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Mapping Self-Perceived Leadership Competencies Among Final-Year Syrian Medical Students: A Cross-Sectional Analysis

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Article

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Abstract

Leadership competency is increasingly vital for effective healthcare delivery yet remains underexplored in Syrian medical education. This study assesses the self-perceived leadership competencies of final-year medical students in Syrian public and private universities to inform curriculum development and strengthen physician leadership training. A cross-sectional study was conducted from December 2024 to February 2025 using a structured, self-administered electronic questionnaire based on the Medical Leadership Competency Framework. The instrument included 41 items across five domains, rated on a 5-point Likert scale. Participants were sixth-year medical students from Syrian universities. Descriptive statistics were computed, and group differences by gender, university type, and Academic Performance Percentage (APP) were analyzed using independent samples t-tests, one-way ANOVA, Mann-Whitney U, and Kruskal-Wallis tests as appropriate. A total of 119 responses were analyzed (response rate: 45.25%). Students reported high overall self-perceived leadership competencies (mean = 3.96). The domain “Improving Services” scored highest (mean = 4.11, SD = 0.51), while “Setting Direction” was lowest (mean = 3.71, SD = 0.63). No significant differences were found in total scores by gender, university type, or APP. However, males scored significantly higher on valuing feedback (AC2) and service improvement (AC33). Students from government universities self-rated higher on five items related to practical knowledge application, collaboration, patient-centered care, transparent communication, and proactive safety practices. Syrian medical students demonstrate strong self-perceived leadership skills, particularly in service improvement, but show a relative deficit in strategic direction-setting. The lack of major demographic differences supports the broad implementation of leadership training. Curricular integration of evidence-based, domain-specific leadership education, especially in strategic thinking and feedback utilization, is recommended. Future studies should employ objective and longitudinal methods to enhance physician leadership readiness.

Introduction

Leadership development is increasingly recognized as a core component of medical education and a critical determinant of effective healthcare delivery [1]. Strong medical leadership enhances patient outcomes, promotes organizational efficiency, and supports positive systemic change across healthcare environments [2, 3]. In addition to clinical expertise, healthcare professionals are expected to demonstrate competencies in communication, decision-making, problem-solving, and teamwork —skills that contribute to the cultivation of high-functioning, patient-centered healthcare systems [4, 5].

Medical graduates equipped with leadership skills are better prepared to navigate the complexities of contemporary healthcare systems and advocate effectively for patients and peers [5, 6]. Moreover, leadership development supports personal and professional growth, enhances career advancement, and contributes to improved healthcare system performance [2].

To address this need, various leadership competency frameworks have been developed. One of the most widely used is the Medical Leadership Competency Framework (MLCF), established by the Academy of

Medical Royal Colleges in collaboration with the NHS (National Health Service) Leadership Academy [3]. Although the NHS Leadership Competency Framework was replaced by the Healthcare Leadership Model in 2013 [7], the MLCF remains tailored to medical professionals, integrating leadership with clinical responsibilities. It emphasizes five core domains: *Demonstrating Personal Qualities, Working with Others, Managing Services, Improving Services, and Setting Direction* [3].

Each domain reflects key leadership attributes. *Demonstrating Personal Qualities* focuses on self-awareness, emotional regulation, continuous personal development, and professional integrity—skills linked to ethical leadership and organizational trust [8]. *Working with Others* emphasizes relational dynamics, including empathy, boundary-setting, and team collaboration, which contribute to staff engagement and operational efficiency [9]. *Managing Services* involves strategic planning, performance monitoring, and optimal resource allocation, ensuring service quality and accountability [10]. *Improving Services* highlights innovation, shared responsibility, and continuous quality improvement grounded in evidence-based practice [3]. Lastly, *Setting Direction* involves data-informed decision-making and the alignment of actions with organizational goals and values [3, 11].

Emerging models such as the “4Cs of Influence” (character, competence, connection, and culture) provide additional perspectives by integrating individual and organizational dimensions of leadership [4, 12]. Despite varying models, consensus exists on embedding leadership training throughout medical curricula using validated and interdisciplinary approaches to meet contemporary healthcare challenges [4, 13].

Leadership education is most effective when introduced early and integrated longitudinally throughout the curriculum [14]. Studies affirm that structured leadership training improves competencies and correlates with positive outcomes at both individual and organizational levels [15]. However, the integration of leadership into medical education remains inconsistent. In the U.S., only about half of medical schools offer formal leadership training, and existing programs vary widely in structure, content, and assessment methods [16, 17]. Common delivery methods include workshops, seminars, mentorship programs, and dual degrees; however, few are longitudinal or systematically integrated throughout medical training [16, 18].

