

QML PATHOLOGY

newsletter April 07

>> Osteoporosis Assessment Biochemical Markers: Diagnostic Considerations and Clinical Applications Dr Charles Appleton, Pathologist in Charge, Biochemistry

Bone is in a dynamic metabolic state throughout life. It is continuously resorbed and formed in a finely regulated process known as remodelling. Through childhood and early adulthood, formation exceeds resorption so that bone density increases until it plateaus around the age of 20 to 30 years. After that, resorption exceeds formation and bone density decreases through the rest of life. If the peak bone mass is relatively low and/or the rate of bone loss in later life is high, osteopenia develops and may progress to osteoporosis.

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>> Osteoporosis Assessment Biochemical Markers: Diagnostic Considerations and Clinical Applications

Dr Charles Appleton, Pathologist in Charge, Biochemistry

Over the past 30 years there have been significant advances in our understanding of the aetiology of osteoporosis. A number of dietary, non-dietary and genetic factors contribute to the development of the condition. The dietary factors include limited lifelong calcium intake, excessive fibre intake; which can interfere with calcium absorption, high sodium levels; particularly in association with a low calcium intake, excessive caffeine consumption, and a high protein intake without an increase in phosphate.

The non-dietary factors are age, sex, race, body frame, family history, premature menopause, nulliparity, exercise, use of cigarettes, and alcohol consumption. Menstrual status is a major determinant of osteoporosis risk in women. Any interruption of menstruation for an extended period results in bone loss. There is currently much interest in genetic aspects of osteoporosis, as it is believed that identification of the genes involved and knowledge of their subsequent function will ultimately result in either improved diagnostic or novel treatment options for osteoporotic patients.

In assessing osteoporosis, a biochemical test panel incorporating a resorption marker and a formation marker provides a non-invasive assessment of overall bone turnover. Bone resorption markers are released into the circulation as by-products of osteoclast action on bone and include N-terminal telopeptide of type 1 collagen (NTX) and deoxypyridinoline (DPyd). Bone formation markers are released during osteoblast synthesis of new bone protein matrix.

Bone diseases have a high prevalence in adults; so the clinical challenge is to identify individual patients with high turnover, and to monitor interventions to slow bone loss and prevent complications. Invasive techniques measuring bone turnover provide useful information but all have limitations. This has led to many challenges in the field of non-invasive biochemical markers of bone remodelling requiring newer tests with improved sensitivity and specificity relative to the old standards - serum alkaline phosphatase for osteoblastic activity and urinary hydroxyproline for osteoclastic dissolution. We describe here the new markers which would give most useful information about the bone turnover process (Table 1).

Measuring Bone Formation Serum osteocalcin

Osteocalcin is a Vitamin K dependent protein. Also known as bone Gla-protein, it is a small non-collagenous protein that is specific for bone tissue and dentine. It is predominantly synthesized by the osteoblasts and incorporated into extracellular matrix of bone. Osteocalcin synthesis is known to be modulated by Vitamin D. Since Vitamin D deficiency remains unrecognized over a long period of time, it may be appropriate to monitor both Vitamin D and osteocalcin levels in patients at risk of developing osteoporosis. Serum osteocalcin levels correlate well with iliac crest histomorphometry and calcium kinetic data. Measurement of decarboxylated osteocalcin has been shown to be a good predictor of hip fracture in elderly women and serial measurement of osteocalcin levels have been shown to be an excellent marker to assess long term effects of antiresorptive therapy.

