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Item type

Journal Contribution

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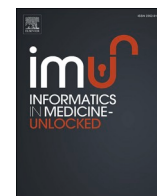
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ARTICLE INFO

Keywords:

Quality improvement
Allied healthcare
Allied healthcare institution
Education

ABSTRACT

Allied Healthcare encompasses various professions involved in diagnosing, evaluating, and preventing diseases and disorders. Allied Healthcare Institutes (AHIs) provide education and training in these professions. However, there is currently a lack of explicit guidelines for ensuring quality excellence in AHIs. This narrative review aims to address this gap by examining existing literature on quality assurance in AHIs and proposing a conceptual framework that outlines essential components for establishing a high-quality AHI. A comprehensive search of PubMed and Google Scholar electronic databases yielded 86 relevant articles, which were analyzed and grouped into Nine themes related to the study's objectives. These themes include leadership in AHIs, student selection and support, teaching quality, curriculum development, research opportunities, stakeholder involvement, quality improvement initiatives, the impact of accreditation/certification, and physical facilities. Based on the review, the study presents 33 carefully formulated recommendations. By implementing these guidelines, policymakers and those interested in establishing AHIs can create institutions that promote the acquisition of new knowledge and skills, foster research and development, and provide excellent educational resources.

1. Introduction

Allied healthcare is a relatively new field in healthcare and was

formally established in the last century [1]. The definition of Allied Healthcare varies between countries, healthcare settings and training institutions. However, it broadly includes all professionals involved in

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the detection, assessment, and prevention of diseases and disorders (dental hygienists, sonographers, dietitians, medical technologists, occupational therapists, physical therapists, radiographers, respiratory therapists, etc.). It also includes dietary and nutrition, rehabilitation and health systems management [2].

Allied health workers form an integral part of the overall health workforce. Although Allied Healthcare Professionals (AHPs) cover different healthcare professions, they share general skills such as communication, patient assessment, management, and education. In addition, they collaborate with multidisciplinary teams, and apply evidence-based practice in their clinical decisions. An increasing number of people with chronic diseases increases the demands on AHPs. In addition, changes in policy and reliance on tertiary care centres have further increased the demand for AHPs. An Allied Healthcare Institution (AHI) is an educational institution that grants a degree in an allied healthcare profession. AHIs should evolve to play their role in the rapidly changing healthcare scene, the overall quality of allied healthcare depends on the quality of AHIs.

Quality in any educational institution is the result of intensively planned practices. Any quality assurance approach involves measuring actual performance and comparing it to expected/approved performance. The final step is to use the observations to make changes to improve the quality of AHIs. Therefore, it is time for policy makers to put in place the necessary regulations to ensure the maintenance of standards and quality of AHIs. Many emerging countries such as Saudi Arabia [3] and India [4] have presented guidelines and draft legislation for AHI. In the current era of a progressively knowledge-driven economy, higher education is fast becoming a major driver of competitiveness. However, there are currently no specific recommendations and guidelines to guide the quality of AHI. The authors identified this research gap and conducted a narrative review to develop a conceptual framework intended to assist policymakers and others interested in establishing AHI. Therefore, the present study was conducted by reviewing the literature with the following two-fold objectives: (i) to identify key focus areas for improving the quality of AHI and (ii) to provide recommendations for each area to achieve quality improvements to guide the development of AHI.

2. Methods

2.1. Search strategy

This study provides a narrative overview of the literature on quality assurance in AHIs, outlining its key components and providing recommendations for each to support the establishment of an AHI. The research was carried out by searching electronic databases such as PubMed and Google Scholar. The search was conducted using Medical Subject Headings (MeSH) through Boolean operators to expand and refine the results. The search terms used through the Boolean operators were (((("Allied health professionals"[Title/Abstract]) OR ("Guidelines"[Title/Abstract])) OR ("Quality"[Title/Abstract])) OR ("Quality improvement"[Title/Abstract])) OR ("Quality assurance"[Title/Abstract])) to broaden and narrow the search. Literature was selected using the following inclusion criteria: All categories of literary sources including original articles, reviews, and other relevant content focusing on quality improvement initiatives on AHI and healthcare facility accreditation published between the year 2020 and 2022, as well as such studies and literature published only in English language included. In addition, the authors referred media reports, government reports and key websites such as WHO (https://www.who.int/hrh/documents/en/quality_accreditation.pdf); NABH (<https://www.nabh.co/>), ACHC (<https://www.achc.org/palliative-care/>). Other quality web links were also referenced: ISO and healthcare quality: <http://www.iso.org/sites/healthstandards/index.html>; National health system resource center India: <http://qi.nhsrindia.org/cms-detail/revised-national-quality-assurance-standards/MjM3>; Agency for healthcare research and quality:

<https://www.ahrq.gov/patient-safety/quality-resources/tools/chttool/bx/understand/index.html>; NICE quality standards: https://www.idsihe.alth.org/wp-content/uploads/2015/01/QS-process-Guide_final-200314.pdf; IBM, quality measures in healthcare: <https://www.ibm.com/topics/quality-measures-healthcare>; World federation for medical education: <https://wfme.org/standards/>; CMS quality safety & oversight: <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/CertificationandCompliance>; JCI goals; Quality standards: <https://asq.org/quality-resources/learn-about-standards>; NICE: <https://www.nice.org.uk/standards-and-indicators>; <https://etec.gov.sa/en/productsandservices/NCAAA/Accreditation/Pages/StepsofAccreditation.aspx>.

This review excluded those works not written in English and published before or after the period specified in the inclusion criteria.

Therefore, the authors conducted this review using the above electronic databases and websites, using key search terms such as 'allied health professionals', 'guidelines', 'quality' or 'quality improvement', 'quality assurance' to capture the relevant literature.