Despite students’ generally positive attitudes toward leadership training, barriers persist. These include limited curricular time, lack of institutional commitment, and the absence of standardized evaluation tools [17, 19]. Addressing these barriers require systemic engagement from faculty, institutions, and policymakers to build a leadership-supportive educational culture [6].

In contrast to global trends, leadership education in Syrian medical institutions remains an underexplored domain. Although the value of leadership in medical training is globally acknowledged, the Syrian context has received limited scholarly attention. As Syria continues to recover from a 14-year conflict, strengthening the leadership capacity of its future healthcare professionals is critical for rebuilding and reforming its healthcare system.

To address this gap, the current study investigated self-perceived leadership competencies among final-year medical students at public and private Syrian universities. Final-year students, positioned at the threshold of clinical practice, offer valuable insights into their readiness to assume leadership roles. This research was guided by two key questions: (1) How do final-year medical students in Syria perceive their leadership competencies? and (2) Are there statistically significant differences based on gender, academic performance, or university type?

Methodology

Conceptual Framework

The study adopted the MLCF as its conceptual foundation. The MLCF outlines a standardized set of core leadership competencies expected of all doctors and is integrated into both undergraduate and postgraduate medical curricula [3, 7]. For this study, the competencies—emphasizing leadership development—were adapted with minor modifications based on discussions among the authors, resulting in a final survey comprising 41 items.

Research Design

A cross-sectional, quantitative research design was employed, utilizing a structured, self-administered electronic questionnaire administered via Google Forms. This method was selected for its cost-effectiveness, wide reach, and suitability for engaging a geographically dispersed population of final-year medical students across Syria [20]. The questionnaire comprised seven sections: an introduction outlining study objectives and implied consent; demographic information; and five domains of the MLCF —*Demonstrating Personal Qualities* (10 items), *Working with Others* (8 items), *Managing Services* (8 items), *Improving Services* (8 items), and *Setting Direction* (7 items)—totaling 41 items. Each item was rated on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree) in response to the prompt: “To what extent do you agree with the following leadership competencies in sixth-year medical students?”. A copy of the questionnaire is provided in Supplementary File 1.

Face validity was established through expert review by eight specialists in education, research, and measurement, leading to item refinement, rephrasing, and restructuring—including the removal of one item and the addition of two items. A pilot test with 20 medical students (excluded from the final sample) assessed clarity, relevance, and usability. Internal consistency was high (Cronbach’s α = 0.94), indicating strong reliability. Data collection occurred between December 2024 and February 2025, with the survey open for two weeks and weekly reminders sent to enhance participation. Effective survey design involves creating reliable and valid items and achieving at least a 40% response rate to reduce nonresponse bias and improve generalizability [21]. An anonymous electronic format enhanced accessibility and helped meet the response rate target.

Participants

This study included sixth-year medical students from public and private medical schools across seven Syrian governorates: Damascus, Homs, Hama, Aleppo, Latakia, Tartous, and Deir Ezzor. The target population consisted of approximately 3,500 students distributed across 13 medical faculties, although precise enrollment figures are not publicly available. A convenience sampling combined with a snowball sampling strategy was employed for participant recruitment. Ethical approval was obtained from the Syrian Virtual University (No. 234/0, dated 13 February 2024). Data were collected electronically using a Google Forms questionnaire, distributed via official WhatsApp and Facebook groups for sixth-year students, and through personalized email and messaging app invitations.

Participants provided informed consent implicitly by completing and submitting the survey. They were also encouraged to share the link with eligible peers to enhance reach and representation.

Data Analysis

Data were analyzed using IBM SPSS Statistics Version 26. Descriptive statistics (mean [M], standard deviation [SD]) were computed for all demographic and questionnaire variables.

Prior to group comparisons, the Shapiro-Wilk test assessed normality of distribution. Based on these results, parametric tests (independent samples *t*-test, one-way ANOVA) or non-parametric alternatives (Mann-Whitney U, Kruskal-Wallis) were applied to examine differences in leadership scores by gender, university type (public vs. private), and academic performance percentage (APP), which was categorized into three levels: low (<60%), medium (60–80%), and high (>80%). Item-level analyses were conducted to identify specific competency differences across subgroups. Cronbach's alpha was calculated for each leadership domain to confirm internal consistency. To facilitate interpretation of Likert scale responses (1–5), a five-point interpretive framework was applied: very low (1.00–1.80), low (1.81–2.60), medium (2.61–3.40), high (3.41–4.20), and very high (4.21–5.00), enabling clear and meaningful data interpretation (Table 1).