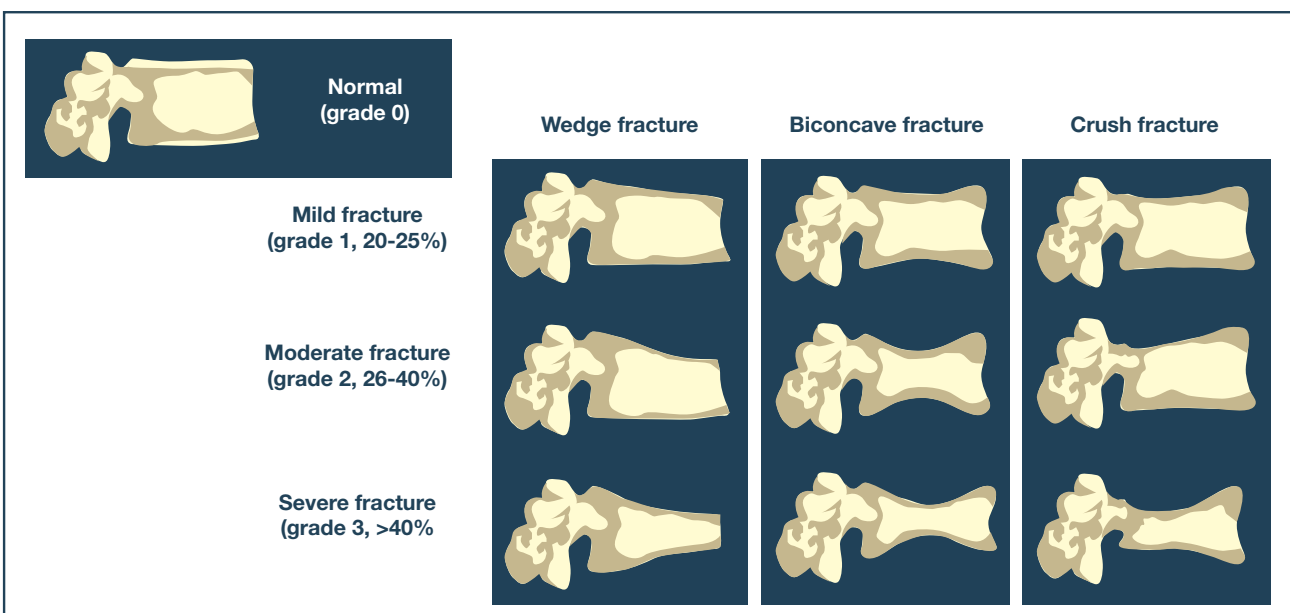


Figure 1.

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Osteocalcin testing is available for \$30.20 (not Medicare refunded).

Serum total and bone alkaline phosphatase

Total alkaline phosphatase comprises the serum of skeletal, intestinal and hepatic components and, therefore, lacks specificity for identifying abnormalities in bone remodelling. Specific bone alkaline phosphatase immunoassay is available, and has improved sensitivity and specificity.

Procollagen 1 Extension Peptides (PICPs)

Collagen is synthesized as procollagen containing peptide extensions in both the C and N terminal ends. These are cleaved from the rest of the molecule before its incorporation into collagen fibrils. Procollagen peptides are produced in equimolar ratios to collagen and are then released into circulation. Although the metabolic fate of these peptides are not fully known, immunoassays to measure blood levels have been developed and reflect osteoblastic collagen synthesis. This test, however, is not currently available through routine laboratories.

Formation	Resorption
Osteocalcin (bone G1a-protein)	Type 1 collagen N and C- telopeptide breakdown products
Alkaline phosphatase (bone specific)	Urinary Deoxypyridinoline
Procollagen 1 carboxy and N-terminal extension peptides	Fasting urinary calcium and hydroxyproline (obsolete)

Table 1: Biochemical markers of bone turnover

Measuring Bone Resorption

N-terminal telopeptides of type 1 collagen (NTX) and Deoxypyridinoline (DPyD)

NTX and DPyD are degradation products of type 1 collagen which are excreted into the urine. A pronounced and significant increase (47-142%) in these markers at menopause indicate that they are sensitive markers of metabolic bone changes taking place at this time. These markers have a specificity of 80% and a sensitivity of more than 70% and can thus be used as a potentially useful screening tools in the risk assessment of postmenopausal osteoporosis and Paget's disease. Levels decrease substantially in response to replacement therapies thus suggesting value in monitoring treatment efficacy.

