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## ORIGINAL ARTICLES

# Usefulness of CanMEDS Competencies for Chiropractic Graduate Education in Europe

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**Purpose:** In 2008, the European Academy of Chiropractic decided to develop a competency-based model for graduate education in Europe. The CanMEDS (Canadian Medical Education Directives for Specialists) framework describes seven competency roles (fields) and key competencies identified as fundamental to all specialist doctors. It was not known how these fields are perceived by chiropractors in Europe. The purpose of this study was to compare perception scores of senior chiropractic as well as medical students with perception scores of licensed chiropractors and to analyze practitioners' remembered confidence in these competency fields. **Methods:** An anonymous 5-point Likert scale electronic questionnaire was sent to senior students of two chiropractic schools and licensed chiropractors of five European nations. Age and gender differences as well as differences in appraisal of the competencies in respect to importance and remembered confidence were analyzed. **Results:** Response rates were low to moderate. Agreement of importance of the seven competencies was not different between chiropractic and medical students as well as licensed chiropractors. Chiropractic students and chiropractors regarded all key competencies as important (averages  $\geq 4.0$ ). The importance versus remembered confidence was consistently judged higher by about 1/2 point on the 5-point scale, significant for all competency fields ( $p < .001$ ). **Conclusion:** The seven competency fields seem to be of the same importance for chiropractic senior students and licensed chiropractors and might be considered as a base for future graduate training in chiropractic. The survey should be replicated with additional samples and further information should be gathered to reflect reality. (*J Chiropr Educ* 2009;23(2):123-133)

**Key Indexing Terms:** chiropractic; competency-based education; curriculum; education, graduate

## INTRODUCTION

In 2008, the European Academy of Chiropractic decided to develop a competence-based model curriculum for graduate education among its 19 member nations (Belgium, Cyprus, Finland, France, Great Britain, Greece, Germany, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden, and Switzerland). Its purpose is to provide minimal standards for an educationally sound and feasible design of chiropractic graduate education in Europe.

Competence encompasses knowledge, skills, abilities, and traits gained through preservice education,

in-service training, and work experience.<sup>1</sup> The CanMEDS (Canadian Medical Education Directives for Specialists) framework describes aspects of competence identified as fundamental for postgraduate training of health care professionals. These aspects are related to seven roles of specialists: medical expert, communicator, health advocate, collaborator, manager, scholar, and professional.<sup>2</sup> Medical doctors<sup>3-5</sup> and senior students<sup>6</sup> in European countries agree with the importance of these aspects of competence. For the purpose of constructing a competency-based postgraduate training, specific professional activities of each of the seven CanMEDS roles have to be defined.<sup>7</sup> Confidence in performing these tasks improves with training. Along with the Danish and Canadian medical boards, the Netherlands has also adopted and used the seven roles from the CanMEDS as a base for specialist training programs.<sup>8</sup> Specialty groups perceived the

importance of the tasks differently and show differences in their confidence in performing them.<sup>9</sup> This is known for different specialties.<sup>1,5,10,11</sup> We do not know how these competencies are perceived by senior chiropractic students and licensed chiropractors in Europe. Instead of roles, seven fields of competency were used, covering the same CanMEDS domains, with four key competencies per field.<sup>6</sup>

## CONTEXT AND SETTING OF THE STUDY

First it was decided to survey senior chiropractic students for their appraisal of the seven competency fields<sup>6</sup> after graduation. In Europe, there are four chiropractic schools accredited by the European Council on Chiropractic Education (ECCE). All four schools were invited to take part in this survey. Only senior students of two institutions were available for a survey at that time. Finally, all last-year senior chiropractic students from the Anglo-European College of Chiropractic in Bournemouth (England) and at the Sydansk Universitet in Odense (Denmark) were asked to fill in the questionnaires. They were not informed about CanMEDS competencies before the survey. Licensed chiropractors from five nations, selected purposely on the basis of a prior survey among graduate education program representatives of all member nations of the European Chiropractors' Union (ECU),<sup>12</sup> were asked to reflect on the same seven competency fields in respect to the importance of competencies in daily practice and remembered confidence 2 years after graduation.