Results

The survey was distributed to 263 invited students, of whom 119 completed it, resulting in a 45.25% response rate. Participants were from 12 Syrian universities: seven public (58.33%) and five private (41.67%). Among the valid responses, 65 (54.62%) were from public university students and 54 (45.38%) from private university students. The gender distribution was 43 males (36%) and 76 females (64%). Self-reported APP was categorized as follows: low (<60%): 13 students (10.92%); medium (60–80%): 70 students (58.82%); and high (>80%): 36 students (30.25%). Internal consistency of the leadership domain subscales was good to excellent, with Cronbach's alpha values ranging from 0.69 to 0.85, indicating reliable measurement of each domain. See Table SM1 in Supplementary File 1.

Analysis Across the Five Leadership Domains

Descriptive statistics and box plot analysis (Figure 1) revealed high overall self-perceived leadership competencies (M = 3.96). The first four domains exhibited stable median scores of 4.0, with "*Improving Services*" scoring the highest (M = 4.11), reflecting strong perceived performance. In contrast, the final domain, "*Setting Direction*," had the lowest mean score (M = 3.65) and the highest variability (SD = 0.63), identifying it as the weakest and most inconsistent domain—and therefore a priority area for development (see Table 1).

Table 1. Descriptive Statistics and Perceived Importance of Leadership Competency Items by Domain.

Domain / Item No.	Item Description	Mean	SD	Perceived Importance
Domain 1	Demonstrating Personal Qualities	3.97	0.42	High
AC1	I deal with others based on my values and ethics	4.67	0.55	Very High
AC2	I care about hearing feedback from others	3.87	0.81	High
AC3	I strive to adjust my behavior based on the feedback of others	3.38	0.96	Medium
AC4	I remain calm and balanced under work pressure	3.71	0.91	High
AC5	I plan my work schedule and fulfil my obligations according to the standards in place	3.88	0.91	High
AC6	I demonstrate flexibility in my performance based on the requirements of the job	4.09	0.72	High
AC7	I always try to seek opportunities for learning and self-development	4.08	0.83	High
AC8	I apply what I have learned theoretically to my practical work practices	3.93	0.79	High
AC9	I sincerely respect the cultures and beliefs of others	4.35	0.70	Very High
AC10	I do not remain silent when I see a breach of professional	3.71	0.86	High
Domain 2	Working with Others	4.01	0.49	High
AC11	I collaborate with others to achieve the development of patient care.	4.27	0.63	Very High
AC12	I share information and resources with others through social networks	3.72	1.01	High
AC13	I communicate transparently with others	3.96	0.79	High
AC14	I listen to the complaints of others and consider their needs.	4.20	0.63	High
AC15	I always strive to listen to the suggestions of others	3.92	0.78	High
AC16	I trust in my ability to resolve differences of opinion and conflicting professional interests	3.77	0.89	High
AC17	I strive to lead and choose the right people within the team	4.06	0.85	High
AC18	I appreciate and respect the efforts and decisions of the work team	4.18	0.62	High
Domain 3	Managing Services	3.99	0.52	High

AC19	I appreciate and benefit from patient and colleague feedback when developing action plans.	4.18	0.66	High
AC20	I am able to evaluate the risks and benefits of proposed solutions.	3.82	0.82	High
AC21	I strive to provide safe and effective services within the available resources.	4.21	0.76	Very High
AC22	I take necessary actions when resources are not being used efficiently.	3.82	0.83	High
AC23	I support team members in developing their roles and responsibilities.	4.06	0.76	High
AC24	I provide the team with advice and guidance to ensure quality work.	4.03	0.69	High
AC25	I am able to analyse information from various sources.	3.82	0.76	High
AC26	I take appropriate measures to improve work performance.	4.03	0.75	High
Domain 4	Improving Services	4.11	0.51	High
AC27	I intervene when I notice any shortcomings that threaten patient safety.	4.15	0.87	High
AC28	I review work steps to improve patient safety and reduce risks whenever possible.	4.13	0.74	High
AC29	I utilize feedback from patients and the care team to improve service performance.	4.16	0.62	High
AC30	I collaborate with others to provide services effectively.	4.21	0.70	Very High
AC31	I propose ideas to improve the quality of services provided.	4.02	0.75	High
AC32	I discuss new ideas with experienced individuals.	4.11	0.78	High
AC33	I strive to change and develop services to improve work quality.	4.04	0.76	High
AC34	I motivate others to facilitate change and development.	4.07	0.77	High
Domain 5	Setting Direction	3.71	0.63	High
AC35	I anticipate future challenges that may create a need for change and communicate them to others.	3.51	0.86	High
AC36	I use data and information to improve work service.	3.88	0.78	High

