Systemic Review

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Best Practices in Leadership Training in Undergraduate Medical Education: A Systematic Review of Studies Published Between 2017–2024

Marina Khan[1], Muhammad Abbas Khan[2*], Farida Parvez[3], Memoona Bibi[4], Fatima Tu Zahra[5] and Shomaila[6]

[1]Department of Medical Education, Gandara University, Peshawar, Pakistan
[2]Department of Medical Education, Jinnah Medical College, Peshawar, Pakistan
[3]Department of Medical Education, Frontier Medical and Dental College, Abbottabad, Pakistan
[4]Department of Physical Therapy, Rehman College of Rehabilitation Sciences, Peshawar, Pakistan
[5]Department of Global Health, Health Sciences Academy, Islamabad, Pakistan
[6]Department of Medical Education, Women's Medical College, Abbottabad, Pakistan

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ABSTRACT

Leadership is increasingly recognized as a core professional competency in undergraduate medical education, yet existing training remains inconsistent in structure and depth. Recent studies show considerable variation in how leadership is taught and evaluated, making it difficult for medical schools to define effective educational strategies. **Objectives:** To synthesize contemporary evidence on teaching methods, curricular structures, and reported outcomes of leadership training for undergraduate medical students (2017–2024). **Methods:** A systematic search of PubMed, Scopus, and the Cochrane Library (2017–2024) identified original research involving undergraduate medical students. Eligible studies reported a leadership-related intervention, perceptions, or readiness. Data extraction focused on teaching approaches, duration, assessment tools, and reported learning outcomes. Study quality was appraised using MMAT and JBI checklists. **Results:** Fifteen studies met the inclusion criteria. Most interventions were short workshops, brief courses, or needs-assessment surveys, with only a few longitudinal or integrated curricula. Common pedagogical methods included interactive workshops, reflective activities, team-based tasks, and student-led sessions. Outcomes largely reflected self-reported improvements in communication, teamwork, and confidence, while evidence of behavioural change or objective performance was limited. Considerable inconsistency existed in outcome measures and leadership competencies assessed. **Conclusion:** Current evidence indicates growing attention to leadership training but highlights significant gaps in curricular structure, assessment tools, and long-term evaluation. Programs using blended, experiential, and repeated learning opportunities show promise, but more rigorous, longitudinal, and competency-based approaches are needed to establish effective leadership development in undergraduate medical education.

INTRODUCTION

Leadership is now regarded as an essential component of modern medical practice, requiring doctors to guide teams, communicate clearly, and manage complex clinical environments. However, evidence consistently shows that many undergraduate medical students progress into clinical training without adequate preparation for these leadership responsibilities [1, 2]. This has prompted renewed attention to how leadership should be incorporated into undergraduate curricula. Across different regions, medical schools have implemented diverse leadership-teaching strategies, including workshops, reflective tasks, mentoring schemes, student-led initiatives, and, in a minority of cases, longitudinal or integrated leadership tracks [3, 4]. While this growing

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variety demonstrates innovation, the lack of standardized competencies and inconsistent assessment methods makes it challenging to determine which approaches are most effective [5, 6]. Most published programs report early gains in communication, teamwork, and confidence [7, 8]. Yet these outcomes are primarily self-reported, and evidence documenting measurable behavioural change or sustained impact remains limited. This raises ongoing questions about how leadership development should be structured, assessed, and supported within the undergraduate learning environment. To address these gaps, this systematic review synthesizes recent evidence (2017–2024) on leadership education in undergraduate medical training.

Leadership is a critical competency for modern medical practice, yet many undergraduate students enter clinical training without sufficient preparation for these responsibilities. Although diverse teaching strategies have been implemented globally, a lack of standardized competencies, inconsistent assessment methods, and limited evidence of sustained behavioral impact make it difficult to determine best practices. Existing studies largely rely on self-reported outcomes, highlighting a gap in objective evaluation of leadership development. Therefore, this systematic review aims to examine teaching methods, curricular designs, and reported outcomes in undergraduate medical leadership education to identify patterns, strengths, and areas for improvement.