The purpose of this study was (1) to determine rating scores on seven competency fields in respect to their importance for senior students and licensed chiropractors, (2) to benchmark scores of chiropractic with medical students,<sup>6</sup> (3) to compare chiropractic students in England and Denmark with licensed chiropractors in Europe with respect to different appraisals of importance of competency fields due to practice, and (4) to analyze licensed chiropractors' judged confidence in these fields. If confidence in these fields is judged lower than the importance of competency fields and key competencies in daily practice, general needs for graduate training could be assessed, a prerequisite to determine desired learning outcomes of a model curriculum for chiropractic graduate education in Europe. The research questions were:

1. Do senior chiropractic students and senior medical students agree with respect to the importance of the seven fields of competencies?
2. Do senior chiropractic students of two independent chiropractic schools similarly assess the importance of these fields?
3. Do senior chiropractic students and licensed chiropractors assess the importance of these fields in a similar manner?
4. Do licensed chiropractors judge importance versus remembered confidence of these fields differently?

## METHODS

This survey is a cross-sectional survey. We used convenience sampling for the senior chiropractic students and purposive sampling for licensed chiropractors in Europe. Before sampling, the European Academy of Chiropractic conducted a pilot survey among all 19 representatives of national graduate

**Table 1. Means, Standard Deviation, and Percent Positive Appraisal of CanMEDS Seven Roles Among European Chiropractors' Union Member Nations (N = 19)**

ECU nations <sup>a</sup>	Mean <sup>b</sup>	Standard deviation	Percent positive appraisal
Luxemburg (N = 5)	–	–	–
Poland (N = 3)	–2.0	0.0	0
Ireland (N = 38)	–1.9	0.3	0
Portugal (N = 22)	–1.8	0.4	0
Sweden (N = 189)	–1.4	0.5	0
France (N = 200)	0.0	0.8	30
Greece (N = 31)	1.3	0.5	100
Finland (N = 50)	1.3	0.9	90
Iceland (N = 7)	1.8	0.6	90
Netherlands (N = 211)	1.9	0.3	100
Italy (N = 200)	1.9	0.3	100
Spain (N = 48)	1.9	0.3	100
Norway (N = 410)	2.0	0.0	100
Cyprus (N = 12)	2.0	0.0	100
Lichtenstein (N = 4)	2.0	0.0	100
Germany (N = 72)	2.0	0.0	100
Great Britain (N = 434)	2.0	0.0	100
Belgium (N = 100)	2.0	0.0	100
Switzerland (N = 270)	2.0	0.0	100

<sup>a</sup> N = ECU members (2007). <sup>b</sup> –2 (I fully disagree); –1 (I partly disagree); 0 (neutral); 1 (I partly agree); 2 (I fully agree).

education programs.<sup>12</sup> The response rate of this pilot survey was 95%. Thirteen (68%) representatives appraised graduate education as a continuation of undergraduate education with the emphasis that graduates learn the CanMEDS seven roles. Five (26%) representatives disagreed (Table 1). We randomized four out of the 13 positive respondents (Norway, Germany, Belgium, and Switzerland) and selected one of the five negative respondents by personal judgment. The negative respondent was Sweden with a mean of  $-1.4$  and a sample size of 189. Finally, links of two anonymous electronic questionnaires, one for senior chiropractic students and a second one for licensed chiropractors, were mailed to either the senior students of the two chiropractic institutions in England ( $N = 89$ ) and Denmark ( $N = 18$ ) or to licensed chiropractors of five chiropractic associations in Belgium ( $N = 100$ ), Germany ( $N = 72$ ), Norway ( $N = 410$ ), Sweden ( $N = 189$ ), and Switzerland ( $N = 270$ ). These links were sent out by administrators of the two institutions and five associations so as to respect the anonymity of respondents. All administrators were asked to forward three emails, one with the official request to fill in the questionnaire followed by two reminder emails. The language of all questionnaires was English.

According to the Research Ethics Committee of Bern, Switzerland, there were no ethical concerns over this study. It was the investigator's responsibility to guarantee confidentiality and scientific validity. The completed questionnaires were collected by the author on the password-protected e-platform [www.surveymonkey.com](http://www.surveymonkey.com). Return of questionnaire implied consent from the participant. In order to respect the anonymity of the participants in such a small group of senior students and practitioners, no comparison was made between responders and nonresponders.

## Questionnaires

The electronic questionnaire for senior chiropractic students included four key competencies within each of the seven competency fields on a 5-point Likert scale (1 = very unimportant; 5 = very important). All were asked to assess in total 28 key competencies concerning their importance in practice after graduation (Table 2). Inverted scoring was not used. Students were also asked to indicate their age and gender.

A second electronic questionnaire for licensed chiropractors contained questions concerning the same 28 key competencies (Table 3). Licensed chiropractors had to assess the importance (1 = very unimportant; 5 = very important), and their remembered level of confidence 2 years after graduation (1 = not at all confident; 5 = totally confident). Respondents were asked to fill in age, gender, school of graduation, years since graduation, education after graduation, and years being in practice.

