

# Exploration of current status and influencing factors of leadership competency of medical graduate freshmen based on three different models

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## Research Article

**Keywords:** Competency based medical education, Leadership competency, Medical graduate freshmen, Themed series of activities

**Posted Date:** April 12th, 2022

**DOI:** <https://doi.org/10.21203/rs.3.rs-1507453/v1>

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# Abstract

**Background:** It calls great attention of the leadership competency status of medical students as it is believed that their good leadership ability can improve the clinical practice or research outcome. It is believed to be among the most important competency of a doctor or a scientist. Meanwhile, the leadership competency status of the medical graduate freshmen and the influencing factors of it had been rarely researched.

**Methods:** From July to September in 2020 and 2021, 851 medical graduate freshmen from seven teaching hospitals of the Capital Medical University (CMU) participated in a survey including three 5-point Likert scales based on different models and in which they implied their leadership abilities. The scales included Socially Responsible Leadership Scale (SRLS), Emotionally Intelligent Leadership for students Inventory (EILI) and the Student Leadership Practices Inventory-Self Instrument (SLPI). After self-scoring of these three scales, four questions were asked about the attitude of the cultivation of leadership and scored by the 5-point Likert scale. The data were then analyzed by two independent samples t-test or one-way ANOVA and multiple linear regressions.

**Results:** The scores of all dimensions of the SRLS were at the medium level except for controversy with civility. The scores of the dimensions of consciousness of context, self and others of EILI and the dimensions of enable others to act and encourage the heart of SLPI were at the medium level. And the scores of the dimensions of model the way, inspire a shared vision and challenge the process of SLPI were at the high level. The leadership abilities of medical graduate freshmen were affected by the demographics, participation of social activities and leadership learning. Multiple linear regression analysis showed that the scores of SLPI were jointly affected by the scores of SRLS and EILI ( $F=2674.44$ ,  $P<0.001$ ,  $R^2=0.86$ ).

**Conclusions:** Chinese medical graduate freshmen had a medium to high level of leadership abilities except for controversy with civility according to the survey. Leadership ability can be affected by demographic characteristics, social activities and leadership learning situations. Leadership practice is influenced by both personal responsibility and emotional intelligence. Themed series of activities especially with a service theme could be involved in the cultivation of their leadership abilities in practice aspect.

## Background

With the rapid adoption of Competency Based Medical Education (CBME) [1], it is agreed that more attention should be given to cultivate medical students' competency rather than mere clinical training and medical skills or scientific research skills. According to the Accreditation Council for Graduate Medical Education (ACGME), there are six core competencies for medical residents: patient care, medical knowledge, systems-based practice, practice-based learning and improvement, professionalism, and interpersonal communication skills[2]. The China Elite Teaching Hospital Alliance for Resident Training

was established in 2015[3]. In 2018 it recommended the core competency framework consensus consisting of professionalism, medical knowledge and skills, patient care, communication and collaboration, teaching and life-long learning [3]. This framework emphasized that cultivation of “leadership ability” should be a major component embedded in the communication competency. A qualified doctor should have the ability to control the whole process of diagnosis and treatment for patients and reasonably guide doctors of relevant department, junior doctors, nurses and patients to actively participate in diagnosis and treatment activities. Clinical doctors need outstanding leadership ability to control the whole process of diagnosis and treatment, and non-clinical doctors also need good leadership to organize medical research activities[4].

Leadership competency is defined as the “the knowledge, values, abilities, and behaviors that help an individual to significantly contribute to or successfully engage in a role or a task”[5]. It also refers to the ability of a person’s qualities to exert a positive influence on others[4]. Clinical leadership although not defined very precisely, it is the ability to work with cross-organizational/cross-departmental professionals or working on behalf of other clinicians and patients to improve the healthcare system[6, 7].