AC37	I influence others using knowledge and scientific evidence to achieve best practices.	3.87	0.85	High
AC38	I consult with decision-makers while considering values and service priorities.	3.82	0.83	High
AC39	I contribute to making official and unofficial decisions about the future of services.	3.24	0.97	Medium
AC40	I take responsibility for implementing new methods to develop work.	3.47	0.98	High
AC41	I evaluate the impact of development and change on patients and healthcare service.	3.77	0.85	High

SD: Standard Deviation

Leadership skills Assessment by Gender

Gender-based analysis revealed no statistically significant differences in overall or domain-specific leadership performance ($p > 0.05$), indicating that gender had no meaningful impact (see Table 2). However, item-level analysis using the Mann-Whitney U test showed that males scored significantly higher on two specific competencies: valuing feedback (AC2, $p = 0.012$) and service improvement (AC33, $p = 0.047$). These exceptions did not alter the overall pattern, suggesting that gender was not a major differentiating factor in leadership competency (see Table SM2 in Supplementary File 1).

Table 2. Comparison of Leadership Domain Scores by Gender (n = 119).

Leadership Domain	Male (n = 43) Mean (SD)	Female (n = 76) Mean (SD)	Test Used*	p-value	Significant?
All Domains	3.98 (0.45)	3.94 (0.43)	Mann-Whitney U	0.260	No
Domain 1- Demonstrating Personal Qualities	4.03 (0.43)	3.94 (0.40)	Independent t-test	0.265	No
Domain 2 - Working with Others	3.99 (0.49)	4.02 (0.49)	Independent t-test	0.786	No
Domain 3 - Managing Services	4.02 (0.53)	3.98 (0.51)	Mann-Whitney U	0.545	No
Domain 4 - Improving Services	4.14 (0.54)	4.09 (0.49)	Mann-Whitney U	0.305	No
Domain 5 - Setting Direction	3.68 (0.65)	3.64 (0.63)	Mann-Whitney U	0.598	No

*The Mann-Whitney U test was used for gender comparison because the male data did not follow a normal distribution.

Leadership Skills Assessment by University Type

No significant statistical differences were found in overall or domain-specific leadership scores between participants from government and private university ($p > 0.05$), as shown in Table 3. However, a small effect size (Cohen's $d = 0.324$) suggests a minor practical advantage for students from government university.

Item-level analysis revealed significant differences in 5 out of 41 items, all favoring government university students (see Table SM3 in Supplementary File 1). Specifically, they rated themselves significantly higher in applying theoretical knowledge (AC8, $p = 0.030$), collaborative patient care (AC11, $p = 0.007$), transparent communication (AC13, $p = 0.018$), striving for safe services (AC21, $p = 0.038$), and reviewing steps for safety (AC28, $p = 0.003$).

Table 3. Comparative Analysis of Leadership Domain Scores by University Type (n = 119).

Leadership Domain	Government (n = 81) Mean (SD)	Private (n = 38) Mean (SD)	Test Used	p-value	Significant?
All Domains (41 items)	4.00 (0.44)	3.86 (0.41)	Independent t-test	0.102	No
Domain 1 - Demonstrating Personal Qualities	4.00 (0.42)	3.90 (0.39)	Independent t-test	0.217	No
Domain 2 - Working with Others	4.06 (0.47)	3.89 (0.51)	Independent t-test	0.077	No
Domain 3 - Managing Services	4.04 (0.53)	3.90 (0.47)	Mann-Whitney U	0.247	No
Domain 4 - Improving Services	4.15 (0.50)	4.02 (0.53)	Mann-Whitney U	0.299	No
Domain 5 - Setting Direction	3.71 (0.66)	3.53 (0.55)	Mann-Whitney U	0.155	No

Leadership Skills Assessment by APP

Kruskal-Wallis analysis (used due to non-normal distributions) revealed statistically significant differences ($p < 0.05$) in five competencies (AC3, AC4, AC8, AC13, and AC17) across APP brackets. However, post-hoc tests and small effect sizes suggest limited practical significance. Most competencies showed no significant variation, indicating that academic performance has minimal

impact on individual leadership competencies (see Table 4; and Tables SM4–SM5 in Supplementary File 1).