## Data Analysis

After exclusion of extreme outliers, means and standard deviations of each item were calculated. Scores were analyzed using the statistical software SYSTAT, version 12 (SYSTAT Software Inc., Chicago, IL). For every group of four items under one competency role (field), the overall score was calculated as the mean score. To establish the reliability of the overall scores, the coherence of each group of items was measured by its internal consistency (Cronbach's  $\alpha$ ).<sup>6</sup> Corrected item-total correlations were calculated to assess the contribution of each individual item to the valuation of the competency field as a whole. Age and gender differences as well as differences in appraisal of the competencies with respect to importance and remembered confidence were analyzed by analysis of variance or the *t*-test in the case of just two groups. All distributions were inspected by visually examining histograms and box-and-whisker displays. All distributions were more or less symmetric and in group comparisons no marked or systematic heteroscedasticity was found. Thus, we deemed parametric tests to be justified.

Agreement of importance was defined as more than 75% of responders rating above the value 3.5, as used in the study by Ringsted.<sup>11</sup> The cutoff point used in the study by Rademakers et al<sup>6</sup> was not identifiable. A result was accepted as significant if the probability of obtaining a result when the null hypothesis is true was smaller than .01. We did not apply any corrections for multiple tests such as the Bonferroni. Predictor variables (eg, school of graduation, years since graduation, years in practice) were treated as nominal. To calculate the correlation of judged importance and remembered confidence, nonmissing items of a scale were added and this sum was divided by the number of nonmissing items to

**Table 2. Competency Fields and Key Competencies, as Appraised by Senior Chiropractic Students (N = 52)**

Competency role (field) and key competencies	Importance before graduation			
	Mean	SD	$r_{it}$	$\alpha$
After graduation a chiropractor				
■ Has adequate knowledge and skills according to the profession's current standards	4.46	.851	.829	
■ Adequately applies the diagnostic, therapeutic, and preventative possibilities of chiropractic in an evidence-based way wherever possible	4.33	.944	.663	
■ Delivers effective and ethical care	4.59	.829	.857	
■ Quickly finds necessary information and applies it adequately	4.21	.893	.754	
<b>Chiropractic Expert (Expert Performance)</b>	<b>4.389 (4.33)</b>	<b>.766 (.42)</b>	<b>.897 (.79)</b>	
After graduation a chiropractor				
■ Establishes adequate therapeutic relationships with patients	4.31	1.001	.831	
■ Listens carefully and obtains relevant patient information effectively	4.69	.781	.801	
■ Adequately discusses chiropractic and medical information with patients and their families	4.23	.962	.830	
■ Reports adequately on patient cases in oral and written ways	4.40	.934	.840	
<b>Communicator (Communication)</b>	<b>4.409 (4.35)</b>	<b>.831 (.47)</b>	<b>.922 (.80)</b>	
After graduation a chiropractor				
■ Consults effectively with others doctors and health care professionals	4.38	.867	.756	
■ Refers adequately to other chiropractors and health care professionals	4.50	.828	.756	
■ Delivers adequate collegial advice	4.00	.849	.738	
■ Supports effective interdisciplinary collaboration and chain care	3.90	.944	.716	
<b>Collaborator (Collaboration)</b>	<b>4.188 (4.14)</b>	<b>.744 (.52)</b>	<b>.880 (.88)</b>	
After graduation a chiropractor				
■ Assesses chiropractic (medical) information critically	4.37	.886	.827	
■ Contributes to development of professional and scientific knowledge	4.10	.799	.749	
■ Develops and maintains a personal ongoing education plan	4.37	.871	.776	
■ Contributes to the education of students, residents, colleagues, patients, and others involved in health care	4.10	.774	.742	
<b>Scholar (Knowledge and Science)</b>	<b>4.226 (4.05)</b>	<b>.736 (.52)</b>	<b>.897 (.79)</b>	
After graduation a chiropractor				
■ Knows and identifies determinants of illnesses	4.29	.977	.726	
■ Contributes to health of patients and the community	4.35	.926	.810	
■ Acts according to relevant legislation	4.48	.939	.839	
■ Acts adequately in case of incidents in health care	4.31	.948	.826	
<b>Health Advocate (Community Performance)</b>	<b>4.351 (4.13)</b>	<b>.839 (.48)</b>	<b>.912 (.71)</b>	
After graduation a chiropractor				
■ Finds adequate balance between professional patient care and personal development	4.31	.781	.824	
■ Works effectively and efficiently in health care organization	4.00	.950	.766	
■ Allocates available health care resources wisely	4.02	.960	.827	
■ Uses information technology to optimize patient care and lifelong learning	3.94	.895	.667	
<b>Manager (Management)</b>	<b>4.067 (3.92)</b>	<b>.783 (.66)</b>	<b>.894 (.83)</b>	
After graduation a chiropractor				
■ Delivers high-quality care with integrity, honesty, and compassion	4.56	.938	.833	
■ Exhibits appropriate personal and interpersonal professional behavior	4.56	.895	.902	
■ Is conscious of the limits of his or her personal knowledge and acts within these limits	4.56	1.018	.728	
■ Practices consistently with the ethical standards of the profession	4.63	.864	.913	
<b>Professional (Professionalism)</b>	<b>4.577 (4.4)</b>	<b>.847 (.52)</b>	<b>.931 (.87)</b>	

