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Medical students' perceptions of improving physician satisfaction and patient care: a text network analysis approach

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Abstract

Background Physicians' job satisfaction and their relationships with patients are critical factors in modern healthcare. Understanding medical students' perceptions of these aspects is crucial for enhancing the quality of healthcare. Hence, this study examined medical students' perspectives on improving physician job satisfaction and the essential patient-oriented attitudes required for developing into skilled physicians.

Methods The participants were 87 medical students who provided descriptive essay responses to two open-ended questions: (1) "What do you think could improve physicians' job satisfaction?" and (2) "What attitudes toward patients do you believe are necessary to become a skilled physician?" Specifically, this study analyzed medical students' perceptions and attitudes toward physician satisfaction and patient relationships by applying text network analysis to their essay responses and identifying key themes and keywords.

Results The major topics were extracted using latent dirichlet allocation topic modeling. Key terms included "physician," "satisfaction," "patient," "medical practice," and "experience." Topics identified for the first question included "work-life balance," "job satisfaction and social impact," and "satisfaction of physicians in the medical environment." Topics for the second question included "attitude toward patient care as a physician," "mistakes in patient care and efforts to correct them," and "patient care experience and physician skill development."

Conclusions This study aligned educational strategies with self-determination theory (SDT) to underscore the importance of promoting autonomy, relatedness, and competence. This approach could elevate the quality of medical education, support students' professional growth, and enhance their job satisfaction through meaningful patient interactions.

Keywords Physician satisfaction, Physicians' attitudes to patients, Text network analysis, Medical education, Topic modeling

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Background

The modern healthcare environment is rapidly evolving owing to technological advancements, shifts in patient expectations, and healthcare policy reforms [1]. These changes directly affect healthcare professionals' job satisfaction and relationships with patients. Moreover, the quality of healthcare services is linked to healthcare providers' job satisfaction, with more satisfied physicians delivering better services [2]. Conversely, low job satisfaction could increase turnover rates, reduce the quality and accessibility of care, and degrade overall healthcare quality [3–5]. Therefore, enhancing physicians' job satisfaction is crucial for improving healthcare quality.

Self-determination theory (SDT) provides a valuable framework for understanding human motivation and development. It posits that optimal functioning and growth occur when three basic psychological needs, namely, autonomy, relatedness, and competence, are satisfied [6]. "Autonomy" is the ability to make and regulate one's own choices. "Relatedness" involves forming meaningful relationships and feeling a sense of belonging, and "competence" denotes the ability to effectively interact with one's environment. In medical education, insights from SDT could help enhance students' autonomy in decision-making; foster relatedness through curriculum structure and classroom interactions; and improve competence through assessments, self-directed learning, and clinical training [7]. SDT offers valuable insights across fields involving education, job satisfaction, and psychological well-being, with a focus on promoting intrinsic motivation and self-determination.

Medical students' educational experiences and professional development greatly influence their career choices [8]. Support systems and proper role modeling in medical education are crucial. Blatt et al. [9] found that positive educational experiences in medical schools are linked to early job satisfaction, suggesting a close relationship between medical students' perceived job satisfaction and their educational experiences. However, existing research has largely focused on the effects of physician job satisfaction in clinical settings, with minimal exploration of medical students' expectations and attitudes toward physician job satisfaction and patient care. Studies investigating such pre-clinical perspectives have been limited, and understanding students' viewpoints before they enter clinical practice is essential for developing educational strategies that support intrinsic motivation and well-being [1, 10, 11]. This gap in the literature highlights the need for studies focusing on medical students' perspectives.

Text–network analysis is an effective tool for analyzing complex descriptive sentences. It allows a visual representation of the relationships among words and

the identification of key themes and ideas [12]. Through this method, researchers can systematically analyze and understand the diverse opinions and thoughts of individuals in various settings. By applying text network analysis, this study seeks to capture the unique perspectives and attitudes of medical students toward physician job satisfaction and patient care. The specific goals are as follows:

1. Identify strategies to improve physician job satisfaction perceived by medical students,
2. Determine the attitudes toward patients that medical students believe are necessary to become skilled physicians, and,
3. Propose directions for medical education based on the study's findings.

Methods

Recruitment

The study participants were medical school students who provided descriptive essay responses during the "Physicians and Society" course that was conducted in 2022 at a South Korean university. This course aimed to assess students' reflective understanding of physicians' job satisfaction and their attitudes toward patients. Students were prompted to respond to the following two questions, designed to elicit their perspectives:

1. What do you think could improve physicians' job satisfaction?
2. What attitudes toward patients do you believe are necessary to become a skilled physician?

