0008-3194/97/221–230/$2.00/©JCCA 1997

The clinical laboratory in chiropractic practice: what tests to order and why?

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Access to the clinical laboratory by chiropractors is an important issue in the context of the role of the chiropractor as a primary health care provider and the public's right to optimal health care in the most efficient and cost-effective manner possible. In its efforts to gain the right to do so in Canada, the profession will have to identify and be able to justify the use of tests that would enhance the ability of its constituents to participate in the delivery of health care more effectively.

In this article we have presented a set of tests which was originally developed as part of a presentation on laboratory services restructuring to the Ontario Ministry of Health by a joint committee of the College of Chiropractors of Ontario, the Ontario Chiropractic Association, and the Canadian Memorial Chiropractic College in 1996. A rationale for the use of each test in the context of chiropractic practice is presented. It is argued that the list of tests could be more, or less extensive than presented, but that it is necessary for the profession to engage in constructive debate and identify its needs more precisely in the interest of more effectively fulfilling its mandate as a primary health care profession.
(JCCA 1997; 41(4):221–230)

KEY WORDS: chiropractic, manipulation, legislation, laboratory, diagnosis.

Le fait, pour les chiropraticiens, d'avoir accès aux laboratoires cliniques est très important étant donné qu'ils sont des fournisseurs de soins de première ligne et que le public a le droit de recevoir les meilleurs soins de la façon la plus efficace et au moindre coût possible. La profession chiropratique, qui s'efforce d'obtenir le droit d'effectuer des épreuves de laboratoire, devra identifier les tests et être en mesure de justifier leur utilisation afin de mettre en valeur le savoir-faire de ses membres en matière de prestation de soins de santé plus efficaces.

Dans cet article, nous avons présenté une série de tests ayant fait partie à l'origine d'une présentation sur la restructuration des services de laboratoire élaborée par un comité conjoint formé de représentants du Collège des chiropraticens de l'Ontario, de l'Association chiropratique ontarienne et du Canadian Memorial Chiropractic College et soumise en 1996 au ministère de la Santé de l'Ontario. Un exposé raisonné de chaque test, dans le contexte de la pratique chiropratique, y est présenté. De plus, il y est mentionné que le nombre de tests peut être plus ou moins élevé que celui exposé dans la liste, mais que ceci est nécessaire afin que la profession chiropratique puisse engager un débat constructif et identifier avec précision ses besoins afin de remplir son mandat de fournir des soins de première ligne avec plus d'efficacité.
(JACC 1997; 41(4):221–230)

MOTS CLÉS : chiropratique, manipulation, législation, laboratoire, diagnostic.

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Introduction

As primary health care providers, chiropractors are responsible for the assessment of their patients and diagnosis of their presenting complaints, thereby providing the basis for appropriate care. The clinical laboratory plays a valuable role in patient care. In most jurisdictions in the United States chiropractors have access to the clinical laboratory.[1,2,3] Of the Canadian provinces, Saskatchewan has been reported to allow access to the clinical laboratory.[3] However, this access has been facilitated through unofficial/informal arrangements rather than being entrenched in legislation (personal communication, Dr. Alexander Grier, Chiropractors' Association of Saskatchewan). Thus, it can be stated that present legislation in all Canadian provinces restricts direct access of chiropractors to order or perform laboratory tests. This creates a need, often unnecessarily, of referring patients to their medical doctors potentially resulting in increased costs and often compromising quality of care, primarily by unnecessary delays.[4]

Historically, the chiropractic profession has considered the clinical laboratory as an important component in the education and training of its members. This is reflected in the inclusion of clinical laboratory courses in the curriculum of all accredited chiropractic colleges, as well as licensing board examinations in Canada and the USA. In addition, the profession has developed guidelines defining the parameters within which clinical laboratory testing should be practised in Canada[5] and the USA.[6]

In accordance with established principles of clinical chemistry, laboratory tests and procedures in chiropractic practice are likely to be utilized for the purposes of screening, diagnosis or monitoring of disease.[7,8] The reader is encouraged to consult the literature for a review of the full gamut of clinical laboratory tests[9] as well as their effective utilization.[10,11] However, for the purpose of this article, we will confine our discussion only to the diagnostic aspect of those tests which we think would be most useful in enhancing the ability of the chiropractor to diagnose commonly observed conditions and associated problems in clinical practice.

