Leadership Training and Undergraduate Medical Education: a Scoping Review

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Abstract
The purpose of this scoping review is to fill the gap in understanding the current status of intervention-based studies regarding leadership training in undergraduate medical education. As of late, there is an increased focus on the role of physicians as leaders in their fields, and communities. In order to evaluate these studies, both the PubMed and ERIC databases were searched, and an ultimate total of 35 articles methodologies were evaluated for their general methodology, curricular content, specific teaching methods, and evaluation methodologies. There were a number of trends identified, as well as remaining gaps.

Keywords Leadership · Undergraduate medical education · Curriculum development · Leadership training · Leadership skills

Introduction
There has been increased attention on the role of physicians as leaders in both clinical healthcare and management settings in recent literature, in many different capacities [1]. “Leadership” is defined by Merriam-Webster as, “the office or position of a leader” “capacity to lead”, and “the act or an instance of leading” [2]. Unfortunately, those definitions do little to define what it means to be a physician leader. Of course, in more recent times, specifically with the SARS-CoV-2 pandemic, physicians are needed to inform their communities and manage public health crises, making leadership training even more important than previously stated. In his summary on the status of leadership training in the USA, Dr. Stewart Gabel notes the need for leadership training not only of those who fill formal leadership roles, but informal roles as well, as all physicians will fill one of those positions at some point in their careers [1].

Fortunately, leadership development in undergraduate medical education is not starting from zero. In a semi structured interview investigation, graduates from the University of Missouri-Kansas City reported that the most impactful leadership developing components of their undergraduate medical education were longitudinal learning communities, peer to peer mentoring, supportive relationships with peers and faculty, and a clinically oriented but integrated curriculum [3]. Although there are differences between eastern and western culture for community service, researchers found that students in Singapore who were previously involved in community service reported gaining experience and knowledge about communication, team dynamics, and leadership styles as a result [4]. That finding underscores the impact of volunteer work on the budding leaders in medical school [4]. Similarly, a study from Ghana explored the importance of role modeling on the development of leadership skills, and how role models impact students’ perception of vital leadership skills [5]. Finally, a survey of US medical school deans revealed various leadership development opportunities, including dual degree programs, workshops, lectures, seminars, and non-curricular options like committee work, student organizations, service projects, and volunteer and teaching opportunities [6]. Although these studies surveyed different groups and considered different methodologies,
undergraduate medical education already shows some success as it relates to leadership development.

Medical students, however, do not feel that they have reached a level of leadership skill needed to be effective leaders [7]. As a result, there has been an increased effort to tackle this deficiency through different leadership building and skills training at the undergraduate medical level [7]. A systematic review published in 2011 identified areas of essential medical leadership and management skills for undergraduate medical education, including quality improvement, managed care, use of resources and healthcare cost, “the role of the doctor”, patient safety, and general leadership and management [8]. The review pointed out the concerns of medical students who want increased training but lack the time and show disinterest in certain areas [8]. One potential solution is to utilize a module-based system in which the learning is more self-paced throughout undergraduate medical education as implemented by the University of Newfoundland [9]. The same study concludes by calling for more research on the topic and more investigations into the best approaches to leadership development for medical students [8]. In another, more recent systematic review of 11 studies from 2018, the authors again concluded that there is limited evidence of effectiveness in the studies they examined ranging from the years 2000–2014 [10]. The same review also summarized a lack of objective and long-term outcomes, as well as a standard framework for evaluation [10].

There is a growing need for expanded areas of leadership development, in part because leadership needs are also changing. A comparative analysis of medical school leadership job postings from 2000-2004 and 2010-2014 showed that there was a difference in the posting language with an increased focus on collaboration, transparency, community centeredness, accountability, and teamwork, highlighting the changing skills needed in medical education [11]. Further, for women in leadership positions, tenured faculty cited individual skills and actions to facilitate development, including mentorship and institutional support for diversity and inclusion as the key factors in becoming successful leaders [12]. So, not only have recent events thrust physician leadership to the forefront, but the broader field of medical education and academia have as well.