2.2. Data Extraction

During the review, the publications were screened in two phases according to the principles of narrative reviews. In the first phase, the authors independently checked the title and abstract of the incorporated articles and reports and classified them as related or irrelevant. In this phase, the authors identified relevant information and assessed validity shift through the abstracts, and then relevant full-text articles were retrieved. In the second phase, all related work was checked for eligibility. The authors used the inclusion and exclusion criteria to shortlist and extract information from eligible articles. The authors reviewed the relevant full-text articles and assigned the information to different sections. The practical recommendations presented in this study were developed through a collaborative process involving input from experts in the field. The experts involved in the development of these recommendations were academicians with extensive experience in allied healthcare education, research, and scholarly publications related to quality assurance. They possessed significant expertise in the relevant field, ensuring a comprehensive and informed approach to the recommendations. While the specific details regarding the selection process of these experts and any conflicts of interest were not explicitly mentioned in the study, their qualifications and expertise were taken into consideration to provide valuable insights and recommendations. Despite voting and if no agreement was reached, the principal author independently assessed any differences and reached agreement. In addition, the review also includes additional suggestions from experts with practical knowledge and prior experience in developing recommendations.

3. Results

3.1. Narrative synthesis

At the end of Phase 1 of this narrative review (i.e., post-abstract review), 86 articles were screened and included in Phase 2 for further analysis. In this phase, all of these full-text articles (N = 86) have been carefully studied and organized into nine themes that have emerged from relevant publications (Fig. 1). Based on the information in the thematic sections and expert opinions, the authors have added key recommendations per theme. The full list of recommendations is available in Table 1. Because information on the Quality improvement in Allied Healthcare is limited, few of the recommendations were based on lessons learned, tips, and practical experiences of the experts, aside from the evidence.



Fig. 1. Key aspects to be strengthened in improving the quality of Allied Healthcare Institutions.

4. Key aspects need to be REINFORCED while improving the quality of AHIs

4.1. Allied healthcare institution leadership

Diggele et al. emphasize the importance of leadership in quality healthcare education [5]. The leadership team establishes a clear vision and mission statement with defined goals. The mission statement describes the hope for the future and aspirations of the institute, while the mission statement represents what the institution is today [6]. Particular emphasis on core values such as student learning, employee empowerment, acceptance of individuality and quality standards in developing the vision and mission statement.

JC Wu et al. from Stanford Cardiovascular Institute emphasize the importance of organizational structure as a key framework for a quality organization. The organizational structure consists of several committees, the Executive Board, the Executive Board, the Steering Committee, the Education and Training Committee, the Advisory Board and the Advisory Professors [7]. The Board is the governing body responsible for high-level decision-making; Executive Committee members oversee day-to-day operations; the steering committee manages the overall strategic direction. Advisory Board and Consulting Professors are recognized scholars who provide valuable perspectives and advice. Regular staff debates should drive institutional policy forward.

A culture of shared leadership between different employees and departments ensures that leadership is not limited to employees holding specific leadership roles (Fig. 2) [8]. To ensure success, organizational culture should support the involvement of individuals and encourage leadership qualities by providing personal autonomy, accountability, recognition, and clarity [9,10]. In addition, the leadership team should be responsive to give the impression of a Lean culture from the top

rather than the traditional hierarchical culture [11].

Quality assurance (QA) and quality improvement (QI) should be key focus areas for the leadership [12]. The team should delineate the oversight roles, responsibilities, and accountability for implementing QA activities. In addition, the leadership team should implement dedicated resources/processes such as weekly meetings/exposing the staff to quality meetings of other institutions or international conferences. The team should also ensure academic autonomy; the autonomy will help the section establish a good quality culture. Following a preset of rules from another organization might sometimes interfere with quality improvement initiatives. To achieve and maintain quality, leadership should ensure regular SOP updates by the head of the respective departments and the quality team, a periodic inflow of improvement initiatives from students, staff, etc. Clearly defined activities are important for achieving quality recruitment, teaching, and credentialing [5,13].

Leaders for an AHI should be chosen considering their skills/capabilities, such as staying ahead of the crowd and always looking for new ideas; someone with proven administrative capacity and a relevant postgraduate degree with experience >10 years in allied and healthcare sciences. In addition, the leaders should also display political and entrepreneurial skills that will enable them to push the institute's agenda and deal with the country's public health department. A leader should be emotionally intelligent to handle tough situations without putting undue pressure on the team. Effective leadership involves a prudent display of three major behaviors (A) change-oriented: providing vision and directions for improvement/innovation creating a sense of need/urgency in the team (B) relation-oriented: supporting, recognizing, rewarding the team to foster greater trust and collaboration and (C) task-oriented: planning, delineation, metrics, efficient use of resources [14]. Another key aspect is giving priority to research. Previous studies have shown that senior management and leadership support for

Table-1
Summary of Key recommendations to improve the quality of AHIs.