What tests to order?

Clinical laboratory procedures comprise a wide array of tests of varying complexity. While some require sophisticated equipment in specialized laboratories, others may be performed easily in an office practice setting (see for example tests that may be performed by M.D.s in Ontario[4]). Technology has emerged utilizing prepackaged reagents and miniaturized equipment that require little technical skill and yield reliable results for a number of tests.[12] This has facilitated point of care testing done in physicians' offices or at home and this trend is likely to continue. To this end, efforts must be made by the profession to secure the right to perform selected tests in an in-office setting. This is particularly important for those who practice in remote rural settings where hospital-based or commercial testing facilities may not be easily available.

The more immediate and fundamental issue however, is that of direct access to the laboratory. Table 1 presents a suggested list of tests which chiropractors should have access to in order to be able to better respond to the needs of their patients. Diagnosis is a responsibility which can be adequately fulfilled only if the necessary knowledge and the tools are available. Clearly, even within the seemingly narrower confines of diagnosis of neuromusculoskeletal problems, it is necessary to rule out some possibilities while increasing the likelihood of the occurrence of others.

In the following paragraphs we attempt to provide the reader with a synopsis for the rationale of including the tests on our list. It should be pointed out that this is not a comprehensive list and will likely change over the years as new tests become available. Nor is this suggested list of tests a rigid presentation of the absolute minimum. As pointed out by Gotlib et al.,[4] the scope of tests for educational purposes in chiropractic colleges may be much wider.

1 Urinalysis

Indicated when the patient presents with low back pain and the history and physical examination suggest that in addition to a mechanical problem there may be an underlying non-mechanical etiology. In particular, if one or more of the following is present:

- history/signs of urinary tract infection
- signs of renal disease
- history/signs of diabetes mellitus
- history of proteinuria, bacteriuria, pyuria, microhematuria.

Issues relating to the judicious use of urinalysis have been

recently discussed.[13] The urinalysis should include physical, chemical and microscopic evaluation. Whilst the use of dipstick testing has offered the advantages of simplicity and speed, the diagnostic accuracy of this procedure continues to be subject of debate.[14]

2 Pregnancy test

Indicated as a selective screen in women of childbearing age, who present with an acute problem including lower back pain with or without associated amenorrhea, for which radiographic examination is contemplated. Choriogonadotropin (hCG) concentrations in serum or urine are determined.[15] It should be remembered that the test is also positive in ectopic pregnancy, and several carcinomas including breast cancer.[9]

3 Complete blood count (CBC) and differential

Indicated in the patient who presents with neck, back or peripheral joint complaints and the history and physical examination suggest that in addition to a mechanical etiology an underlying pathology may exist. A CBC would be most commonly used when infection is suspected. It would be valuable also in identifying haematological disorders, particularly anemia that may be associ-

Table 1
Proposed list of clinical laboratory tests for chiropractors* showing cost per test (CDN $) in Ontario**

TEST	COST	TEST	COST
1. Urinalysis:		15. Serum Alkaline Phosphatase	5.17
– routine	2.58	16. Serum Prostatic Acid Phosphatase	7.75
– microscopy	1.03	17. Serum Prostate-Specific Antigen	20.00†
2. Pregnancy	3.10	18. Total Bilirubin	5.17
3. Complete Blood Count:		19. Serum Aspartate Aminotransferase	5.17
– Blood film	7.24	20. Serum Alanine Aminotransferase	5.17
– Hemoglobin	2.07	21. Serum Creatine Kinase	12.92
– Hematocrit	1.55	22. Thyroid Stimulating Hormone (TSH)	20.68
– Platelet count	3.10	23. Serum Uric Acid	3.10
4. Erythrocyte Sedimentation Rate	1.55	24. Rheumatoid Factor	3.10
5. Gram Stain and Culture (sputum)	11.37	25. Anti-Nuclear Antibody	18.10
6. Serum or Plasma Glucose	3.10	26. HLA-B27	25.85
7. Serum Urea and Creatinine	3.10 ea.	27. Serum Potassium	3.10
8. Serum Calcium	5.17	28. Serum Sodium	3.10
9. Serum Inorganic Phosphorus	5.17	29. Serum Iron	17.58
10. Parathyroid Hormone	62.04	30. Serum Ferritin	20.68
11. Serum Total Protein and Albumin	5.17 ea.	31. B12 and RBC Folate	31.02/20.60
12. Bence-Jones Protein	63.07	32. Prothrombin Time	6.20
13. Protein Electrophoresis	18.61	33. Fecal Occult Blood	1.55
14. Cholesterol	5.17		