Other biochemical factors affecting bone turnover Systemic hormones:

- (a) Gonadal hormones
- (b) Parathyroid hormone (PTH)
- (c) Vitamin D
- (d) Hyperthyroidism.

(Note: There is some discussion in the literature at the moment as to the significance of bone changes in thyroid disease and with excessive replacement therapy).

Of all the factors, we now know that Vitamin D is absolutely necessary for the efficient absorption of calcium and phosphate from our diet, as well as for normal metabolism. It has been established beyond doubt that calcium malabsorption is a primary contributor to the development of osteoporosis. The link between Vitamin D deficiency and the incidence of osteoporosis, rickets and osteomalacia is well documented.

Why test Vitamin D levels?

Vitamin D deficiency is an unrecognized epidemic in the middle aged and older population. The current emphasis on minimisation of sun exposure has accentuated this, as formerly, much of the Australian population's Vitamin D was derived from the action of sunlight on cholesterol molecules within superficial capillaries of the skin.

The conditions or the risk factors that put people at risk of Vitamin D related health problems are:

- Post-menopausal state
- Lack of sun exposure
- Advancing age
- Smoking
- Corticosteroid drug use.
- Improper diet
- High cholesterol
- High blood pressure
- Diabetes

Given the many variables that can affect serum Vitamin D levels and the positive outcome effects of treatment, it is reasonable to conclude that Vitamin D levels should be evaluated in patients at risk for osteoporosis and hypovitaminosis.

Recent developments in the genetic arena of osteoporosis

Since 1994, much interest has centred on identifying the genes involved in the regulation of bone mass. Early association studies focussed on the Vitamin D Receptor (VDR) gene but recently a number of other additional candidate genes including parathyroid hormone and its receptor; oestrogen receptor, and collagen type 1 receptor genes have also been studied. These studies have opened a new avenue for osteoporosis evaluation. Together with BMD, biochemical markers indices, and hormonal profile correlation studies, they may lead to an efficient diagnostic protocol for osteoporotic diagnosis and evaluation at a preventable stage.

>> Monitoring Bone Loss - The Laboratory perspective

Dr Charles Appleton, Pathologist in Charge, Biochemistry

References

1. Garnero P, Borel O, Sornay-Rendu E, Arlot ME, Delmas PD. *Vitamin D receptor gene polymorphisms are not related to bone turnover, rate of bone loss, and bone mass in postmenopausal women*. J Bone Miner Res 1996; 11 : 827-34.
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Monitoring Bone Loss – The Laboratory Perspective

The skeleton is a complex organ which plays not only obvious roles in support, protection and mobility, but also more subtle roles in haematological homeostasis, reticulo-endothelial function, and calcium and phosphate metabolism.

However, in recent years with Australia's ageing population, an apparently steadily increasing prevalence of Vitamin D deficiency, and a growing concern about the ability of our society to support the burden of metabolic bone disease, we have seen a remarkable growth of interest in recognition and medical management of osteopenia/osteoporosis. The focus of this interest has been in the older female Caucasian group, but we must not lose sight of the fact that males and non-Caucasian patients also have a significant risk despite a degree of protection afforded by their higher peak bone density.

There are currently two approaches to assessment of patients with concerns regarding bone disorders - Bone densitometry and Biochemical markers of bone dissolution. Bone densitometry is a powerful tool for assessing the current state of bone calcification. However, it provides a snapshot. That is, it tells us very accurately the current status at the time of the test, but gives no information as to the rate of bone loss.

In contrast, the biochemical markers of bone dissolution indicate the current rate of loss of bone collagen. Put these two approaches together and we have a powerful

set of tools for assessing the patient's current state, as well as the likelihood of progressing through osteopenia to osteoporosis in future.

What are these biochemical markers of bone dissolution?

