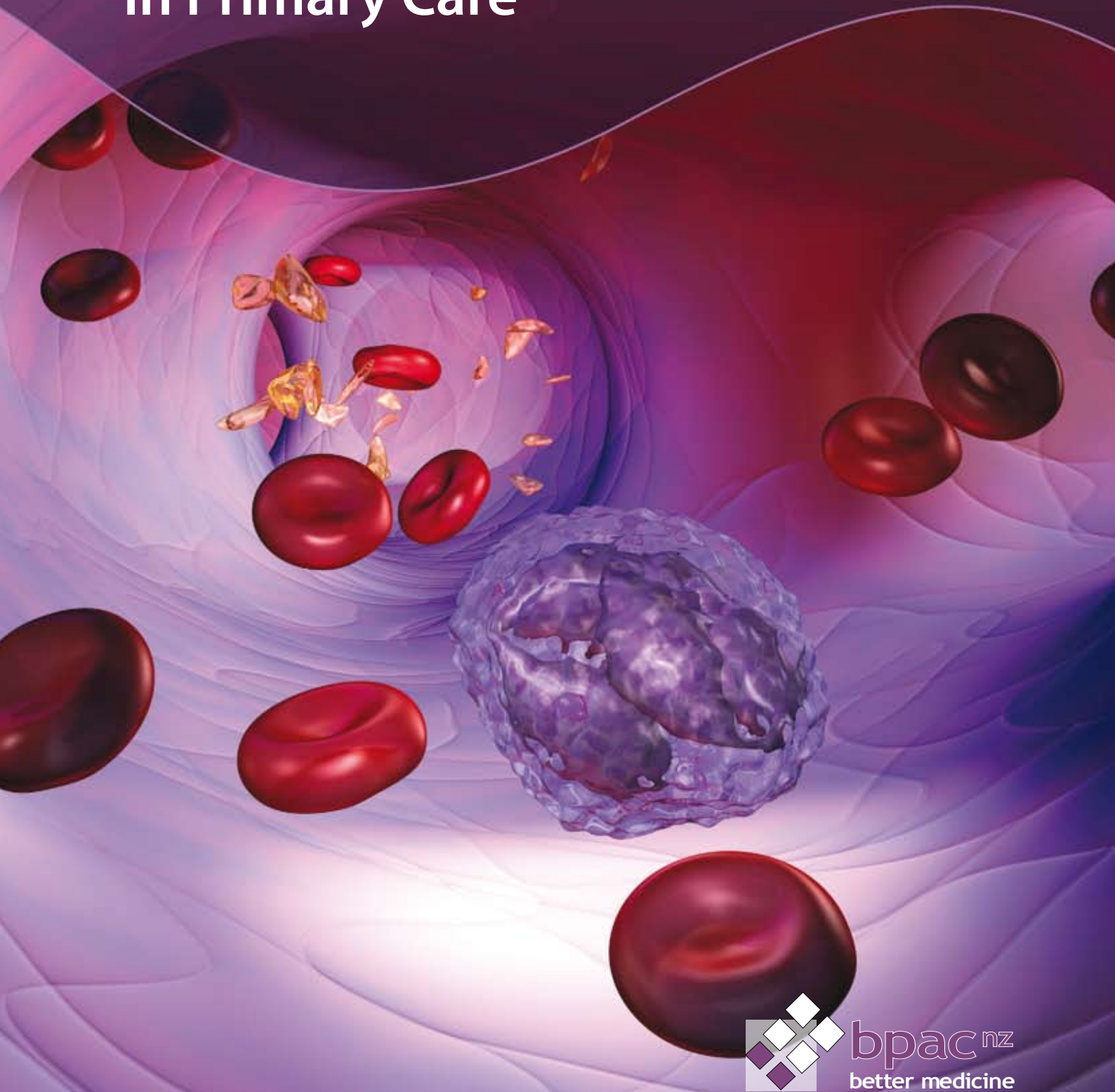


QUIZ FEEDBACK

Complete Blood Count in Primary Care



bpac^{nz}
better medicine

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Acknowledgment:

bpac^{nz} would like to thank the GP review panel and Dr Edward Theakston for their expertise and guidance on the development of this resource.

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All information is intended for use by competent health care professionals and should be utilised in conjunction with pertinent clinical data.

