

# Diagnostic and treatment methods used by chiropractors: A random sample survey of Canada's English-speaking provinces

Aaron A. Puhl, MSc, DC<sup>1</sup>  
Christine J Reinhart, PhD, DC<sup>1</sup>  
H. Stephen Injeyan, PhD, DC<sup>2</sup>

*Objective: It is important to understand how chiropractors practice beyond their formal education. The objective of this analysis was to assess the diagnostic and treatment methods used by chiropractors in English-speaking Canadian provinces.*

*Methods: A questionnaire was created that examined practice patterns amongst chiropractors. This was sent by mail to 749 chiropractors, randomly selected and stratified proportionally across the nine English-speaking Canadian provinces. Participation was voluntary and anonymous. Data were entered into an Excel spreadsheet, and descriptive statistics were calculated.*

*Results: The response rate was 68.0%. Almost all (95.1%) of respondents reported performing differential diagnosis procedures with their new patients; most commonly orthopaedic testing, palpation, history taking, range of motion testing and neurological examination. Palpation and painful joint findings were the most commonly used methods to determine the appropriate*

*Objectif : Il est important de comprendre la pratique des chiropraticiens qui dépasse le cadre de leur éducation formelle. L'objectif de cette analyse était d'évaluer les méthodes de diagnostic et de traitement utilisées par les chiropraticiens dans les provinces canadiennes anglophones.*

*Méthodologie : Un questionnaire a été créé pour examiner les habitudes de pratique des chiropraticiens et a été envoyé par la poste à 749 d'entre eux, choisis au hasard et stratifiés proportionnellement entre les neuf provinces anglophones. La participation était volontaire et anonyme. Les données ont été saisies dans un tableur Excel, et les statistiques descriptives ont été calculées.*

*Résultats : Le taux de participation a été de 68,0 %. Presque tous (95,1 %) les répondants ont déclaré effectuer des diagnostics différentiels de leurs nouveaux patients; plus couramment des tests orthopédiques, la palpation, l'anamnèse, des tests d'amplitude de mouvement et l'examen neurologique. La palpation et la détection d'articulations douloureuses étaient les méthodes les plus couramment utilisées pour déterminer*

<sup>1</sup> Private Practice; Able Body Health Clinic, Lethbridge, Alberta

<sup>2</sup> Chair, Department of Pathology and Microbiology, Professor, Canadian Memorial Chiropractic College, Toronto, ON, M2H 3J1

Corresponding author: Aaron A. Puhl  
T: 403-329-1300  
Able Body Health Clinic, 1212-3<sup>rd</sup> Avenue South, Lethbridge, Alberta, T1J 0J9

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joint to apply manipulation. The most common treatment methods were manual joint manipulation/mobilization, stretching and exercise, posture/ergonomic advice and soft-tissue therapies.

**Conclusions:** *Differential diagnosis is a standard part of the assessment of new chiropractic patients in English-speaking Canadian provinces and the most common methods used to determine the site to apply manipulation are consistent with current scientific literature. Patients are treated with a combination of manual and/or manipulative interventions directed towards the joints and/or soft-tissues, as well as exercise instruction and postural/ergonomic advice.*

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**KEY WORDS:** chiropractic, survey, differential diagnosis, diagnostic testing, treatment methods

## Introduction

Doctors of Chiropractic (DC) focus on the evaluation and management of disorders of the musculoskeletal system<sup>1</sup> and there is a movement towards adopting a role as primary spine care providers<sup>2,3</sup>. The appropriate management of a patient requires the DC to diagnose the complaint, determine the best course of treatment and finally, provide that treatment, or refer to another healthcare provider for appropriate care. DCs are taught numerous diagnostic and therapeutic procedures during their undergraduate education and clinical internships and perhaps just as important, they are also able to obtain certifications through seminars and continuing education courses to employ a diversity of assessment and treatment techniques that may not be introduced within the context of their formal educational settings. It is imperative that we understand how Canadian DCs diagnose and treat their patients in order to guide research, guide the undergraduate, post-graduate and continuing educational chiropractic curricula, as well as to inform all stakeholders, including the public, insurance companies and government agencies about chiropractic practice. While previous studies have investigated similar topics among Canadian DCs<sup>4-7</sup>,