Traditionally, urinary excretion of the amino acid, hydroxyproline was the only effective way of assessing collagen turnover in the body. However, it could be a particularly difficult test to interpret because it did not differentiate the tissue source of the collagen - bone, skin or any other connective tissue. In addition, a large portion of the urinary excretion resulted from dietary sources and so, while a low level was reassuring, a raised urinary level required further consideration.

Monitoring of bone disease took a large step forward approximately 15 years ago when two new markers of type 1 collagen were introduced to the routine laboratory repertoire.

To take a step back, let us look at bone formation and turnover.

When new bone is being laid down by osteoblasts, the cells first of all create a matrix which consists predominantly of type 1 collagen. The mature collagen consists of cables of collagen monomer, twisted and bound together by the formation of unique terminal amino acids, desmosine and isodesmosine. The collagen scaffold is subsequently encased in a calcium phosphate (hydroxy apatite) matrix to add physical strength.

When that bone is subsequently mobilised (whether pathologically or physiologically), the hydroxy apatite is first dissolved and then the collagen is degraded, releasing into the circulation a number of fragments of the collagen which are unique to bone, N-terminal telopeptide of type 1 collagen (NTX) and deoxypyridinoline (DPyD).

These are excreted into the urine and their rate of excretion gives a direct indication of the rate of bone dissolution.

In our original investigations, we concluded that NTX was a better marker than DPyD, but it is clear that both are excellent markers and indeed both are better than older tests. We continue to perform and report both on request. However, a significant consideration is that in order to effectively monitor a patient, it is important that the same marker, NTX or DPyD should be used each time.

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>> ThinPrep Imaging System - An Update

Dr James Duhig, Pathologist in Charge, Cytology Department

Australian laboratories have begun to embrace the latest technology in automated scanning of gynaecological cytology specimens. The ThinPrep Imaging System is now being used in several laboratories in Australia. QML Pathology is the only Queensland laboratory with the ThinPrep Imaging System in place.

The ThinPrep Imaging System combines the existing ThinPrep Pap test with an automated Imaging System. Specimens are collected into ThinPrep vials in the usual manner and slides are prepared in the laboratory with the ThinPrep Processor, which uses a special stoichiometric stain. This stain enhances nuclear staining to provide a quantitative measure of DNA content and to minimise staining variability.

The slides are loaded onto the ThinPrep Image Processor. The Processor rapidly scans each slide and 22 fields of interest are selected for review by the Cytotechnologist. The slides are assessed by Cytotechnologists at a special Review Microscope where negative cases are signed out and archived. If any of the 22 fields of interest are considered abnormal or suspicious a full manual review of the slide occurs and it is referred to a Pathologist for checking and reporting.

Symbion Lavery Pathology has recently published results from a trial they undertook which compared over 11,000 routine paired conventional and ThinPrep slides using the ThinPrep Imaging System¹. They demonstrated a significant difference in sensitivity for high-grade disease using Imaged ThinPrep slides (73%) compared with conventional smears (58%). There was

no significant difference in the positive predictive value for high-grade and possible high-grade abnormalities in the two arms of the study. There was a significant increase in productivity noted – a 27% increase compared with manually screened ThinPreps and a 54% increase compared with conventional slides.

