology testing in most forms of illness prevention and chronic disease management and how the changing focus of our health system has had a significant impact on the pathology sector.

Government policies

The need to re-orient our health system towards illness prevention and chronic disease management has been recognized by both the current and previous governments. Over the past decade, a number of policies and programs have been introduced to support an increased focus on illness prevention and chronic disease management.

The aims of these policies and programs are to reduce the overall burden of disease and disability on the Australian community, through achieving the following:

- primary prevention of disease (where possible);
- early detection of disease (enabling more timely and effective treatment);
- a reduction in the level of illness, complication rates, incapacity and mortality associated with specific conditions;
- an increase in the numbers of 'healthy and active' older Australians; and
- an increase in the overall health and well-being of the population.

¹ "The Role of Pathology in Preventative Health and Chronic Disease Management" section 3 pg 28-32 from "An Analysis of Pathology Test Use in Australia" AAPP utilizing data from BEACH program, Family Medicine research Centre University of Sydney June 208.

Role of pathology

Pathology underpins almost all preventive health care and is vital to the effective management of chronic disease. Pathology contributes to the overall effectiveness of health care provided to patients through a number of different means, including:

- assisting in the diagnosis of a disease (e.g. diagnosing HIV/AIDS);
- determining the type of disease present (e.g. the specific type of breast cancer);
- assessing the level of progression of disease (e.g. the severity of heart disease);
- preventing the transmission of disease to others (e.g. testing pregnant women for syphilis to prevent exposure of the baby during the birth);
- preventing the development of more serious conditions (e.g. testing sexually active women for Chlamydia to prevent infertility); and
- ensuring the treatment is targeted to the individual patient's needs (e.g. Her 2 gene amplification testing in breast cancer).

Prevention

Some examples of the role of pathology testing in key areas of preventive health are outlined below. These are categorized into three separate categories:

1. population screening (the testing of a defined population group);
2. individual screening (the opportunistic testing of an asymptomatic individual patient);
3. early investigation (the testing of a symptomatic patient).

Population screening		
Population	Specific test	Role of pathology
New-born babies	Test for cystic fibrosis	Testing of blood for evidence of cystic fibrosis (immuno reactive trypsin)
Sexually active women	Test for cervical cancer	Testing of cervical cells for evidence of malignancy (Pap smears)
Pregnant women	Test for rubella immunity	Testing of blood for rubella antibodies
Individual screening		
Individuals	Specific test	Role of pathology
Injecting drug user	Test for Hepatitis C virus	Testing of blood for Hepatitis C virus antibodies
Person with a family history of diabetes	Test for glucose tolerance	Testing of blood for glucose metabolism
Person with diabetes	Test for early onset renal disease	Testing of urine for mild proteinuria
Woman at risk for STDs	Test for Chlamydia trachomatis	Testing of first passed urine using PCR test for Chlamydia DNA

Early detection testing		
Individuals	Specific test	Role of pathology
Person with suspicious mole or lesion	Test for melanoma	Testing of tissue biopsy for evidence of malignancy
Person with symptoms of osteoporosis	Test for Vitamin D deficiency	Testing of blood for Vitamin D levels
Person with unexplained lethargy and tiredness	Test for iron deficiency	Testing of blood for ferritin, a measure of iron stores

These tests all provide long-term health benefits to individuals, as well as to the community as a whole, through enabling the early identification of disease and thus providing the best opportunity for early intervention and treatment. For example, by testing people with early signs of osteoporosis for Vitamin D deficiency, one of the main causes of this debilitating condition can be identified and addressed. This reduces the rate of progression of the disease and the risk of serious complications, such as hip fractures, which are life threatening, expensive to treat and which result in significant reductions in quality of life for patients. In some cases, such as the routine testing of pregnant women for rubella antibodies, potentially serious and disabling rubella infection of babies in utero can be prevented, thus resulting in life-long benefits.

With an increasing focus on prevention and early detection of disease within our health system, pathology testing will continue to support doctors and other health professionals to deliver optimum health outcomes to patients and to contribute to maximizing the efficient use of scarce health resources.