1 = very unimportant; 5 = very important; SD = standard deviation;  $r_{it}$  = correlation of item with scores on the three other items;  $\alpha$  = Cronbach's coefficient alpha. Rademakers et al's data for senior medical students are listed in parentheses.

**Table 3. Competency Fields and Key Competencies, as Appraised by Licensed Chiropractors**

Competency role (field) and key competencies	Confidence 2 years after graduation				Importance at time of the survey			
	Mean	SD	$r_{it}$	$\alpha$	Mean	SD	$r_{it}$	$\alpha$
Two years after my graduation as a chiropractor, I was confident in								
■ My knowledge and skills according to the profession's current standards	3.960	.827	.621		4.504	.886	.789	
■ Adequately applying the diagnostic, therapeutic, and preventative possibilities of chiropractic in an evidence-based way wherever possible	3.811	.873	.584		4.289	.894	.701	
■ Delivering effective and ethical care	4.256	.714	.557		4.621	.816	.805	
■ Quickly finding necessary information and applying it adequately	3.821	.856	.575		4.228	.841	.771	
<b>Chiropractic Expert (Expert Performance)</b>	<b>3.962</b>	<b>.635</b>		<b>.778</b>	<b>4.410</b>	<b>.749</b>		<b>.894</b>
Two years after my graduation as a chiropractor, I was confident in								
■ Establishing adequate therapeutic relationships with patients	4.116	.771	.619		4.462	.880	.805	
■ Listening carefully and obtaining relevant patient information effectively	4.243	.738	.618		4.621	.809	.833	
■ Adequately discussing chiropractic and medical information with patients and their families	3.878	.827	.644		4.244	.864	.774	
■ Reporting adequately on patient cases in oral and written ways	3.741	.927	.563		4.156	.868	.665	
<b>Communicator (Communication)</b>	<b>3.995</b>	<b>.644</b>		<b>.795</b>	<b>4.371</b>	<b>.746</b>		<b>.895</b>
Two years after my graduation as a chiropractor, I was confident in								
■ Consulting effectively with others doctors and health care professionals	3.832	.841	.656		4.221	.847	.826	
■ Referring adequately to other chiropractors and health care professionals	3.850	.922	.616		4.383	.846	.818	
■ Delivering adequate collegial advice	3.543	.920	.594		4.108	.874	.757	
■ Supporting effective interdisciplinary collaboration and chain care	3.548	.929	.635		4.135	.892	.780	
<b>Collaborator (Collaboration)</b>	<b>3.693</b>	<b>.720</b>		<b>.808</b>	<b>4.212</b>	<b>.767</b>		<b>.909</b>
Two years after my graduation as a chiropractor, I was confident in								
■ Assessing chiropractic (medical) information critically	3.836	.861	.482		4.331	.821	.697	
■ Contributing to development of professional and scientific knowledge	3.113	1.050	.617		3.856	.904	.704	
■ Developing and maintaining a personal ongoing education plan	3.911	.899	.441		4.280	.867	.749	
■ Contributing to the education of students, residents, colleagues, patients, and others involved in health care	3.229	1.043	.622		3.896	.896	.713	
<b>Scholar (Knowledge and Science)</b>	<b>3.522</b>	<b>.727</b>		<b>.744</b>	<b>4.091</b>	<b>.737</b>		<b>.866</b>
Two years after my graduation as a chiropractor, I was confident in								
■ Knowing and identifying determinants of illnesses	3.891	.752	.482		4.421	.866	.776	
■ Contributing to health of patients and the community	3.856	.857	.491		4.363	.880	.734	
■ Acting according to relevant legislation	4.199	.806	.544		4.328	.898	.737	
■ Acting adequately in case of incidents in health care	3.689	.912	.527		4.424	.891	.815	
<b>Health Advocate (Community Performance)</b>	<b>3.909</b>	<b>.615</b>		<b>.721</b>	<b>4.384</b>	<b>.770</b>		<b>.894</b>
Two years after my graduation as a chiropractor, I was confident in								
■ Finding adequate balance between professional patient care and personal development	3.699	.886	.537		4.197	.885	.694	
■ Working effectively and efficiently in health care organization	3.473	.960	.554		3.857	.937	.564	
■ Allocating available health care resources wisely	3.664	.841	.616		4.159	.871	.714	