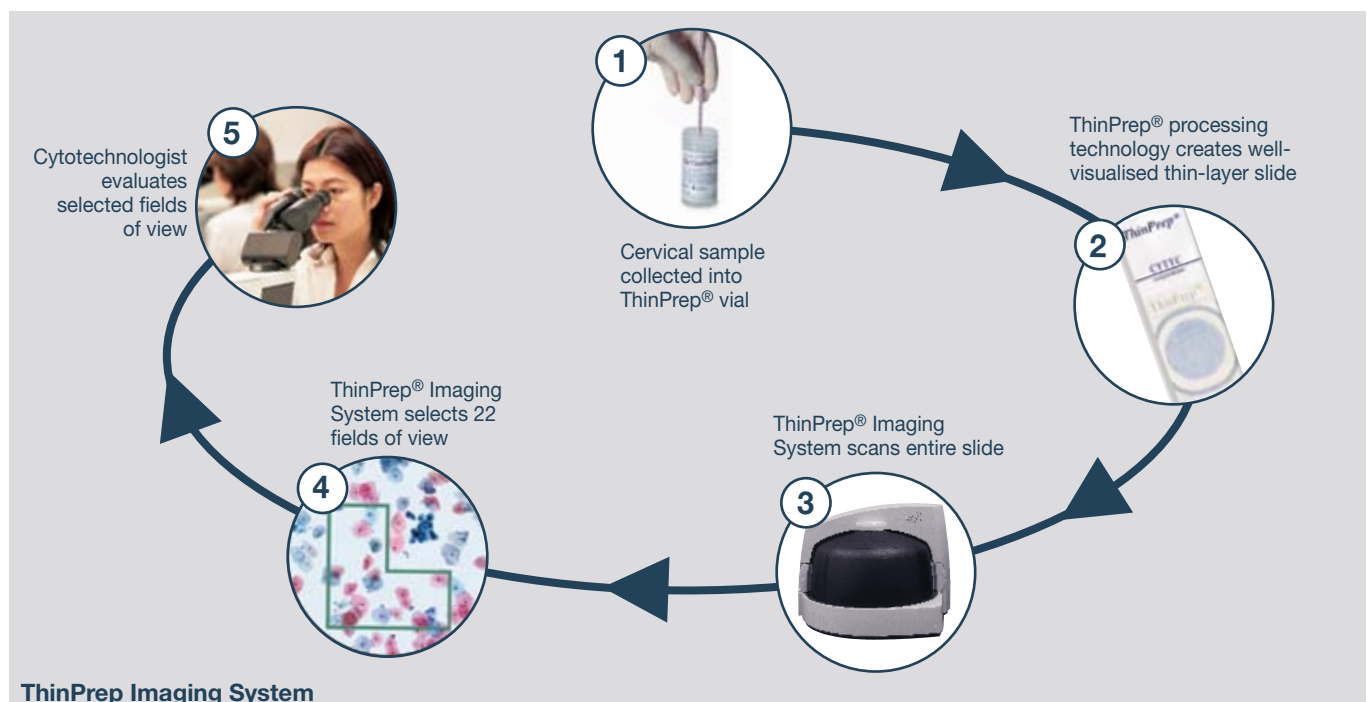
The dual review process of this system means that every slide is both analysed by the Imager and screened by a Cytotechnologist. The combination of expert human review and interactive automated scanning allows for improved diagnostic performance and confidence.

Since installing the Imaging System in May 2006, QML Pathology has processed just over 30,000 ThinPrep slides with paired conventional smears. Of the conventional slides, 2.97% were found to be unsatisfactory, but only 0.46% were unsatisfactory by both methods, representing an 84% reduction in unsatisfactory smears.

Of the 29,093 paired results that were satisfactory for both slides, 28,145 (96.7%) showed total agreement in the final diagnosis. Of the discrepant cases, there was an abnormality identified only in the ThinPrep Imaged slide in 75% of cases, and only in the conventional slide in 25% of cases. Histological follow up of all the abnormal cases is currently underway.