All 87 students enrolled in the course voluntarily consented to participate and submitted their essays, thereby providing a substantial dataset for the analysis. All essays were rigorously anonymized to safeguard respondents' identities. The students were thoroughly briefed about the study and assured that participation was entirely voluntary, with the option of declining without any repercussions. Informed consent was obtained from each student before collecting and analyzing their essays. Their participation did not influence their grades or academic standing. The reflective writing assignment had no bearing on the students' grades, and no feedback or evaluations were administered on their submission. To ensure impartiality and uphold academic integrity, the research team, which included professors specializing in emergency medicine and medical education, did not review the essays until the course was completed. This procedural safeguard was implemented to eliminate potential biases and maintain the integrity of the academic assessment process.

Questionnaire development

The questionnaire used to guide students' reflective writing responses was specifically developed for this study. The questions were designed to foster students' deep reflection and critical thinking regarding their future roles as physicians. Furthermore, consistent with the study's objective of analyzing medical students' perceptions and attitudes, the answers to these questions allowed us to recommend enhancements for medical education to improve physicians' job satisfaction and patient care competencies.

Analytical approach

Keyword selection and data preprocessing

Preprocessing began with an initial review using Microsoft Excel's spell-check function, followed by manual correction of typographical errors through careful reading of the essays. Next, defined words, synonyms, and exclusion words were established to select the keywords and clean the data. Defined words are phrases in which two or more words combine to form a single meaning (e.g., "medical fees" or "work–life balance") [13]. Synonyms are words with similar meanings; these were consolidated under a single representative term. For example, "South Korea," "Republic of Korea," and "Our country" were all unified under the term "South Korea" [14]. Common or less relevant words were omitted from the analysis [14]. Examples of excluded words are "and," "or," "front," "in case of," "finally," and "during." The extraction and cleaning processes were conducted collaboratively by three professors specializing in emergency medicine and medical education, and the final selection was reviewed by the entire research team.

Keyword extraction

The term frequency–inverse document frequency (TF–IDF) method was applied to extract keywords. Term frequency calculates how often a word appears in a document, and inverse document frequency calculates the frequency of a word across all documents [15, 16]. Subsequently, the results of the TF–IDF analysis were used to assess the relative importance of words [17]. For network analysis, a two-mode word–document network was converted into a one-mode word–word network. In a two-mode network, nodes represent both words and documents, whereas in a one-mode network, only words are represented and connections are formed based on their co-occurrence within documents. The co-occurrence frequency threshold was set to a minimum of two appearances, and based on prior research, the word distance was set to two, thus ensuring meaningful relationships without excessive noise [18]. This conversion

helped us understand the relationships and associations between different keywords, revealing patterns and structures within the text data.

Topic modeling

Topic modeling, an advanced text-mining and big-data analysis tool, is commonly used to identify latent topics within textual data by examining word associations [19–22]. This technique, particularly the latent dirichlet allocation (LDA) algorithm, facilitates the extraction of the underlying knowledge structures and patterns from academic studies. LDA is a probabilistic model that infers hidden topics by analyzing word distributions within documents, effectively reducing data complexity and generating coherent topics [19, 21].

In this study, LDA was used to identify keywords that represent core ideas within the document corpus. This application of LDA supported cohesion analysis and validated thematic categorization through empirical evidence. The analysis was performed using NetMiner (version 4.5.1.c) primarily to understand medical students' perceptions of strategies for improving future job satisfaction and the attitudes toward patients necessary for them to become skilled physicians.

Various combinations of options were tested to determine the optimal number of topics: $\alpha=0.010-03$, $\beta=0.010-03$, the number of topics=3–8, and 1,000 iterations. The optimal model was selected based on the coherence score (c_v), with the highest coherence score ensuring the validity and reliability of inferred topics [23–25]. Subsequently, the research team named the topics that reflected the thematic trends identified in the data. To enhance the robustness of our analysis, three researchers (MN, HHY, and CWK) independently reviewed and reached a consensus on the identified themes and topics. Finally, a topic model visualization was created to display the top keywords and their interconnections, and clearly depict the main themes and underlying structure within the text data.