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Introduction

This quiz provided an opportunity to revisit the recent bpac programme “Complete Blood Count in Primary Care”. This programme provided an overview of the use of the complete blood count in primary care and advice on appropriate follow-up for abnormal results. This quiz has allowed some key points to be reexamined and additional detail is provided for some questions.

This copy of the quiz feedback includes the aggregated responses from GPs that completed this quiz, comments from the GP review group and specialist commentary from Dr Edward Theakston.

All GPs who responded to this quiz receive CME points. After the closing date, the quiz can still be completed online. Currently there are approximately 20 interactive case studies available providing an ongoing opportunity for the accumulation of points. These are available from www.bpac.org.nz.

Complete Blood Count in Primary Care

Complete Blood Count Quiz

Due date: 26 May 2008



- Which of the following condition(s) can be ruled out by a normal CBC?
 - B12/folate deficiency
 - Bacterial infection
 - Iron deficiency
 - Viral infection
 - What statement(s) are true about the total white cell count?
 - It is more useful than the absolute count of each cell type
 - It may be normal in a neutropenia
 - It may be normal in a lymphocytosis
 - It will be elevated in all infections
 - What would be appropriate action(s) for a neutrophil count $< 1.0 \times 10^9/L$?
 - Repeat the neutrophil count in 4-8 weeks
 - Consider medication effects
 - Look for other blood count abnormalities
 - Urgent referral for all patients
 - Urgent referral if patient is febrile or unwell
 - Which of the statement(s) about neutrophils demonstrating a "left shift" are true?
 - The neutrophils are less mature
 - Can be produced in response to infection
 - Does not occur with inflammation
 - The cells can show "toxic granulation"
 - Which of the statement(s) about the thalassaemias most frequently encountered in New Zealand are true?
 - Often present with a microcytosis
 - Is more common in Māori and Pacific Islanders compared with European descended New Zealanders
 - Ferritin levels are normally low
 - The CRP is usually raised
 - A reticulocytosis is often present in which condition(s)?
 - Blood loss
 - Haemolysis
 - Pregnancy
 - Thalassaemia
 - Which of the following factor(s) may contribute to thrombocytopenia?
 - An autoimmune disease
 - Pregnancy
 - Smoking
 - A viral illness
 - A neutrophilia can occur in which situation(s)?
 - Heavy exercise or stress
 - A myocardial infarction
 - Pregnancy
 - Viral infection
 - Which statement(s) are true about Chronic Myeloid Leukaemia?
 - It is associated with a persistent elevation of neutrophils
 - Has a decreased number of basophils and eosinophils
 - Is usually associated with a left shift
 - Usually occurs with a mild neutrophilia
 - Which statement(s) are true concerning lymphocytopenia?
 - Is usually due to an acute infection e.g. EBV
 - Can be related to radiation
 - Can be seen late in HIV infection
 - May be secondary to smoking
- Name: _____
- NZMC: _____
- Practice: _____
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This CME quiz can also be completed online at www.bpac.org.nz

Quiz feedback: Complete Blood Count

1. Which of the following condition(s) can be ruled out by a normal CBC?

	You	Your Peers	GP Panel
B12/folate deficiency		25%	+/-
Bacterial infection		32%	
Iron deficiency		16%	
Viral infection		12%	

GP panel

This question generated a lively discussion as the panel are aware of the limitations of all laboratory test results. While a normal CBC is reassuring, particularly in a patient with clear clinical signs and symptoms, a normal CBC is often less useful for a patient with a less clear clinical picture. In the early stages of all these conditions, the CBC may be normal until the cells show significant change, as well as the CBC appearing “normal” when there are mixed etiologies (eg iron deficiency and B12 deficiency).

Specialist comment

All these conditions may be associated with a normal blood count, particularly with early disease. If B12/folate or iron deficiency are suspected appropriate assays should be performed along with a blood count. A mixed B12/iron deficiency may have a normal MCV, but the patient is likely to be anaemic.

