

# Leadership competencies for medical education and healthcare professions: population-based study

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**To cite:** Çitaku F, Violato C, Beran T, *et al.* Leadership competencies for medical education and healthcare professions: population-based study. *BMJ Open* 2012;**2**:e000812. doi:10.1136/bmjopen-2012-000812

► Prepublication history and additional appendix for this paper are available online. To view these files please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2012-000812>).

Received 2 January 2012  
Accepted 16 February 2012

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## ABSTRACT

**Objective:** To identify and empirically investigate the dimensions of leadership in medical education and healthcare professions.

**Design:** A population-based design with a focus group and a survey were used to identify the perceived competencies for effective leadership in medical education.

**Setting:** The focus group, consisting of five experts from three countries (Austria n=1; Germany n=2; Switzerland n=2), was conducted (all masters of medical education), and the survey was sent to health professionals from medical schools and teaching hospitals in six countries (Austria, Canada, Germany, Switzerland, the UK and the USA).

**Participants:** The participants were educators, physicians, nurses and other health professionals who held academic positions in medical education. A total of 229 completed the survey: 135 (59.0%) women (mean age=50.3 years) and 94 (41.0%) men (mean age=51.0 years).

**Measures:** A 63-item survey measuring leadership competencies was developed and administered via electronic mail to participants.

**Results:** Exploratory principal component analyses yielded five factors accounting for 51.2% of the variance: (1) social responsibility, (2) innovation, (3) self-management, (4) task management and (5) justice orientation. There were significant differences between physicians and other health professionals on some factors (Wilks's  $\lambda=0.93$ ,  $p<0.01$ ). Social responsibility was rated higher by other health professionals (M=71.09) than by physicians (M=67.12), as was innovation (health professionals M=80.83; physicians M=76.20) and justice orientation (health professionals M=21.27; physicians M=20.46).

**Conclusions:** The results of the principal component analyses support the theoretical meaningfulness of these factors, their coherence, internal consistency and parsimony in explaining the variance of the data. Although there are some between-group differences, the competencies appear to be stable and coherent.

According to Bennis<sup>1</sup>—an expert in the study of leadership—an important threat facing the world today is the lack of effective leadership of our human institutions. Indeed,

## ARTICLE SUMMARY

### Article focus

- The major focus was to identify and empirically investigate the dimensions of leadership in medical education and healthcare professions.
- A 63-item survey was developed and administered via electronic mail to 229 healthcare professional educators and leaders in six countries (Austria, Canada, Germany, Switzerland, the UK and the USA).

### Key messages

- Exploratory principal component analyses yielded five dimensions of leadership: (1) social responsibility, (2) innovation, (3) self-management, (4) task management, and (5) justice orientation.
- Social responsibility was rated higher by other health professionals compared with physicians, as was innovation and justice orientation.

### Strengths and limitations of this study

- The results of the principal component analyses support the theoretical meaningfulness of these factors, their coherence, internal consistency and parsimony in explaining the variance of the data.
- Our five-factor leadership competency model needs to be replicated and extended with larger representative samples from other cultures.
- Notwithstanding the limitations of the present study, it is one of the few that has explicitly defined and provided empirical evidence for leadership competencies considered to be the most important in medical education.

Lipman-Blumen<sup>2</sup> has called attention to the failure of leadership in government, universities, healthcare and financial institutions. Health organisations and medical schools—like other human institutions—need competent and effective leaders now more than ever to face the threats and challenges of the modern world.<sup>3 4</sup>

Long time scholars in the field of leadership, Vroom and Jago<sup>5</sup> defined leadership as a 'process of motivating people to work together collaboratively to accomplish great

things' (p. 18). Accordingly, leadership is a process, not a property of a person. It involves a particular form of influence called *motivating*, resulting in collaboration in pursuit of a common goal to achieve the great things that are in the minds of both leader and followers.<sup>5</sup> Identifying and defining the central competencies of leadership, however, remain elusive. The major purpose of the present study was to empirically investigate the core competencies for medical education leaders—an area that has not been systematically studied.