References

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clinical data Apr 07

Infectious Diseases Report - Geographic Distribution - March 2007

SEROLOGY	Regions (as per key below)															Total			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Mar	Feb	Jan	Dec
Adenovirus (not typed)	1	3							1							5	2	7	11
Adenovirus (typing pending)			1								1					2	1	3	0
Barmah Forest virus	7	1	2	2			6	3	18	8	4	8	2	12	7	80	35	27	24
Bordetella pertussis	2	3	4				6		2		4	3	1			25	45	30	41
Brucella species											1					1	0	2	0
Campylobacter jejuni																0	0	0	0
Chlamydia pneumoniae																0	0	0	0
Chlamydia trachomatis, not typed	82	83	19	16	3	1	104		27	20	111	48	12	29	8	563	526	524	383
Coxiella burnetii	4		2									4		1		11	7	9	8
Cryptococcus species							1					1			1	3	1	4	0
Cytomegalovirus (CMV)		4		3			6		3	2	5	3	1	2		29	24	42	29
Entamoeba histolytica																0	0	4	0
Enterovirus - not typed		1					1					1				3	2	4	3
Epstein-Barr virus (EBV)	12	17	9	1			29		21	7	42	19	4	7	5	173	148	138	110
Flavivirus unspecified	4						1				2	2		5		14	9	12	14
Hepatitis A virus		1					3				2		1	1		8	2	1	3
Hepatitis B virus	7	3	2	1			16		5	2	48	3	2	1		90	90	85	62
Hepatitis C virus	19	52	13	4			37		23	8	48	43	8	4	16	275	284	240	181
Hepatitis D virus																0	1	0	0
Hepatitis E virus																0	0	0	1
Herpes simplex Type 1	16	41	15	2		1	57		20	8	71	32	2	9	1	275	201	219	190
Herpes simplex Type 2	19	36	8	2		1	23		22	3	41	30	1	9	2	197	163	136	135
Herpes simplex virus - not typed	6	3	1	1			8		3	3	10	5	2	1	1	44	43	63	39
HIV-1		1		1			4		2		4	1	1			14	8	8	0
HTLV-1																0	0	0	0
Influenza A virus	2			1			5	1	1	1	2			3		16	26	9	7
Influenza B virus																0	1	0	0
Legionella species																0	0	0	0
Leptospira species	5											1		1	1	8	12	7	4
Measles virus	2															2	1	0	0
Mumps virus																0	0	3	1
Mycoplasma pneumoniae	2	19	4	2			16	3	4	5	15	5	4	1		80	96	68	77
Neisseria gonorrhoeae	4	2			3		9				8	2				28	25	31	25
Parainfluenza virus Type 1																0	0	0	0
Parainfluenza virus Type 2		1					1				3					5	1	0	0
Parainfluenza virus Type 3							1				1					2	2	2	9
Parvovirus		3					1		4	4	7	3	1		1	24	14	32	34
Pneumocystis carinii		3														3	3	1	3
Respiratory Syncytial virus	4	13	6				16		10	12	11	2		23		97	27	18	29
Ross River virus	11	6	4	6	2		7	4	16	31	16	11	5	52	9	180	67	30	20
Rubella virus	1		1				1					1		1		5	0	0	0
Salmonella paratyphi A																0	1	0	0
Salmonella paratyphi B						1										1	0	0	0
Salmonella typhi																0	1	0	1
Shigella dysenteriae																0	0	0	0
Shigella flexneri																0	0	0	0
Streptococcus Group A	14	9	3	1	6		8	3	11	8	7	13	2	7	3	95	83	71	82
Toxoplasma gondii																0	3	3	10
Treponema pallidum	20	7	4		7	1	25		8	4	31	6	1	3	1	118	113	119	75
Trichomonas vaginalis	5	1			1						1			1		9	6	6	7
Varicella Zoster virus	7	20	8		1	5	26		30	6	44	11	1	5		164	156	154	186
Yersinia enterocolitica																0	0	0	0
TOTAL	256	333	106	43	23	10	418	14	231	132	540	258	51	178	56	2649	2230	2112	1797

REGIONS

1 Cairns
2 Gold Coast/Northern Rivers
3 Ipswich

4 Mackay
5 Mount Isa
6 New England
7 North Brisbane Suburbs

8 Northern Territory
9 Redcliffe
10 Rockhampton
11 South Brisbane Suburbs

12 Sunshine Coast
13 Toowoomba
14 Townsville
15 Wide Bay/Burnett

February 2007 and further historical clinical data can be obtained by contacting your local Medical Liaison Officer

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QML Pathology updates Apr 07

>> Lipids Revisited - 2007

Dr Charles Appleton, Pathologist in Charge, Biochemistry

The National Heart Foundation of Australia and the Cardiac Society of Australia and New Zealand released a joint position statement on Lipid Management – 2005 to replace the NHFA 2001 Statement. A full copy can be downloaded or printed from www.heartfoundation.com.au on the Health & Lifestyle/ Professional link. The two differ in several aspects and current guidelines are summarised below. PBAC issued revised guidelines for subsidy of lipid lowering drugs in 2006. The current eligibility criteria are summarised on the reverse.