Although, it is well-known that there is a great need of leadership competency cultivation for medical students, the situation of it and awareness of the need for it is not so optimistic. In a survey aimed to develop a novel curriculum on administrative and leadership competency on clinicians from 38 different countries majoring in emergency medicine, leadership development curricula were only available to a minority (28.5%) of survey respondents despite the literature supporting the need for integrated leadership development in healthcare [8]. In Australia, Canada, the U.S., U.K. and other European countries, clinicians can formally develop their management competency via the completion of postgraduate qualifications in health administration or health service management. However, the proportion of clinicians trained by the formal programs remains limited[9].

Leadership competency training for medical students has been explored by some institution in China. Peking Union Medical College has set clinical leadership courses since 2014[4]. Scholars of Southwest Medical University proposed to include leadership courses into the category of general education and build a leadership training system for college students[10]. Scholars from faculty Development Center of Zhejiang University School of Medicine put forward suggestions on hierarchical leadership training methods for medical talents at all levels. The university offers leadership courses for medical students, carrying out case studies for junior doctors and arranging senior doctors to attend leadership training camps[11]. Nevertheless, the leadership ability status of the medical graduate freshmen and its influencing factors has been rarely investigated in China.

Considering that leadership is a core competency of medical students and is closely related to the quality of health service, we investigated the current situation of leadership competency and its influencing factors among medical graduate freshmen of Capital Medical University(CMU). We anticipated that this study may aid institutions to identify potential reforms in the education frameworks of developing leadership competency in China.

# Methods

## *Study design and sample:*

During 2020 and 2021, 851 medical graduate freshmen from seven teaching hospitals of CMU were selected by random sampling. Among the respondents, 268 were from Xuanwu Hospital, 243 were from Beijing Children's Hospital, 103 were from Beijing Anzhen Hospital, 90 were from Beijing Friendship Hospital, 61 were from Beijing Tongren Hospital, 41 were from Beijing Chaoyang Hospital and 45 were from Beijing Chest Hospital.

They participated in a survey including three 5-point Likert scales based on different models and in which they were assessed for their leadership competency. All participants provided written consent. This study was approved by the CMU Institutional Review Board.

## *Survey instruments:*

This study adopted a scale survey method, which conformed to the ethical principles of medical research in the Declaration of Helsinki. The scales included Socially Responsible Leadership Scale-Revised Version Two (SRLS)[12, 13], Emotionally Intelligent Leadership for students Inventory (EILI)[14, 15] and The Student Leadership Practices Inventory-Self Instrument (SLPI)[16, 17]. For our current study, we used the translated Chinese version[18]. Likert 5-level scoring method was used to classify the options. For SRLS, 1=strongly disagree, 5=in full agreement, and for EILI and SLPI, 1=never, 5=always. These scales investigate leadership competency in three different aspects.

SRLS was developed based on The Social Change Model of Leadership Development[12, 19]. It consisted of 68 questions, which evaluated 8 dimensions of self-consciousness, congruence, commitment, collaboration, common purpose, controversy with civility, citizenship and change[13]. The total score was 340, and the reliability coefficient was 0.966. In order to overcome the common method bias caused by social approval effect, the original scale item order was disordered and the reverse question was introduced[20]. The total score of the dimension of self-consciousness was considered low if the score was below 32, medium if between 32-37, high if above 37. For congruence it was considered low if below 28, medium if between 28-34, high if above 34. For commitment, it was considered low if below 24, medium if between 24-29, high if above 29. For collaboration, it was considered low if below 30, medium if between 30-36, high if above 36. For common purpose, it was considered low if below 34, medium if between 34-40, high if above 40. For citizenship, it was considered low if below 29, medium if between 29-35, high if above 35. For controversy with civility, it was considered low if below 53, medium if between 53-64, high if above 64. For change it was considered low if the score was below 35, medium if between 35-41 and high if above 41[13].