*l'articulation appropriée à manipuler. Les méthodes de traitement les plus fréquentes étaient la manipulation ou la mobilisation manuelle des articulations, les étirements et les exercices, les conseils posturaux ou ergonomiques et la thérapie des tissus mous.*

**Conclusions :** *Le diagnostic différentiel fait partie de la norme d'évaluation de nouveaux patients chiropratiques dans les provinces anglophones canadiennes, et les méthodes les plus couramment utilisées pour déterminer les points à manipuler concordent avec les publications scientifiques actuelles. Les patients sont traités par une combinaison d'interventions manuelles ou de manipulation axées sur les articulations ou tissus mous, ainsi que par des instructions d'exercice et des conseils posturaux et ergonomiques.*

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**MOTS CLÉS :** chiropratique, enquête, diagnostic différentiel, tests de diagnostic, méthodes de traitement

those previous examinations are limited by the age of the analysis<sup>4</sup>, limited sampling<sup>5-7</sup>, or poor response rates<sup>6,7</sup>, resulting in poor reliability and generalizability. Moreover, no previous study has specifically investigated what methods Canadian DCs are using in clinical practice to decide where to apply joint manipulation, which is the most notable treatment method used by chiropractors.<sup>8</sup> The objectives of this descriptive analysis of DCs in English-speaking Canadian provinces were to 1) determine if DCs are performing differential diagnosis procedures and describe the methods used for this purpose; 2) describe the tests/procedures used to determine the site of joint manipulation and the frequency of their use; and 3) describe the treatment methods used and the frequency of their use.

## Methods

Survey development and administration have been detailed in previous works.<sup>9,10</sup> In short, a 16 item survey instrument was developed by the authors that included topics ranging from practice techniques to practice philosophy. This paper reports on the data from three questions (Figures 1-3), which specifically addressed approaches to diagno-

A) When a **new patient** presents to you, do you perform a **differential diagnosis**?  Yes  No

B) If yes, which of the following do you usually use to help make a **differential diagnosis**? Mark all that apply.

<input type="checkbox"/> Blood pressure	<input type="checkbox"/> Leg length measurement	<input type="checkbox"/> Posture analysis
<input type="checkbox"/> Gait analysis	<input type="checkbox"/> Motion/static palpation	<input type="checkbox"/> Surface EMG
<input type="checkbox"/> Gross ROM analysis	<input type="checkbox"/> Muscle testing	<input type="checkbox"/> Thermography
<input type="checkbox"/> History (Complete health)	<input type="checkbox"/> Neurological exam	<input type="checkbox"/> X-ray
<input type="checkbox"/> History (Focused)	<input type="checkbox"/> Orthopaedic testing	<input type="checkbox"/> Other _____

Figure 1.

*Survey item for assessing the differential diagnostic tests/procedures used by Canadian DCs.*

On approximately what percentage of patients do you use the following methods to **decide where to adjust**?

**0** = never    **1** = 1-25% (rarely)    **2** = 26-50% (often)    **3** = 51-75% (usually)    **4** = 76-100% (almost always)

___ Gross ROM analysis	___ Nerve conduction study	___ Surface EMG
___ Leg length analysis	___ Orthopaedic testing	___ Thermography
___ Motion/static palpation	___ Painful joint findings	___ X-ray measurements
___ Muscle testing	___ Posture analysis	___ Other _____

Figure 2.

*Survey item for assessing the clinical tests/procedures used by Canadian DCs to determine the most appropriate site to apply joint manipulation.*

On approximately what percentage of your patients do you use the following **methods of treatment**?

**0** = never    **1** = 1-25% (rarely)    **2** = 26-50% (often)    **3** = 51-75% (usually)    **4** = 76-100% (almost always)

___ Adjustments/Mobilization (manual)	___ Nutritional supplements
___ Adjustments (instrumented)	___ Orthotics
___ Acupuncture	___ Postural/ergonomic advice
___ Cold laser	___ Soft tissue therapy (e.g., thumper, ART, Graston)
___ Dietary advice	___ Stretches/Exercise (in clinic or prescribed)
___ Electrotherapy (e.g., TENS, IFC)	___ Traction/distraction (manual/mechanical)
___ Homeopathic remedies	___ Ultrasound
___ Hot/Ice packs	___ Other _____

Figure 3.