There are also significant impacts for medical students as to their acquisition of leadership skills or lack thereof. In a commentary on the type of leadership development emergency medicine residency directors are looking for specifically, a number of different leadership development tools were discussed as an essential component of a hopeful emergency medicine resident [13]. Different methods like serving on medical school committees, student interest group involvement, involvement in organized medicine, and working on, and completing, projects were some of the examples listed as beneficial for leadership growth [13]. Yet, those gaps still persist into residency. In a survey of internal medicine residents at Massachusetts General Hospital, resident physicians reported needing more experience in “leading a team”, “confronting problem employees”, and “resolving interpersonal conflict” [14]. The most frequent ways they hoped to gain those skills were through interactive methods like case discussion, small group discussion, simulation, and lectures [14].

The aim of our scoping review is to identify, examine, and synthesize the most recent literature published on leadership training in undergraduate medical education and to consider classifications and characteristics of leadership interventions and outcome measures and to determine the possibility of conducting an updated systematic review. Our hope is that this scoping review may be used to help develop medical students’ leadership skills and explore the gaps outlined by previous systematic reviews and whether they have been filled in the most recent literature [8, 10]. In order to do so, we used a leadership domain framework previously outlined in the literature, which we hope may be used to aid in the future development of uniform leadership competencies for US medical education, as well as to enhance additional comparison of leadership training interventions. Finally, we aim to help steer future leadership development programs by highlighting areas where current literature is lacking in order to reinforcing the core skills needed to become effective clinical and managerial leaders as resident physicians. Some of those skills include collaboration, understanding the fluidity of leadership, and to synthesize various information to produce a final decision according to one focus group study of clinicians [15]. Additionally, in another leadership program for internal medicine residents at The Ohio State University, some hallmark curricular topics included “leadership in medicine”, “leadership versus management”, “professionalism”, “leadership styles”, “conflict management”, “team decision-making and bias”, and “communication in multidisciplinary teams” [16].

**Method**

We comprehensively searched both the PubMed and the Education Resources Information Center (ERIC) databases. We included articles if they described a leadership intervention in medical education published from 2015 to 2020, were written in English, and available in full text. We used search terms including medical school, undergraduate medical education, medical students, leadership development, leadership skills, leadership identity, leadership training, and leadership program. Of the 152 articles we retrieved, 55 were identified as potential candidates for full-text screening, and
36 articles were ultimately selected for review, with one repeated intervention program, leaving 35 articles for full review, except for the consideration of evaluation measures which varied between the two publications. **Although the “current standards and needs” articles were not included in the analysis, they were used as background information and many were cited in the introduction.

**Results**

The selected studies showed a wide range of representation from different countries. The USA represented 68.57% (n = 24) of the interventions studied, followed by the UK 8.57% (n = 3). Other countries of studies included Australia, Belgium, Brazil, Canada, Iran, and India. Studies were included from multiple nations in order to be as inclusive as possible with understanding leadership in medicine. Although there may be differences in the medical education systems and process for providing care, some of the leadership traits and skills gained abroad may be a beneficial addition to the health care system of the USA.

The targeted population for intervention was classified into several different groups based upon the descriptions provided in the literature. Preclinical (n = 14, 40.00%) included interventions taking place during the first and/or second years of medical school, while clinical (n = 6, 17.14%) included third and/or fourth years. Longitudinal programs (n = 10, 28.57%) were defined as including three or more years of undergraduate education. Some of the interventions did not fit into this model and were either focused on attending physicians (n = 3, 8.57%) or a combination of resident physicians and medical students (n = 2, 5.71%). Those which focused on attending...
or resident physicians were primarily focused on their own development as mentors to then transfer such skills to medical students, and thus were also included in the analysis.

**Type of Leadership Intervention**

Reviewed studies employed different type of intervention that we categorized as:

- **Workshops**—a single occurrence, lasting less than 3 days total
- **Stand-alone non-curricular course**—a course which would not be reflected on a student transcript or be counted as credit for graduation
- **Stand-alone curricular course**—a course would be reported on the students’ transcripts and be counted as credit for graduation

Out of the 35 primary studies, the most frequent delivery method was a stand-alone curricular course ($n = 9, 25.71\%$), closely followed by workshops ($n = 7, 20.00\%$), student organizations ($n = 6, 17.14\%$), and stand-alone non-curricular courses ($n = 5, 14.29\%$). Less frequent program types included full curriculum integration ($n = 3, 8.57\%$), activities and curricular tracks (not required by all students), both ($n = 2, 5.71\%$), and one module ($n = 1, 2.86\%$).