METHODS

This systematic review followed a structured and reproducible process to identify, screen, and synthesize evidence on leadership training in undergraduate medical education. The search covered eight years from January 1, 2017, to December 31, 2024, and the final search was conducted on January 5, 2025. Three major databases, PubMed, Scopus, and the Cochrane Library, were systematically searched. To enhance reproducibility and address the reviewer's concerns, full Boolean search strings were added, including: PubMed: ("leadership" [Title/Abstract] OR "management") AND ("medical students") AND ("undergraduate" OR "UME"); Scopus: (leadership OR management) AND (medical students) AND (curriculum OR program OR training); and Cochrane Library: ("leadership training") AND ("medical students"). These detailed search expressions were incorporated to replace the previously vague description of search terms. Only English-language, original research articles were included. Across all databases, 615 records were initially identified, after which duplicates were removed, and the remaining titles and abstracts were screened. To improve reproducibility and directly address reviewer feedback, a structured set of inclusion and exclusion criteria was

added. Studies were included if they: (1) involved undergraduate medical students; (2) evaluated or described leadership-related teaching, perceptions, or outcomes; (3) used quantitative, qualitative, or mixed-methods designs; and (4) were published in English between 2017–2024. Studies were excluded if they: (1) involved postgraduate or non-medical populations; (2) were reviews, editorials, commentaries, or viewpoints; (3) lacked leadership-related outcomes, or (4) were conference abstracts without full data. Full-text articles were then reviewed, and studies were excluded if they lacked original empirical data, did not evaluate leadership outcomes, or focused on unrelated educational content. Data extraction followed a structured template documenting study setting, design, participants, leadership intervention, duration or intensity, assessment tools, and key findings. Quality appraisal was performed using the Mixed Methods Appraisal Tool (MMAT) and the Joanna Briggs Institute (JBI) checklists, with tools selected based on each study's methodological design. Risk of bias was assessed by scoring each study against the relevant MMAT or JBI criteria. Studies meeting ≥75% of criteria were classified as "high quality," those meeting 50–74% as "moderate quality," and those meeting <50% as "low quality." The most common risks of bias included convenience sampling, reliance on self-reported outcomes, and absence of control groups. This review adhered to PRISMA 2020 guidelines, and the PRISMA checklist is included as supplementary material. The results were synthesized by extracting and organizing key variables from each included study, including study design, participant characteristics, type and duration of the leadership intervention, assessment tools, and reported outcomes. Studies were then grouped according to the nature of the leadership training, such as workshops, clerkships, longitudinal curricula, and needs-assessment surveys, to allow comparison across similar educational approaches. Qualitative findings were summarized narratively, whereas quantitative outcomes were reported descriptively due to heterogeneity in measurement tools and study designs. This integrated synthesis enabled the identification of common themes, strengths, and gaps across the leadership training literature.
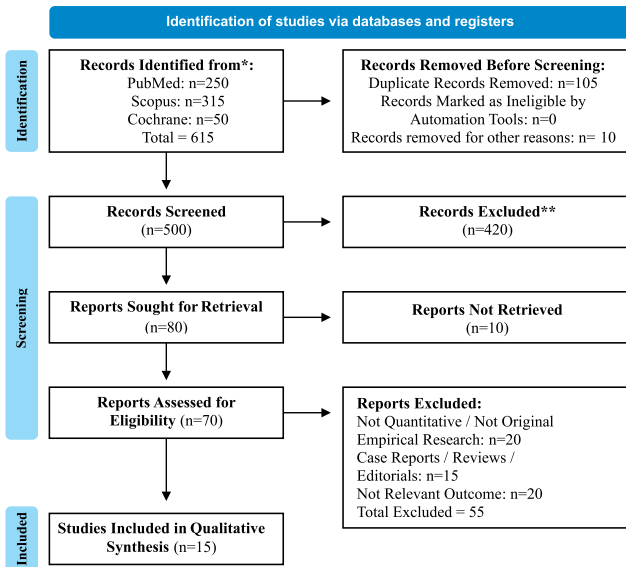
Figure 1: The Identification, Screening, Eligibility Assessment, and Final Inclusion of Studies (n=15)

RESULTS

The study summarizes the characteristics of the 15 included studies, showing considerable variation in study design, training formats, and evaluation tools used to assess leadership development. Across settings, leadership instruction remained limited, with many programs relying on short workshops, surveys, or single-session activities rather than longitudinal or competency-based designs. The majority of studies used self-reported measures that focused on knowledge, skills, or attitudinal outcomes, with few using validated or behavioural assessments. Only a small number included structured or multi-session programs. These findings indicate that leadership training remains inconsistently implemented across undergraduate programs (Table 1).