Continued

**Table 3. (Continued)**

	Confidence 2 years after graduation				Importance at time of the survey			
	Mean	SD	$r_{it}$	$\alpha$	Mean	SD	$r_{it}$	$\alpha$
Competency role (field) and key competencies								
■ Using information technology to optimize patient care and lifelong learning	3.559	.986	.572		4.024	.958	.670	
<b>Manager (Management)</b>	<b>3.599</b>	<b>.706</b>		<b>.767</b>	<b>4.059</b>	<b>.744</b>		<b>.830</b>
Two years after my graduation as a chiropractor, I was confident in								
■ Delivering high-quality care with integrity, honesty, and compassion	4.283	.752	.622		4.699	.812	.877	
■ Exhibiting appropriate personal and interpersonal professional behavior	4.144	.742	.578		4.406	.880	.830	
■ Being conscious of the limits of my personal knowledge and acting within these limits	4.128	.803	.558		4.536	.857	.831	
■ Practicing consistently with the ethical standards of the profession	4.397	.711	.593		4.586	.844	.852	
<b>Professional (Professionalism)</b>	<b>4.238</b>	<b>.585</b>		<b>.781</b>	<b>4.557</b>	<b>.776</b>		<b>.935</b>

1 = very unimportant; 5 = very important; SD = standard deviation;  $r_{it}$  = correlation of item with scores on the three other items;  $\alpha$  = Cronbach's coefficient alpha.

give a mean rating of importance and remembered confidence; a product-moment (Pearson) correlation coefficient between these two mean judgments is reported.

## RESULTS

In total, 52 (49%) senior chiropractic students and 393 (41%) licensed chiropractors responded to the two questionnaires. The response rate for the Anglo-European College of Chiropractic was 45%, for the Sydansk Universitet 67%, and for each of the five chiropractic associations the following: 45% (Belgium), 31% (Germany), 14% (Norway), 59% (Sweden), and 56% (Switzerland).

### Importance Perceived by Students

Chiropractic senior students perceived all 28 key competencies as important (Table 2). Corrected item-total correlation of each item was in line with Rademakers' reported data. We found the highest mean rating scores of importance for professionalism (4.577) and communication (4.409) and the lowest mean scores for management (4.067). There was no significant difference between the seven competency fields assessed in relation to students' age ( $p \geq .429$ ) and gender (24 male, 26 female;  $p \geq .992$ ).

Agreement of importance was not different between senior students of the two schools; however, its variance differed: English school students ( $N = 40$ ;

mean = 4.337; SD = 0.840) and Danish school students ( $N = 12$ ; mean = 4.199; SD = 0.254). There were two students who answered exclusively "very unimportant." A large portion of the variance was due to their expressed attitude. It was therefore decided to exclude the two most extreme outliers. Indeed, their contribution to the variance was responsible for much of the high reliability estimates. Once this was done, the reduced alpha coefficients were more in line with Rademakers' reported estimates of reliability.<sup>6</sup> The competency field communication ( $p = .001$ ) and professionalism ( $p = .001$ ) were perceived as more important by the students from the English college.

### Importance Perceived by Licensed Chiropractors

Licensed chiropractors perceived all 28 key competencies as important (Table 3). Agreement of importance was not different between the five associations involved. Outcome concerning judged importance was in line with senior chiropractic students, the highest mean rating scores of importance for professionalism (4.69) and expert performance (4.53) and the lowest mean score for management (4.15). There was no significant difference between the seven competency fields assessed in relation to chiropractors' age (age ranges: 25–34, 35–44, 45–54, 55–99;  $p \geq .06$ ), gender (263 male, 116 female;  $p \geq .210$ ), place of graduation

(groups: England, Denmark, others;  $p \geq .160$ ), years since graduation (groups: 0–5, 5–9, 10–19, 20–29, 30–99 years;  $p \geq .044$ ), places where they were working (five nations surveyed;  $p \geq .089$ ), and years being in practice (1–2, 2–3, 3–5, 16–20, 21–30, 31–99 years;  $p \geq .071$ ).