Key Focus Area	Summary of Key Recommendations
Allied healthcare institution leadership	<ul style="list-style-type: none">• Develop a vision and mission statement for the institution• Plan and establish an organizational structure• Create a strategic plan with clear set of goals and quantifiable objectives that align with the mission statement.• Implement proper leadership selection for AHI with due regard for leadership qualities and managerial capacity.
Students Selection, Orientation, Assessment, and opportunities for extracurricular activities	<ul style="list-style-type: none">• The institution should adhere to an established admissions system that assesses both quality and interest criteria to ensure the most suitable students are admitted to the program.• Establish a constant feedback loop and peer review to foster a culture of lifelong learning.• Install state-of-the-art extracurricular facilities and encourage students to participate to overcome academic stress and achieve better mental health• Establish an alumni network and offer students professional advice in choosing a suitable career.
Teaching Quality	<ul style="list-style-type: none">• Clinical educators should be carefully selected based on their past experience, professional aspirations, and readiness to adapt, as the characteristics of clinical educators have a direct impact on student learning.• Student input, peer feedback, and level of engagement should all be used to regularly assess the quality of teaching.• AHI should optimize an appropriate faculty-student ratio to ensure quality.• Encourage teacher mentoring programs and expose teachers to regular professional development programs to improve their teaching skills.• Develop and implement mechanisms/ guidelines to overcome work stress and burnout among teachers.
Curriculum	<ul style="list-style-type: none">• The establishment of an advisory board with national and international specialists from many fields (education, multimedia, ethics, behaviour and culture) to advise on the curriculum should be a priority.• Curricula should be aligned with the organization's vision and mission, and should take into account the input of key stakeholders, including employers, alumni and students.• Curricula should include social, cultural, behavioural, and leadership components in addition to clinical teaching/ instruction.• To prepare students for lifelong active learning, leaders should encourage students to choose learning goals based on their interests.• Include interprofessional education, and culture training as cocurricular activities to inculcate patient-centered care among AHPs which improves patient safety, quality of care and health outcomes.• Introduce QA concepts to AH students as part of the primary curriculum to establish a professional status for QA among AHPs.
Research and Development	<ul style="list-style-type: none">• The executive and AH leadership must prioritize research in their

Table-1 (continued)

Key Focus Area	Summary of Key Recommendations
	<ul style="list-style-type: none">organizations' goals and objectives.Senior executives should use a variety of initiatives (research projects, curricula, training, mentoring, journal clubs) to create research culture at the individual, team, and institution levels.• Allocate necessary resources considering future research needs and establish an institutional review board to oversee research activities both within and between institutions.• Assess research capacities and culture regularly using standard/established survey tools (RCC, research spider, etc), observe results and, based on this, establish important elements of success for research based on reality.• Leadership should ensure that all stakeholders (staff and students) work together to set QA standards and participate in surveys to support frequent data collection and bring their insights to quality improvement.• AHI should use as multidisciplinary team approach to conducting self-evaluation, peer evaluation (questionnaires) and external evaluation (accreditations) to monitor the effectiveness of the internal quality assurance system.• Conduct regular focus group QA awareness seminars to increase employee awareness and participation.
Leadership commitment & Stakeholders' involvement in Quality Assurance Activities	<ul style="list-style-type: none">• The leadership should establish and maintain an organisational commitment to quality improvement by guaranteeing the engagement of all stakeholders.
Quality improvement initiatives	<ul style="list-style-type: none">• Detailed process maps and quality indicators should be produced and used on a daily basis by collecting data and use them to bring quality improvement.• Leverage and apply QI and process management practices including Lean, Six Sigma, Failure Mode Effects Analysis (FMEA) and Failure Mode, Effects, Criticality Analysis (FMECA) to identify and resolve quality issues in AHIs.
Impact of Accreditation/Certification on Quality Improvement	<ul style="list-style-type: none">• Leadership should be proactive in pursuing and maintaining accreditation, devoting time and money to the process.• Ensure daily quality improvement efforts to achieve certification criteria compliance.
Physical facilities	<ul style="list-style-type: none">• With a view to current and future requirements, a well-thought-out master plan should be drawn up that focus on building codes, safety and efficiency.• Establish proper waste disposal services to dispose of waste and provide clean drinking water throughout college campuses.• Apply LEED standards and other green concepts to address current health and safety concerns and manage future pandemics. Encourage AHIs to adopt UI GreenMetrics' sustainability goals.

research significantly impacts the institution's research culture [15].

4.2. Students Selection, orientation, assessment, and opportunities for extracurricular activities

Quality undergraduate education influences allied health professionals to become healthcare providers with high clinical skills [16]. For decades, the admissions procedure for medical and allied health

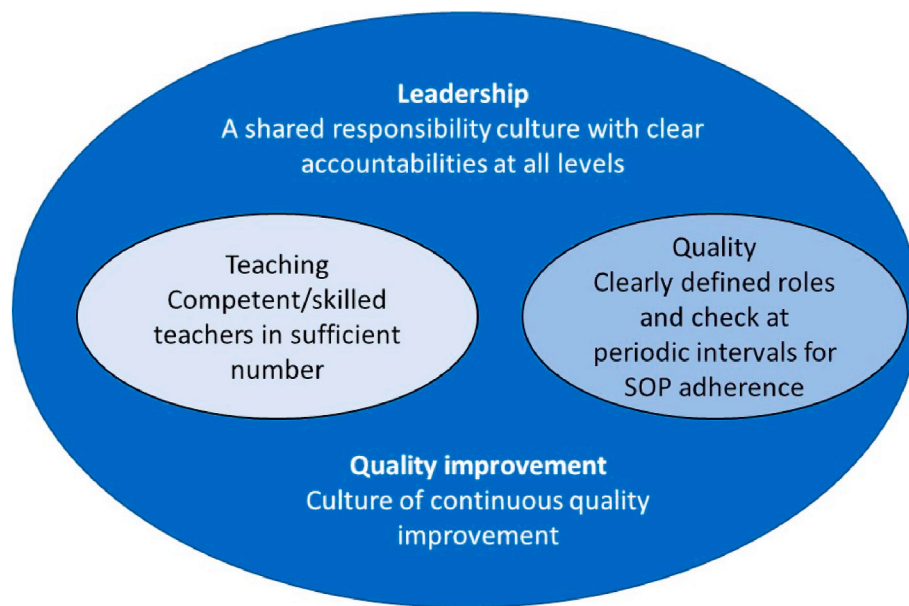


Fig. 2. Conceptual representation of the governance framework.

institutions has been a subject of much interest and universities have spent a great deal of effort creating selection criteria [16]. The selection criteria locate those with the intellectual and personality skills to complete an allied health degree. Undergraduate student selection comprises two significant steps [16,17]. The first step is to decrease the application pool. Interviews, personal statements, and emotional intelligence are all examples of qualitative approaches. An aptitude exam may measure a person's emotional intelligence. Quantitative procedures employing pre-admission grades are increasingly frequent. The second step assesses the candidate's potential to study at a health-related institution using work samples, conventional interviews, structured interviews, mini-interviews, and selection centres. Selection criteria must be fair and rigorous. From the student's perspective, the factors that influenced allied health students' career choices were "the drive to serve others," "prestige," "professional autonomy," "options for promotion," "income potential," and "the impact of the specialty on family and personal life."