2. What statement(s) are true about the total white cell count?

	You	Your Peers	GP Panel
It is more useful than the absolute count of each cell type		2%	
It may be normal in a neutropenia		92%	•
It may be normal in a lymphocytosis		87%	•
It will be elevated in all infections		5%	

GP panel

The panel noted the focus on certain CBC results has changed as laboratory reporting becomes more sophisticated. In the past often the only results first acted on were the haemoglobin, total white count and platelets, but now GPs have to change this mindset and consider the individual cell lines. Although the total white cell count may be distracting, the highlighting of abnormal results by the laboratory is very useful.

Specialist comment

In general it is best to review the entire white cell differential count, because increases in one cell line may mask decreases in another, if only the total white count is considered.

3. What would be appropriate action(s) for a neutrophil count $< 1.0 \times 10^9/L$?

	You	Your Peers	GP Panel
Repeat the neutrophil count in 4–8 weeks		8%	
Consider medication effects		75%	•
Look for other blood count abnormalities		64%	•
Urgent referral for all patients		3%	
Urgent referral if patient is febrile or unwell		97%	•

GP panel

The panel was quite comfortable with the advice around neutropenia in the “Complete Blood Count in Primary Care” resource. Although the panel are aware of the risks of infection in people with a low neutrophil count, initial management decisions would be determined by clinical presentation. In people with marked neutropenia, those who show signs of systemic illness in particular, would be referred immediately (usually after a discussion with the haematologist).

Specialist comment

No further comment

4. Which of the statement(s) about neutrophils demonstrating a “left shift” are true?

	You	Your Peers	GP Panel
The neutrophils are less mature		97%	•
Can be produced in response to infection		98%	•
Does not occur with inflammation		8%	+/-
The cells can show “toxic granulation”		92%	•

GP panel

Most of the discussion for this question was whether or not inflammation would cause a left shift. Generally, the panel associated the term “left shift” with infection rather than inflammation. The panel were curious to know if there are situations in which there may be a left shift, but with a normal neutrophil count.

Specialist comment

A left shift is usually a sign of stressed or stimulated granulopoiesis. A left shift can be seen with infection or inflammation, with other stressors including normal pregnancy, significant tissue damage, severe hypoxia and bone marrow infiltration / fibrosis / dysplasia. In any of these disorders there may be a left shift with a normal neutrophil count, particularly early on in the course of the disease and also later during the recovery phase.

5. Which of the statement(s) about the thalassaemias most frequently encountered in New Zealand are true?

	You	Your Peers	GP Panel
Often present with a microcytosis		96%	•
Is more common in Māori and Pacific Islanders compared with European descended New Zealanders		91%	+/-
Ferritin levels are normally low		7%	
The CRP is usually raised		1%	

GP panel

The panel usually associate thalassaemia with significant pathology in people of Mediterranean descent and were surprised to learn that thalassaemia occurs reasonably frequently in Māori and Pacific Island people. The panel are curious to know more details of the prevalence and presentation of thalassaemia in a New Zealand context.

Specialist comment

Single gene deletion alpha thalassaemia occurs in approximately 10% of Māori and Pacific Island people, although there is some variation between different island groups, and definitive population studies have not been performed. Immigrant groups from the Mediterranean, the Middle East, Africa, India and Pakistan, and South East Asia all have increased frequency of both alpha and beta thalassaemias, with the exact frequency of the abnormalities depending on the country of origin. One example would be Thai people, who have frequencies of Haemoglobin E (usually heterozygous) approaching 20%.

6. A reticulocytosis is often present in which condition(s)?

	You	Your Peers	GP Panel
Blood loss		97%	•
Haemolysis		93%	•
Pregnancy		6%	
Thalassaemia		6%	

GP panel

The panel acknowledged that although reticulocyte counts can be useful they don't often request them. Thinking that perhaps a manual test was involved, they are conscious of creating extra work for the laboratories. The panel would appreciate some guidance on interpreting the result, and if it provides clues on the degree of blood loss or differentiating between acute or chronic blood loss.

Specialist comment

Most current generation haematology analysers provide automated reticulocyte counts. There is too much inter-individual variation, with too many modifying factors (inflammation, incipient iron deficiency etc.) for a result to provide information on the severity of blood loss. It should be noted that after an episode of acute blood loss it takes several days for a significant reticulocyte response to develop, and so the reticulocyte count may be normal during this time. The absolute reticulocyte count is also dependent on the absolute number of red cells, so with marked anaemias the percentage of reticulocytes may be high but the absolute number normal. An anaemia with reticulocytosis usually reflects blood loss or haemolysis.