### Confidence Perceived by Licensed Chiropractors

Agreement of remembered confidence was not different between the five associations involved. No difference was observed in relation to chiropractors' age (age ranges: 25–34, 35–44, 45–54, 55–99;  $p \geq .055$ ), gender (263 male, 116 female;  $p \geq .210$ ).

Outcome concerning remembered confidence was only different in the following competency fields: expert performance in relation to age in years ( $p = .006$ ), community performance in relation to years since graduation ( $p = .013$ ) and years in practice ( $p = .011$ ), and management performance in relation to years being in practice ( $p = .013$ ). Figures 1 to 4 show how different variables (ie, age, years since graduation, and years being in practice) affected outcomes of three groups of licensed chiropractors, namely chiropractors graduating from the Anglo-European College of Chiropractic in England ( $N = 129$ ; 32%), the Sydansk Universitet in Denmark ( $N = 22$ ; 6%), and other chiropractic institutions ( $N = 244$ ; 62%). The majority of chiropractors from other chiropractic institutions

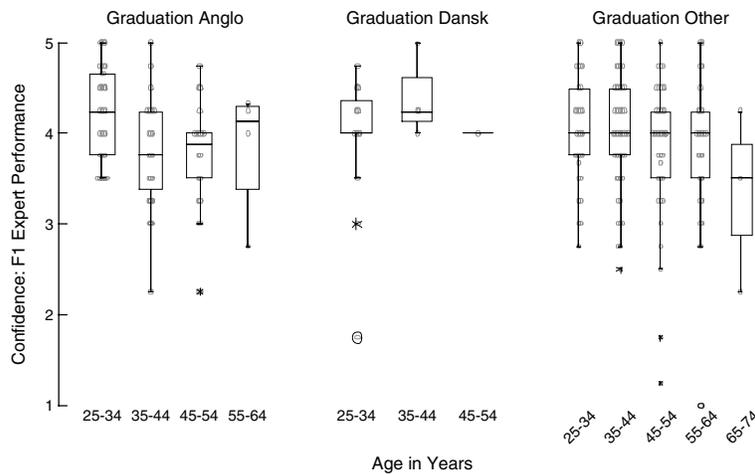


Figure 1. Remembered confidence of chiropractors graduated from England (Anglo), Denmark (Dansk), and other chiropractic institutions (Other): Expert performance in relation to age in years ( $p = .006$ ).

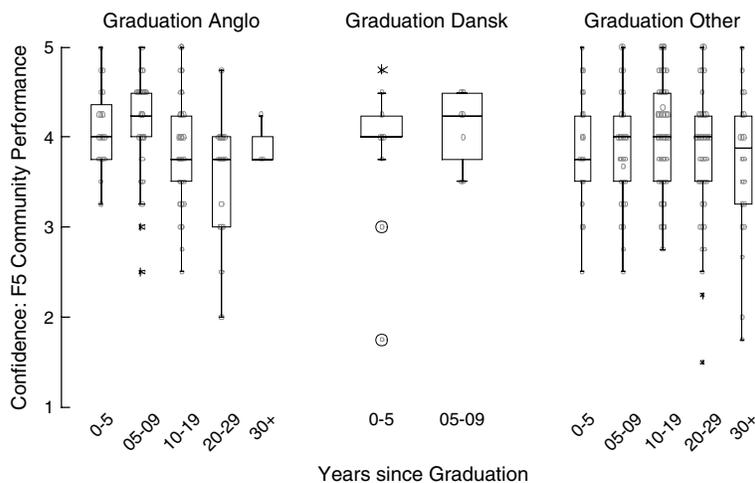


Figure 2. Remembered confidence of chiropractors graduated from England (Anglo), Denmark (Dansk), and other chiropractic institutions (Other): Community performance in relation to years since graduation ( $p = .013$ ).

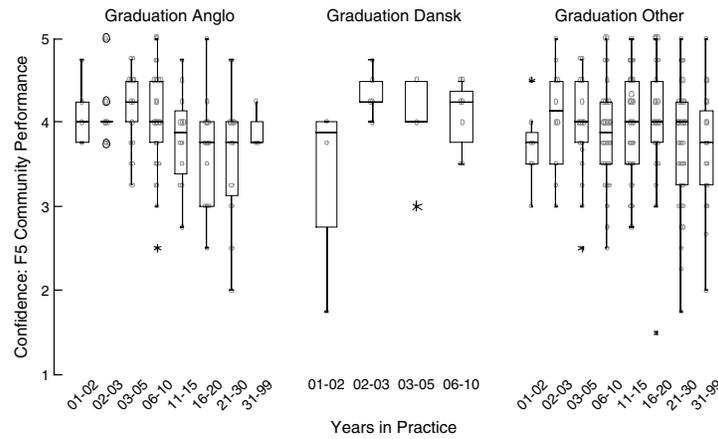


Figure 3. Remembered confidence of chiropractors graduated from England (Anglo), Denmark (Dansk), and other chiropractic institutions (Other): Community performance in relation to years in practice ( $p = .011$ ).