Results

Keyword analysis

Table 1 shows the keywords derived from the analysis of medical students' essays using TF and TF–IDF analyses. For Question 1, the TF analysis revealed "physician" (578) as the most frequently mentioned word, followed by "satisfaction" (288), "thought" (242), "job" (219), and "patient" (170). By contrast, the TF–IDF analysis highlighted "patient" (55) as the highest-scoring word, followed by "medical practice" (39), "person" (38), "self" (38), and "need" (37). Notably, words such as "medical fees," "medical school," "result," and "hospital" emerged uniquely in the TF–IDF analysis.

Table 1 Top 20 keywords for question 1 using TF and TF-IDF analyses

Rank	TF ^a		TF-IDF ^b	
	Keywords	Frequency	Keywords	TF-IDF
1	Physician	578	Patient	55
2	Satisfaction	288	Medical Practice	39
3	Thought	242	Person	38
4	Job	219	Self	38
5	Patient	170	Need	37
6	Medical	170	Time	35
7	Improvement	152	Society	35
8	Work	137	Work	33
9	Medical Practice	105	Method	33
10	Time	97	Life	27
11	Person	89	Problem	26
12	Society	74	Environment	24
13	Self	59	South Korea	24
14	Need	54	Importance	24
15	South Korea	53	Medical Fees	24
16	Department	52	Medical School	23
17	Problem	51	Result	23
18	Method	47	Hospital	22
19	Environment	45	Process	22
20	Life	42	Study	21

^a TF Term frequency^b TF-IDF Term frequency-inverse document frequency

To provide a visual representation of these findings, Fig. 1A and B present word clouds of the TF and TF-IDF results for Question 1, respectively. The size of each word corresponds to its frequency or importance, offering a quick visual insight into the most significant terms.

Table 2 presents the TF and TF-IDF analysis results for Question 2. The TF analysis showed “patient” (300) as the most frequently used word, followed by “physician” (248), “thought” (142), “medical practice” (113), and “skill” (111). However, the TF-IDF analysis ranked “medical practice” (53) as the highest-scoring word, followed by “experience” (32), “attitude” (31), “first” (30), and “effort” (30). New words such as “diagnosis,” “professor,” and “senior” appeared in the TF-IDF analysis.

Figure 1C and D provide word clouds of the TF and TF-IDF results for Question 2, visually highlighting the key terms and their relative prominence in the students responses.

Topic modeling

The topic modeling results for Question 1 revealed three main topics (see Fig. 2). Topic 1 comprised 17% of all topics, with keywords such as “time,” “satisfaction,” “work,” “thought,” and “job.” This topic, reflecting themes related

Table 2 Top 20 keywords for question 2 using TF and TF-IDF analyses

Rank	TF ^a		TF-IDF ^b	
	Keywords	Frequency	Keywords	TF-IDF
1	Patient	300	Medical Practice	53
2	Physician	248	Experience	32
3	Thought	142	Attitude	31
4	Medical Practice	113	First	30
5	Skill	111	Effort	30
6	Attitude	53	Study	30
7	Experience	52	Mistake	29
8	Mistake	51	Process	28
9	First	49	Best	27
10	Process	43	Work	27
11	Study	42	Importance	24
12	Best	37	Lack	23
13	Effort	37	Person	22
14	Person	34	Knowledge	21
15	Importance	33	Mind	20
16	Work	32	Medical	19
17	Lack	32	Mr. or Ms. ^c	19
18	Mind	29	Diagnosis	18
19	Knowledge	27	Professor	18
20	Mr. or Ms.	26	Senior	17

^a TF Term frequency^b TF-IDF Term frequency-inverse document frequency

^c The original Korean word (“sensayngnim”), which can be translated into Mr. or Ms., is often used as an honorific title in combination with the words “doctor” or “nurse”

to job satisfaction, was called “work-life balance.” Topic 2 accounted for 34%, with keywords such as “job,” “patient,” “thought,” “satisfaction,” and “society,” and was labeled “job satisfaction and social impact.” Topic 3 comprised 49% of all topics with keywords such as “medical,” “satisfaction,” “thought,” “improvement,” and “medical practice.” This topic was labeled “satisfaction of physicians in the medical environment.”

For Question 2, topic modeling identified three main topics (see Fig. 3). Topic 1 comprised 12% of all themes, with keywords such as “physician,” “patient,” “attitude,” “thought,” “medical practice,” and “medicine.” This topic, reflecting proper medical practice attitudes, was labeled “attitude toward patient care as a physician.” Topic 2 accounted for 30% of all topics, with keywords such as “physician,” “patient,” “skill,” “medical practice,” “mistake,” and “effort.” This topic was labeled “mistakes in patient care and efforts to correct them.” Finally, Topic 3 comprised 58% of all topics, with keywords such as “patient,” “physician,” “thought,” “medical practice,” “experience,” “skill,” and “first.” This topic was labeled “patient care experience and physician skill development.”