EILI was developed based on the Emotionally intelligent Leadership Model[21], consisting of 24 questions, that were assessed from three dimensions of consciousness of context, self and others respectively, with a total score of 120 points, and a reliability coefficient of 0.961. The total score of each

dimension of EILI of students ranged from 8-25, 26-34 and 35-40, which were considered as low, medium and high respectively [14, 15]

SLPI was developed based on the The Student Leadership Challenge Model [22] and consisted of 30 questions, which were evaluated from five dimensions of model the way, inspire a shared vision, challenge the process, enable others to act and encourage the heart, with a total score of 150 points. The reliability coefficient was 0.985. The total score of the dimension of Model the way was considered low if between 17-20, medium if between 21-24, and high if between 25-30. For inspire a shared vision it was considered low if between 14-19, medium if between 19-23 and high if between 24-30. For challenge the process it was considered low if between 14-18, medium if between 19-23 and high if between 24-30. For enable others to act it was considered low if between 18-22, medium if between 23-25 and high if between 26-30. And for encourage the heart it was considered low if between 17-21, medium if between 22-25, and high if between 26-30 [16, 17].

### ***Survey questions:***

The students were asked four questions regarding the student's attitude towards leadership training: 1) leadership training is the responsibility of student cadres, 2) leadership is one of the most important abilities that college students should possess, 3) it makes sense to develop leadership in college, 4) leadership must be cultivated in leadership positions. The answers were scored by the 5-point Likert scale to classify the options into strongly disagree, relatively disagree, general, agree, in full agreement.

### ***Statistical analysis:***

A Kolmogorov-Smirnov test, Q-Q plot and p-p plot were used to confirm normality for continuous variables. All normally distributed continuous variables were reported as the mean  $\pm$  standard deviation. When the data were normally distributed and the variances were homogeneous, t-test or ANOVA were used. Categorical variables were represented by frequency and percentage [example (%)]. The effects were examined via a multiple linear regression analysis with the score of SLPI as the dependent variable and SRLS and EILI as independent variables assessed separately. Statistical significance was set at  $P=0.05$  (2-sided). All statistical analyses were performed with SPSS (Version 25.0) software.

## **Results**

Table 1 shows the characteristics of the study population. Among the 851 medical graduate freshmen, nearly 70% were female (N = 564), more than two third were from urban area (N = 575) and more than half were only children (N = 461). More than 70% were masters (N = 602) and were professional degree students (N = 606). More than half of them were league members (N = 549), served as student cadres (N = 488), when they were student cadres, more than 70% of them served as secretaries (N = 359) and nearly half of them were student cadres longer than two semesters (N = 228). Although only nearly 40% of them participated in student organizations (N = 337), nearly 90% participated in social practice (N = 750) and voluntary service (N = 748), and more than half of them took a part time job (N = 481). Only nearly 7% of

them took leadership courses (N = 59), nearly 16% participated in training classes for student cadres (N = 130) and nearly 22% of them took lectures on leadership (N = 181).

Table 1  
Descriptive characteristics of the study population

Category	Variable	N	percent(%)
Demographic information	Gender		
	Male	287	33.73
	Female	564	66.27
	Household registration		
	Urban area	575	67.57
	Rural area	276	32.43
	Whether the only child of the family		
	yes	461	54.17
	no	390	45.83
	Degree level		
	master	602	70.74
	doctor	249	29.26
	Degree category		
	Scientific degree	245	28.79
Professional degree	606	71.21	
Politics status			
General public	57	6.70	
League members	549	64.51	
Political party members	245	28.79	
Take part in social activities	Whether participated in student organizations		
	Participated in student organizations	337	39.60
	Not participated in student organizations	514	60.40
	Whether served as student cadre		
	Student cadre	488	57.34
	Non-student cadre	363	42.66
	Position		

Category	Variable	N	percent(%)
	Secretary	359	73.56
	Chairman	77	15.78
	Clerkship	52	10.66
	Duration of act as student cadre		
	Less than one semester	57	11.68
	One to two semesters	203	41.60
	Longer than two semesters	228	46.72
	whether participated in social practice		
	yes	750	88.13
	no	101	11.87
	Whether participated in voluntary service		
	yes	748	87.90
	no	103	12.10
	Whether participated in part-time work		
	yes	481	56.52
	no	370	43.48
Leadership Learning	Whether had taken leadership courses		
	yes	59	6.93
	no	792	93.07
	Whether participated in the training classes for student cadres		
	yes	130	15.28
	no	721	84.72
	Whether attend lectures on leadership		
	yes	181	21.27
	no	670	78.73