* Most of these tests were originally included in the CCA guidelines[5] the list having been adopted and modified from the Mercy Guidelines.[6] The list above was part of a submission to the Ontario Ministry of Health, on laboratory services restructuring, made in 1995 jointly by the College of Chiropractors of Ontario, the Ontario Chiropractic Association and the Canadian Memorial Chiropractic College.

** Costs shown are current, as per Ministry of Health Schedule of Benefits Physician Services under the Health Insurance Act, October 1, 1992.

† Not a health insurance benefit in Ontario.

ated with fatigue, rheumatoid arthritis and malignancies. For a rigorous analysis of the results of the CBC the reader is referred to the review of Walters and Abelson.[16]

4 Erythrocyte sedimentation rate (ESR)

Usually ordered with the CBC, the ESR is indicated in patients who present with neck, back or peripheral joint pain and/or stiffness and the history and physical examination suggest the possible presence of an infection, an inflammatory or neoplastic process.[9,17] This test may be substituted for, or complemented by, the serum C-reactive protein (CRP) test,[18] which is assayed less frequently and is more expensive to perform than the ESR, but appears to correlate better with other clinical criteria of severity of rheumatic diseases.[19]

5 Gram stain and culture

Indicated in the patient who presents with lower back pain, upper back pain associated with chest pain, or neck pain and the history and physical examination findings suggest the possibility of an infectious etiology. Chiropractors may be the first health care practitioners seen by these patients. If an infectious condition is suspected, time may be critical in the diagnosis and management of the case. In situations where in-office specimen collection is necessary, strict guidelines are to be followed as collection, storage and transport of specimens are all critical to the outcome of clinical microbiological testing.[20]

6 Serum or plasma glucose (fasting blood sugar)

Indicated in patients who present with leg pain and/or paresthesias to the extremities, associated with low back pain, and in whom the history and physical examination are equivocal with respect to a purely mechanical etiology. An elevated fasting serum or plasma glucose level will aid in the identification of diabetes mellitus.[21]

7 Serum urea and creatinine

Indicated in patients who present with mechanical low back pain and the history and physical examination findings suggest renal disease including pyelonephritis, glomerulonephritis and renal calculi. Urinalysis along with renal function tests, most commonly creatinine clearance, may be indicated in these cases. In addition, patients with a chronic history of hypertension will benefit from renal function tests.[22]

8 Serum calcium

Indicated in patients presenting with low back pain in whom, in addition to musculoskeletal findings, an underlying non-mechanical etiology is suspected. Specifically, when the history and physical examination findings suggest the possibility of malignant disease, metabolic bone disease, renal disease, hypocalcemia as suspected by the presence of paresthesias and muscle cramps, a serum calcium test along with phosphorus and parathyroid hormone (see below) would be helpful in the evalution.[23]

9 Serum inorganic phosphorus

Indicated in patients presenting with low back pain in whom, in addition to mechanical findings, an underlying organic etiology is suspected. This test is indicated specifically, when the history and physical examination findings suggest the possibility of metastatic bone disease, metabolic bone disease or renal disease.[23]

10 Parathyroid hormone (PTH)

Indicated in patients presenting with low back pain in whom, in addition to mechanical findings, an underlying organic etiology is suspected. Specifically, if the history and physical examination findings warrant further evaluation for metabolic bone disease or metastatic bone tumours, determination of serum PTH along with serum calcium and phosphorus would assist in the diagnosis.[23]

11 Serum total protein and albumin

Indicated in patients presenting with spinal pain, and in whom the history and physical examination findings indicate that, in addition to mechanical problems there may be an underlying organic etiology. Specifically, the serum total protein is useful when ESR is elevated, CBC has revealed blood dyscrasias and/or a malignancy such as multiple myeloma is suspected. The latter is one disease which results in a drop in the albumin/globulin ratio to below 1.0.[17] Thus, the test may be ordered prior to ordering a Bence Jones protein test in the investigation of multiple myeloma (see below). Knowledge of the serum albumin level is also required for the interpretation of the serum calcium test when the latter is indicated (see above).