Table 1: Characteristics of Studies on Leadership Training / Readiness in Undergraduate Medical Education (2017–2024)

Sr. No.	References	Country / Setting	Study Design	Sample / Participants	Leadership Training Approach	Duration / Intensity	Assessment Tools Used	Key Findings Related to Leadership Development
1	[9]	Pakistan, private medical college	Mixed-methods needs assessment	Undergraduate medical students (multiple years; n≈227)	No formal course; study mapped leadership potential and perceptions to inform a future curriculum	One-time survey + qualitative component	Custom leadership-perception questionnaire; focus groups/ interviews	Students recognized leadership as important, but reported very limited formal training, supporting the need for a structured leadership curriculum
2	[10]	USA, military medical school	Longitudinal curriculum description with evaluation	Undergraduate medical students enrolled in a four-year leadership track	Formal 4-year longitudinal "Leader & Leadership" curriculum integrated across UME	Continuous over 4 years, embedded in pre-clinical and clinical phases	Portfolio, multi-source feedback, performance evaluations in leadership roles	Sustained, longitudinal exposure allowed tracking of leadership behaviours over time; the authors report feasibility and positive learner evaluations
3	[11]	Egypt, University Hospital	Quasi-experimental pre-post course evaluation	Pre-registration medical and nursing house officers	Interprofessional course on management and leadership (workshops + collaborative project)	A series of workshops plus a group project over one course block	Pre/post knowledge tests; course evaluation questionnaire	Course improved understanding of basic management/leadership concepts and inter-professional teamwork; participants valued early leadership exposure
4	[12]	USA, LCME-accredited school	Mixed-methods program evaluation	First-year medical students (single cohort; elective/ selected course)	Student-designed and student-led leadership course (teamwork, communication, conflict management, self-awareness)	Short course embedded in first year (multi-session)	Pre/post self-assessment surveys, reflective assignments, and course feedback	Students reported improved confidence in leadership and teamwork, and rated the course highly; the model shows the feasibility of peer-led leadership training
5	[13]	USA, University of Michigan	Program description with outcomes	First-year medical students	Structured first-year leadership program (seminars, small-group work, projects linked to leadership roles)	Longitudinal within first year	Self-reflection tasks, narrative feedback, course evaluations	The program increased students' awareness of leadership roles and self-perceived leadership capacity; experience used to refine later iterations

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6	[14]	Turkey, medical faculty	Qualitative evaluation of a clerkship	Senior under-graduate medical students in a "Leadership in Medicine" clerkship	Multifaceted leadership & team-work clerkship, including seminars, group work, and project-based learning	Short intensive clerkship during clinical years	Thematic analysis of student feedback; course evaluations	Students valued practical leadership activities and role-modelling; authors suggest integrating such clerkships into routine curricula
7	[15]	India, government medical college	Pilot mixed-methods study	Final-year medical students (n= 24)	Structured Student Leadership Program focusing on self-management, team management, reflective practice, and experiential learning	6-month stepwise program with multiple sessions	Qualitative analysis of reflective writing; session feedback	Reflections showed growth in assertiveness, teamwork, and conflict management; the program also led to the creation of a Student Leadership Society
8	[16]	Pakistan, public medical college	Qualitative exploratory study	Undergraduate medical students and faculty (purposive sampling)	No formal course yet; study explored perceived needs, timing, and teaching methods for a future leadership course	One-time series of focus groups/ interviews	Semi-structured interview guide; thematic analysis	Participants supported leadership training, preferred interactive teaching methods, and suggested introducing it mid-curriculum; highlighted barriers like time and faculty development
9	[17]	Pakistan, Fatima Memorial Hospital College	Mixed-methods study	207 medical students (1st & final year) plus qualitative subsample	No formal course; the study explored perceived leadership domains and strategies to enhance leadership skills	Cross-sectional survey with embedded qualitative questions	Validated questionnaire; thematic analysis of open responses	Students recognized communication, decision-making, and professionalism as key domains; suggested role models, awareness campaigns, and curricular integration as strategies
10	[18]	Morocco, multiple medical faculties	Cross-sectional online survey	Non-graduated medical students in 5th year or above (n=267)	No formal leadership course; assessed baseline knowledge, practice, and perceptions to guide curricular design	One-time online questionnaire	Custom leadership KAP survey	Many students had a limited understanding of "leadership" but showed some leadership behaviours in practice; findings highlight the need for explicit leadership education in the curriculum
11	[19]	Pakistan, King Edward Medical University	Cross-sectional questionnaire study	MBBS students across multiple years	No dedicated leadership course; survey focused on perceptions, importance and barriers to leadership training	One-time paper/online survey	Self-administered questionnaire on attitudes and barriers	Students strongly endorsed the importance of leadership training; major barriers were time constraints, lack of curriculum, and limited faculty interest in leadership teaching
12	[20]	Middle East (Saudi context), medical universities	Cross-sectional perceptions study	Medical students and faculty members	Conceptual framing for future program; examined which knowledge and skills should be included in undergrad leadership/management courses	One-time survey	Structured questionnaire on needed competencies	Both students and faculty prioritized communication, team management, and systems thinking; the authors propose a context-specific leadership/management curriculum for medical universities
13	[21]	Saudi Arabia, 4 medical colleges	Descriptive cross-sectional study	Undergraduate medical students from 4 schools (700 invited; 464 responses)	No common leadership course; survey explored prior exposure, needs, and preferences for leadership training	Single survey administration (March–May 2019)	Researcher-developed questionnaire; descriptive + comparative statistics	Very few students had taken leadership courses; most supported curriculum-integrated leadership training and workshops. The authors recommend a nationwide policy for leadership in UME