Table 2-4 showed the total scores and the scores of different dimensions of SRLS, EILI and SLPI and in which level they were according to the cut-off values. Table 2 showed the total score of SRLS which was  $278.27 \pm 34.74$ , and total scores of dimensions of self-consciousness, congruence, commitment,

collaboration, common purpose, citizenship and change of SRLS, which were  $35.19 \pm 4.89$ ,  $28.84 \pm 4.07$ ,  $25.27 \pm 3.56$ ,  $33.46 \pm 4.79$ ,  $38.39 \pm 5.31$ ,  $33.76 \pm 5.01$ ,  $39.75 \pm 5.58$  respectively. These dimensions were all at the medium level. While the total score of controversy with civility of SRLS was  $43.6 \pm 5.16$  and it was at the low level.

Table 2  
The total scores and scores of different dimensions of SRLS

Contents	Mean(SD)	level
Self-consciousness	35.19(4.89)	Medium
Congruence	28.84(4.07)	Medium
Commitment	25.27(3.56)	Medium
Collaboration	33.46(4.79)	Medium
Common Purpose	38.39(5.31)	Medium
Controversy with Civility	43.6(5.16)	Low
Citizenship	33.76(5.01)	Medium
change	39.75(5.58)	Medium
the Socially Responsible Leadership Scale	278.27(34.74)	

Table 3 showed the total score of EILI which was  $99.42 \pm 15.29$ , and total scores of dimensions of consciousness of context, self and others of EILI, which were  $32.12 \pm 5.53$ ,  $33.82 \pm 4.95$ ,  $33.48 \pm 5.38$  respectively. These dimensions were at the medium level.

Table 3  
The total scores and scores of different dimensions of EILI

Contents	Mean(SD)	level
Consciousness of context	32.12(5.53)	Medium
Self-consciousness	33.82(4.95)	Medium
Consciousness of others	33.48(5.38)	Medium
Emotionally Intelligent Leadership for students Inventory	99.42(15.29)	

Table 4 showed the total score of SLPI which was  $125.96 \pm 19.4$ , and total scores of dimensions of model the way, inspire a shared vision, challenge the process of SLPI, which were  $25.26 \pm 3.99$ ,  $25.2 \pm 4.09$ ,  $24.85 \pm 4.15$  respectively. They were at the high level. Table 4 also showed the total scores of dimensions of enable others to act and encourage the heart of SLPI, which were  $25.31 \pm 3.74$ ,  $25.36 \pm 3.99$  respectively and they were at the medium level.

Table 4  
The total scores and scores of different dimensions of SLPI

Contents	Mean(SD)	level
Model the way	25.26(3.99)	High
Inspire a shared vision	25.2(4.09)	High
Challenge the process	24.85(4.15)	High
Enable others to act	25.31(3.74)	Medium
Encourage the heart	25.36(3.99)	Medium
The Student Leadership Practices Inventory-Self Instrument	125.96(19.4)	

The answers to those four questions mentioned, “leadership training is the responsibility of student cadres” scored  $2.64 \pm 1.22$ , “leadership is one of the important abilities that college students should possess” scored  $4.3 \pm 0.76$ , “it makes sense to develop leadership in college” scored  $4.39 \pm 0.74$  and “leadership must be cultivated in leadership positions” scored  $3.16 \pm 1.25$ .