Chronic disease management

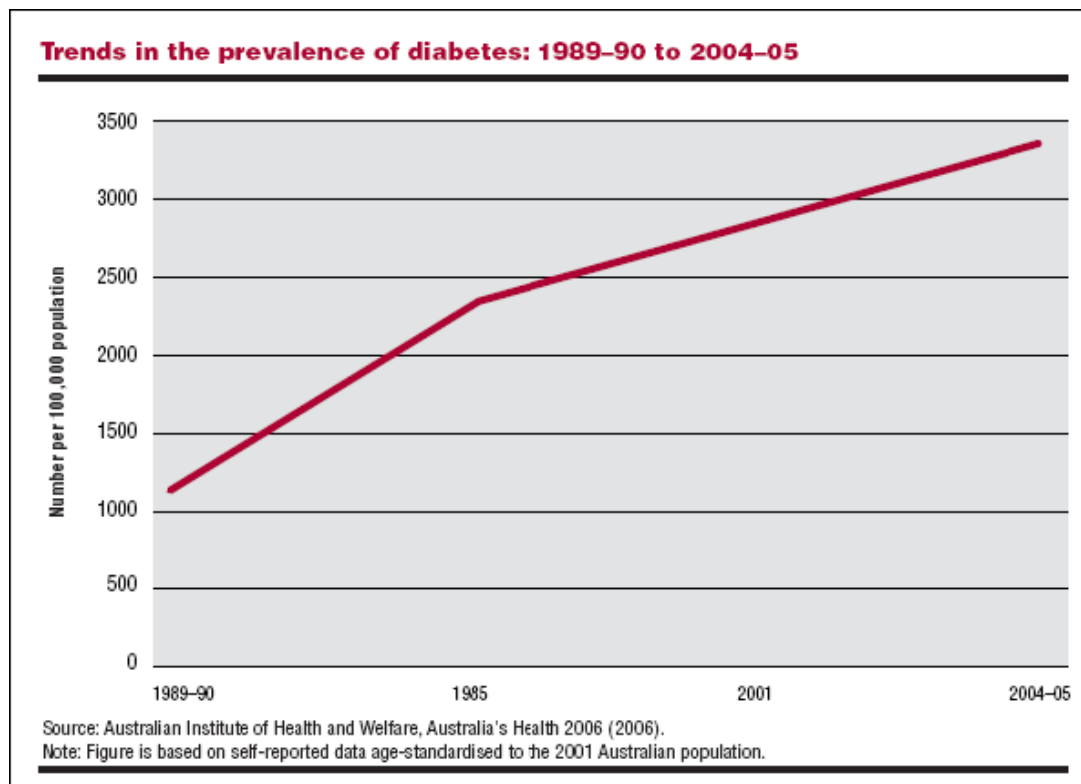
Pathology also plays a vital role in the diagnosis and management of chronic disease. Some common chronic conditions which rely on pathology testing include diabetes mellitus, hypertension and high cholesterol. Other conditions, such as pregnancy, also involve a range of pathology tests for best practice management. Some examples of specific pathology tests involved in managing the above conditions are as follows:

Chronic disease/condition management		
Condition	Specific test	Role of pathology
Diabetes	HbA1C levels	Testing of average blood glucose to determine how well diabetes is being managed
High cholesterol	Test for levels of LDL cholesterol, HDL cholesterol, triglycerides and total cholesterol	Testing of blood for atherogenic factors including cholesterol and triglyceride levels
Pregnancy	Triple test for fetal immaturity	Identify Down syndrome and other trisomies
Overweight/obesity	Glucose tolerance test	To determine the risk of diabetes mellitus

Through supporting best practice management of chronic disease, pathology testing provides doctors with the information they need to prevent, as far as possible, further progression of the disease and ensure patients with chronic conditions remain as healthy as possible.

Diabetes mellitus – a case study

Diabetes provides a useful case study for examining the role of pathology testing in chronic disease management. Diabetes is a significant cause of disability within our community, especially amongst the indigenous population. Of particular concern is the rapidly increasing rate of type 2 diabetes – currently 850,000 Australian adults have type 2 diabetes and this figure has doubled in the last decade. If this trend continues, we can expect that three million Australians will have diabetes by 2031.



Poorly managed diabetes can lead to a range of serious health complications, such as chronic kidney disease – the long-term loss of kidney function. People whose diabetes is not managed well are two to five times more likely to have a heart attack or stroke. Heart attacks and strokes are major causes of premature death in Australia today and can also often result in significant disability and a reduction in quality of life.

Diabetes costs the Australian community approximately \$21 billion per year. This figure includes health and medical costs, as well as the costs associated with lost productivity, foregone taxation revenue, welfare payments and carers' costs.

However, many of the complications of diabetes can be avoided or reduced through effective management of this condition. This increases the quality of life of people with diabetes and also significantly reduces the associated treatment costs. According to one estimate, the cost of treating uncomplicated diabetes is \$4,000 per person per year, but this rises to \$10,000 for people whose eyes, heart or circulation are affected.

The Australian Institute of Health and Welfare has also found that 25% of the almost one in ten diabetic hospital admissions each year could have been avoided with better care of the complications of diabetes. This equates to 138 000 Australians with diabetes being admitted to hospital each year for complications which could have been avoided or better managed in the community. This indicates the benefits, in terms of both quality of life and avoidable health care costs, which can be achieved through the better management of diabetes. Monitoring of diabetic control is totally dependent on pathology tests. Pathology will continue to make an essential contribution to improving the prevention and management of diabetes and in reducing the future burden that this condition will impose on our health system and on the community as a whole.