Leaders face many challenges in healthcare and medical education institutions.<sup>6–8</sup> Educational leaders are under scrutiny to achieve heightened expectations for improvement to teaching and learning. They are called to be educational visionaries, instructional and curriculum leaders, assessment experts, community builders, public relations experts, budget analysts, facility managers, special programmes administrators and expert overseers of legal, contractual and policy mandates and initiatives. Yet, they encounter major challenges such as commercialisation of the university's and medical school's central purpose, perceived lack of accountability of higher education and heightened sensitivity of taxpayers towards ineffective and inefficient leadership in academia.<sup>9</sup> Medical school leaders, in addition, are confronted with many concerns such as financial stability, curriculum development, research support and accreditation standards. The ability to meet these demands may be compromised as a result of inadequate and inefficient leadership.

## LEADERSHIP THEORIES

In a recent (2011) meta-analysis of trait and behavioural theories of leadership, Derue *et al.*<sup>10</sup> concluded that much of the research evidence fails to provide an integrated framework for understanding what constitutes leadership effectiveness. They did empirically identify some leader traits and behaviours that represent effective leadership, however. The concept of leadership overlaps with two similar terms, management and administration. The former is used widely in Europe and Africa, while the latter is preferred in the USA, Canada and Australia. Leadership is often of great contemporary interest in most countries in the developed world.<sup>11</sup>

Some leadership researchers distinguish between leadership, administration and management. They suggest that leadership is synonymous with change, while management and administration are considered as maintenance. All three dimensions are identified as critical functions of organisational activity. Taken together, leadership can be construed as a means of shaping the goals, motivations and actions of others to initiate change or maintain stability.<sup>12</sup> Some researchers have adopted a social perspective to conceptualise leadership. Spillane *et al.*<sup>13</sup> for example, argued that leadership activity is defined or constructed through the interaction of leaders and followers during the execution of leadership tasks.

## The importance of effective leadership

Many authors<sup>14 15</sup> have argued that high-quality leadership is imperative to the success of educational institutions. Many researchers have emphasised idealised personal characteristics such as educational visionaries, instructional and curriculum leaders, assessment experts, community builders, public relations experts, budget analysts, facility managers, special programmes administrators and expert overseers of legal, contractual and policy mandates, and initiatives are thought to characterise effective leaders. The preponderance of empirical evidence, however, does not support this trait model of leadership effectiveness.<sup>10</sup> Although effective leaders can have a positive influence on achievement, poor leaders can have a marginal or even negative impact on success.<sup>14</sup>

Waters and Grubb<sup>14</sup> in their study reported three major findings that support the notion that school-level leadership matters in student achievement. First, they found that principal leadership was correlated with student achievement; one SD improvement in principal leadership was associated with a 10 percentile increase in student achievement. Second, they identified several leadership practices or processes required to fulfil a number of responsibilities that were significantly and directly related to student achievement. Third, they found a differential impact of leadership—just as leaders can have a positive impact on student's achievement, they also can have marginal or, worse, a negative impact on student's achievement.

Wagner and colleagues<sup>16</sup> operationalised leadership competencies based on a systematic review of research in business practices, resulting in an inventory of over 107 specific competencies. These were categorised to obtain five major competencies including self-management that refers to personal insight and self-control, leading others involves motivating others to set and meet goals, task management includes effective and efficient completion of prioritised duties, innovation describes developing a vision and responding to opportunities and social responsibility entails promoting integrity. It is not yet known whether these types of competencies are relevant to medical education. Indeed, only one study has examined leadership in this context. Violato and Cawthorpe<sup>17</sup> in a systematic review identified key competencies for scholars, teachers, researchers and leaders in medical education. These include (1) medical education expert, (2) educational leadership, (3) curriculum designer, (4) teacher, (5) educational researcher and scholar and (6) learner assessor. They concluded that acquisition of these competencies requires systematic formal education such as graduate studies.

Leadership is a complex multifaceted phenomena that is widely observed but poorly understood. In consonance with the conclusions of others,<sup>1 10</sup> the foregoing review indicates that further empirical work in leadership—particularly in medical education—is required. Given that leadership is associated with student achievement,

successful team functioning and efficient institutional operations, it is critical that an empirically supported comprehensive definition be developed in medical education. The major purpose of the present study, therefore, was to identify the core competencies for medical education leaders. Accordingly, we adapted a survey questionnaire based on the instrument from Wagner *et al*<sup>6</sup> to present to medical education leaders to identify the primary competencies of medical education leadership. Specifically, we wished to address the following research questions: (1) what are the perceived competencies that characterise successful leadership in medical education? (2) Do these perceived leadership competencies in medical education vary by country or language groups or for men and women? and (3) Do these desired leadership competencies in medical education differ between physicians and other health professions?