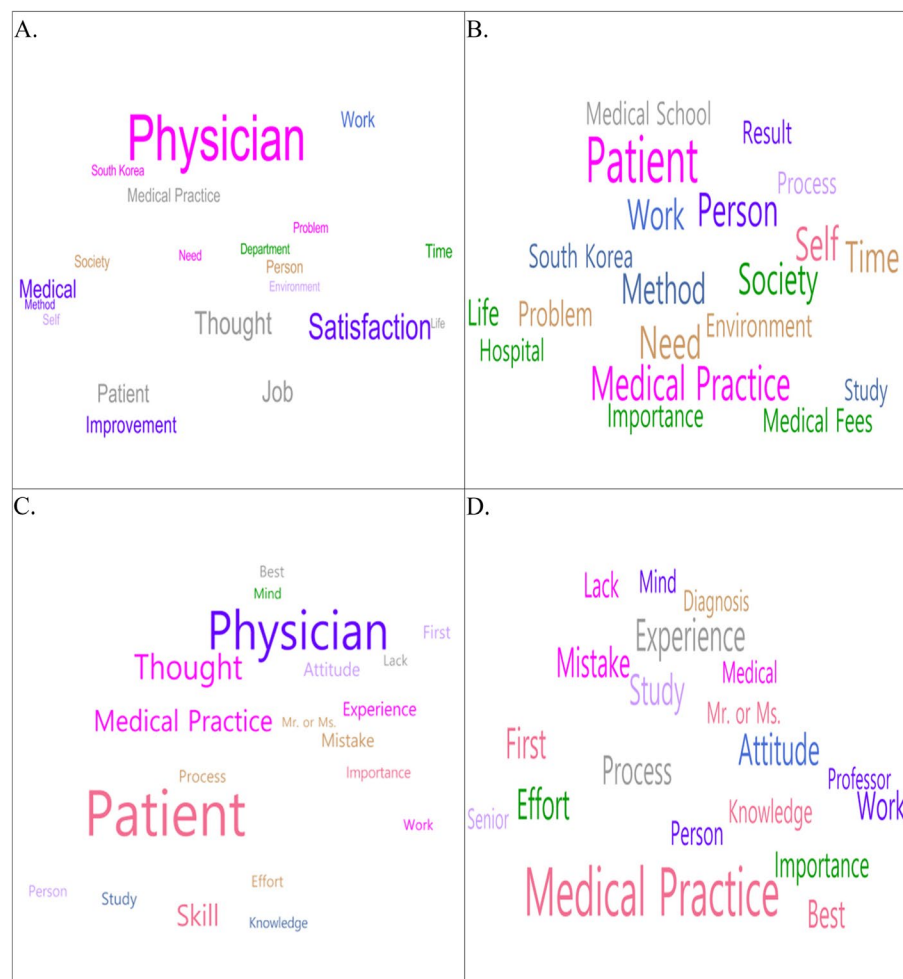


Fig. 1 Word clouds of the TF and TF-IDF results for Questions 1 and 2. Note: **A** TF word cloud for Question 1; **B** TF-IDF word cloud for Question 1; **C** TF word cloud for Question 2; **D** TF-IDF word cloud for Question 2. TF (Term Frequency) reflects how often each word appears; larger words indicate higher frequency. TF-IDF (Term Frequency-Inverse Document Frequency) highlights words uniquely relevant to each question; larger words show greater importance

Table 3 summarizes the topics and corresponding keywords generated for each question through LDA topic modeling. For Question 1, the primary topics were work-life balance (17%), job satisfaction and social impact (34%), and satisfaction of physicians in the medical environment (49%). For Question 2, the main topics were attitudes toward patient care as a physician (12%), mistakes in patient care and efforts to correct them (30%), and patient care experience and physician skill development (58%).