**Leadership Content Coverage**

We examined all of the studies for their content coverage based on the leadership domains described in the Methodology section by Mangrulkar et al. [18]. The summary of these six domains is found in Fig. 2. Notably, the three domains with the greatest representation in these studies were leadership ($n = 27, 77.14\%$), change agency ($n = 23, 65.71\%$), and teamwork ($n = 29, 82.86\%$), while the lowest by far was professionalism and ethics ($n = 11, 31.43\%$). Modestly, evidence-based medicine and practice and interprofessionalism fell between those two groups, both with $n = 20, 57.14\%$.

**Delivery Method**

Many different delivery methods of intervention were identified and fell into several categories: community engagement, extracurricular activity, clinical experience, assessments and projects, medical students as educators, mentoring, interactive sessions, and didactics/lectures. We defined several major categories by including constituent items which were related, which included didactics/lectures/modules (lectures $n = 22$, modules $n = 2$), interactive sessions (role play/case scenarios $n = 8$, problem solving/team based learning $n = 12$, group discussion $n = 17$, group activities $n = 7$, and skills sessions $n = 9$), mentoring (physician mentoring $n = 13$, peer mentoring $n = 3$), assessments, and projects (written assignments $n = 5$, projects $n = 15$, presentations $n = 5$, and self/group assessment, $n = 12$). There were an additional four categories which did not fit a specific modality and were left alone, including medical students as educators, community engagement, extracurricular activities, and clinical exposure. A frequency plot of the major categories we defined is found in Fig. 3.

The most frequent methods of instructional delivery were interactive sessions ($n = 53$) and assessments and projects ($n = 37$) by far, with a moderate level of didactics ($n = 24$) and mentoring ($n = 16$), with limited representation of the other categories comparatively. There were several curricula which involved multiple types of interactive sessions, explaining the high frequency of the interactive category. Many interventions also utilized more than one method of teaching, and we listed all of the methods utilized.

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![Fig. 2 Leadership domain coverage summary](image)
Outcome Assessment Methods

The assessment methods were widely varied among the different types of leadership interventions. By far the most popular assessment method was an in-house survey ($n=18$) [20–38]. But, a number of existing or validated tools ($n=11$) were used, including the Ottawa Crisis Resource Management Global Ranking Scale [39], FourCe-PITO Framework Assessment [40], Jefferson Teamwork Observation Guide [41], Kornives LID [42], the Medical Leadership Competency Framework (MLCF) [43], Kirtpatrick’s Four Levels of Evaluation [21, 43], and the Kane-Blates Leadership Survey [44]. Further, we classified verbal evaluation ($n=4$) to include interviews and focus groups, formal evaluations ($n=4$) to include quizzes, a course grade, or faculty evaluation, and those which were considered “other” ($n=3$) included course evaluations, other quantitative data, or an intervention which did not have results to report at the time of publication. There were two other categories without different consistent groupings: individual reflections ($n=5$) and projects or project proposals ($n=8$).

A complete summary of the studies reviewed, including their leadership content coverage and outcome assessment methodologies is available in Online Resource 1 [52–60].

Discussion

There is a variation in content coverage in the interventions studied. In part, this may be due to the integration of the later curricular domains, interprofessionalism, evidence-based medicine and practice, and professionalism and ethics into other components of medical education. As noted in the introduction, many leadership components are best learned through practice and integration into the curriculum. Because of that, some of these domains may be better covered through the rest of the undergraduate medical education curriculum and would not necessarily be reflected in interventional studies relating to leadership, and instead be found as interventions in their more specific content areas. However, it does still highlight an absence in the holistic development of leadership skills in medical students and a focus for new intervention development that synthesizes leadership and its relationship to those domains. This concept is further supported by the focus on management skills in three different leadership training proposal articles, focusing on the managerial demands of physicians and the need to train physicians in those areas, albeit through different means, but still under the domain of evidence-based medicine and practice [45–47].

The constant difficulty in undergraduate medical education is the compromise between adding more content into an already content dense education [8]. However, based on the discrepancies found in our assessment of the existing literature, there appears to be a gap in training as it relates to required management and leadership skills. As many of the studies suggested, it is important for all students to have leadership and management skills because all physicians will have to lead at some point in their careers. Despite this axiom, most of the intervention-based learning experiences were not mandatory and often optional either by means of involvement in a specific student organization, workshop, elective course, or a specific track of medical education as expanded on in the “Type of Intervention” in the “Results” section. In one notable example from the University of Michigan, it was found that there was limited success in an experimental, required curriculum for all students, which may signal that integrated efforts may not produce the most robust response to the training, despite students wanting to receive this education on the whole [48]. Thus, while a goal of mandatory basic education should continue to be held in regard, further study needs to be done on the best curricular
and operational methodology to affect students’ leadership development.