*Survey item for assessing the treatment methods used by Canadian DCs.*

sis and treatment. The survey instrument was tested by ten DCs and revisions were made to the survey instrument after interviewing the test subjects to identify any problems. A list of all currently licensed DCs for each of the nine English-speaking Canadian provinces was developed from the online directories of the provincial chiropractic licensing bodies. A random sample was selected from each provincial list using a computerized random number generator; the final sample included 749 DCs (12% of eligible DCs), stratified proportionally across the English-speaking Canadian provinces. The survey was administered by mail from August 2010 to December 2010 and used postage-paid, return addressed envelopes and two follow-up mailings to maximize response rates.<sup>11</sup> Surveys were mailed with a personalized letter briefly explaining the purpose of the study, guaranteeing anonymity and providing a means of avoiding future mailings if they did not wish to participate; informed consent was implied by participation. The CMCC Research Ethics Board approved the study protocol (REB Approval # 1006X02) and the CMCC Research Division provided all funding.

In order to determine the use of various diagnostic procedures by DCs for the purposes of differential diagnosis, subjects were asked to document, from alphabetized lists of tests/procedures, which procedures they common-

ly used (Figure 1). With regard to determining where to apply joint manipulation, subjects were asked to document, from an alphabetized list of diagnostic procedures, which tests/procedures they used and also to indicate the percentage of patients on whom they used each procedure (Figure 2). To determine which treatment methods are being employed, participants were asked to document, from an alphabetized list, which treatment modalities they used and the frequency with which they are used (Figure 3).

All survey data were entered into an electronic spreadsheet by two authors using the double data entry method to control for errors. Descriptive statistics were used to report the data.

### Results

Of 740 deliverable surveys, 503 were returned, a response rate of 68.0%; seven respondents returned the cover page only, indicating they did not wish to participate; nine surveys were undeliverable. The majority of respondents were male (68.4%); had attained a Bachelor's degree prior to attending chiropractic college (76.2%); and had attended chiropractic college at CMCC (62.6%). The average number of years in practice was 14.9 (standard deviation  $\pm 11.0$ ). Table 1 contains the response rates and demographic information of respondents by province.

Table 1.  
*Response rates and respondent demographics by province.*

Province	Surveys mailed / <sup>a</sup> Licensed DCs	Response rate; % (N)	Male responder; % (N)	Years in practice; Ave (SD)	<sup>b</sup> Bachelor degree; % (N)
BC	103/851	71.3 (72)	76.4 (55)	16.3 (10.5)	63.9 (46)
AB	117/971	68.1 (79)	78.5 (62)	14.4 (9.9)	63.3 (50)
SK	21/170	76.2 (16)	62.5 (10)	15.8 (11.7)	75.0 (12)
MB	33/271	68.8 (22)	81.8 (18)	19.8 (15.9)	77.3 (17)
ON	444/3,700	66.2 (292)	63.9 (186)	14.3 (10.8)	81.9 (236)
NB	8/59	87.5 (7)	85.7 (6)	17.7 (14.7)	71.4 (5)
NS	14/112	71.4 (10)	30.0 (3)	13.2 (13.0)	90.0 (9)
PEI <sup>c</sup>	2/15	—	—	—	—
NFLD	7/55	85.7 (6)	66.7 (4)	12.7 (2.8)	100 (6)
TOTAL	749/6,204	68.0 (503)	68.4 (344)	14.9 (11.0)	76.2 (381)

<sup>a</sup> Total number of DCs listed in the online directories of the provincial chiropractic licensing body in 2010.

<sup>b</sup> Earned a Bachelor's degree prior to attending chiropractic college

<sup>c</sup> All mailed surveys were undeliverable

Table 2.  
*Diagnostic tests/procedures used for the purpose of differential diagnosis. N=474.*

Diagnostic method	% Canadian chiropractors commonly using method (N)
Orthopaedic tests	88.8 (421)
Motion/static palpation	88.0 (417)
History (focused)	83.5 (396)
History (complete)	82.9 (393)
Range of Motion	80.0 (379)
Neurological exam	79.5 (377)
Posture analysis	71.5 (339)
Muscle testing	53.8 (255)
Gait analysis	48.1 (228)
Leg length	46.4 (220)
X-ray	45.1 (214)
Blood pressure	28.5 (135)
Surface Electromyography	11.2 (53)
Thermography	10.5 (50)
Other	4.6 (22)