## METHODS

### Participants

#### Experts

A focus group consisting of five medical education experts from three countries (Austria  $n=1$ ; Germany  $n=2$ ; Switzerland  $n=2$ ) was conducted (Master of medical education graduates who earned their Masters degree at University of Bern in collaboration with University of Illinois at Chicago). Their specialisation background was medicine ( $n=2$ ) or health professions ( $n=3$ ). The mean age of the focus group participants was 43.2 years. They had several years of clinical ( $M=10.7$  years) and teaching experience ( $M=10.3$  years), with a few years of medical education leadership ( $M=2.4$  years).

#### Survey respondents

A final sample of 229 participants from six countries completed an electronic survey (338 had been contacted for a 67.8% response rate). Most participants were from Canada ( $n=75$ ; 32.8%), followed by the USA ( $n=59$ ; 25.8%), Switzerland ( $n=41$ ; 17.9%), Germany ( $n=25$ ; 10.9%), Austria ( $n=14$ ; 6.6%) and the UK ( $n=14$ ; 6.1%). The participants all held academic positions in medical education with different backgrounds including physicians ( $n=91$ ; 39.7%), nurses ( $n=84$ ; 36.7%), educators ( $n=25$ ; 10.9%) and other health professionals ( $n=29$ ; 12.7%).

There were 135 (59.0%) women and 94 (41.0%) men. The mean age for women was 50.3 years and for men was 51.0 years. There were 137 (59.8%; women=90; men=47) from countries with English as the predominant language, 88 (38.4%; women=45; men=43) from countries with German as the predominant language and 4 from countries with various other identified predominant languages (2.2%; the Netherlands=2; Denmark=1; South Africa=1). Respondents indicated the following academic titles: professor=123 (53.7%), associate professor=37 (16.2%), assistant professor=28 (12.2%), master degree teacher=36 (15.7%) and bachelor degree teacher=5 (2.2%).

Compared with the 109 participants (32.2%) who did not complete the survey, those who had completed the survey had slightly more years of experience in leadership ( $M=11.97$  (0.58) vs  $M=8.54$  (8.39),  $p<0.05$ ) and years of teaching experience ( $M=17.34$  (10.81) vs  $M=14.26$  (10.43),  $p<0.05$ ) as they did years of clinical experience ( $M=17.75$  (12.22) vs  $M=15.23$  (12.26),  $p<0.05$ ). There were no differences between the two groups, however, for sex composition, language group and level of scholar.

#### Focus group procedures

Five experts in a focus group were asked to select the most appropriate competencies relevant for medical education from the Leadership Competency Model questionnaire developed by Wagner *et al*.<sup>16</sup> To determine which competencies to retain from the 107 items dealing with leadership in general, a consensus approach was used. At least four expert raters (80%) were required to independently agree that the competency was applicable to leadership in medical education for the competency to be retained. Based on this procedure, the questionnaire was reduced to 63 items applicable to leadership in medical education. In the present study, we used the same long definitions as did Wagner *et al* but because of space considerations, we used brief descriptions in the tables. Appendix A contains all the Wagner *et al* items and an indication of which we retained in the present study and which we did not use.

#### Survey procedures

Survey participants were from four medical schools in each country, which was randomly selected using the cluster sampling method (Austria, Canada, Germany, Switzerland, UK and the USA). In cluster sampling, according to Gay *et al*,<sup>18</sup> intact groups rather than individuals are randomly selected. Cluster sampling was the only feasible method of selecting a sample because it was not possible to obtain a list of all members from the theoretical population. Gay *et al*<sup>18</sup> suggest using this method when the population is very large and spread over a wide geographical area such as the present sample.<sup>1</sup> The 63-item survey was sent by email to professors, associate professors and assistant professors.

#### Data analyses

Reliability of the survey scores was assessed using Cronbach's  $\alpha$ . In addition to content validity, evidence of factorial validity was assessed using exploratory factor analysis. Specifically, principal components analysis with varimax rotation was utilised. Between-group differences were analysed using contingency tables (Fisher's exact test) and multivariate analyses of variance (MANOVAs). The study was approved by the Ethics Review Committee of the University Ambrosiana.