A focused student orientation program with responsibilities from all departments ensures students understand the vision, quality initiatives and other responsibilities such as feedback. A dedicated orientation coordinator or academic advisor and an orientation checklist can help achieve the above orientation goals. A culture of continuous assessment with targets ensures quality student education. Peer review is a type of pedagogical technique that focuses on peer feedback, communication, reflection and collaboration [18]. Peer review helps students develop judgment, critical thinking, self-awareness and an understanding of course evaluation [19,20]. In higher education, peer evaluation is causing a shift from an individualistic, teacher-led approach to a collaborative, student-centered approach associated with social constructivism.

Encourage students to take up extra activities to help with mental health issues [21]. A review suggests that learning about mindfulness may help students manage academic stress, anxiety, and depression; cultivate a physical and mental state of calm; be more present and empathetic with clients; and be more focused and attentive in professional practice settings [22]. Support teams to manage fatigue and burnout among students [23]. A dedicated placement cell and professional guidance for career opportunities. An alumni association should be maintained with clearly defined goals and students should be encouraged to take in mentors and attend alumni sessions.

4.3. Teaching quality

Teachers with excellent academic ability improves the overall quality of the institution. Effective clinical educators possess various abilities linked to improved student learning and patient care. Gibson SJ et al. identified a range of skills, behaviors and attitudes for clinical educators, which were refined to seven themes: (i) intrinsic and personal characteristics (patience, approachability, confidence) (ii) skillful feedback (constructive, prompt); (iii) teaching abilities (planning, applicability, resources); (iv) collaborative learning (engagement, debates); (v) understanding expectations; (vi) organization and planning; and (vii) clinical educators in their professional role [24,25]. Previous experience, responsibilities, and long-term career ambitions are key factors in selecting the teaching staff. Senior management must be committed to gathering all the aspects that contribute to the overall quality of instructional delivery. Teaching quality should be part of the institutional plan, and external factors at the national and international levels (for example, the Bologna Process of the European Union) should be included [26].

Accordingly, there is a need to develop a plan to increase students' willingness to provide feedback on education through analysis and assessment in order to improve the overall quality of teaching. A recent study also emphasized increased student participation and involvement in the teaching processes [27]. To encourage student participation, teachers should learn to understand and communicate in the local dialect. In addition, educators must support students in developing a professional identity [28]. The faculty-student ratio is another aspect the senior management should keep in mind; it is a proxy for the teaching and learning environment. The ratio should be benchmarked with national and international standards. Another important aspect to improve is the quality of clinical placement trainings. Allied Health clinical training is challenging as many programs have short placement time periods of less than 12 weeks and involve more intensive mentoring for students with lower student/CE ratios [19]. A study of 29 higher education institutions from 20 countries reported the following key commitments to improving teaching quality: student support (career advice, mentoring, counseling, etc.), teaching and learning environments (libraries, virtual learning facilities), student evaluation, institution policy design, monitoring and Implementation of policies and recruitment of teachers [29].

In addition, staff development to improve the quality of teaching in

the classrooms and during the internship plays an important role. It is noteworthy that human resources development (i.e., staff development) is a typical activity of the Allied Healthcare Education Department, assessment and the creation of educational materials [30]. Two examples of staff development programs are monthly seminars and curriculum development workshops. Module evaluation, grading review, student and faculty surveys, and preparation for hospital practice should all be compulsory parts of the curriculum. Mentoring qualities are valued by allied health educators who influence and help shape the careers of the next generation of health practitioners [31]. Mentors are important in providing the explicit academic information needed to understand a curriculum topic. They can also improve the implicit understanding of the "hidden curriculum" of professionalism, ethics, values, and the art of medicine, which is not taught in textbooks. Mentors often provide emotional support and encouragement. In order to be a successful mentor, one must constantly continue to hone and expand mentoring skills [31]. Mentors benefit from the relationship through increased productivity, professional fulfillment, and personal enjoyment. The leadership team should encourage the professional development of teaching staff and ensure that a system for regular communication between the professional communities within and between institutions is in place [25]. Despite staff development, mechanisms/guidelines should be in place to prevent teacher burnout. Burnout has been defined as a state of 'emotional weariness, depersonalization, and diminished personal achievement.' Institutions should devote substantial time and resources to supporting and educating allied health educators to overcome stress [30].

4.4. Curriculum

In order to meet the needs of the 21st century in healthcare, the curriculum should take into account specific competencies that healthcare professionals (AHPs) need when dealing with patients [30]. The 2010 Lancet Commission identified a mismatch between healthcare professionals' competencies and patient needs, largely due to poor teamwork, gender discrimination, narrow clinical focus, episodic rather than continuous care, and beyond that to digital shifts, accreditation requirements, and national and global emergencies (COVID) require innovative curricula and agile teaching methods [32,33]. In addition, students start medical studies with a high level of technological competence and expect variety in the curriculum [34]. These students' interests have been recognized by the accreditation bodies [35]. As such, the curricula should be aligned with the vision and mission of the organization and take into account key stakeholders (patients, students), context, culture and national issues.