| 14 | [22] | Pakistan, Rawalpindi Medical University | Quasi-experimental controlled study | 60 medical students (30 in leadership program, 30 controls) | Structured Student Leadership Development Program (series of training sessions using Leadership Trait Questionnaire framework) | Multi-session program over the study period | Leadership Trait Questionnaire (self, peer, mentor ratings); descriptive and comparative stats | The intervention group showed notable gains in leadership traits compared with controls; the paper argues for evidence-based leadership programs embedded in UME |
| 15 | [23] | USA, Medical College of Wisconsin | Program description with mixed-methods evaluation | Medical students participating in SLDI (student-led organization) | Student-run leadership development initiative with workshops, mentoring, and later virtual modules | Ongoing program; series of events over academic year(s) | Attendance data, satisfaction surveys, qualitative feedback | Participants reported improved understanding of physician-leader roles and \networking; authors discuss lessons from the transition to virtual leadership training |

The study outlines the instructional approaches reported in the included studies, highlighting the range of pedagogical approaches used, including workshops, reflective tasks, mentoring, simulation, project-based learning, and longitudinal curricula. These approaches targeted varying outcome domains across knowledge, skills, and attitudes. Short-term workshops frequently produced attitudinal improvements, while multi-session or longitudinal programs demonstrated broader development of skills. However, heterogeneity in design and measurement tools limited direct comparison of educational impact (Table 2).

Table 2: Leadership Teaching Methods, Pedagogical Approaches, and Educational Rationale in Undergraduate Medical Education

Sr. No.	Teaching Method / Pedagogical Approach	References	Educational Rationale / Theoretical Basis	Reported Strengths	Reported Limitations	Outcome Level (Kirkpatrick Model)
1	Workshops (Interactive, Skills-Based)	[22, 23]	Experiential learning; adult learning theory	Improves communication, teamwork, conflict resolution, and active participation	Time-intensive, requires trained facilitators	Level 1–2
2	Longitudinal Integrated Leadership Curriculum	[10, 13]	System-based leadership frameworks; competency progression	Allows sustained development; tracks behavioural change	Resource-heavy; difficult to implement in low-resource settings	Level 1–3
3	Peer-Led / Student-Led Leadership Teaching	[12, 23]	Near-peer learning theory; collaborative leadership	Enhances relevance and motivation; strengthens peer collaboration	Requires skilled student-leaders; inconsistent instructional quality	Level 1–2
4	Reflective Practice (Journals, Narratives, Portfolios)	[13, 15]	Kolb's experiential learning, self-awareness models	Develops insight, emotional intelligence, and professionalism	Hard to objectively assess; variable student engagement	Level 2
5	Problem-Based Learning (PBL) / Team-Based Learning (TBL)	[14, 15]	Constructivist theory; team dynamics	Improves collaboration, shared decision-making	Needs structured facilitation; group conflicts sometimes arise	Level 2
6	Simulation-Based Leadership Experiences	[10]	Experiential, high-fidelity learning	Safe environment to practice team leadership	Limited availability in resource-constrained schools	Level 2–3
7	Project-Based Leadership Tasks	[14, 15]	Project-based learning; applied leadership	Real-world problem solving encourages accountability	Needs supervision; outcome quality varies	Level 2–3
8	Mentoring/Coaching Frameworks	[10, 13]	Social learning theory; role-modelling	Encourages professional identity formation	Time constraints for mentors	Level 1–3
9	Interprofessional Leadership Training	[11]	Collaborative practice framework (WHO)	Develops cross-disciplinary leadership and mutual respect	Scheduling across professions is difficult	Level 2–3
10	Self-Directed Learning (SDL) & Independent Modules	[10, 12]	Adult learning principles: autonomy	Flexible, personalized learning	Needs strong student motivation	Level 1–2
11	Virtual Leadership Modules	[23]	Technology-enhanced learning	Widens accessibility; cost-effective	Lower engagement than face-to-face	Level 1