Table 4. Significant Competency Differences by APP: Kruskal-Wallis and Post-hoc Results

Competency	High APP, Mean (SD)	Medium APP, Mean (SD)	Low APP, Mean (SD)	p-value	Effect Size (η^2_H)	Post-hoc (Significant Differences)
AC3	3.31 (0.85)	3.31 (1.01)	4.22 (0.67)	0.020	0.051	High–Low (p = 0.025), Medium–Low (p = 0.017)
AC4	3.98 (0.81)	3.49 (0.95)	3.89 (0.60)	0.022	0.049	High–Medium (p = 0.020)
AC8	4.18 (0.68)	3.78 (0.86)	3.78 (0.44)	0.035	0.041	High–Medium (p = 0.037)
AC13	4.20 (0.76)	3.83 (0.80)	3.67 (0.50)	0.029	0.044	High–Medium (p = 0.054, marginal); High–Low (p = 0.170)
AC17	4.22 (0.77)	4.02 (0.91)	3.56 (0.53)	0.049	0.035	High–Low (p = 0.045)

Domain-level analysis revealed a statistically significant overall difference in the "*Working with Others*" domain (ANOVA, p = 0.036). (see Table 5) However, subsequent Tukey HSD post-hoc comparisons did not identify any statistically significant pairwise differences, indicating a general group effect without meaningful differences between specific academic performance brackets (see Tables SM6–SM7 in Supplementary File 1).

All other domains showed no significant variation across academic performance groups. These findings suggest that leadership performance across domains is largely unaffected by academic performance (see Table 5; and Tables SM6–SM7 in Supplementary File 1).

Table 5. Comparative Analysis of Leadership Domain Scores Across APP Brackets

Domain	High APP, Mean (SD)	Medium APP, Mean (SD)	Low APP, Mean (SD)	Test Used	p-value	Significant?
Demonstrating Personal Qualities	4.06 (0.34)	3.89 (0.47)	4.07 (0.18)	Kruskal-Wallis	0.133	No
Working with Others	4.14 (0.42)	3.95 (0.53)	3.76 (0.37)	ANOVA	0.036	Yes*
Managing Services	4.12 (0.51)	3.92 (0.53)	3.90 (0.30)	ANOVA	0.116	No
Improving Services	4.21 (0.44)	4.06 (0.56)	4.00 (0.42)	ANOVA	0.221	No
Setting Direction	3.78 (0.63)	3.57 (0.66)	3.59 (0.39)	ANOVA	0.240	No
overall leadership competencies	4.07 (0.38)	3.89 (0.47)	3.88 (0.26)	ANOVA	0.077	No

*Details of post hoc test in table SM7 in Supplementary File 1.

Discussion

This study addresses a critical gap in medical education by assessing self-perceived leadership competencies among final-year medical students in Syria, a context profoundly affected by prolonged conflict and in urgent need of resilient healthcare leadership. The use of a validated, comprehensive instrument based on the MLCF across multiple institutions ensures methodological rigor and contextual relevance, providing a reliable foundation for curricular development.

This study found that final-year medical students in Syrian universities perceive themselves as highly competent in leadership, with an overall mean score of 3.96 out of 5. The domain "*Improving Services*" received the highest ratings, while "*Setting Direction*" was rated lowest, though still within the high range. No significant differences in leadership self-assessment were observed based on gender, university type, or academic performance.

These findings are consistent with findings from a similar study at Hashemite University in Jordan, which also reported high perceived leadership competencies without significant demographic differences, although the ranking of domains differed [22]. Variations in domain rankings may be due to contextual factors such as academic level, curriculum design, and cultural differences. Supporting this, a South African study found that while dental students acknowledged interpersonal and personal leadership skills, they lacked awareness of broader competencies like service improvement and strategic planning [23].

The strong internal consistency of the questionnaire (Cronbach's α = 0.95), with all five leadership domains demonstrating acceptable to good consistency, reinforces the reliability of these findings in the context of medical education.

Analysis of leadership competencies across domains highlights both strengths and developmental needs among final-year Syrian medical students. While students generally reported high level self-perceived competencies, proficiency levels varied across domains. *Improving Services* (domain 4) was the most highly rated domain, reflecting strong engagement with quality improvement practices such as collaboration (AC30, M = 4.21) and feedback utilization (AC29, M = 4.16). These findings corroborate existing literature highlighting feedback as essential for communication skills, professional development, staff well-being, and enhanced patient outcomes [24, 25]. The strong interpersonal skills, teamwork, and patient safety awareness demonstrated suggest a commitment to collaborative leadership and continuous service enhancement.