<sup>1</sup>Switzerland has only five medical schools and Austria has four. Switzerland has only four universities that offer academic nursing or health professions education. Austria has also only four such institutions.

## RESULTS

### Descriptive statistics of the survey items

Descriptive statistics of the items are summarised in table 1. Most of the participants rated each item as important (4) or very important (5), but for many items, the entire scale (1–5) was utilised (table 1). The means of the items ranged from 3.85 (#18: Honesty and Integrity) to 4.76 (#3: Personnel Decision Quality). The SDs are typical (<1.0) for five-point items, indicating that data points are clustered closely around the mean.

### Principal component analyses and reliability

Several exploratory principal component analyses were conducted resulting in 10, 8, 7 and 5 factor solutions. It was determined that the optimum solution was five factors as they accounted for more than 50% of the variance, were cohesive and made theoretical sense (see table 2). The five factors identified as leadership competencies were Social Responsibility, Innovation, Self-Management, Task Management and Justice Orientation.

Of the initial 63 items, 11 were removed since they had small loadings (<0.40) on all factors. The removed questions were from the following competency domains: one from Task Management, one from Social Responsibility, one from Self-Management Competencies, six from Leading Others and one from Innovation.

As can be seen from table 2, the eigenvalue for Factor 1 (Social Responsibility) is large (35.55) compared with the others. This shows that the Social Responsibility factor across countries, languages, sex, professions and experiences in medical education was the most cohesive, accounting for the most variance (16.63%). Innovation was identified as the second factor, accounting for 15.35% of the total variance. Self-management, Task Management and Justice Orientation were also identified as shown in table 2.

The results summarised in table 2 also show very high reliability of items within each factor. Cronbach's  $\alpha$  was 0.93 for Social Responsibility and Innovation, 0.84 for Self-Management, 0.72 for Task Management and 0.93 for Factor 5 Justice Orientation. All five factors were intercorrelated (mean  $r=0.55$ ; range: 0.44–0.79;  $p<0.01$ ).

Together with the high internal consistency of each factor's items, the overall pattern of factor loadings supports the coherence of the factors. Among the items that had the highest loadings on Social Responsibility, for example, are honesty and integrity (0.81) and accountability (0.81). All the other loadings on this factor were moderate (eg, >0.40) to large (>0.80). A similar pattern of loadings is evident for the other four factors.

A close inspection of table 2 also shows that there is agreement between the items that form the scales of the original instrument<sup>16</sup> and the obtained factor structure. Many of the items do load on the expected factors (or scales) even though our results produced a slightly different set of scales (ie, Justice Orientation) compared with the original Wagner *et al* instrument.<sup>16</sup> The sum of scores was calculated for items with the highest loadings

under each factor. These new scores were used as dependent variables in the subsequent analyses.

### Differences between countries and sex differences

Given the disproportionate number of women (60.9%) in the sample, we compared the number of men and women who spoke each language. Accordingly, a contingency table with sex by language with Fisher's exact test was done. There was a significant difference between the proportion of English-speaking women (90; 66.7%) and German-speaking ones (45; 33.3%) ( $p<0.01$ ), while for men, there were approximately equal proportions (English=51.1%; German 48.9%). Two one-way analyses of variance (independent variable = sex) with the dependent variables (age and leadership experience) were run. There were no significant differences for age ( $F=0.48$ ,  $p<0.49$ ) or for leadership experience ( $F=1.80$ ,  $p<0.18$ ) between men and women.

### Sex and language differences by subscales

A two-way MANOVA (independent variables = sex and language) with five dependent variables (factors = Social Responsibility, Innovation, Self-Management, Task Management and Justice Orientation) was run. There was no main effect for sex (Wilk's  $\lambda=0.96$ ,  $p<0.10$ ). There was a main effect for language (Wilk's  $\lambda=0.93$ ,  $p<0.007$ ) but on only two factors (Innovation, Justice Orientation) with English speakers providing higher ratings than German speakers on both factors (table 3). There were no significant interaction effects (Wilk's  $\lambda=0.98$ ,  $p<0.50$ ). The means and SDs of the factors by sex and language are shown in table 3.