Essays reflecting topic modeling themes

Responses to question 1

Topic 1: Work-life balance

One student discussed the importance of ensuring doctors' autonomy and maintaining work-life balance to enhance job satisfaction and prevent burnout:

I believe two main factors can enhance doctors' job satisfaction: ensuring doctors' autonomy and identity and maintaining a work-life balance. [...] Work-life balance has become a pervasive value in our society, affecting many professions [...] but I believe it has yet to significantly impact the medical profession. Many doctors still suffer from excessive workload in numerous hospitals, leading to burn-out and significantly lowering job satisfaction. [...] I believe that at least a minimal quality of life should be guaranteed. (Student 87)

Topic 2: Job satisfaction and social impact

Another student emphasized that acceptable patient numbers, appropriate rest times, and proper financial compensation are crucial for maintaining doctors' job satisfaction and quality of medical services:

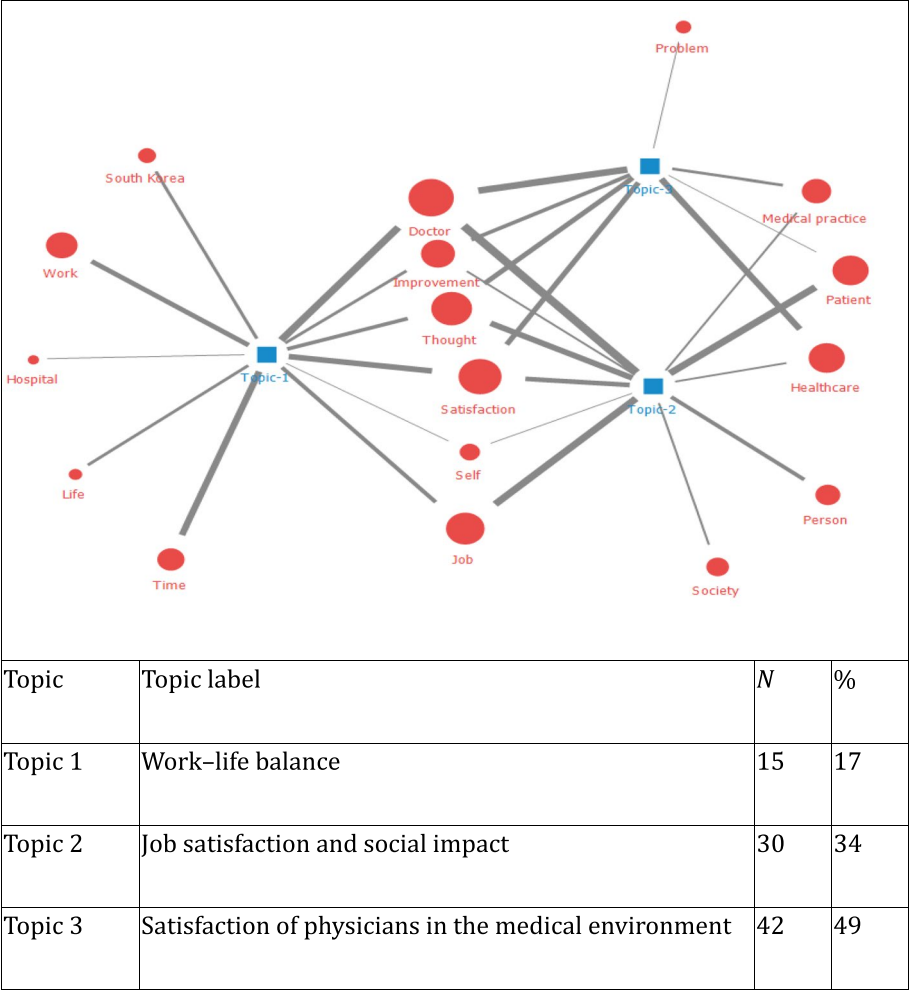


Fig. 2 Topic-keyword map from topic modeling for Question 1

Acceptable patient numbers, appropriate rest times, and proper financial compensation must be ensured for the profession of “doctor” to remain a continuously satisfying career. [...] The most critical measure of job satisfaction for doctors is whether proper medical services are provided to patients in need, if there are any neglected groups, and if there are any issues caused by excessive costs. [...] The medical profession plays the most important social role in maintaining a healthy society and contributing to a better world. [...] Doctors can perform their medical duties with greater satisfaction when patients are happy, healthy, and receiving better medical services. (Student 19)

Topic 3: Satisfaction of physicians in the medical environment

A different student highlighted the need for improvements in the working environment, reducing working

hours, addressing specialty imbalances, and enhancing the social image of the medical profession to boost physicians’ job satisfaction:

The job satisfaction of physicians can be enhanced in several ways. [...] Firstly, the working environment needs improvement. [...] Reducing working hours and ensuring personal time for basic needs would improve doctors’ satisfaction. Secondly, the imbalance between medical specialties must be addressed. [...] Improving policies for vital specialties could reduce unnecessary competition and enhance overall job satisfaction for doctors. [...] By demonstrating self-regulation, the medical community can enhance its social image. (Student 9)