To facilitate this, an advisory board can be formed by inviting national and international experts from various domains (education, multimedia, ethics, behavior, and culture) to inform the curriculum [36–38]. In addition, a dedicated study plan wing should be set-up with resources focused on harmonizing the curriculum nationally/internationally and implementing changes as part of continuous quality improvement. In particular, final year curricula should be developed in collaboration between institutions and organizations to facilitate the preparation of students for further specialized studies.

Asokan GV et al. reported that the transition from student to professional life is a challenge for healthcare professionals [39]. A formal graduate year for transition to professional work is common in nursing; however, such programs are not standard in AH and can be very useful if implemented. In addition, students should be exposed to performance evaluation frameworks such as ASPIRE — which aims to build practitioners' evaluation skills and allows them to assess more effectively [40]. The benefits of AHP participation in research are many, including increased uptake of research into practice, the development of critical thinking skills, and a culture of evidence-based practice [41]. Evidence-based medicine (EBM) is a core competence required by the institute of medicine [42]. EBP is defined as the "conscientious, explicit

and judicious use of the current best evidence in making decisions about the care of individual patients [43]. Teaching EBP involves instilling in students the values and skills needed to identify, critically evaluate, and apply practice-related scientific evidence throughout their careers [39]. There should be more emphasis on a learner-centered approach, with teachers facilitating discussion rather than delivering a passive lecture — medical students show high IQs but low interest in reading long texts [44]. Students should be trained to use social media (Facebook, Twitter) and e-learning courses for interactive learning [45,46]. A review by McCoy L et al. stressed the importance of technology-based activity (apps, games, simulators) and multimedia applications on learning outcomes [34]. Many clinical studies and epidemiological data are being summarized and discussed on Twitter for the first time in the current pandemic situation.

Another important aspect to consider when developing the curriculum for AH programs is the inclusion of interprofessional education, as AHPs are expected to work with physicians and other healthcare team members to provide quality patient care [47]. Such interprofessional education improves patient safety, quality of care and health outcomes. To develop interprofessional skills, preference should be given to behavioral sciences, social sciences and ethics, and leadership. QA concepts should be introduced as part of the primary curriculum to establish a professional status for QA among AHPs [48,49].

Cultural differences, including beliefs, behaviors, attitudes and language, coupled with globalization and migration, pose challenges for health professionals to treat patients with diverse cultural and linguistic needs [50]. To meet this challenge, culture training should be part of co-curricular activities that help provide patient-centered care that reduces disparities between different patient populations [51]. In addition, time should be scheduled for sports and extracurricular activities to maintain work-life balance and avoid burnout.

4.5. Research and development

The best information or scientific discoveries should guide healthcare rather than custom and tradition. All healthcare professionals should use the latest research in their day-to-day clinical management [52]. A research culture in an organization encourages and supports scientific studies that generate new information and provides avenues for translating knowledge into action [53]. Furthermore, research capability development is defined as a "personal and organizational growth concept that results in higher levels of competence and a greater ability to do quality research to bring about social change [54].

Leadership should prioritize research capacity-building at individual, team, institution, and national levels (universities, professional body groups) [52,55–57]. Instruction on research procedures and mentorship are examples at the individual level [55,58]. The addition of research as part of the undergraduate training and curriculum allows individuals to develop independent critical thinking skills [59]. Research projects and training can help improve research capacity at group level. Educational administrators can profoundly influence research culture by building organizational structures, processes and systems; and development of appropriate external partnerships and scientific development pathways [56]. Additional national tactics for developing research capacity include collaborating with universities or other organizations and creating specialized research centres or roles that multiple organizations can share [60]. The leadership team should allocate the necessary resources considering future research needs. It is also important to establish an institutional review board to oversee research activities both within and between institutions.

Several tools have been established to assess research capacity and culture, including the Research Capacity and Culture Tool (RCC) [61], the Research Spider [62], the Research Knowledge, Attitudes and Practices (KAP) of Research Survey [63], the Edmonton Research Orientation Survey (EROS), and the Barriers to Research Utilization Scale. For RCC measurements, participants rank research competence

and success in each area (individual, team, and organizational) on a scale of 1 (lowest) to 10 (highest). The Research Spider measures AH research interest, experience and confidence on a 5 points scale (where 1 is 'no interest, experience and confidence' and 5 is 'very confident, interested and experienced'). The Research KAP Survey rates 33 research activities on a three-point scale, grouped into three concepts of research knowledge, attitudes, and practices [63]. The EROS ranks 38 items on a five-point scale for engagement in research and research orientation in practice. The Barriers to Research Utilization Scale comprises 28 elements assessed on a four-point scale. Research culture and potential can also be measured by the number of publications, presentations, successful grant applications, and postgraduate degrees [52]. Educational institutions for allied healthcare professionals should also concentrate on the number of AHPs recruited and retained by a research-oriented company to increase their credibility as a research-oriented institution.

Clinicians who participate in research are also more likely to experience greater job satisfaction [25,26]. A healthy research culture influences allied health career progression and evidence-based retention and acceptance of practice. In conclusion, a better-allied health research culture and skills establish the groundwork for increased research capacity, which increases the evidence base accessible to impact AH policy and practice.