Identify High-Risk Individuals:

Patients at a higher absolute risk of a cardiovascular disease (CVD) event have the most to benefit from treatment. This group includes:

- Those with clinically evident existing vascular disease, diabetes mellitus, chronic kidney disease and familial hypercholesterolaemia
- Aboriginal and Torres Strait Islander patients whose LDL cholesterol exceeds 2.5 mmol/L
- Those whose absolute risk using the NZ CVD risk calculator exceeds 15%
- Those whose absolute risk using the NZ CVD risk calculator lies in the 10-15% range, and who also have the metabolic syndrome or a first degree relative who developed CVD before the age of 60.

Targets:

- In high-risk patients with existing CHD, the recommended target LDL cholesterol (LDL-C) has been lowered to below 2.0 mmol/L
- The HDL cholesterol (HDL-C) target remains above 1.0 mmol/L
- The triglyceride target is now below 1.5 mmol/L.

How do we Manage These Patients?

- Lifestyle interventions must underpin lipid management in all patients.
- Lipid-modifying therapy is indicated for all patients in the high-risk group (see above).
- Statin therapy is recommended for all patients with clinically evident vascular disease, and should be commenced at the time of the first recognised event.
- Fibrates can be considered in combination with statins, particularly in those patients with the metabolic syndrome.
- Statin therapy should be considered for diabetics whose LDL cholesterol remains above 2.5 mmol/L after diabetic intervention.
- Fibrate therapy should be considered for diabetics whose triglycerides remain above 2.0 mmol/L after diabetic intervention.
- Statin therapy is always recommended for patients with familial hypercholesterolaemia.

Once at target, all high-risk patients should have their lipid levels measured every 6-12 months.

Notes

- Not all of the above patients will be eligible for PBS support.
- The NZ CVD risk calculator now plays a central role in guiding your patient's management. This is available in several popular medical practice software packages and can be downloaded from http://www.nps.org.au/resources/Health_Professional_Tools/nz_cardiovascular_risk_calculator.pdf as a soft copy or printed out as hard-copy for the patient to take with him as an aide-memoire. Alternatively copies can be requested through QML Pathology Medical Liaison on (07) 3121 4943.
- The serum total cholesterol now plays no role in the NHFA guidelines other than in the calculation of the total/HDL cholesterol ratio for use in the calculator. This ratio is included in each QML Pathology HDL cholesterol report.
- However, serum total cholesterol continues to play a role in determining eligibility for PBS subsidy.
- The full document includes discussion regarding lipid-lowering drug safety, patient compliance failure, disadvantaged groups, renal impairment, etc.
- Medicare requires that to attract payment for HDL cholesterol, LDL cholesterol, total/HDL cholesterol ratio etc, the request form must include a specific HDL cholesterol request. On a request for 'Lipid studies', 'Lipids' etc, we can only perform and report total cholesterol and triglycerides.

For further information please contact the QML Pathology Biochemistry Department on (07) 3121 4420.

PBS Eligibility Criteria for Cholesterol Lowering Drugs from 1 April 2007

Patients identified as being in one of the following very high-risk categories may commence drug therapy with statins or fibrates at any cholesterol level:

- Coronary heart disease which has become symptomatic
- Cerebrovascular disease which has become symptomatic
- Peripheral vascular disease which has become symptomatic
- Diabetes mellitus with microalbuminuria (defined as urinary albumin excretion rate of >20µg/min or urinary albumin to creatinine ratio of >2.5 for males, >3.5 for females)
- Diabetes mellitus in Aboriginal or Torres Strait Islander patients
- Diabetes mellitus in patients aged 60 years or more
- Family history of coronary heart disease which has become symptomatic before the age of 55 years in two or more first degree relatives
- Family history of coronary heart disease which has become symptomatic before the age of 45 years in one or more first degree relatives.