### Differences between physicians and other health professionals

A one-way MANOVA (independent variable = physicians and other health professionals) with five dependent variables (factors = Social Responsibility, Innovation, Self-Management, Task Management and Justice Orientation) was conducted. There were significant differences between physicians and other health professionals (Wilk's  $\lambda=0.93$ ,  $p<0.01$ ). As shown in table 4, Social Responsibility, Innovation and Justice Orientation were rated higher by other health professionals than by physicians.

To identify which groups of health professionals (nurse, general practitioner, internist, surgeon and educator)<sup>ii</sup> endorse higher ratings on the three leadership competences, a one-way MANOVA was used. There

<sup>ii</sup>A total of 53 specialities in medical and health professions were identified. To permit analyses across specialities, they were coded into five groups: (1) nursing, which included nursing, midwifery, physiotherapy and occupational therapy; (2) general practitioner comprising general practitioners, dentists, family medicine, etc.; (3) internal medicine comprising internists, gynaecologists, palliative specialists, oncologists, cardiologists, endocrinologists, etc.; (4) surgery comprising subspecialities in surgery and anaesthesiologists and (5) educators comprising psychologists, sociologists, biologists, chemistry educators, administrators, etc.

**Table 1** Minimum, maximum, mean and SD of the 63 questionnaire items

Items	Minimum	Maximum	Mean	SD
1. Maintain quality	1	5	4.16	0.77
2. Succession planning/recruiting	1	5	4.31	0.82
3. Personnel decision quality	1	5	4.54	0.69
4. Maintaining safety	1	5	4.13	0.87
5. Enhancing task knowledge	2	5	4.24	0.70
6. Eliminating barriers to performa	1	5	4.26	0.72
7. Strategic task management	1	5	4.43	0.70
8. Communication with community	1	5	3.85	0.90
9. Providing a good example	2	5	4.58	0.67
10. Knowledge of organisation justice	2	5	4.44	0.72
11. Legal regulations	1	5	4.29	0.75
12. Open-door policy	2	5	4.41	0.78
13. Explaining decisions respect	1	5	4.55	0.66
14. Servant leadership	1	5	4.30	0.77
15. Distributing rewards fairly	1	5	4.28	0.85
16. Responsibility for others	1	5	4.24	0.81
17. Financial ethics	1	5	4.17	0.93
18. Honesty and integrity	1	5	4.76	0.59
19. Being accountable	1	5	4.71	0.61
20. Time management	1	5	4.24	0.71
21. Goal orientation	2	5	4.21	0.66
22. Taking initiatives	1	5	4.13	0.74
23. Effort: achieve goals	1	5	4.26	0.73
24. Persistence: despite challenges	2	5	4.32	0.71
25. Self-control	1	5	4.17	0.80
26. Stress tolerance	2	5	4.36	0.67
27. Adaptability	1	5	4.45	0.73
28. Self-reliance	1	5	4.21	0.79
29. Continuous learning	1	5	4.36	0.71
30. Seeking feedback	1	5	4.35	0.72
31. Communicating with coworkers	2	5	4.51	0.67
32. Active listening	1	5	4.50	0.71
33. Facilitating discussion	1	5	4.37	0.71
34. Developing external contacts	1	5	4.11	0.80
35. Psychological knowledge	2	5	4.02	0.79
36. Social perceptiveness	2	5	4.10	0.75
37. Nurturing relationships	2	5	4.32	0.69
38. Taking charge	2	5	4.20	0.73
39. Orienting others	1	5	4.10	0.80
40. Setting goals for others	2	5	4.00	0.77
41. Reinforcing success	3	5	4.18	0.68
42. Developing and building teams	2	5	4.32	0.69
43. Knowing principles of learning	2	5	3.94	0.83
44. Assessing others	2	5	4.07	0.71
45. Coaching, develop, instructing	1	5	4.23	0.76
46. Cooperating	1	5	4.36	0.66
47. Resolving conflicts/negotiating	2	5	4.44	0.62
48. Empowerment	2	5	4.38	0.71
49. Political savvy	1	5	4.10	0.88
50. Critical thinking	2	5	4.41	0.68
51. Creative problem solving	1	5	4.44	0.72
52. Identifying problems	3	5	4.44	0.64
53. Seeking improvement	2	5	4.17	0.76
54. Openness to ideas	1	5	4.46	0.70
55. Collaborating	1	5	4.36	0.74
56. Perceiving systems	2	5	4.15	0.76
57. Evaluating consequences	2	5	4.21	0.76
58. Visioning	2	5	4.02	0.88
59. Managing the future	2	5	4.20	0.75