12	One-Time Surveys/ Needs Assessments Guiding Future Curriculum Design (Not Teaching)	[20, 21]	Ground-up curriculum design; contextual leadership needs	Identifies gaps, barriers, and learner preferences	Does not train leadership directly	Level 0 (pre-training baseline)
13	Trait-Based Leadership Assessment Models (LTQ Framework)	[22]	Northouse Leadership Trait Theory	Objective measurement of traits fosters measurable growth	Does not capture situational leadership	Level 2–3
14	Competency-Based Leadership Frameworks	[19, 20]	ACGME / CanMEDS leadership roles	Clear, structured competencies; align with global standards	Assessment tools are often inconsistent	Level 1–2
15	Small-Group Discussions/Seminars	[13, 15]	Collaborative learning; facilitated dialogue	Builds communication, negotiation, and confidence	Quality depends on the facilitator	Level 1–2

Findings summarize the methodological quality of the included studies, showing that most achieved moderate ratings based on MMAT or JBI criteria. Common limitations included small samples, lack of control groups, reliance on self-reported outcomes, and short follow-up durations. Only one quasi-experimental study achieved a high-quality rating. The predominance of descriptive and cross-sectional research constrains the strength of inferences regarding leadership development outcomes (Table 3).

Table 3: Quality Appraisal of Included Studies on Leadership Training/Readiness in Undergraduate Medical Education

Sr. No.	References	Study Design	Appraisal Tool / Criteria*	Overall Quality Rating	Main Methodological Limitations
1	[9]	Mixed-methods needs assessment	MMAT (mixed-methods) domains	Moderate	Single institution; convenience sampling; self-reported perceptions; no objective outcome measures.
2	[10]	Longitudinal curriculum description with evaluation	MMAT (quantitative descriptive)	Moderate	Descriptive design, no control/comparison group; limited long-term outcome data; potential selection bias in students who engaged deeply.
3	[11]	Quasi-experimental pre-post course evaluation	JBI checklist for quasi-experimental studies	High–Moderate	No parallel control group; short follow-up; outcomes mainly knowledge and self-reported learning.
4	[12]	Mixed-methods program evaluation	MMAT (mixed-methods)	Moderate	Small cohort; elective nature may favor more motivated students; limited generalizability beyond one school.
5	[13]	Program description with outcomes	JBI checklist for descriptive studies	Moderate	Primarily descriptive; self-reported gains; no standardized leadership outcome measures; single institutional setting.
6	[14]	Qualitative evaluation of clerkship	JBI qualitative checklist	Moderate	Modest sample size; findings context-specific; leadership outcomes inferred from perceptions rather than observed behaviour.
7	[15]	Pilot mixed-methods intervention	MMAT (mixed-methods)	High–Moderate	Small sample (n=24); no control group; short-term evaluation; relies heavily on reflective narratives.
8	[16]	Qualitative exploratory needs analysis	JBI qualitative checklist	Moderate	Purposive sampling; findings limited to one college; no triangulation with objective performance data.
9	[17]	Mixed-methods cross-sectional	MMAT (mixed-methods)	Moderate	Cross-sectional design; self-reported leadership domains; potential response and social–desirability bias.
10	[18]	Cross-sectional online survey	JBI cross-sectional checklist	Moderate	Online self-selection; possible non-response bias; cross-sectional snapshot without interventions or follow-up.
11	[19]	Cross-sectional questionnaire study	JBI cross-sectional checklist	Moderate	Single-country, multi-year sample, but still context-specific; self-reported attitudes; no objective leadership performance measures.
12	[20]	Conceptual / literature-based paper on leadership and management training	Narrative review criteria (clarity, coverage, synthesis)	Low–Moderate	Not an empirical intervention study; limited methodological detail on literature searching; no primary data on learners.
13	[21]	Descriptive cross-sectional needs assessment	JBI cross-sectional checklist	High–Moderate	Large sample, but only student perspective; self-reported exposure and needs; restricted to four Saudi medical schools.
14	[22]	Quasi-experimental controlled study (intervention vs control)	JBI quasi-experimental checklist	High	Single institution; relatively small N (30 vs 30); leadership traits measured mainly by questionnaires; limited long-term follow-up.