Demonstrating Personal Qualities (domain 1) showed strong adherence to ethical standards and cultural sensitivity. Top-rated items included ethical conduct (AC1, M = 4.67) and respect for diversity (AC9, M = 4.35). However, students showed limited behavioral adaptability in response to feedback (AC3, M = 3.38), indicating a need to strengthen reflective practices. Ethical leadership plays a critical role in delivering high-quality healthcare by fostering trust, psychological safety, and transparent communication. These factors collectively improve patient outcomes, boost staff morale, and strengthen organizational performance, particularly within complex and high-stress clinical environments [26].

Working with Others (domain 2) emphasizes collaboration, clear communication, and respectful teamwork. Participants demonstrated strong interpersonal and collaborative skills, as reflected in high scores for items such as AC11 (M = 4.27) and AC18 (M = 4.18). Nevertheless, competencies related to conflict resolution (AC16, M = 3.77) and resource sharing (AC12, M = 3.72) scored comparatively lower, suggesting underdeveloped skills in these critical areas. These findings highlight the need for targeted leadership training focused on emotional intelligence, conflict management, communication, and interprofessional collaboration to improve care delivery [5, 27].

Managing Services (domain 3) reflected solid performance in patient safety and feedback-driven service improvement (AC21, M = 4.21; AC19, M = 4.18). However, analytical competencies were comparatively weaker (e.g., AC20, AC22, and AC25 all scored M = 3.82), pointing to a gap in critical thinking and data-driven decision-making. This domain is vital, as effective medical leadership requires not only technical expertise but also promotion of safety, continuous quality improvement, and team development through the integration of feedback and evidence-based care [28].

Setting Direction (domain 5) scored lowest and showed the greatest variability, reflecting limited strategic leadership capabilities. Students reported moderate confidence in data use (AC36, M = 3.88) and struggled with decision-making and innovation leadership (e.g., AC39, M = 3.24; AC40, M = 3.47). These findings suggest insufficient exposure to long-term planning and service transformation. Addressing these gaps calls for stronger focus on strategic foresight and leadership development that

integrates data-driven decision-making, ethical governance, and interpersonal skills to drive innovation and improve patient outcomes [29].

The analysis showed no significant gender differences in most leadership competencies, except for two items (AC2, A33) where males scored higher on openness to feedback and service improvement. Overall, male and female participants demonstrated similar perceived leadership skills, aligning with prior research [13, 30]. However, women remain underrepresented in senior medical leadership roles due to structural and socio-cultural barriers—not differences in ability—including lack of role models, lower confidence, and persistent gender bias [31, 32].

While no significant differences were found in overall leadership scores between government and private university students ($p = 0.102$), a small effect size (Cohen's $d = 0.324$) suggested a slight advantage for government university students. Five specific items (AC8, AC11, AC13, AC21, AC28)—related to practical knowledge, collaboration, communication, patient-centered care, and safety—showed significant differences favoring government university students. These distinctions may reflect differences in admission standards and academic rigor, as government universities in Syria require higher entrance scores and demonstrate better outcomes on the national medical exam [33].

Leadership skills assessment by academic performance revealed statistically significant differences in five items, though with small effect sizes, indicating limited practical significance. Only the "*Working with Others*" domain showed an overall difference ($p = 0.036$), but post-hoc comparisons were not significant after correction. This suggests that academic performance has a minimal overall impact on leadership competencies, but a more nuanced relationship exists between academic achievement and leadership capacity.

Research indicates that Grade Point Average (GPA) is positively associated with leadership traits such as teamwork and coaching, whereas undergraduate GPA may negatively correlate with certain leadership dimensions, suggesting limited predictive value of academic performance alone for leadership potential [34]. Supporting this, other studies indicate that students with higher academic achievement often demonstrate stronger leadership skills, such as adaptability and decision-making [35]. Importantly, this relationship is dynamic and bidirectional—students engaged in leadership roles tend to develop greater learning autonomy and achieve better academic outcomes [36]. Ultimately, effective leadership is shaped by a combination of academic success and personal attributes like communication, time management, and strategic thinking [37].

The study highlights several important implications for leadership development in medical education. First, the consistently low ratings in the "*Setting Direction*" domain indicate a need for curricula that emphasize strategic thinking and vision-setting. Programs like the AAMC's RISE [38] and methods such as case-based learning, strategic planning exercises, and mentorship helping to address this gap.