12 Bence Jones protein

Indicated in patients who present with low back pain and in whom the history and physical examination suggest that

in addition to musculoskeletal findings, there may be an underlying non-mechanical etiology. Specifically, if there is any suspicion of multiple myeloma based on radiographic and/or laboratory data (e.g. CBC, ESR, total serum protein, protein electrophoresis), demonstration of Bence Jones proteins in urine will increase the clinician's index of suspicion for this malignancy. However, it should be noted that Bence Jones proteins are found only in about one-half of the patients with multiple myeloma and they can be associated also with blood dyscrasias other than multiple myeloma as well as with leukemia, lymphoma, and autoimmune and infectious diseases.[24] Furthermore, the sensitivity of the test, as originally conceived, is not very high and new methods are being developed for better detection both in urine and in serum.[26]

13 Protein electrophoresis

Indicated in patients who present with back pain as above, and in whom a total serum protein determination and/or a urine Bence Jones protein test has yielded positive results. Protein electrophoresis is a quantitative analysis of globulins which is useful in confirming or ruling out certain conditions including multiple myeloma, chronic infections, renal disease and collagen disease.[17]

14 Cholesterol

Indicated in patients who present with back pain and in whom the history and physical examination and/or the outcome of initial treatments suggest that in addition to mechanical findings there may exist an underlying organic etiology. Where nephrotic syndrome, liver disease, pancreatitis or hypothyroidism are considered in the differential diagnosis, the total serum cholesterol will be helpful. In addition, if patient complaints include leg pain and peripheral vascular disease is suspected, total serum cholesterol would be helpful in the diagnosis.

Finally, determination of serum cholesterol and related lipids is justified as a "case finding" measure in patients who present with problems that are treatable within the scope of chiropractic but in whom the history and physical examination findings indicate multiple risk factors for cardiovascular disease (e.g. hypertension, obesity, sedentary lifestyle, smoking). This is consistent with the chiropractor's role as a primary health care provider. In the interest of preventing unnecessary testing, the practitioner should be familiar with the different clinical guideline recommendations for screening for dyslipidemia.[5,27,28,29,30]

15 Serum alkaline phosphatase

Indicated in patients who present with skeletal complaints and in whom the history and physical examination findings suggest that in addition to a mechanical etiology there may be an underlying pathological condition. Specifically, if there is a suspicion of primary or metastatic tumors, Osteomalacia, Paget's disease, or hepatobiliary disease, demonstration of elevated serum alkaline phosphatases may be useful in the diagnostic work-up. It is important to remember that alkaline phosphatase may be elevated in a large number of conditions. Thus, when a positive test is reported it may be necessary to order a follow-up test of serum alkaline phosphatase isoenzymes in order to help with the differential diagnosis.[9]

16 Serum prostatic acid phosphatase (PAP)

Indicated in patients who present with lower back pain and in whom the history and physical examination findings suggest that in addition to a mechanical etiology there may be an underlying pathological condition. Specifically, if metastasis of prostate cancer is suspected, such as in a patient with signs of urinary obstruction or previous history of surgical intervention for prostate carcinoma, but with no active follow-up program, serum prostatic acid phosphatase determination would be helpful. Although acid phosphatases are found in many tissues, specificity is increased using the prostatic fraction procedure which specifically measures activity of enzyme produced by cells of the prostate gland. Thus, significantly elevated acid phosphatase values, by this method, almost always indicate metastatic cancer of the prostate.[31]