The vast majority (470/494; 95.1%) of respondents reported performing differential diagnosis procedures when a new patient presents to them for the first time. The prevalence of use of common diagnostic tests/procedures for the purpose of differential diagnosis is detailed in Table 2. The most commonly used diagnostic tests/procedures were orthopaedic testing (88.8%), palpation (88.0%), history taking (83.5%), range of motion (80.0%) and neurological examination (79.9%); each of which were used by at least 80% of respondents. With regard to determining where to apply joint manipulation procedures, the prevalence of use of common diagnostic tests/procedures and the proportion of patients on which they are used is detailed in Table 3. The most commonly used tests/procedures for determining where to apply spine manipulation were palpation (98.4%) and painful joint findings (89.8%); both used by at least 90% of respondents and used on the majority of their patients. Also commonly used was analysis of posture, range of motion and leg length, as well as orthopaedic testing (each used by at least 80% of respondents).

Table 3.  
*Clinical tests/procedures used for the purpose of determining where to apply joint manipulation and frequency of use. N = 488.*

Diagnostic method	Percentage of patients on which diagnostic technique is used (N)				
	76-100% (always)	51-75% (usually)	26-50% (often)	1-25% (rarely)	0% (never)
Motion/static palpation	79.9 (390)	10.9 (53)	5.7 (28)	1.8 (9)	1.6 (8)
Painful joint findings	52.3 (255)	20.9 (102)	12.9 (63)	3.7 (18)	10.2 (50)
Posture analysis	29.9 (146)	20.7 (101)	18.9 (92)	14.3 (70)	16.2 (79)
Range of motion	42.6 (208)	18.4 (90)	11.9 (58)	10.7 (52)	16.4 (80)
Leg length analysis	31.1 (152)	13.3 (65)	18.4 (90)	20.1 (98)	17.0 (83)
Orthopaedic testing	35.9 (175)	22.1 (108)	13.7 (67)	10.9 (53)	17.4 (85)
Muscle testing	13.7 (67)	13.7 (67)	17.8 (87)	21.3 (104)	33.4 (163)
X-ray measurements	9.4 (46)	6.1 (30)	8.4 (41)	15.6 (76)	60.2 (294)
Nerve conduction	1.2 (6)	0.8 (4)	2.7 (13)	12.1 (59)	83.2 (406)
Surface EMG	5.3 (26)	1.4 (7)	1.8 (9)	5.1 (25)	86.3 (421)
Thermography	4.9 (24)	0.8 (4)	1.8 (9)	4.9 (24)	87.3 (426)
Other	3.3 (16)	0.8 (4)	0.8 (4)	0.4 (2)	94.9 (463)

The prevalence of use of specific treatment methods by respondents is detailed in Table 4. The most commonly used methods of treatment were manual joint manipulation and/or mobilization (99.0%), stretching and/or exercises (96.0%), posture and/or ergonomic advice (90.8%) and soft-tissue therapies (85.4%). These were each used by greater than 85% of respondents and used on the majority of their patients. Also used by a significant majority (>80%) of respondents, but used on only small proportion of their patients, were orthotics and dietary advice.

### Discussion

While at least 65% of chiropractic patients have been shown to present for back pain<sup>12</sup>, several medical conditions, such as cancer, infections, and visceral disease, are known to mimic non-specific, low back pain conditions<sup>13-15</sup>. As such, appropriate and skilled examinations are imperative for the delivery of optimal patient care.

Indeed, the Canadian Chiropractic Association suggests that the chiropractic profession adheres to a patient-centred, biopsychosocial approach to health care that encompasses examination, diagnosis and treatment<sup>16</sup> and clinical practice guidelines suggest that the accurate diagnosis of patient conditions is key to effective management and treatment<sup>17</sup>. DCs are taught numerous diagnostic procedures during their undergraduate education and clinical internships and analyses conducted by the National Board of Chiropractic Examiners in the United States (US) have suggested that US DCs develop differential diagnoses on a daily basis.<sup>18</sup> However, to our knowledge only one recent investigation has assessed the use of diagnostic tests/procedures by Canadian DCs.<sup>7</sup> While the aforementioned study attempted a more specific assessment of the individual diagnostic tests and therapeutic procedures used by Canadian DCs than our current study, it had a number of limitations, including a very low response rate and

Table 4.  
Treatment methods used by Canadian chiropractors and frequency of use. N=500.