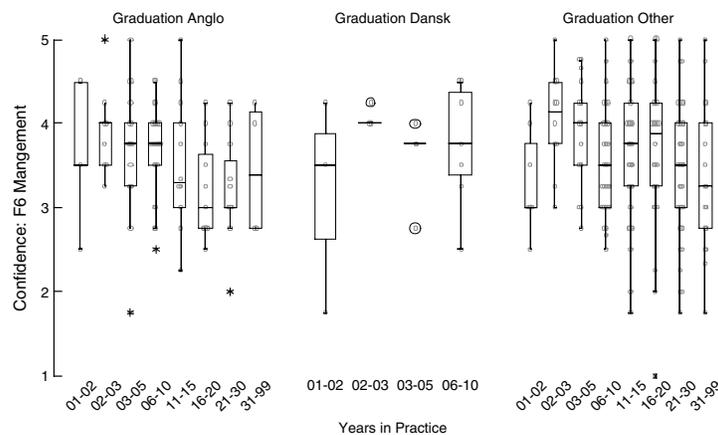


Figure 4. Remembered confidence of chiropractors graduated from England (Anglo), Denmark (Dansk), and other chiropractic institutions (Other): Management performance in relation to years being in practice ( $p = .013$ ).

( $N = 239$ ; 98%) graduated from chiropractic institutions of North America; three respondents graduated from the Institut Franco-Européen de Chiropratique in France, and two from the Macquarie University in Australia. All 151 (62%) responders from Switzerland graduated from chiropractic institutions outside of Europe.

### Difference of Judged Importance and Remembered Confidence Perceived by Licensed Chiropractors

We were interested in the correlation of judged importance and remembered confidence at 2 years after graduation. We decided to exclude cases with an importance judgment below 2.5 as unexplainable outliers. As we computed the sum scores of scales from nonmissing responses only, we wanted these

scores to be relatively free of missing data. Excluding responders with 20 or more missing responses, an admittedly arbitrary setting, we arrived at 370 persons with few missing data; by excluding 30 responders (7.5%) with more than 20 missing responses, we were able to exclude 531 of 677 or 78% of the missing responses. Had we excluded all responders with any missing response we would have been left with a sample size of 326.

A high rating of importance was consistently associated with a lower rating of remembered confidence (ie, with correlations between .3 and .4 (Table 4). The degree of judged importance of the items could be compared with the degree of remembered judgment of confidence at 2 years after graduation. The importance was consistently judged higher by about 1/2 point on the 5-point scale. This was significant ( $p < .001$ ) for all content scales (Table 4).

## DISCUSSION

The overall response rate of this anonymous survey was moderate to low despite the brevity of the questionnaire; its clear and attractive design; the author's appreciation, advice, and support to the administrators of the seven institutions involved; the author's aid to administrators concerning two timely reminders; and establishing trust by informing all stakeholders involved in advance. The major obstacle to Internet-based surveys is external validity and specifically how to obtain a representative sample and adequate response rate.<sup>13</sup> Low response rate is considered to be a major threat to the usefulness of a survey. Curtin et al<sup>14</sup> showed in their study of telephone response rates that this is not necessarily true. Comparison of response rates of 60%–70% to rates as low as 20%–40% showed minimal differences in substantive answers. Keeter et al<sup>15</sup> added that surveys with response rates of 60%–70% also suffer from significant nonresponsive bias. The robustness of the data collected partially redresses the low response rate, especially the ones from Germany and Norway. However, we do not know nonresponders' attitudes toward and confidence in these seven competency fields and one could assume that those students and practitioners who were more confident in their abilities would respond, perhaps with biased perceptions of their own abilities.<sup>16</sup> Therefore, the following discussion and conclusion must be viewed with this limitation. Conclusions drawn on the basis of the respondents' replies could be misleading and not true appraisals of populations from which samples were drawn. Practitioners' remembered level of confidence may give rise to recall bias.