Continued

Table 1 Continued

Items	Minimum	Maximum	Mean	SD
60. Sensitivity to situations	2	5	4.16	0.75
61. Challenging the status quo	1	5	4.24	0.82
62. Intelligent risk taking	2	5	4.21	0.75
63. Reinforcing change	2	5	4.29	0.69

were significant differences across specialties (Wilk's  $\lambda=0.82$ ,  $p<0.003$ ). Post hoc tests (Tukey's HSD) revealed that Social Responsibility was rated the highest by nurses (M=71.79), followed by internists (M=70.83). General practitioners rated this leadership competency the lowest (M=66.53). Innovation was rated the highest by nurses (M=82.23) and the lowest by general practitioners (M=74.26). Justice Orientation was rated the highest by nurses (M=21.64) and the lowest by general practitioners (M=20.20). There were no

significant differences for Self-Management and Task Management.

Group differences between junior, midlevel, senior and administrator scholars

A one-way MANOVA determined whether there were any significant differences in the five leadership competencies across junior-, midlevel-, senior- and administrator-level positions. No significant differences were found (Wilk's  $\lambda=0.90$ ,  $p>0.05$ ).

Table 2 Principal components orthogonally rotated varimax factor matrix to the normalised Kaiser criterion\*

Items	Factors				
	1 Social responsibility	2 Innovation	3 Self-management	4 Task management	5 Justice orientation
Succession planning/recruiting				0.636 TM	
Personnel decision quality				0.578 TM	
Maintaining safety					0.480 TM
Enhancing task knowledge				0.401 TM	
Eliminating barriers				0.457 TM	
Strategic task management				0.540 TM	
Communication with community					
Providing a good example	0.511 SR				
Knowledge of organisation justice					0.546 SR
Legal regulations					0.674 SR
Open-door policy	0.677 SR				
Explaining decisions respect	0.698 SR				
Servant leadership	0.563 SR				
Distributing rewards fairly	0.434 SR				
Responsibility for others				0.486 SR	
Honesty and integrity	0.810 SR				
Being accountable	0.806 SR				
Goal orientation			0.544 SM		
Taking initiatives			0.515 SM		
Effort: achieve goals			0.576 SM		
Persistence: despite challenges			0.516 SM		
Self-control			0.484 SM		
Stress tolerance			0.530 SM		
Adaptability	0.651 SM				
Self-reliance			0.623 SM		
Continuous learning			0.431 SM		
Seeking feedback	0.506 SM				
Communicating with coworkers	0.511 LO				
Active listening	0.658 LO				
Facilitating discussion	0.494 LO				
Developing and building teams		0.498 LO			
Psychological knowledge		0.593 LO			
Social perceptiveness		0.649 LO			
Setting goals for others			0.568 LO		

Continued

Table 2 Continued

Items	Factors				
	1 Social responsibility	2 Innovation	3 Self-management	4 Task management	5 Justice orientation
Knowing principles of learning		0.565 LO			
Assessing others		0.495 LO			0.567 LO
Coaching, development, instruction		0.546 LO			0.405 LO
Cooperating	0.603 LO				
Empowerment	0.425 LO				
Political savvy		0.596 LO			
Critical thinking		0.521 IN			
Creative problem solving	0.473 LO	0.529 IN			
Identifying problems		0.509 IN			
Openness to ideas	0.654 IN				
Collaborating	0.542 IN	0.418 IN			
Perceiving systems		0.643 IN			
Evaluating consequences		0.616 IN			
Visioning		0.657 IN			
Managing the future		0.720 IN			
Sensitivity to situations		0.664 IN			
Challenging the status quo	0.437 IN	0.499 IN			
Intelligent risk taking		0.642 IN			
Reinforcing change		0.537 IN			
Eigenvalue	35.55	5.68	3.66	3.48	3.12
% Of variance	16.63	15.35	7.09	6.92	5.19
M	69.52	79.00	37.71	25.82	20.95
SD	8.22	10.15	4.56	3.06	2.73
Cronbach's $\alpha$	0.93	0.93	0.84	0.72	0.93

\*Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalisation; rotation converged in 12 iterations. SR, social responsibility; LO, Leading others; SM, Self-management; IN, innovation; TM, Task management.