15	[23]	Program description with mixed-methods evaluation	MMAT (mixed-methods)	Moderate	Voluntary participation; outcome measures largely satisfaction and perceived benefit; disruption due to transition to virtual format.

DISCUSSION

The findings of this review highlight substantial variability in how leadership training is designed, delivered, and evaluated across undergraduate medical programs, with most included studies offering short, stand-alone sessions rather than integrated or longitudinal curricula. This pattern aligns with recent evidence showing that leadership education in medical schools remains fragmented and inconsistently embedded across institutions [24]. A consistent observation across the included studies is the dominance of self-reported outcomes, which restricts conclusions about actual leadership behaviour [25]. Recent umbrella reviews similarly note that leadership research relies heavily on subjective outcome measures and lacks validated behavioural assessments [26]. The pedagogical methods used across the included studies were diverse, incorporating workshops, reflective activities, simulation, student-led sessions, and project-based learning. Although these approaches frequently demonstrated improvements in perceived communication and teamwork skills, heterogeneity in outcome tools limits direct comparison across studies. This challenge has been reported globally, where the lack of alignment between competencies and assessment frameworks hampers program evaluation [27]. Reflection emerged as a recurrent component, with several included studies requiring written reflections or portfolios. Contemporary literature supports that structured reflection promotes awareness of leadership principles and enhances professional identity formation [28]. Peer-led or student-designed leadership models, present in some included studies, were associated with high engagement and perceived relevance. External research shows that peer-supported leadership development can strengthen learner autonomy and motivation, although rigorous evaluation remains limited [29]. Needs-assessment studies within this review consistently revealed strong student demand for structured leadership training, particularly in communication, conflict management, and systems thinking. These findings mirror broader international trends showing that medical students increasingly view leadership as an essential competency for successful transition into residency [30]. Similar surveys show that learners across disciplines express a readiness to engage in leadership development when opportunities are clearly structured [2]. Interprofessional leadership experiences were underrepresented in the included studies, despite evidence suggesting that cross-disciplinary training enhances collaborative practice and shared decision-making [31, 32]. More recent multi-country data confirm that health-profession students are generally receptive to integrated leadership education, particularly when structured across professions [33].

The methodological limitations seen in this review, single-institution designs, small samples, absence of control groups, and heavy reliance on subjective measures, mirror concerns identified in recent large-scale evaluations of leadership programs across health professions [6, 34]. These limitations restrict the ability to draw strong inferences about the long-term effectiveness of leadership training at the undergraduate level. To strengthen the evidence base, future research should incorporate validated leadership assessment tools, clearer competency frameworks, longitudinal follow-up, and multi-institutional sampling. These recommendations are aligned with emerging consensus statements on leadership education reform [35] and with international calls for competency-based leadership development in early medical training [8]. Future studies should adopt standardized, validated leadership frameworks with longitudinal and multi-institutional designs to generate robust evidence on the effectiveness of undergraduate leadership training.

CONCLUSIONS

This review shows that leadership training in undergraduate medical education is gaining visibility but remains inconsistent in structure, duration, and evaluative precision. The most promising approaches across the included studies featured structured, repeated exposure, blended pedagogical methods, and intentional opportunities for reflection and teamwork, although the evidence supporting behavioural change remains limited due to methodological weaknesses. Clearer leadership competencies, validated assessment tools, and longitudinal designs are needed to move beyond self-reported outcomes and establish measurable development of leadership skills. Medical schools that invest in coordinated, evidence-informed leadership curricula are likely to better prepare graduates to navigate complex clinical teams, assume responsibility early in practice, and contribute to improving healthcare delivery.

Authors' Contribution

Conceptualization: MK
Methodology: FP, MB, FTZ, S
Formal analysis: S
Writing and Drafting: MK, MAK, FP, MB, FTZ
Review and Editing: MK, FP, MB, FTZ, S, MAK

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

Source of Funding

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