Responses to question 2

Topic 1: Attitude toward patient care as a physician

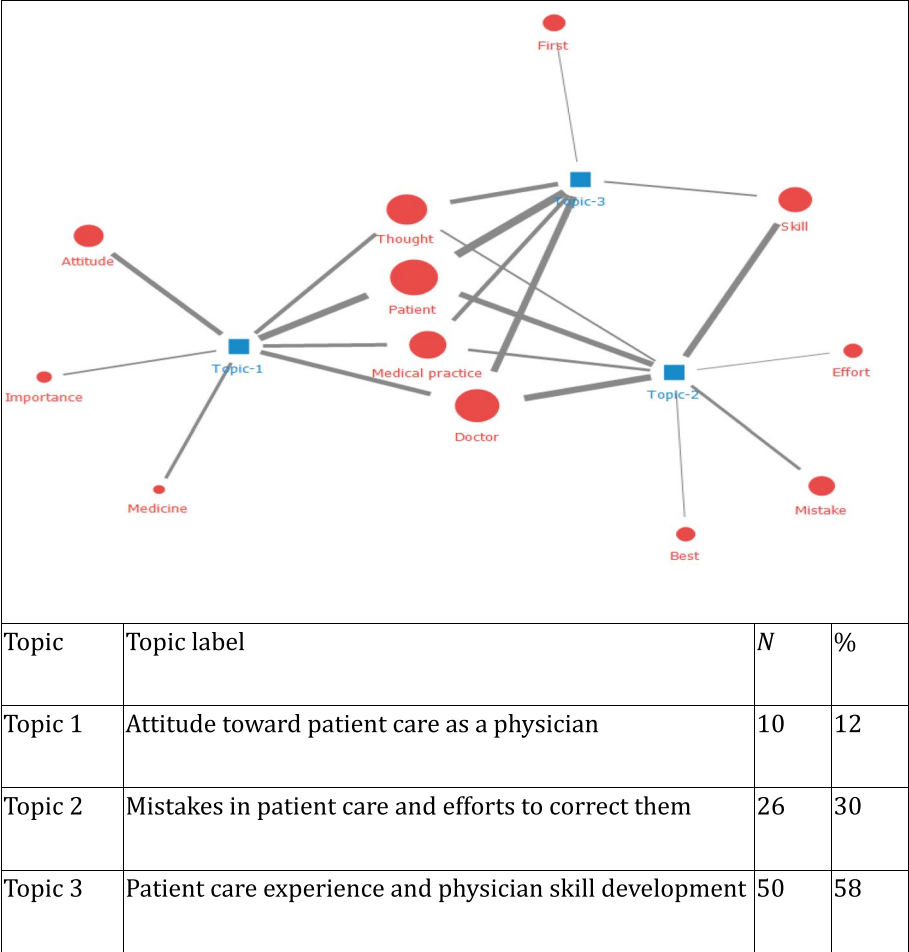


Fig. 3 Topic-keyword map from topic modeling for Question 2

Table 3 Topics and keywords generated through latent dirichlet allocation topic modeling

Topics	Keywords	%
Question 1: What do you think could improve physicians' job satisfaction?		
Topic 1: Work-life balance	Time, satisfaction, work, thought, job	17
Topic 2: Job satisfaction and social impact	Job, patient, thought, satisfaction, society	34
Topic 3: Satisfaction of physicians in the medical environment	Medical, satisfaction, thought, improvement, medical practice	49
Question 2: What attitudes toward patients do you believe are necessary to become a skilled physician?		
Topic 1: Attitude toward patient care as a physician	Physician, patient, attitude, thought, medical practice, medicine	12
Topic 2: Mistakes in patient care and efforts to correct them	Physician, patient, skill, medical practice, mistake, effort	30
Topic 3: Patient care experience and physician skill development	Patient, physician, thought, medical practice, experience, skill, first	58

Description of data: This supplementary material contains a student questionnaire designed to assess reflective understanding of physician job satisfaction and the necessary attitudes for effective patient interactions. The questionnaire is part of the “Physicians and Society” course and focuses on factors that enhance physician job satisfaction and essential behaviors for professional patient care. Participation is voluntary; responses are anonymous, and the data will be used solely for research in medical education

One student underscored the significance of humility and careful attention in patient care by focusing on thorough communication and vigilant monitoring to ensure patient safety:

As a novice doctor, I strive to be humble and meticulous when treating patients. [...] I make an effort to explain diagnoses and treatments thoroughly and observe any changes during the treatment process to

respond appropriately. In summary, my attitude is to “not miss or overlook anything” [...] to avoid causing harm to patients. (Student 10)

Topic 2: Mistakes in patient care and efforts to correct them

Another student reflected on the inevitability of mistakes for new doctors, emphasizing the importance of acknowledging errors, learning from them, and taking steps to prevent future occurrences:

Although everyone wants to perform well from the start, beginner doctors inevitably have shortcomings. [...] Recognizing these deficiencies, learning, and thinking about what can be done for patients is crucial. If a mistake is made, a quick response and taking responsibility are important. [...] Efforts must be made to prevent such mistakes from recurring to ensure continuous growth. (Student 4)

Topic 3: Patient care experience and physician skill development

One student highlighted the importance of rigorous training, seeking assistance from experienced colleagues, and maintaining a balance between confidence and humility to enhance patient care:

Becoming a skilled physician requires extensive training. [...] If a task is beyond their current capabilities, they should study, or seek help from more experienced doctors to provide the best possible care. [...] It is also important to convey confidence while maintaining humility to reassure patients. (Student 8)

Discussion

This study derived keywords and their relationships from student essays to propose directions for medical school curricula. The main findings are as follows.

First, the keyword analysis for Question 1 revealed “physician” and “satisfaction” as the most frequently mentioned terms, indicating that the students were considering ways to enhance job satisfaction as physicians. In addition, the TF–IDF analysis highlighted “patient,” “medical practice,” and “person” as significant keywords. This finding reflects the importance that students placed on patient relationships and medical practice. It also aligns with those of Deng et al. [26] and Long et al. [27], who found that positive relationships with patients played a crucial role in increasing physicians’ job satisfaction. Similarly, Wu et al. [28] noted that negative interactions with patients affected physicians’ job satisfaction. For Question 2, the TF–IDF analysis showed that “medical practice,” “experience,” and “attitude” were important

keywords. This finding aligns with that of Brennan et al. [29], who revealed that continuous and “meaningful” contact with patients led to better learning outcomes, thus underscoring the value of clinical experience. Therefore, medical education should include opportunities for students to experience positive interactions with patients, strengthen these relationships through clinical experience, and enhance job satisfaction.

Second, the topic modeling analysis for Question 1 identified “work–life balance,” “job satisfaction and social impact,” and “satisfaction of physicians in the medical environment” as pivotal factors influencing physician satisfaction. The topic of “work–life balance” indicates that the students, from the perspective of their future professional roles, recognized the importance of balancing their personal and professional lives to improve job satisfaction. This aligns with the concept of autonomy in SDT, where individuals seek control over their own lives. Dierker et al. [30] emphasized that enhancing personal quality of life is essential for reducing burnout among physicians, which is consistent with our study’s findings. Therefore, by preparing students for the challenges of their future careers, including the importance of self-care and personal well-being, medical education can increase job satisfaction and reduce burnout in their professional lives.

The topic of “job satisfaction and social impact” highlighted the critical influence of social recognition and support on job satisfaction. This finding reflects the students’ awareness of their roles and the importance of social acknowledgment. It also suggests a need for educational approaches that foster relatedness within medical education, as this social aspect is pivotal for sustained job satisfaction. Liu et al. [31] also demonstrated the positive impact of social support on healthcare workers’ satisfaction, which reinforces our study’s implication that exposure to supportive environments could enhance professional fulfillment in practice. The topic of “satisfaction of physicians in the medical environment” aligns with previous studies [32, 33] that showed the impact of healthcare system environment quality on job satisfaction. This suggests that students anticipate their job satisfaction to be influenced by both the structural conditions and their role within the system. Medical curricula should, therefore, encourage engagement with healthcare system quality and decision-making processes to enable students to positively influence their future work environments. Such preparation may improve physicians’ job satisfaction and proactive adaptation within the healthcare system.