17 Serum prostate specific antigen (PSA)

The rational for use of PSA is similar to that of PAP. The latter has higher specificity whereas the specificity of PSA is low as it is found elevated in benign prostatic hypertrophy and prostatitis. On the other hand, the sensitivity of the PSA test is high, making it valuable for use concurrently with PAP in the evaluation of patients with clinical evidence of prostatic carcinoma.[31] The PSA test can be helpful in monitoring postsurgical prostate cancer patients who present with lower back pain and in whom the history reveals failure of adequate postsurgical monitoring for

cancer recurrence. The role of the PSA test in screening/case finding has been controversial. Most authors agree that when used in conjunction with digital rectal exams or ultrasonography, it is a valuable tool for detecting prostate cancer. Evidence has accumulated indicating the effectiveness of PSA testing as a screening tool.[32,33,34] This may be significant in the context of case-finding in male patients of > 50 years of age who present with lower back pain and history reveals signs of diminished urinary flow (frequency, urgency, nocturia). In such patients, elevated PSA levels should lead to prompt referral for further medical management.

18 Total bilirubin

Indicated in patients who present with pain in the mid back and/or right upper back area and the history and physical examination suggest that in addition to a mechanical etiology there may be an underlying, pathological condition. Gallbladder involvement often refers pain to this area. A positive total serum bilirubin test is usually indicative of either an impaired excretory function of the liver (suggesting cholestasis) a poisoning or overloading of liver functions or excessive hemolysis of red blood cells. Follow-up determinations of increased conjugated bilirubin in the serum would suggest cholestasis due to possible gallstones, tumour or inflammation.[31] The reliability of total bilirubin measurements however, has been questionable[35] making the interpretation of positive results difficult.

19 Serum aspartate aminotransferase (AST)

Indicated in patients who present with mid-to-upper back pain, chest pain, neck pain with a primary anterior orientation extending to the upper chest, with or without arm involvement. In all these presentations the AST (along with ALT and CK – see below) is indicated if the history and physical examination are equivocal and/or are not consistent with a mechanical etiology. The test is useful in aiding with the differential diagnosis of heart disease, liver disease and skeletal muscle disease.[36]

20 Serum Alanine amino-transferase (ALT)

Useful when used in conjunction with AST (see above) to rule out liver disease thus increasing the index of suspicion for heart disease where AST is elevated.

21 Serum Creatine Kinase (CK)

Indicated in patients with similar presentation to that described for AST. The CK test is usually ordered with a lactate dehydrogenase test in the investigation of heart disease and skeletal muscle disease. Comprehensive discussions of the use of the tests in the differential diagnosis of heart disease are available.[37,38] New cardiac markers have emerged with increased sensitivity[39] which will enhance the clinician's ability to rapidly rule out heart disease. An elevated CK, in the absence of heart disease may implicate musculoskeletal soft tissue diseases including polymyositis and dermatomyositis.[31]

22 Thyroid stimulating hormone (TSH)

Indicated when a patient presents with musculoskeletal complaints that are vaguely defined (generalized fatigue, muscle weakness, myalgia, arthralgia) and the history and physical examination suggest that the complaints may be related to thyroid dysfunction.

Thyroid function testing involves measurements on the same sample including thyroxine, free thyroxine index, triiodothyronine, and thyroid stimulating hormone determinations. However, the latter also referred to as sensitive thyroid stimulating hormone (STSH) has largely replaced the others and its usefulness as a screening tool for hypothyroidism in the elderly has been advocated.[40]

23 Serum uric acid

Indicated in patients (usually males over the age of 30 years) who present with monoarticular arthritis, particularly involving the big toe and to a lesser frequency, the ankles, heels, knees, elbows, wrists and fingers, and in whom the history and physical examination findings are equivocal for a mechanical etiology. In such patients, elevation of the serum uric acid level is indicative of gouty arthritis. However, the test has low specificity as uric acid levels are normally high in older patients and are also commonly elevated in patients with hypertension, obesity, and those receiving low-dose aspirin or diuretic therapy.[41] Depending on the clinical and physical findings, it may be necessary to refer the patient for an evaluation of synovial fluid for urate crystals, as this would provide the definitive diagnosis for gout.[41]