Conclusion

Pathology testing plays a vital role in illness prevention and chronic disease management. Without access to pathology testing, doctors would have to make decisions about the diagnosis and treatment of patients without having vital information about the patients' condition. This would lead to a higher rate of mis-diagnosis and delayed diagnosis and make it more difficult for doctors to find the best treatment for their patients.

Without pathology testing, patients would experience delays in accessing the most appropriate treatment for their condition and would be at risk of suffering unnecessary side-effects from inappropriate treatments. Overall, people with chronic conditions would have poorer outcomes and reduced health and well-being.

Without access to pathology testing, the effectiveness of screening and prevention programs would be greatly reduced as the means to identify diseases within the population would be limited. This would significantly increase the incidence of preventable diseases in the community, resulting in higher health care costs and reducing the overall health of our society.

The benefits to patients and the health system generally that flow from the early detection of disease ²

Prevention of disease is the ideal goal

This is often impossible (e.g. most forms of cancer) or practically difficult (e.g. achieving universal condom use in casual sexual encounters).

The alternative approach is early detection

This reduces the amount of illness, the complication rate, incapacity, mortality and often the cost and difficulty of treating the disease.

A good example is the Sexually Transmitted Disease (STD) caused by Chlamydia trachomatis. Although transmission can be prevented by condom use, the incidence of this infection in Australia is rising. Most infected females have no symptoms – however, the infection persists indefinitely and in some may progress to involve the fallopian tubes and other organs (which causes significant morbidity). The most common complication is infertility due to tubal scarring – requiring expensive Assisted Reproductive Techniques to achieve pregnancy. During this whole time spread to other sexual partners can also occur. The infection would be suspected by an astute GP (usually following the taking of a sexual history during a consultation) and is easily confirmed by a cheap and non invasive (urine) pathology test. Treatment with antibiotics is also cheap and usually straight forward. The comparison between the costs of early detection and treatment and those of late treatment are stark at the individual level – let alone factoring in the other cases which may have occurred as a consequence of delay.

Early detection of disease thus often requires pathology tests to be used in symptomless patients (i.e. population screening or individual case finding). However, early detection of disease mostly occurs in patients with recently observed symptoms or signs.

The investigation of symptomless persons may be done in a systematic and organized way – this is usually called 'screening' – and involves the testing of all persons with certain attributes (age, sex etc). It can also occur opportunistically where other factors may influence the decision to test (e.g. family history, existing conditions). This is also called 'case finding'.

The BEACH GP data base categorises patients' presenting complaints when pathology is requested as follows:

Undifferentiated illness (diagnostic testing) - 40%;

Differentiated illness (monitoring) – 40-45%;

No illness (screening) - 15-20%.

² "The benefits to patients and the health system generally that flow from the early detection of disease ² pgs 24-27 from " An Analysis of Pathology Test Use in Australia by AAPP utilizing data from the BEACH program, family Medicine Research Centre University of Sydney June 2008.

1. Screening is organized and systematic

Examples include:

- **Neonatal** – all newborns – heel prick blood tested for cystic fibrosis, phenylketonuria, galactosaemia and hypothyroidism: www.chw.edu.au/prof/services/newborn/
- **Cervical cancer** – all sexually active females; age and previous results influence frequency: [www.cervicalscreen.health.gov.au/.../publishing.nsf/Content/cv-early-detection/\\$File/early-detection](http://www.cervicalscreen.health.gov.au/.../publishing.nsf/Content/cv-early-detection/$File/early-detection)
- **Antenatal testing** – all pregnancies for syphilis, rubella, HIV, HBV, HCV, glucose tolerance: www.mja.com.au/public/issues/177_09_041102/wal10595_fm.html
- **Faecal occult blood testing** – all persons of appropriate age: www.cancerscreening.gov.au/internet/screening/publishing.nsf/Content/bw-facts
- **Breast cancer** – mammography of all females of appropriate age: www.breastscreen.info.au/internet/screening/publishing.nsf/Content/breastscreen
- **Blood donations** are tested for HIV, hepatitis B and C, HTLV1, Syphilis, CMV: www.health.gov.au/internet/main/publishing.nsf/Content/health-mediarel-yr1999-mw-hmc1.htm

For a screening program to be performed, a cost benefit analysis must have shown a reasonable benefit. Apart from cervical cancer screening using cytology and antenatal testing, these programs are performed by State/Federal service providers.

2. Screening as an opportunistic process

This usually occurs when a patient presents to a GP for other reasons – this is also called ‘case finding’.