Treatment method	Percentage of patients on which therapy is used				
	76-100% (always)	51-75% (usually)	26-50% (often)	1-25% (rarely)	0% (never)
Manual joint mobilization/manipulation	78.8 (394)	13.0 (65)	4.0 (20)	3.2 (16)	1.0 (5)
<sup>a</sup> Stretching/Exercise	53.8 (269)	27.0 (135)	11.6 (58)	3.6 (18)	4.0 (20)
Posture/ergonomic advice	34.4 (172)	28.2 (141)	18.6 (93)	9.6 (48)	9.2 (46)
Soft-tissue therapy (e.g., Thumper, ART, Graston)	49.6 (248)	18.6 (93)	9.6 (48)	7.6 (38)	14.6 (73)
Orthotics	1.2 (6)	6.4 (32)	30.6 (153)	45.8 (229)	16.0 (80)
Dietary advice	6.6 (33)	14.6 (73)	30.2 (151)	31.6 (158)	17.0 (85)
Traction/distraction	12.2 (61)	20.8 (104)	26.6 (133)	19.2 (96)	21.2 (106)
Heat/Cold therapy	15.6 (78)	17.0 (85)	21.6 (108)	21.2 (106)	24.6 (123)
Instrument-assisted joint manipulation	17.8 (89)	9.2 (46)	18.8 (94)	25.2 (126)	29.0 (145)
Nutritional supplements	3.4 (17)	10.6 (53)	20.2 (101)	31.0 (155)	34.8 (174)
Electrotherapies (e.g., TENS, IFC)	8.8 (44)	13.0 (65)	13.4 (67)	16.6 (83)	48.2 (241)
Ultrasound	2.4 (12)	7.8 (39)	13.0 (65)	18.8 (94)	58.0 (290)
Acupuncture	1.6 (8)	6.4 (32)	10.8 (54)	7.8 (39)	73.4 (367)
Low-level laser therapy	1.4 (7)	3.4 (17)	10.0 (50)	9.4 (47)	75.8 (379)
Homeopathic remedies	0.6 (3)	2.2 (11)	4.4 (22)	15.2 (76)	77.6 (388)
Other	1.4 (7)	0.8 (4)	1.2 (6)	1.2 (6)	95.4 (477)

<sup>a</sup> Could include in-office, or prescribed stretches/exercises.  
ART=Active Release Therapies



a pseudo-randomized sampling method, which reduces both the reliability and generalizability of the findings. The present study suggests that nearly all (95%) DCs in English-speaking provinces are performing some form of differential diagnosis procedures with their new patients. The vast majority of respondents indicated using diagnostic methods consistent with standard assessment of musculoskeletal conditions<sup>19</sup>; that is, history taking, orthopedic testing, palpation, range of motion testing and neurological exams.

Notable is the fact that only a minority (28.5%) of DCs surveyed indicated using blood-pressure assessment as a common diagnostic test with new patients. Blood-pressure measurement can aid in the identification of cardiovascular, or pulmonary problems that might affect prognosis and intervention, or require referral to another practitioner. Indeed, it has been argued that blood-pressure measurements can prove to be an appropriate objective test for assessment prior to manual therapy interventions and provide direction for risk assessment and/or the management of patients.<sup>20</sup> That only a minority of respondents indicated assessing new patient's blood-pressure makes us question whether they are aware of the relevance of hypertension to the clinical reasoning necessary for the optimal management of musculoskeletal patient populations.