Third, the topic modeling analysis for Question 2 identified “attitude toward patient care as a physician,” “mistakes in patient care and efforts to correct them,” and “patient care experience and physician skill development” as key themes. The topic of “attitude toward patient care as a physician” revealed that the students valued a serious approach to patient care as an avenue for personal growth, which is consistent with the findings of Kaba and Sooriakumaran [34]. The students viewed patient interactions as opportunities for personal development beyond subject treatment. The topic of “mistakes in patient care and efforts to correct them” underscored the importance of overcoming mistakes through patient interaction. Physicians learn and improve patient care by addressing errors that occur during patient interactions [35, 36]. Medical education should offer feedback and learning opportunities when mistakes arise, to foster continuous growth and early patient safety awareness. By conducting regular debriefing sessions and creating a non-punitive culture to discuss mistakes, the process of learning from errors and continuous improvement could be normalized. The topic of “patient care experience and physician skill development” underscored the role of patient interactions in developing clinical expertise; this aspect aligns with previous research [37, 38] emphasizing how experiential learning contributes to skill enhancement. This perspective reflects students’ understanding that their expertise as physicians should benefit the broader community, not just individual patients. Medical education can leverage this aspect by fostering environments that enhance clinical skills through meaningful patient interactions to further strengthen students’ sense of purpose and contribution to society.

Educational implications for future medical education

This study provides valuable insight into medical students’ perspectives on physicians’ job satisfaction and patient care, which emphasizes the need for comprehensive educational strategies. Given the generational differences in learning preferences and expectations between current medical students and older generations of physicians, various efforts are being made in educational settings to address the rapidly changing needs of students [39, 40]. Consistent with SDT, our findings support curricular reforms that could fulfil students’ psychological needs for autonomy, competence, and relatedness. Furthermore, aligned with Kern’s six-step approach to curriculum development [41], this study lays the groundwork for problem identification and needs assessment, pinpointing areas where medical education can be adapted to foster greater motivation and satisfaction among future physicians.

Limitations

This study had several limitations. First, the sample was restricted to students from a specific medical school, which potentially limited the generalizability of the results. Future research should include students from diverse geographical regions and medical schools to enhance the generalizability of the results. Second, the analysis relied on students’ descriptive essay responses, which were susceptible to subjective bias. We mitigated this issue through rigorous data preprocessing and analysis, including the use of model fit indices to ensure statistical robustness, and by prompting students to explicitly articulate their perspectives on key topics. Nevertheless, incorporating complementary methodologies such as in-depth interviews or other qualitative approaches could offer a more comprehensive understanding. Third, the study captured students’ perceptions at a single point in time, which implies potential temporal limitations. Although we aimed to provide a detailed snapshot of current perceptions, the evolution of students’ views and the long-term impact of these insights on their professional development and educational interventions should be tracked and assessed through future longitudinal studies.

Conclusions

This study offers valuable insights into medical students’ views on physician job satisfaction and the patient-centered attitudes necessary for developing professional skills. Our findings emphasize the need for curricular enhancements addressing work–life balance, social impact, and supportive medical environments, all of which are crucial for fostering job satisfaction in future physicians. Additionally, integrating structured patient interactions that encourage learning from mistakes is essential for skill development and promoting a committed approach to patient care. Using SDT to frame these insights, this study provides practical recommendations for medical educators to support students’ autonomy, competence, and relatedness. These findings can guide curriculum development and thereby prepare students to navigate healthcare challenges with resilience and satisfaction, ultimately supporting their well-being and success as patient-centered physicians.

Abbreviations

IDF	Inverse document frequency
LDA	Latent dirichlet allocation
Mr	Mister
Ms	Miss
SDT	Self-determination theory
TF	Term frequency
TF-IDF	Term frequency–inverse document frequency

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12909-024-06406-x>.

Additional file 1. Student Questionnaire. This supplementary material contains a student questionnaire designed to assess reflective understanding of physician job satisfaction and the necessary attitudes for effective patient interactions. The questionnaire is part of the “Physicians and Society” course and focuses on factors that enhance physician job satisfaction and essential behaviors for professional patient care. Participation is voluntary; responses are anonymous, and the data will be used solely for research in medical education.

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Authors' contributions

Study idea and design: YK, MN, CK. Data collection: YK, MN, HY, CK. Data analysis and interpretation: YK, MN, SP. Drafting of the article: YK, MN, SP, MK. Critical revision of the article: YK, MN, SP, MK, HY, CK.

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Data availability

The datasets generated and/or analyzed during the current study are not publicly available because of ethical constraints but are available from the corresponding author upon reasonable request.

Declarations

Ethical approval and consent to participate

The Institutional Review Board (IRB) of Chung-Ang University determined that this study is exempt from IRB review as it was conducted in established or commonly accepted educational settings and involved normal educational practices (Approval Number: 1041078-20240615-HR-150). Written informed consent was obtained from all the participating students. This study was performed in accordance with relevant guidelines and regulations, including the principles outlined in the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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