Second, while no significant differences emerged between students from government and private universities, institutional culture—including values, governance structures, historical precedents, and

stakeholder perceptions—strongly influences leadership development. This underscores the necessity of tailoring programs to local contexts while maintaining alignment with core competencies [39, 40].

Third, the observed trend of higher GPA students reporting stronger leadership skills suggests that integrating academic and leadership development through integrated curricular approaches, and active, real-world projects can enhance both leadership competencies and academic confidence among faculty and students [41, 42].

Fourth, incorporating regular self-assessment into leadership development programs enhances students' self-awareness, engagement, and targeted growth by allowing them to monitor progress and identify areas for improvement. To maximize these benefits, medical schools should integrate validated self-assessment tools at multiple points in the curriculum to effectively track and support students' leadership development over time [43, 44].

Finally, the findings emphasize that medical leadership development is a complex, multidimensional process requiring targeted, domain-specific approaches rather than a one-size-fits-all model. Effective curricula should address all five leadership domains, especially those where student confidence is low, using diverse, longitudinal, and experiential strategies. Programs that treat leadership as a single skill are less effective than those that tailor development to specific competencies [6, 18].

This study highlights self-perceived leadership strengths and gaps among final-year Syrian medical students, emphasizing the need to integrate leadership training into undergraduate education to better prepare future physicians for complex healthcare roles. These insights can guide evidence-based curricula and national strategies to strengthen healthcare leadership, ultimately supporting clinical excellence and system resilience in Syria's post-conflict recovery [19].

Strengths and Limitations

This study has several notable strengths, including a comprehensive assessment of five leadership domains, high internal consistency, and the use of a detailed 41-item questionnaire that surpasses shorter tools used in previous research. The inclusion of students from both government and private universities also allows for institutional comparisons often lacking in single-site studies.

However, certain limitations should be acknowledged. Self-assessment tools are prone to cognitive biases—such as self-serving, response-shift, and reference biases [45, 46]—which may distort accuracy. Therefore, these tools should be complemented by external evaluations or objective performance metrics for a fuller picture of leadership competencies [45, 46].

Second, the study's cross-sectional design captures data at a single time point, limiting insights into leadership development over time, which longitudinal approaches could better address [47]. Additionally, uneven and small sample sizes in certain demographic subgroups, particularly in the low APP bracket, may have reduced statistical power. Lastly, the study did not control for confounding factors such as

prior leadership experience or cultural background, which could affect self-perception. Future research should include broader variables and longitudinal designs to deepen understanding of leadership development in medical education.

Recommendations

To strengthen the generalizability and impact of current findings, future research should include larger and more diverse samples of Syrian medical students across multiple universities and faculties. Cross-institutional and cross-cultural studies can help identify both universal and context-specific factors influencing leadership development.

A mixed-methods approach, combining qualitative and quantitative data, would offer deeper insights into how variables like APP scores and university type affect leadership competencies. Furthermore, longitudinal studies tracking students from entry into medical school through clinical practice are essential for identifying developmental patterns and key intervention points.

This study provides a foundation for integrating leadership and management training into Syrian medical curricula, ideally aligned with international frameworks to support benchmarking and curriculum design. National-level evaluations and clinical case-based assessments can help monitor training outcomes. Lastly, involving students, curriculum designers, and educational leaders in program development will be crucial to ensure leadership programs are both effective and contextually relevant.

Conclusion

This study explored medical graduates' self-perceived leadership competencies across five key domains, revealing generally positive self-assessments but highlighting a need for improvement in "*Setting Direction*." The lack of significant demographic differences suggests that leadership training principles can be broadly applied across diverse student groups. The reliable assessment tool and domain-specific findings emphasize the multidimensional nature of leadership and the need for targeted educational strategies. Overall, this research supports integrating evidence-based leadership development into medical curricula and calls for future research using objective measures and longitudinal designs to better prepare physician leaders for complex healthcare environments.

Abbreviations

AAMC: Association of American Medical Colleges

ANOVA: Analysis of Variance

APP: Academic Performance Percentage

GPA: Grade Point Average

HSD: Honestly Significant Difference (Tukey HSD post-hoc test)

M: Mean

MLCF: Medical Leadership Competency Framework

NHS: National Health Service (UK)

RISE: Research, Innovation, Service, and Education (AAMC leadership program for medical students)

SD: Standard Deviations

η^2_H: Eta-squared (H = Kruskal-Wallis version, measure of effect size)

Declarations

Data availability

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

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Contribution to authorship

RD conceptualized the study and served as the principal investigator. RD collected the survey data. RD and IZ conducted the data analysis and drafted the initial manuscript. MD supervised the study design and implementation. All authors contributed to the study design, interpretation of findings, and critical revision of the manuscript. All authors read and approved the final version.