## DISCUSSION

The purpose of the present study was to identify and empirically investigate the perceived competencies of leadership in medical education. First, a group of medical education leaders selected 63 of the most important leadership characteristics from a list of 107 identified in the previous research. Second, questionnaire data were used in principal component analyses to obtain five competencies of leadership that include Social Responsibility, Innovation, Self-Management, Task Management and Justice Orientation. Cronbach's  $\alpha$  reliabilities of the factors were high, indicating good coherence and internal consistency. Third, differences between men and women, areas of specialisation and language were found for Social Responsibility, Innovation and Justice Orientation. Fourth, all five factors were strongly intercorrelated indicating that they all assessing the construct of leadership. These combined results suggest that the five leadership competences represent a coherent, reliable and parsimonious model of leadership in medical education. Moreover, these fit well with the definition provided by Vroom and Jago<sup>5</sup> of leadership as a process of motivating people to 'accomplish great things' in medical education by demonstrating social responsibility, innovation and justice, as well as more prosaic activities of self- and task management.

Medical education leaders identified Social Responsibility as the most dominant competency. It was found to

be the least important, in contrast, by Wagner *et al.*<sup>16</sup> This difference is likely due to the emphasis on collaboration and interdisciplinary practice within the medical and health professions, in comparison to competition and independence within business.<sup>1</sup> Another major difference between the two models is that we identified a Justice Orientation competency, which was not part of the Wagner *et al.*<sup>16</sup> model. It is not surprising that maintaining safety, following laws and regulations, and monitoring progress, as indicated by Justice Orientation, are critical to teaching in medicine. Innovation was also deemed to be a major leadership competency in the present study, according to ratings of knowing learning principles and building relationships. With limited resources and high expectations, leadership requires creative approaches that are based on sound principles and human resources. Self-management involves setting and achieving goals despite barriers, and Task Management entails planning and efficiency. All these qualities are important for managing threats to human health and providing leadership to health professionals.

The expert input from the focus group together with the principal component analyses confirmed that medical educators do have a shared vision of the competencies that comprise effective leadership in medical education. The items of Leading Others in Wagner *et al.*<sup>17</sup> model are found in our results as well but are spread across several factors. If a leader demonstrates

**Table 3** Means and SDs for the five subscales for sex and language

	Sex	Language	M	SD	n
Social responsibility	Male	English	67.40	11.05	47
		German	68.60	7.72	45
		Total	67.99	9.54	92
	Female	English	71.31	7.35	90
		German	68.63	6.32	43
		Total	70.44	7.12	133
Total	English	69.97	8.95	137	
	German	68.61	7.03	88	
	Total	69.44	8.26	225	
Innovation*	Male	English	77.68	11.94	47
		German	77.38	10.95	45
		Total	77.53	11.41	92
	Female	English	80.99	9.00	90
		German	77.33	8.54	43
		Total	79.80	8.99	133
	Total	English	79.85	10.18	137
		German	77.35	9.79	88
		Total	78.88	10.09	225
Self-management	Male	English	37.57	5.06	47
		German	37.56	4.93	45
		Total	37.57	4.97	92
	Female	English	38.32	4.23	90
		German	36.60	4.28	43
		Total	37.77	4.31	133
Total	English	38.07	4.53	137	
	German	37.09	4.62	88	
	Total	37.68	4.58	225	
Task management	Male	English	25.68	3.25	47
		German	25.69	2.75	45
		Total	25.68	3.00	92
	Female	English	25.84	3.31	90
		German	25.77	2.67	43
		Total	25.82	3.11	133
Total	English	25.79	3.28	137	
	German	25.73	2.69	88	
	Total	25.76	3.06	225	
Justice orientation*	Male	English	20.74	3.17	47
		German	19.98	2.84	45
		Total	20.37	3.02	92
	Female	English	21.96	2.30	90
		German	20.19	2.35	43
		Total	21.38	2.45	133
	Total	English	21.54	2.68	137
		German	20.08	2.60	88
		Total	20.97	2.74	225

\*p<0.05.

high Social Responsibility, Innovation, Self-Management, Task Management and Justice Orientation, these competencies will support him or her to efficiently lead others.