In addition to the standard tests involved with the diagnosis of a musculoskeletal complaint, DCs and other professionals who use joint manipulation will often perform supplementary physical examinations to determine whether dysfunctional joints are present that may be contributing to a patient's condition. If dysfunctional joints are present and no contraindications are found, manipulative procedures are often applied with the intent of improving joint biomechanics and function, which in turn may explain the efficacy of manipulative therapy for improving mobility and reducing pain. However, numerous reviews examining the validity and reliability of common examination methods intended to identify dysfunctional spinal joint segments have, to date, suggested that many tests are relatively unreliable and/or invalid.<sup>21-26</sup> Scientific investigation seems most supportive of direct, mechanical methods of assessing and identifying the site of care, such as maneuvers that replicate the patient's familiar pain.<sup>26</sup> There is also some evidence suggesting that palpation and leg-length analysis may be useful for some applications and orthopedic maneuvers may help narrow the region

where treatment may be applied. On the other hand, the evidence is not supportive of less direct methods such as manual muscle testing for non-pathological states, radiographic measurements, thermography and surface electromyography.<sup>26</sup>

The present study thus suggests that DCs in English-speaking Canadian provinces are practicing consistently with the current scientific literature, as "palpation" and "painful joint findings" were the most commonly used methods for identifying spinal segments that could benefit from joint manipulation, used by nearly every respondent, on nearly every patient. Moreover, methods that are currently not supported by the scientific literature, such as radiographic measurements, thermography and surface electromyography, were the least-commonly used procedures. Nevertheless, it is a concern that there is a notable minority of DCs that reported regularly using methods not shown to be valid or reliable. Our data also suggests that DCs in Canada's English-speaking provinces use a combination of examination findings to identify spinal segments that could benefit from joint manipulation. While many clinical tests are of questionable diagnostic value, it has been suggested in the literature that improved diagnostic accuracy can be achieved by using combinations of clinical examination findings, as compared with individual physical examination tests.<sup>27</sup> As such, the use of examination methods with only low to moderate reliability and validity may add some clinical value when used in conjunction with pain provocation; to our knowledge, no analysis has examined the use of combination tests for identifying levels of segmental dysfunction in the spine.

In addition to the joint manipulation procedures commonly associated with care from a DC, nutritional and postural advice, lifestyle counselling and prescription of exercises have long been associated with chiropractic practice and are often considered as important hallmarks of the profession. In 1997, the Canadian Chiropractic Research Databank reported that the treatment techniques used by greater than 80% of chiropractors were joint manipulation, patient education and exercise.<sup>4</sup> Although our current data suggests that similar treatment modalities are still being used by most DCs, there was a notable increase in the use of soft-tissue therapies. In 1997, only 71.9% of Canadian DCs reported using soft-tissue therapies, whereas this survey saw 85.4% of respondents indicating

the use of soft-tissue therapies. This finding is consistent with the previously suggested trend towards the use of proprietary soft tissue therapies (e.g., Active Release Therapy, Graston technique, etc.) for patient care.<sup>6,28</sup> Our data suggest that the majority of chiropractors in English-speaking Canadian provinces today use a combination of manual and/or manipulative interventions directed towards the joints and soft-tissues, as well as exercise instruction and postural/ergonomic advice when they treat their patients.

Our study has some important strengths and limitations. The relatively high response rate (68%) may be considered a strength that increases the validity of the findings, however we do recognize that this was a select sample, and the chiropractors surveyed may not be representative of all Canadian DCs. The exclusion of French-speaking Canadian provinces and the Canadian territories means that our data might not be generalizable to those regions, but was necessary to avoid confounds related to language and regulatory differences. Respondents may have been influenced by social-desirability bias. The survey did not provide an operational definition for the term 'differential diagnosis', thus it is possible that some respondents misinterpreted the meaning of this term. We acknowledge that although the survey items were constructed using examples from the existing literature, the survey instrument used in this study was not previously tested or validated.

## Conclusion

Differential diagnosis is a standard part of the assessment of new chiropractic patients in English-speaking Canadian provinces and this is most commonly done using orthopaedic tests, palpation, history-taking, range of motion testing and neurological examination. The clinical tests/procedures used most commonly by these DCs to determine where to apply joint manipulation are palpation and painful joint findings. These methods are consistent with the current scientific literature. Chiropractic patients in Canada's English-speaking provinces are treated with a combination of manual joint manipulation/mobilization, exercise, posture/ergonomic advice and soft-tissue therapies. These treatment methods are consistent with earlier analyses of Canadian DCs, but the data do suggest that chiropractors in Canada are increasingly using soft-tissue therapies as part of their therapeutic regimen.

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