Examples include:

- **Random or fasting blood glucose** – obesity or family history: [Diabetes Care 27:2120-2128, 2004](http://Diabetes_Care_27:2120-2128,2004)
- **Cholesterol and HDL Cholesterol:** www.heartfoundation.org.au/document/NHF/guideline_lipid_summary_2001.pdf -
- **STDs**- Chlamydia, gonorrhoea, HIV, HBV: www.mja.com.au/public/issues/175_08_151001/donovan/donovan.html
http://www.som.uq.edu.au/hivandhcvprojects/about-us/Meeting_S_H_Clinicians/PDFPPT/Commonwealth_Chlamydia_Screening_Program_Qld.pdf
- **Blood born viruses** in IV drug users: www.aic.gov.au/publications/proceedings/04/liew.pdf
- **Genetic diseases** where there is a family history of thrombophilia – Factor V Leiden and other clotting factors, haemochromatosis, cystic fibrosis: www.racgp.org.au/redbook/static/2.htm
www.mja.com.au/public/issues/179_10_171103/ger10460_fm-2.html
- **Vitamin D** – diet, sex, age, racial groups, family history, smoking: www.thewomens.org.au/VitaminDAntenatalScreening
www.racgp.org.au/.../NavigationMenu/Publications/AustralianFamilyPhys/2006issues/afp200607/20060705wong.pdf
- **Renal disease** – diabetes, chronic infection, glomerulonephritis: www.kidney.org.au/LinkClick.aspx?fileticket=87c5TqrIfIo%3D&tabid=650&mid=455
www.mja.com.au/public/issues/176_11_030602/cas10211_fm.html
- **Iron deficiency** – age, sex, dietary, bleeding, ethnicity: www.racpcongress.com/PDF_files/ppt/BENSON_Jill.pdf
www.labtestsonline.org.au/understanding/wellness/ab_infant.html

- **Depression** – Hypothyroidism: www.mja.com.au/public/mentalhealth/articles/ellen/ellen.html
 Some work has been done on the effectiveness of this strategy but the cost benefit analysis is not as well developed as for 1.

3. Early investigation of symptomatic patients

This requires the potential cause to be considered and that there is a way that early disease can be detected. This process can be extended to virtually any disease process but obviously is most effective for diseases that do not spontaneously resolve. A patient with any treatable condition should benefit from early detection and thus early treatment of their illness. Early diagnosis of untreatable conditions may be of dubious value.

Examples including clues leading to testing:

- **Thyroid function tests (TSH/TFTs):** weakness and tiredness but also past history, age, sex, pregnancy. Of proven benefit - [Danase et al: Screening for mild thyroid failure at the periodic health examination: a decision and cost effective analysis. JAMA. 1996;276:285-292](#)
- **Glucose tolerance testing (GTT):** in patients with indicator illnesses for diabetes (e.g. thrush). See www.mja.com.au/public/issues/176_03_040202/hil10056_fm.html which demonstrated the clinical effectiveness of GTTs in this setting.
- **Ischaemic heart disease:** non cholesterol risk factors such as homocysteinaemia. See [Am J Public Health 1998 January; 88\(1\):61-67](#). This article describes a cost effective intervention.
- **Osteoporosis:** Vitamin D deficiency. Cost effective intervention described in www.mja.com.au/public/guides/osteo/intvntn.html
- **Hypertension:** hyperaldosteronism etc - cost effective investigations. See [J Clin Hypertens \(Greenwich\) 2008 Jan; 10\(1\):77-80](#).
- **Hepatocellular carcinoma:** cost benefit of screening in cirrhotics. See [Gastroenterology 2004 Nov; 127\(5 Suppl 1\):S108-12](#).
- **PSA:** early detection of prostate cancer is controversial. See www.mja.com.au/public/issues/sep1/stricker/stricker.html
- **BNP** – early diagnosis of cardiac failure. See www.heart.nhs.uk/BNP/necvn/NECVN%20A%20Fuat%20are%20we%20ready.doc
- **Helicobacter pylori:** testing cost effectiveness in www.eprints.soton.ac.uk/24490/
- **Tissue biopsy:** Any biopsy of an in apparent/impalpable lesion. See www.who.int/cancer/detection/en

4. Data on the amount of screening and early detection of disease.

Examples include:

- All pregnancies have antenatal screening testing performed (250,000 per annum);
- All newborns are screened for at least five diseases (250,000 tested per annum);
- 1.5 million women are screened yearly for breast cancer;
- GP activities outside the above programs are best identified through examination of the BEACH data base or the AIHW reports (see above).

The BEACH program is a national study of GP activity. It provides direct linkage of management actions (e.g. prescriptions, referrals, investigations) to the problem under management. BEACH annually surveys 1000 GPs and its results can be validly extrapolated to all GPs.

This data shows that pathology testing requested by GPs is the mainstay of preventive health and the early detection of disease in the Australian health system.



There is a strong body of scientific evidence supporting this activity and this has become a major mechanism in reducing morbidity and mortality and increasing life expectancy in Australia.