4.6. Leadership commitment & stakeholders' involvement in Quality Assurance Activities

A recent study found that managerial support, working conditions and perceived job security have a significantly positive impact on the job satisfaction of academic faculty and teaching staff and that their feedback is a key factor in improving quality [64]. Therefore, QA in an AHI depends on the perspective of various stakeholders and may focus on curriculum, learning methods, assessment, teaching staff, faculty development and human resource management [65]. QA is essentially self-evaluation, peer evaluation (questionnaires) and external

evaluation (accreditations). It involves two major activities: collecting data for accountability and providing suggestions for improvement [66]. All key stakeholders (leadership, staff, students, graduates and employers) should complete a series of surveys to help collect data on a regular basis [67]. QA committee reviews data and information and comes up with suggestions for improvement. QA involves a multidisciplinary team approach to problem solving and quality improvement [68]. QA should be part of the daily activities and integrated into the existing management and information systems of each facility. QA models should be individualised and not adapted across institutions or regions. A Centre of excellence for QA with personnel from leadership, staff and students can be incorporated. The principal focus of QA activities must be within the institution, external agencies should serve primarily as resources for training, data collection and feedback and for monitoring the effectiveness of the internal quality assurance system.

AHI staff must understand the institution and its key processes in order to improve them. QA training workshops and simulations can improve staff awareness. Regularly conduct quality awareness or QI workshops championed by student leaders. To make QA sessions more interesting, use smaller discussion groups, take home materials with key messages, add interactive content and provide more hands-on exercises.

4.7. Quality improvement initiatives

Institution quality needs to be defined, assessed, and monitored on a regular basis to ensure its existence to meet the needs of students and society. Quality improvement is purposive, systematic, and continuous action to improve the overall experience of the activity (Fig. 3) [69]. In addition, in the rapidly changing environment, a systematic assessment of institutional policies and technological innovations should be carried out regularly. QI is becoming more and more important for AHI; Students seeking admission expect better education, lower costs and higher quality from universities. Furthermore, QI initiatives offer a unique opportunity for key stakeholders to participate in collaborative

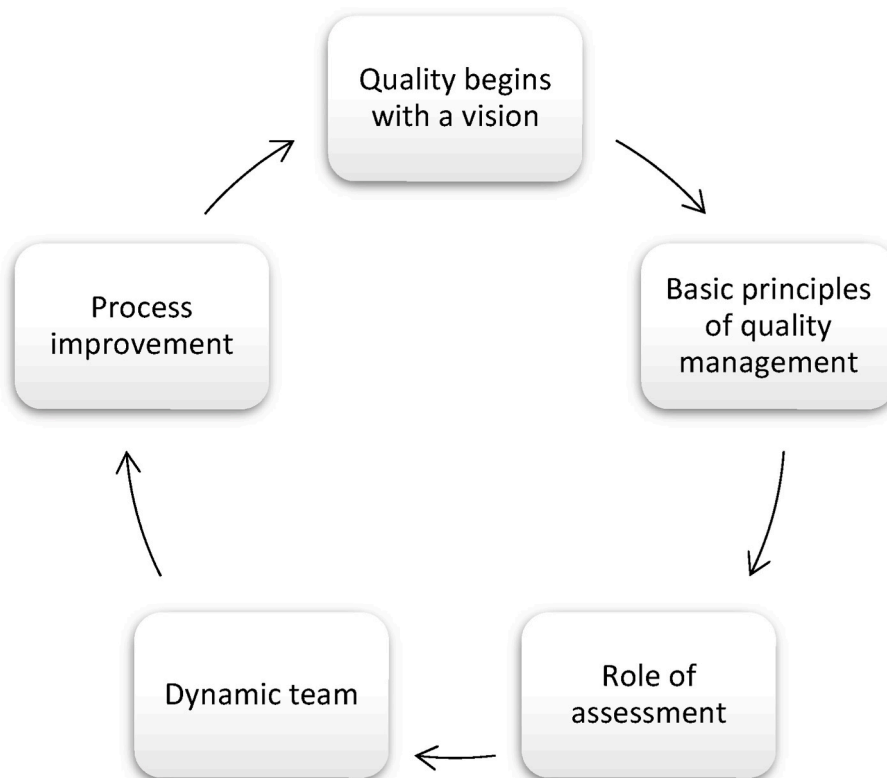


Fig. 3. Quality improvement framework.

activities. An effective QI program requires coordination, communication, and collaboration across various teams and changes in culture to work towards a common quality goal [70]. QI is achievable when all staff embrace the philosophy of QI and understand their role in supporting an organization-wide focus on QI.

QI initiatives start at the top; the leader's role begins with creating and sustaining an organizational focus on QI through actions [71]. Major decisions such as starting a new course, curriculum and evaluation should be decentralized to ensure faculty involvement. A school should begin by assigning the Chief Academic Officer (usually the Dean) of the educational program to establish a process for continually monitoring accreditation standards and demonstrating constant QI. Next, establish an institutional committee consisting of the leaders; for example, the dean or a designee could chair a committee responsible for curriculum, student affairs, student admissions, and faculty affairs. Finally, assigning a faculty and staff member the responsibility to ensure continuous review and implementation of the QI process (with the support of the dean or Vice-Dean of Academic Affairs or Dean of the attached institution) will safeguard against the neglected process [72].

Several approaches have adopted by industries to improve quality. One such approach is 'process mapping' — "the approach that leads to a holistic understanding of the activity under review" which is commonly used across industries to enhance QI initiatives [73]. Process mapping also helps with root cause analysis, an important QI action. Therefore, AHI should develop detailed process maps for all day-to-day activities to leverage future QI initiatives.

Evaluation parameters are the key to detecting/monitoring quality and several indicators are being used by universities. An indicator is a measurable statement that encompasses the structure, process or outcome of education/service quality [74]. Development of a uniform minimum data set of important quality indicators such as students retention rate, percentage of students graduated, etc. which can be used by teachers, students and other staff for a comparative performance evaluation. The key is to understand the comprehensive quality management tools (QMT), including critical drivers, data sources, interpretation and quality opportunities [75].