Additional Information

Disclosure of interests

The authors confirm that they have no conflicting interests.

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Clinical trial number

Not Applicable

Ethics Approval and Consent to Participate

This study was conducted in accordance with the ethical standards of the institutional research committee and with the 1964 Declaration of Helsinki and its later amendments.

Ethical approval has been granted from the ethical committee at the Syrian Virtual University (No. 234/0, dated 13 February 2024), and Participants provided informed consent implicitly by completing and submitting the survey.

Consent for publication

Not applicable.

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Figures

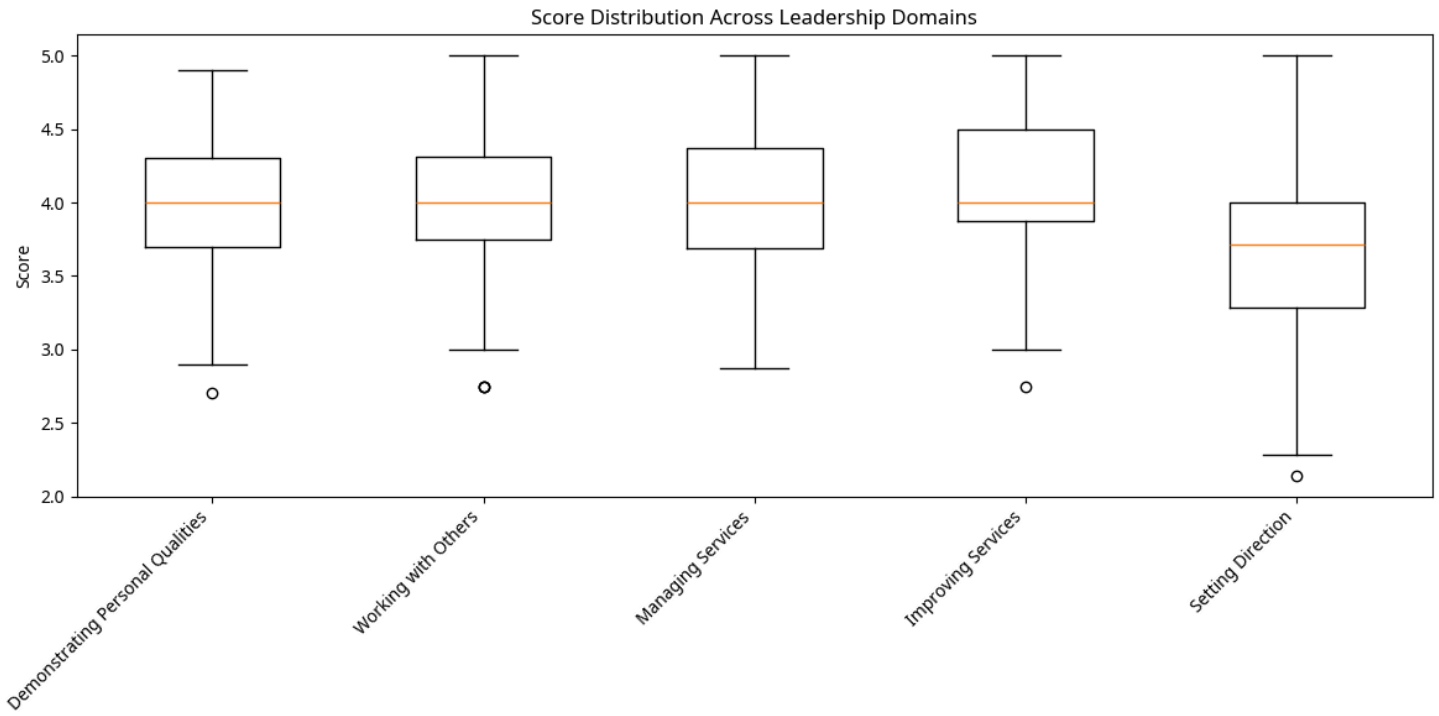


Figure 1

Box plots illustrate the distribution of scores across the five leadership domains.

Figure 1 Legend:
Figure 1. Score distribution across five leadership domains: Demonstrating Personal Qualities, Working with Others, Managing Services, Improving Services, and Setting Direction. Each boxplot shows the median (orange line), interquartile range (box), and outliers (dots). Scores range from 2.0 to 5.0.

Supplementary Files

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- Supplementaryfile1.docx