7. Which of the following factor(s) may contribute to thrombocytopenia?

	You	Your Peers	GP Panel
An autoimmune disease		97%	•
Pregnancy		92%	•
Smoking		5%	
A viral illness		96%	•

GP panel

The panel appreciated the opportunity to discuss the platelet count, as they frequently see slightly high or low results and query the significance of this.

The panel was interested to learn that smoking was not the cause of either a high or low platelet count.

Although the panel were aware of a different reference range used for pregnancy, they wondered why the platelet count often decreases in pregnancy and if this was due to a dilutional effect.

Specialist comment

Although there is considerable inter-individual variation, the platelet count generally does decrease during the course of pregnancy. Similarly to the drop in haemoglobin, this is thought to represent a dilutional effect.

A number of studies have investigated variation in a variety of platelet parameters amongst smokers, but no clear differences between smoking and non-smoking populations have consistently been identified.

8. A neutrophilia can occur in which situation(s)?

	You	Your Peers	GP Panel
Heavy exercise or stress		95%	•
A myocardial infarction		89%	•
Pregnancy		93%	•
Viral infection		28%	+/-

GP panel

In general, the panel used the presence of high neutrophils as a useful indicator of bacterial infection, and would generally be less likely to assume viral infections as the cause. The panel wondered if any data was available for high neutrophils on the sensitivity and specificity for bacterial vs viral infection.

Specialist comment

Because of the difficulty in conclusively demonstrating bacterial infection, the wide variety of sites of bacterial infection and differences in age groups, conclusive data on the specificity and sensitivity of neutrophilia for bacterial infection are not available. It is clear that the likelihood of bacterial infection increases with increasing neutrophil count. The presence of neutrophil toxic changes may also be a pointer towards a bacterial cause, particularly the presence of the more severe changes such as vacuolation and the presence of Döhle bodies.

Lymphocytes usually decline with bacterial infection and increase with viral infection, although whooping cough and atypical infections are exceptions to this general rule. Infants and young children may have a lymphocytosis in response to bacterial infection. Viral infection may be associated with a neutrophilia, but if so it is generally mild.

Exercise and stress usually only lead to marginal changes in the white count. The increase in white count associated with pregnancy is relatively mild and is reflected in pregnancy reference ranges (usually total white count is approximately $4-15 \times 10^9/L$ in pregnancy). The lymphocytosis associated with myocardial infarction/trauma etc can be quite marked and is usually in the range $4.0-14.0 \times 10^9/L$. Neutrophilia is often associated with myocardial infarction but is usually less than $15 \times 10^9/L$. There is some evidence that it may predict poorer outcome.

9. Which statement(s) are true about Chronic Myeloid Leukaemia?

	You	Your Peers	GP Panel
It is associated with a persistent elevation of neutrophils		94%	•
Has a decreased number of basophils and eosinophils		3%	
Is usually associated with a left shift		89%	•
Usually occurs with a mild neutrophilia		12%	

GP panel

The panel see cases of CML reasonably infrequently, and they would be strongly guided by the results and comments from the laboratory. Any subtle changes associated with CML (such as basophilia and eosinophilia) are not distinguishing enough to make diagnostic decisions, and generally are of little more than academic interest.

Specialist comment

Chronic myeloid leukaemia usually presents with a significant increase in white count and a marked left shift. A particular characteristic of chronic myeloid leukaemia is a prominence of myelocytes and segmented neutrophils, with a relative paucity of intermediate forms. There is often an increase in basophils and eosinophils, and splenomegaly is common. Untreated chronic myeloid leukaemia will usually progress over the course of 2–5 years.

10. Which statement(s) are true concerning lymphocytopenia?

	You	Your Peers	GP Panel
Is usually due to an acute infection e.g. EBV		11%	+/-
Can be related to radiation		90%	•
Can be seen late in HIV infection		93%	•
May be secondary to smoking		6%	

GP panel

The panel found it reassuring that in most situations encountered in primary care, a low lymphocyte will not be clinically significant.

Specialist comment

Lymphocytopenia is a relatively non-specific response to a wide variety of stressors, including trauma, surgery, infection, renal impairment and steroid administration.

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