The most striking differences in the intervention-based data are that the significant level interactive methodologies are used in leadership training, with a frequency of 53 varying interactive methods out of 35 total studies considered, because many studies utilized more than one interactive method. Hands-on leadership training was referenced as a preference of students, as seen in the survey of Massachusetts General residents, as well as the qualitative responses from student facilitators in one of the interventions reviewed [14, 49]. The use of such interactive experiences also enhanced the ability to practice specific skills in teamwork as a function of leadership. For example, the study by Earis et al. utilized a military style training exercise to increase teamwork, and students described increasing their abilities in listening and communicating effectively, valuing of command tasks, and gaining confidence and contributing in the group [50]. In total, although interactive course work and activities may be more resource intensive and logistically taxing, it is the preferred method of students and was the most frequent teaching method used in the most recent literature.

Somewhat surprisingly, the importance of student organizations and institutional participation was highlighted in many ways. From what is currently important and present in undergraduate medical education as reported by US medical school deans, to the community service component evaluated in Singapore, there is already a robust identification of the importance of student engagement [4, 6]. Those same sentiments also echo through graduate medical education selection in reference to emergency medicine residency selection, which noted the importance of student organizations in building leadership skills [13]. There also was a notable focus on students’ engagement at the student organization and institutional level based upon the interventional studies evaluated, with 17.14% (n = 6) of the studies directly involving student organizations as the overarching type of intervention and a frequency of n = 13 for extracurricular activities as a method of leadership training.

Additionally, methods of evaluating the leadership skills and the methods used were often through an in-house survey designed by the investigators. The frequent use of non-standardized tools for evaluation underscore another need in leadership development in the USA specifically—a consensus for the use of a validated assessment instrument and an agreed upon, competency—based leadership model with clear curricular goals, not unlike what Mangrulkar et al. described. Such a model would allow for uniform classification of curricular goals and outcomes and provide a framework for research focus and overarching curricular goals moving forward. The absence of that unified framework also resulted in a limitation of our categorization of current curricular domain coverage, representing inherent limitations in this review, where studies had to be generalized to fit the framework, rather than the interventions being driven by that framework initially. Development of those uniform standards not only would be able to guide the intervention development, but a uniform assessment in the skills gained as a result.

There were further limits to this literature review as well. As a scoping review, this review was limited in its scope in regard to the literature search process including potential selection bias, as well as limited assessment of the quality of the included studies, a structural issue of this type of review, identified by Grant et al. [51]. While some studies did make reference to long-term follow up as to the maintenance of these skills, it was not a significant enough number to quantify, so there may be loss of these skills later on, especially if the intervention was a single activity or class period, representing both a limitation of our own review’s validity and conclusions, as well as a gap that the field may need to move toward in future interventions.

Conclusions

Physicians are quickly being called upon to lead, not only because of the SARS-CoV-2 crisis, but because of the current model of an interdisciplinary medical team, with an increasing component requiring business and management knowledge. There is consensus that this leadership training needs to begin in undergraduate medical education, but there has not been a consensus curricular content, teaching modalities, or evaluation framework leading to a uniformly prepared resident physician which is widely accepted. There have been many attempts to develop different programs to address this need, but very few are required by all medical students. However, one common theme among the examined interventions for leadership development implies a focus on student engagement, through methods of teaching, as well as a focus on student organizations. Among interventions, it appears there has been a consistent curriculum that revolves around the most traditional components of leadership development, general leadership, change agency, and teamwork. But in this scoping review, there have been fewer interventions focused on more indirect but needed knowledge, like interprofessionalism, evidence-based medicine and practice, and professionalism and ethics as they relate to, and define, leadership. Moving forward, leadership-based interventions may be more effective if geared toward a wider audience, encompassing most, if not all, medical students and other health professions students, as well as highlighting a diverse curriculum focusing on all of the components of...
leadership and management that the contemporary physician needs to function as an effective and efficient leader.

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Availability of Data and Material An abbreviated version of the data generated during this review is included in this published article and its supplementary information files.

Declarations

Competing Interest The authors declare no competing interests.

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