24 Rheumatoid factor (RF)

Indicated in patients who present with musculoskeletal

complaints including spinal and peripheral joint pain and in whom the history and physical examination findings are equivocal in terms of a mechanical etiology. In cases where there is vague aching with arthralgia, including symmetric joint involvement, and if a positive ESR or CRP test has been obtained, then the RF test will be useful in the evaluation for rheumatoid arthritis (RA). However, in the presence of classic signs of RA, such as systemic involvement of the small joints of the hand, synovial swelling, interosseous wasting and ulnar deviation, the RF test is not justified.[19] Test result interpretation should be done strictly in the context of clinical and physical findings as the RF test is not highly sensitive. Furthermore, it lacks specificity yielding false positive results in older patients and in a variety of rheumatic and nonrheumatic diseases.[19,41]

25 Anti-nuclear antibody (ANA)

Indicated in patients (usually females between the ages of 13–50 years) who present with musculoskeletal complaints including spinal and/or peripheral joint pain, and in whom the history and physical examination suggest that in addition to the mechanical manifestations, there may be an underlying inflammatory etiology. Specifically, in the presence of signs and symptoms suggesting systemic lupus erythematosus (SLE) such as fatigue, arthralgia, "butterfly" rash, photosensitivity, alopecia,[42] and if a positive ESR or CRP test has been obtained, a positive ANA test will increase the index of suspicion for SLE. The ANA test is highly sensitive but lacks specificity, yielding positive results in a variety of autoimmune disorders, bacterial endocarditis and some malignancies.[19,41]

26 HLA-B27

Indicated in patients who present with low back pain of insidious onset, normal spinal movements and chest expansion, and in whom the radiographic findings are equivocal for ankylosing spondylitis (AS). A positive HLA-B27 test will increase the likelihood of AS and a negative test will decrease it. False negative results can be obtained using either of the two commonly used immunological tests for HLA-B27. Testing done by a polymerase chain reaction appears to offer the highest sensitivity as it detects gene sequences of HLA-B27.[43] In addition, the test may be useful in the differential diagnosis of other seronegative spondyloarthropathies including Reiter's syndrome and psoriatic arthritis. All of these conditions are likely presented to chiropractic offices relatively frequently and efficient diagnosis is crucial for the plan of management.

27 Serum potassium

Indicated in patients who present with musculoskeletal complaints and in whom the history and physical examination reveal signs and symptoms that raise the clinician's suspicion for hypo- or hyperkalemia.[44] In particular, if the clinical presentation includes prolonged use of diuretics, irritability, nausea, vomiting, intestinal colic or in the case of hypokalemia, reduced muscle contractility, weakness, paralysis, hyporeflexia, ileus, or cardiac arrythmias are noted, the serum potassium test would be helpful in evaluating the patient for further management of the case.

28 Serum sodium

Indicated in patients who present with musculoskeletal complaints and the history and physical examination reveal signs and symptoms suggestive of hyponatremia (e.g. weakness, confusion, lethargy) or hypernatremia (e.g. dehydration, thirst, agitation, restlessness, hyperreflexia).[44] A thorough understanding of electrolyte metabolism[45] is crucial for the effective utilization of the serum sodium and potassium tests.

29 Serum iron

Indicated in patients who present with musculoskeletal complaints and in whom a CBC (see #3) has suggested the occurrence of microcytic hypochromic anemia. A reduced serum iron level will confirm the diagnosis.

30 Serum ferritin

Indicated in patients who present with musculoskeletal complaints that are chronic in nature and might have an inflammatory component. A reduced ferritin level would be indicative of anemia. Measurement of serum ferritin also assists in differentiating chronic disease anemia from iron-deficiency anemia.

31 Serum B12 and RBC folate

Indicated when the patient presents with musculoskeletal complaints and the history and physical examination reveal a history of pernicious anemia and/or symptoms including fatigue and paresthesias. In particular, if the

CBC has demonstrated megaloblastic anemia, evaluation of B12 and folic acid levels will help identify the specific deficiency. For a detailed discussion of the pathophysiology of B12, intrinsic factors, and folate deficiency see Brewster.[46]

32 Prothrombin time

Indicated in patients who present with spinal pain, neck pain, stiffness, or headaches and in whom the history and physical examination have indicated a mechanical etiology and who are (or have been) on anticoagulant therapy. The test will establish the effectiveness of this therapy and guide the treatment/management strategy of the chiropractor. Values above or below the normal range of 11.0–12.5 seconds[17] should be considered a relative contraindication to spinal manipulations. Spinal meningeal hematomas in patients on anticoagulant therapy have been reported,[47] and increased risk of vertebrobasilar accidents in such patients should be considered a distinct possibility as well.