We only listed the statistically different outcome for the compare of different groups. For the question of “leadership training is the responsibility of student cadres”, males scored higher than females ( $t=2.53, P=0.012$ ), students who were only children scored higher than non-only children ( $t=-2.13, P=0.033$ ), professional degree students scored higher than scientific degree students ( $t=-2.523, P=0.012$ ). For the questions of “leadership is one of the important abilities that college students should possess” and “it makes sense to develop leadership in college”, students who participated in student organizations scored higher than those who didn’t ( $P<0.05$ ), the situations were the same in the group of whether served as student cadre, whether participated in social practice, whether participated in voluntary service, whether participated in part-time work, whether participated in the training classes for student cadres, whether took lectures on leadership. For the question of “leadership is one of the important abilities that college students should possess”, students who took leadership courses scored higher than those who didn’t. For the question of “leadership training is the responsibility of student cadres”, professional degree students scored higher than scientific degree students ( $t=-2.523, P=0.012$ ). For the question of “it makes sense to develop leadership in college”, scientific degree students scored higher than professional degree students ( $t=2.111, P=0.035$ ). For the question of “leadership must be cultivated in leadership positions”, professional degree students scored higher than scientific degree students ( $t=-3.181, P=0.002$ ).

The statistically significant differences of the scores of the three scales between/among different groups were as follows. For the demographic information, students from urban areas scored higher than from rural areas in the self-consciousness dimension of SRLS ( $t=2.57, P=0.010$ ). Students who were only children scored higher than non-only children in the self-consciousness dimension of SRLS ( $t=-2.79, P=0.005$ ). Doctor scored higher than master in the dimensions of self-consciousness of

SRLS( $t=-1.982$ ,  $P=0.048$ ) and challenge the process of SLPI( $t=-2.264$ ,  $P=0.024$ ). Political party members scored higher than league members in the dimensions of congruence and common purposes of SRLS.

For the situation of social activities, students participated in student organizations scored higher in all the dimensions of the three scales than those who didn't ( $P<0.05$ ). The results were the same in the groups of whether served as student cadre, whether participated in social practice, whether participated in voluntary service. Students acted as student cadre lasted longer than two semesters scored higher than those lasted for one to two semesters in almost all dimensions of the three scales except for consciousness of context of EILI. Students who participated in part-time work scored higher than those who didn't in total score and the dimensions of commitment, collaboration, common purpose, citizenship, change of SRLS and consciousness of others of EILI and total score and all dimensions of SLPI. Chairman scored higher than secretaries in the total score and dimensions of self-consciousness, collaboration, change of SRLS and in total score and the dimensions of consciousness of context, others of EILI.

For the results of leadership learning, students participated in the training classes for student cadres, took lectures on leadership scored higher in all the dimensions of the three scales than those who didn't ( $P<0.05$ ). Students who took leadership courses scored higher than those who didn't in the dimensions of controversy with civility and change of SRLS.

SLPI was focused on the action procedure, while SRLS and EILI were focused on different characters of leadership competency. Since the characters might affect the action and the outcome of it, we tried to establish the relationship of these three scales. For this purpose, we did the multiple regression test. The results of SLPI survey were taken as dependent variables, and the results of SRLS and EILI surveys were taken as independent variables for regression analysis. It was found that SLPI score was jointly affected by SRLS and EILI score. As Table 5 showed, the regression equation could be established as  $SPLI = -1.861 + 0.128 * SRLS + 0.928 * EILI$  ( $F = 2674.44$ ,  $P < 0.001$ ,  $R^2 = 0.86$ ). In Table 5,  $B$  referred to the constant term of the regression equation, and the regression coefficient of SRLS was 0.128, that of EILI was 0.928. Both of them were statistically significant ( $P < 0.001$ ). The variance inflation factor (VIF) equaled to 3.132, which was below five, indicating the collinearity was within the acceptable range.

Table 5  
Regression analysis indicating the relationship of SRLS and EILI to SPLI scores

Independent Variable	partial regression coefficient		standard regression coefficient Beta	<i>t</i>	<i>P</i>	Collinearity Statistics	
	<i>B</i>	standard error				allowance	VIF
constant term	-1.861	1.990		-0.935	0.350		
the Socially Responsible Leadership Scale	0.128	0.013	0.229	10.191	< 0.001	0.319	3.132
Emotionally Intelligent Leadership for students Inventory	0.928	0.029	0.731	32.511	< 0.001	0.319	3.132

## Discussion

In this study, we investigated the graduate freshmen' current leadership competency status and influencing factors using three different scales in the context of one of the well-established medical university in China. In addition, we developed a questionnaire to assess their attitudes toward the cultivation of leadership competency. The results showed that the leadership competency were at the medium to high level except for controversy with civility. Considering the current status, it is necessary to pay more attention to leadership training for medical graduates from both the courses/lectures training aspects and the practice aspect. We found that students' leadership competencies can be affected by demographic characteristics[23], social activities[24] and leadership learning situations[25]. These results are consisted with some other studies of leadership competencies of students of other disciplines[18]. This study is the fewer large scope study for medical students. We established the relationship of these three leadership models.