Another limitation is the sampling strategy. At the time of the survey, it was extremely difficult to select either a random or a systematic nonrandom sample. Therefore, we had to use convenience sampling for the students and purposive sampling for the licensed chiropractors, being aware of their biases. Future replication of this survey at the remaining two ECCE-accredited institutions and 14 other ECU member nations must address this issue in order to be considered representative of the whole population of all ECU member nations.

Another possible drawback of the study could be that questionnaires have not been translated into Danish, French, Swedish, Norwegian, and German. However, students and licensed chiropractors in Europe should be familiar with the English language and culture because most of today's chiropractic literature has been and still is written in English. Finally, the key competencies assessed by the two questionnaires, although piloted by chiropractic educators before, have never been introduced to the participants of this study or assessed in daily chiropractic practice so far.

### Judged Importance

The data of Rademakers et al<sup>6</sup> and our study showed that senior students' appraisal of CanMEDS competency fields seem to be very concordant in medicine and chiropractic. All 28 key competencies were judged as important, independent of age and gender. Both groups assessed professionalism and communication as most important, management as least important (chiropractic students: mean = 4.07; medical students: mean = 3.92). Management describes a competency field as concerning personal

**Table 4. Comparison of Judged Importance and Remembered Confidence, Based on 370 of Originally 400 Respondents With Few Missing Values**

Competency fields	Mean importance	Mean confidence	Difference	<i>p</i>	Correlation
Expert performance	4.534	3.985	0.549	<.001	.307
Communication	4.489	4.006	0.482	<.001	.336
Collaboration	4.314	3.693	0.620	<.001	.389
Knowledge and science	4.183	3.524	0.659	<.001	.301
Community performance	4.502	3.924	0.578	<.001	.365
Management	4.150	3.599	0.551	<.001	.411
Professionalism	4.691	4.253	0.438	<.001	.322
<b>Total</b>	<b>4.407</b>	<b>3.855</b>	<b>0.552</b>	<b>&lt;.001</b>	<b>.394</b>

Note: The correlation coefficients are product-moment correlation coefficients.

development, working in a health care organization, allocating health care resources, and using information technology and should not be mistaken for patient management, which is part of the competency field of expert performance. Communication and professionalism were perceived as more important by English than Danish students. This might be interpreted as a possible influence of a competency-based curricular change in 2002 at the English institution.<sup>17</sup> All of these findings might be relevant for the two chiropractic colleges surveyed and should be studied in more detail so they can be addressed by their curricula.

Licensed chiropractors also perceived all 28 key competencies as important. Age, gender, graduating institution, years since graduation, and years being in practice made no difference. Outcome concerning judged importance was in line with senior students—highest mean rating scores of importance for professionalism and lowest for management (mean = 4.06).

### Remembered Confidence 2 Years After Graduation

Agreement of remembered confidence was not different between the five associations involved. No difference was observed in relation to age and gender. The four significant differences of judged confidence between the three different groups of licensed chiropractors with respect to their place of graduation could be due to the content of their undergraduate curricula or the self-assessment method of our survey.<sup>16,18</sup> Chiropractors graduating from institutions in North America might have appraised themselves as more confident as experts, health advocates, and managers than chiropractors graduating from the two European institutions during the last 2 decades except for the past 9 years. It seemed that graduates from European institutions gained in confidence in these three competency fields during the past 9 years (Figs. 1–4). This outcome must be considered as a likely result of the fact that 62% of respondents graduating from institutions outside of Europe were chiropractors from Switzerland, the only ECU member nation with 2 years of mandatory and structured postgraduate education (after graduation from undergraduate chiropractic institutions) for the past 25 years.<sup>19</sup> Further research is needed to explore these differences.

### Difference of Judged Importance and Remembered Confidence

A high rating of importance was consistently associated with a lower rating of remembered confidence at 2 years after graduation. This difference in appraisal of the seven competency fields should be kept in mind while developing a model curriculum for chiropractic graduate training in Europe.

### CONCLUSION

This study showed that all seven competency fields (CanMED roles) were perceived as important in a chiropractic context. The fact that all 28 key competencies were seen as important by students and chiropractors adds to their face validity and therefore to their potential usefulness as a basis for graduate training. In addition, licensed chiropractors judged the importance of these competencies to be significantly higher than their remembered confidence in these competency fields at 2 years after graduation. Therefore, all seven competency fields might be used as a base for future chiropractic graduate training in Europe. Because of the low to moderate response rates and relatively small samples, this survey should be replicated institution by institution. Other methods such as the Delphi method to acquire consensus regarding aspects of competencies being trained during graduate education in Europe as well as additional information should be gathered to reflect reality in practice.

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### CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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