In addition to the existence of processes and evaluation parameters, specific teams should be formed that can apply QI and process-oriented management practices, including Lean, Six Sigma, Failure Mode Effects Analysis (FMEA), Failure Mode, Effects, Criticality Analysis (FMECA) [66,76]. The Lean methodology dictates that the utilization of resources for any goal other than the creation of value is wasteful and should be eliminated. Six Sigma uses a structured cycle (define, measure, analyze, improve, and control) to identify and solve quality problems [77]. Sometimes both methods are combined, which is referred to as Lean Six Sigma. In addition, quality systems should include positive incentives to solve problems in order to achieve demonstrable improvements in outcomes. All staff and students should be properly trained to facilitate the above QI activities. A study suggested that QMT, SQIM and CHAMP are effective methods to educate staff about QI. Modules developed by local content experts with relevant experience and certification were more effective in training employees. Additionally, student-led skill workshops effectively improve attitudes and behaviors towards QI. The workshops also paved the way for garnering students' interest in QI early into their medical education [78].

4.8. Impact of Accreditation/Certification on Quality Improvement

An organization's certification highlights the roots of systematic hospital evaluation against defined norms. While the influence and consequence of healthcare certification are still debated, its rise has surged in recent decades. Lack of accreditation impacts both students and the school, causing embarrassment and other effects such as student and staff worry, prospective decrease in future applications, and loss of financing prospects [79].

As certifying agencies tighten criteria, institutions must actively

improve quality rather than wait for the following certification cycle [35]. However, maintaining accrediting standards may be difficult for teachers, staff, and administrators. Over 70 countries have implemented certification schemes in healthcare, including emerging nations like the UAE [80–82]. Determining what to monitor and how often to monitor impacts the resources required for continuous monitoring (Table 2). Moreover, although healthcare certification may appeal to managers and stakeholders, many contend that it increases worker effort and stress.

Singaporean research found that certification improved educational and clinical learning infrastructure. Lutfiyya et al. found a statistically significant difference in performance between accredited and non-accredited hospitals [83]. Likewise, Halasa et al. reported improvements in several aspects of patient care (reduction in return to ICU within 24 h, reduction in staff turnover) following a JCI accreditation process in a 4-year retrospective study in Jordan [84]. Additionally, a hospital's accreditation status had mixed effects on patient safety, perceived adverse events, and event reporting [85].

The leadership of the medical education program must first recognize the necessity of frequent assessment of accrediting requirements [86]. Involvement of institutional leaders with duties related to accrediting standards raises awareness of the condition of attaining and maintaining compliance with accreditation standards and links quality improvement efforts to standards. Implementing a plan of continual accreditation standard monitoring is one way (Fig. 4). A "no risk" self-study of conformity with all relevant accrediting requirements is the next phase, which documents a baseline database of information to evaluate compliance and begin the continuous monitoring and CQI program. The self-study results should be provided to the medical school dean to achieve or maintain accreditation criteria. Finally, follow a checklist to complete an accreditation standard evaluation.

4.9. Physical facilities

A master plan is required to translate the institution's vision and strategy into well-functioning physical facilities. The master plan specifies the architecture of the institution's physical buildings, how it will provide care, and how its internal structure will best be organized to deliver services. Building phasing and grouping, interior building layout, access and transit routes, and service efficiency are factors in a comprehensive master plan [87].

The physical attributes of a facility include its structure, systems, and major equipment. Functional planning provides a complete inventory of the physical resources required to deliver a new system or service [87]. This can also include clinical service spaces (such as patient care, staff, and student areas), critical equipment, furniture, and building support systems. In addition, non-clinical service facilities including cafeterias, lobbies and executive rooms are included. Staff benefit from direct and accessible links between departments and areas of clinical support services. Moreover, a university needs to be close to a major transportation hub to be effective. This helps to attract competent personnel. To be successful, allied health organizations must have healthy facilities. Future plans should be considered when designing a facility.

Maintaining the physical environment ensures the safety of students and visitors. National standards must be observed for information technology systems. All IT systems should be designed to facilitate compliance and audits. Suppliers and institutions must plan and implement educational and other activities to ensure service continuity. Infection prevention and control should be incorporated into basic infrastructure specifications for secure buildings and setting benchmarks for specific service areas and facilities. The school should use an evidence-based design to ensure the safety of teachers and students. Security services ensure the safety of the hospital. This includes defending the school and its property, as well as the students, teachers and staff. Security forces must learn to deal with a variety of undesirable situations. The security team also needs space and perhaps a