For the attitude of cultivation of the leadership competency, most of the students we investigated admitted it was important and leadership competency could be developed in college. While some of them still felt that leadership training was the business of student cadres, and must be trained in the leadership position. The average scores of all the former three questions could reflect the attitude about leadership competency cultivation except the last one ("leadership must be cultivated in leadership positions"). Its average score was around three. This suggested that most of them neither agree with nor disagree with this question. It should be emphasized that the correct answer is no.

Here are some possible reasons for our results. Females and non-only children admitted leadership training is not only the business of the student cadres when compared to their counterparts. Females and non-only-children might interact more often to their peers and understood what leadership means. Students took leadership courses admitted the importance of leadership as opposed to the students who did not. Students who attended lectures on leadership, participated in social activities admitted more of

the importance of it and its cultivation in college when compared to their counterparts. Students who took the leadership courses or lectures learned more about leadership competency and its importance, and were willing to pay more attention to its development. It can be concluded that the more the social activities they participated in, the more they realized the importance of leadership cultivation. Scientific degree students are more aware of the importance of leadership competency education than professional degree students. They have time to pay more attention of it.

Students from urban areas and who were the only-children scored higher in the dimension of self-consciousness of SRLS. It is possibly because they got more attention from their parents and have better senses of self. Doctors scored higher in self-consciousness of SRLS and challenge the process of SLPI than masters. Their self-consciousness grew with age and their tutors required them to challenge the current situation. Political party members scored higher than general league members in the dimensions of congruence and common purposes of SRLS. Party members needed to attend several meetings and theory classes. They were well trained about how to motivate others and establish common goals leading to higher scores.

Students who had participated in more social activities and taken leadership lectures scored higher than those who hadn't in almost all dimensions of the three leadership scales. The longer they acted as student cadre, the higher their scores were. This suggested that social activity played an important role in the cultivation of leadership competency. The more activities they joined in, the more they communicated, the more leadership competencies they gained. Chairmen scored higher than secretaries in the total score and the dimensions of self-consciousness, collaboration and change of SRLS and in the total score and the dimensions of consciousness of context and others of EILI. They are outstanding among student cadres and are responsible for designating, making plans and thinking of innovative ideas. They have more practices in leadership skills. Those who had taken leadership lectures wanted to know more about leadership competency and had the intention to improve it (resulting higher scores in the scales). Students who took the leadership courses scored higher in the controversy with civility and change dimensions of SRLS. They were obligated to take the courses and the effect is not as good as those who took the lectures. Lack of leadership courses (less than 7%) led to a low average score in the dimension of controversy with civility in our investigation.

Our study showed leadership competency was influenced by the situations of social activity. Here are some suggestions for leadership competencies education from the students' affairs officer. Supported by the leadership identity development model(LID) which believed that students' leadership competencies development at different stages were achieved by expanding their horizons in the context of different interpersonal relationships within the group[26]. Themed series of activities could be involved in shaping the values of young generations and to build leadership competency. Brand project of themed series of activities held by different clinical colleges' student union has been established to cultivate graduate freshmen' leadership competency in CMU. These activities included English speaking contests, academic forums, chorus competitions, debate competitions and medical knowledge competitions with financial incentives.