33 Fecal occult blood

Indicated in patients who present with low back pain and in whom, in addition to musculoskeletal findings of mechanical origin, the history and physical examination suggest an underlying pathological etiology. Specifically, if the patient is over 40 years of age and history and examination findings (abdominal pain, localized tenderness, diarrhea or constipation, inflammatory bowel disease, history of colon cancer in a first-degree relative) raise suspicion of colorectal cancer.[48]

The fecal occult blood test (FOBT) has low sensitivity and specificity.[49] However, when used selectively it would be valuable in case-findings. Positive FOBT results are followed up by colonoscopy for further medical management.

The real value of the FOBT is in its use as a screening test for colorectal cancer. Although some controversy continues to exist about this,[49] strong evidence has accumulated supporting annual (or possibly biennial) screening for asymptomatic individuals over age 50.[50,51] It is emphasized however, that a positive FOBT result only identifies a need for a complete medical evaluation of the colon for further diagnosis.[51]

Concluding comments

In the preceding paragraphs we have provided an overview of the rationale for a number of tests which would enhance the clinician's ability to better diagnose, and ultimately manage, the patient's case in the most advantageous way possible. It is important to note that in all the possible scenarios suggested, ordering of the tests is contemplated only in the context of a primary musculoskeletal problem for which the patient would seek chiropractic help. This is consistent with current legislation defining the scope of practice in Ontario and most other provinces in Canada.

Depending on the outcome of the test(s), and taking into account all other information that would help formulate a diagnosis, the practitioner may decide to proceed with treatment, refer, or refer and continue with concomitant treatment. However, a strong argument can be made, that as primary health care providers, the role of chiropractors should extend beyond the realm of diagnostics to include screening and monitoring. Of the tests discussed above, serum glucose, serum lipids, and the fecal occult blood tests provide good examples where chiropractors may be involved more fully in the management of their patients. In order to facilitate this kind of clinical decision-making, it is incumbent upon the profession and its academic institutions to ensure that educational standards in the area of clinical laboratory diagnosis are maintained at a high level both at the undergraduate and graduate levels. Furthermore, training in the area of clinical laboratory should, in addition to the knowledge and understanding of the tests themselves, include economic and ethical considerations to ensure utilization of laboratory tests is performed cost effectively. There is evidence in the medical literature that suggests poor physician awareness of clinical laboratory test costs.[52,53] Table I provides the current prices for the proposed tests in Ontario, Canada. While some tests are relatively inexpensive others are costly ranging from $1.55 for ESR to $63.07 for the Bence Jones Protein test. Furthermore, it is often necessary to order several tests simultaneously, to improve diagnostic efficiency, increasing the cost per patient to more substantial levels. The frequency of repeat tests and the total number of patients for whom tests have been ordered further contribute to the overall clinical laboratory costs. We feel that familiarity with these costs is an important element that will contribute to the judicious use of the clinical laboratory as we

strive to gain access to it. It has been shown that educational programs designed to increase clinicians' awareness of the costs will help decrease expenditures.[53]

We feel that the appropriate use of clinical laboratory tests in chiropractic practice will ultimately result in improved and more cost-effective patient care. This would enhance the public interest. It is interesting that although clinical laboratory tests have been accessible to chiropractors, particularly in the United States, for some time[1,3] there are no studies investigating their usefulness and utilization. Clearly, such studies would provide valuable feedback regarding standards of practice, in addition to serving as a valuable resource to those who are making efforts to include access to the clinical laboratory in their respective scopes of practice.

Acknowledgements

We wish to express our appreciation to Ms. Valda Svede, Canadian Memorial Chiropractic College Library, and Ms. Sum Tse for their assistance with the literature search, and to Ms. Veronica Nass for typing the manuscript. We are grateful to Drs. J. Kellen, M.D., Ph.D., and Dr. R. Moore, Ph.D. of the Sunnybrook Health Sciences Centre, Toronto, Ontario, for critically reading this manuscript. Special thanks are due to Ms. Arlene Gorman, Med-Chem Laboratories, Toronto, Ontario, for providing us with current information on pricing of tests.

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