See over page for table of patient requirements to meet Lipid levels for PBS subsidy

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Other patients are required to meet the lipid levels shown in the following table after at least six weeks of dietary therapy:

PATIENT CATEGORY	LIPID LEVELS FOR PBS SUBSIDY
Patients with diabetes mellitus not otherwise included	Total cholesterol > 5.5mmol/L
Aboriginal or Torres Strait Islander patients Patients with hypertension	Total cholesterol > 6.5mmol/L or Total cholesterol > 5.5mmol/L and HDL cholesterol < 1mmol/L
Patients with HDL cholesterol <1 mmol/L	Total cholesterol > 6.5mmol/L
Patients with familial hypercholesterolaemia identified by: • DNA mutation; or • Tendon xanthomata in the patient or a first or second degree relative Patients with: • Family history of coronary heart disease which has become symptomatic before the age of 60 years in one or more first degree relatives; or • Family history of coronary heart disease which has become symptomatic before the age of 50 years in one or more second degree relatives.	If aged 18 years or less at treatment initiation: LDL cholesterol > 4mmol/L If aged more than 18 years at treatment initiation: LDL cholesterol > 5mmol/L or Total cholesterol > 6.5mmol/L or Total cholesterol > 5.5mmol/L and HDL cholesterol < 1mmol/L
Patients not eligible under the above: • Men aged 35 to 75 years • Post-menopausal women aged up to 75 years.	Total cholesterol > 7.5mmol/L or Triglyceride > 4mmol/L
Patients not otherwise included	Total cholesterol > 9mmol/L or Triglyceride > 8mmol/L

Doctor's Noticeboard

- Dr Neisha D'Silva, Endocrinologist, will be opening a new practice at:
Shop 18, Ground Floor, Times Square
250 McCullough Street, Sunnybank Qld 4109
(opposite Sunnybank Private Hospital).

For further information/appointments please telephone (07) 3345 2143 or fax (07) 3423 8173.

- Dr Michael Mar Fan is pleased to announce that his principle consulting rooms are now located at:
Suite 212, Times Square, Sunnybank Qld 4109.
Dr Mar Fan will still consult at Greenslopes Private sessional rooms on a Monday afternoon, and varying days at the Sunnybank rooms. All appointments can be made by phoning the rooms on (07) 3216 9226 or by faxing (07) 3216 9227.

- Dr Kate Sugars will be expanding her psychiatric practice based at:
New Farm Clinic, 22 Sargent Street, New Farm
Ph: (07) 3254 0639

Patients at New Farm Clinic can access comprehensive private mental health treatment through outpatient, inpatient and day patient services. Dr Sugars can offer prompt assessment, consultation and ongoing management of patients with major mental illness including general adult psychiatry. Her special interests include perinatal psychiatry and women's mental health.

- Dr Michael Busby (ENT surgeon) wishes to advise that he has relocated to new rooms. The new contact details are:
Suite 4F, John Flynn Medical Centre
42 Inland Drive, Tugun
Ph: (07) 5598 0010
Fax: (07) 5598 0040.

Dr Busby is interested in all areas of ear, nose and throat surgery, including paediatric ENT, and head and neck cancer surgery. Waiting times are minimal and every effort is made to fit in urgent referrals.

New Collection Centres

Byron Bay Central

37 Fletcher Street
Byron Bay NSW 2481
Phone/Fax: (02) 6680 9634
Opening Hours: 9.30am - 2.30pm (Monday-Thursday)

Ballina Central

Shop 3, Ballina Central Shopping Centre
Cnr Pacific Highway and Bangalow Street
Ballina NSW 2478
Phone/Fax: (02) 6681 6784
Opening Hours: 8.00am - 1.00pm (Monday-Friday)