Supported by the opinion that service learning which belongs to experiential learning is a good way to build leadership skills[27, 28]. And by the opinion that experiential learning is to construct knowledge and meaning from real-life experience, the foundation of which is social interactions and the core condition of which is active participation[29]. Service themed series of activities were held by political party or league party in our university. Participation ratio is a major issue to be considered. To encourage more students to participate in, activities focused on community services could be carried out in conjunction with Eye Care Day, World Rare Disease Day or World Alzheimer's Disease Day etc. This would make them feel their actions more meaningful. With the support of certain funds, graduates can go to the rural areas to do community service. Rural areas experience would help them understand the lack of access to health care there and enhance their motivation to serve there. Through service learning, student may be more likely to take leadership roles and develop leadership skills[30]. Establishing a program that tracks and verifies students' participation in service projects is a good means of service based education[27].

The regression analysis showed that the SLPI scores of 851 freshmen were affected by SRLS scores and EILI scores. SLPI was divided into five dimensions and they were model the way, inspire a shared vision, challenge the process, enable others to act and encourage the heart. It reflects the process of leadership activity, focuses on the relationship between leaders and followers, and is the ability of leaders to motivate others to do specific tasks in the organization[31]. The higher the scores for the practice are, the more the person believes they engage in leadership practices[17]. SRLS focuses on change and is influenced by individual values, group values and social values. Individual value includes self-consciousness, congruence and commitment. Group value includes collaboration, common purpose and controversy with civility and it is a common value system formed by constant running-in based on a common goal. Social value includes citizenship and change and it is a manifestation of an individual's social responsibility[13]. In the model of EILI, emotional intelligence is the core basis of positive leadership, and emotions affect an individual's leadership by influencing their thoughts, decisions and behaviors[14]. These theories of leadership competencies all have some limitations, but they can complement each other and measure students' leadership competency from multiple perspectives. Through the regression analysis, we can conclude that the process of leadership activity is positively influenced by leaders' individual, group and social values, and their emotional management skills.

## Conclusions

We found that the leadership competency of the medical graduate freshmen of CMU is at the medium to high level except for controversy with civility. The scores and attitude of the graduate freshmen toward leadership competency cultivation needs to be improved. The demographic characteristics, social activity status and leadership learning status are factors that can positively influence the leadership competency. The process of leadership activity is also positively influenced by leaders' individual, group and social values, and their emotional management skills. Considering the current status, it is necessary to pay more attention to leadership training for medical graduates from both the course/lecture training aspects and the practice aspect. From the practice aspect, themed series of activities especially with a

service theme are effective ways. As the training of medical students' leadership competency is related to the improvement of medical treatment level, leadership training is essential. For the further study, we will analyze the leadership competency of these freshmen after they participating the themed actives mentioned above.

## Abbreviations

CMU:Capital Medical University, SRLS:Socially Responsible Leadership Scale, EILI:Emotionally Intelligent Leadership for students Inventory, SLPI:The Student Leadership Practices Inventory-Self Instrument, VIF:the variance inflation factor, LID:The leadership identity development model.

## Declarations

Acknowledgments:The authors thank the medical graduate freshmen of Capital Medical University who participated in this survey

### Funding

Under the process of application.

### Availability of data and materials

The datasets analyzed during the current study are not publicly available due to participants' confidentiality, but de-identified datasets can be made available from the corresponding author upon reasonable request.

### Authors' contributions

YL<sup>1</sup> and KY conceived and designed the study. YL<sup>1</sup> carried out and KY revised data analysis. YL<sup>1</sup> interpreted the results and drafted the manuscript. YL<sup>6</sup>, LC, JC, XW, KC, TJ distributed the survey questionnaire and collect the data. XJ and JL took charge of project supervision, administration, and funding acquisition. YW,WZ, SS,YZ gave suggestions for the manuscript writing. SL revised the final manuscript. (YL<sup>1</sup> refers to Yue Li from Xuanwu Hospital of Capital Medical University and YL<sup>6</sup> refers to Yong Liu from Beijing Children's Hospital, Capital Medical University).

### Ethics approval and consent to participate

The study was approved by the Institutional Review Board of Capital Medical

University. All participants signed an informed consent form, in which

confidentiality was guaranteed. All methods in this study were carried out in accordance with relevant guidelines and regulations (declaration of Helsinki).

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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