These competencies, in addition, are cohesive, theoretically meaningful and reliable. There were no sex differences on any of the factors. Moreover, while there was generally agreement in the two language groups on three factors, as indicated by the similarity in scores between languages, there were differences for

**Table 4** Means and SDs between physicians and other health professionals

		Physicians versus health professions	M	SD	n
Social responsibility**	Physicians	67.12	9.58	91	
	Health professionals	71.09	6.76	138	
	Total	69.51	8.22	229	
Innovation**	Physicians	76.20	10.53	91	
	Health professionals	80.83	9.32	138	
	Total	78.99	10.05	229	
Self-management	Physicians	37.12	5.00	91	
	Health professionals	38.09	4.22	138	
	Total	37.70	4.56	229	
Task management	Physicians	25.51	3.06	91	
	Health professionals	26.00	3.05	138	
	Total	25.81	3.05	229	
Justice orientation*	Physicians	20.46	2.85	91	
	Health professionals	21.27	2.61	138	
	Total	20.95	2.73	229	

\*p<0.05, \*\*p<0.01.

Innovation and Justice Orientation. It was the English language respondents who rated these two factors higher than did the German language respondents. This probably reflects the emphasis put on innovation and justice in educational and health systems in the Anglo world.

Additionally, there were significant differences between physicians and other health professionals on some of the dimensions (Social Responsibility, Innovation and Justice Orientation). The physicians gave lower ratings to the importance of these competencies compared with the other health professionals. The majority of responders from other health professions were nurses, followed by physiotherapists, midwives and educators. This group is likely to spend considerable time with patients developing rapport and perhaps a sense of responsibility for creative solutions to ensure that their personal needs are met. Nurses, thus, may be likely to endorse the need for Social Responsibility and Innovation in medical education. The Justice Orientation competency was also rated higher by other health professionals than by physicians. Knowing and applying principles of fairness to ensure that subordinates are treated fairly may resonate more with nurses and other healthcare professionals than with physicians, who tend to be in a position of power over other healthcare professionals.

**Limitations**

The survey response rate was high (67.8%), but the completers were slightly older and had slightly more years of teaching and clinical experience than did the non-completers. In several other ways, the two groups were the same, so it is unlikely that these minor differences produced biased results. All the six countries represent Western cultures and, therefore, are not fundamentally different regarding social, economic and demographic characteristics.



## Conclusions

The present study indicates that core competencies in medical education leadership can be empirically identified and categorised into five factors: (1) Social Responsibility, (2) Innovation, (3) Self-Management, (4) Task Management, and (5) Justice Orientation that are theoretically meaningful, coherent, internal consistent and parsimonious in explaining the variance of the data. Although there are some between-group differences in the factors (physicians versus other healthcare professionals), there are no substantive differences by country or language. Accordingly, the competencies appear to be stable and coherent. Work in the UK has also resulted in a classification of 'clinical leadership' competencies that are in concordance with the present findings.<sup>19</sup> Notwithstanding the limitations of the present study, it is one of the few that has explicitly defined and provided empirical evidence for leadership competencies considered to be the most important in medical education.

Future research should be designed to replicate, extend and confirm the present findings. Our five-factor leadership competency model needs to be replicated and extended with larger representative samples from other cultures. Future research could be theoretically strengthened by employing confirmatory factor analyses on a new data set. Meanwhile, we have provided an empirical model of leadership competencies that can be employed to further investigate leadership in medical and health professions education.

**Contributors** All authors contributed equally to this study. All authors have made contributions to the paper according to the ICMJE guidelines for authorship: (1) substantial contributions to conception and design, acquisition of data or analysis and interpretation of data; (2) drafting the article or revising it critically for important intellectual content and (3) final approval of the version to be published.

**Funding** This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None.

**Ethics approval** Ethics Review Committee of the University Ambrosiana.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data sharing statement** Raw data for this study can be acquired upon request from the corresponding author at [violato@ucalgary.ca](mailto:violato@ucalgary.ca).

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**STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology\***  
**Checklist for cohort, case-control, and cross-sectional studies (combined)**

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1, 5
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5-8
Objectives	3	State specific objectives, including any pre-specified hypotheses	8
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	8-10
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	8-9
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	11
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9-10
Bias	9	Describe any efforts to address potential sources of bias	10
Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	10
		(b) Describe any methods used to examine subgroups and interactions	10
		(c) Explain how missing data were addressed	10

		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses	
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	9
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	9, 11 12
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	12-14
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	12
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	13-14
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16-17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).