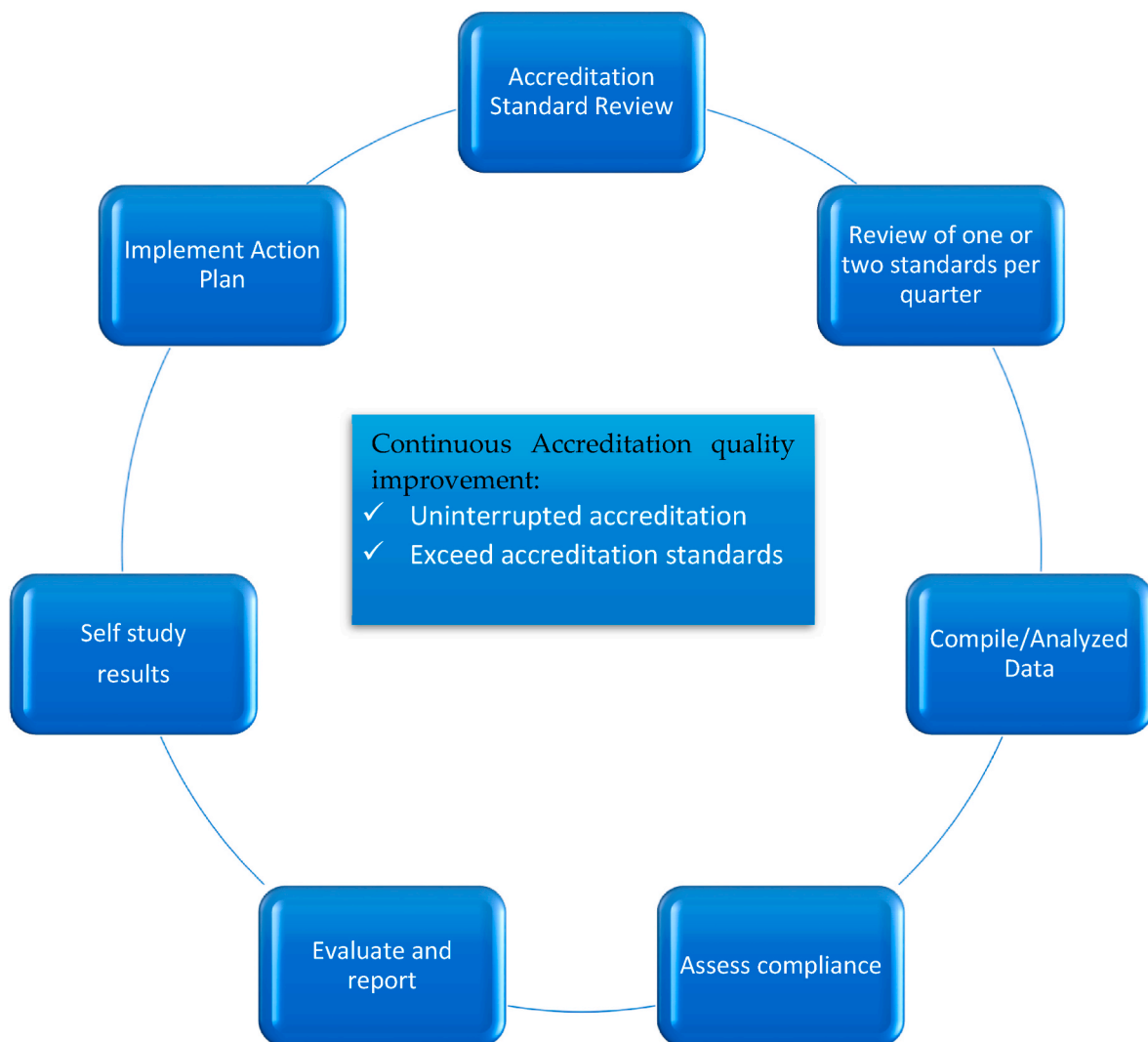


Fig. 4. Continuous accreditation workflow.

telecommunications infrastructure. A fire safety code should be followed to reduce fatalities and injuries. There are several aspects of fire safety to consider such as, such as avoiding and limiting the spread of fires and escape routes. Organizations may address fire safety by installing protective measures in buildings and structures, using fire-resistant materials in construction, and maintaining fire escapes. Organizations may also consider providing staff with fire prevention and response training [88].

There should be sufficient natural light and sound-absorbing materials. Depending on the context, cultural and gender sensitivity can be incorporated into the design of religious spaces or private quarters for both men and women. These principles are implemented through physical design and materials to address current health and safety concerns related to pandemics. Wherever possible, LEED standards and other environmentally friendly concepts should be applied, such as the LEED grading system [89]. The global community actively promotes ISO certification for its educational facilities [90].

Water, sanitation and waste management services ensure proper waste disposal and safe drinking water supplies. The separation of clean articles from aged and contaminated goods is a basic requirement in plant design. Healthcare waste includes infectious waste, sharps, pharmaceutical, chemical, pressurized containers and general waste. Designers must find new ways to reduce the risk of infection and foodborne illness in areas without adequate water and waste management systems

[91].

4.10. Limitations

The narrative synthesis approach employed in this study has certain limitations that should be acknowledged. Firstly, there is a possibility of excluding relevant studies despite efforts to conduct a comprehensive search in electronic databases. This could be due to variations in indexing, availability of full-text articles, or the inclusion criteria used. Secondly, the identification and categorization of themes in the literature review are subjective processes that may introduce bias. While efforts were made to minimize bias by involving experts in the field and multiple reviewers and reaching a consensus, individual interpretations and judgments may still have influenced the results. Lastly, the inclusion of only English-language articles may have resulted in the exclusion of relevant studies published in other languages, potentially limiting the scope and generalizability of the findings.

4.11. Conclusions

Allied Healthcare is a relatively young medical specialty that was founded in the last century. Nonetheless, healthcare professionals make up the vast majority of healthcare workers. They work at all levels of care—primary, acute, tertiary, and chronic—and in all kinds of

healthcare settings—physician and dental offices, healthcare organizations, laboratories, autonomous facilities that provide specialized services, ambulances, and home care. Because the training levels of allied health workers vary as much as the services they provide and the locations in which they operate, standard guidelines must be in place that focus on key quality assurance aspects of AHIs. Through this narrative, the authors propose nine key aspects that need to be strengthened while improving the quality of AHIs. This includes quality improvement activities focused on: (i) Role of Allied healthcare institution leadership; (ii) Students Selection, Orientation, Assessment, and opportunities for extracurricular activities; (iii) Teaching Quality; (iv) Curriculum; (v) opportunities for Research and Development; (vi) Leadership commitment & Stakeholders' involvement in Quality Assurance Activities; (vii) Quality improvement initiatives; (viii) Impact of Accreditation/Certification on Quality Improvement; (ix) Physical facilities of AHIs. To meet these key aspects of quality improvement activities, AHIs develop and implement strategies to attract competent and committed students, fund the best in class and provide highly qualified educators, attract a cadre of researchers and academic leaders to advance the scientific foundations of allied health practice. Additionally, AHIs with significant research commitments may consider implementing initiatives to identify and nurture outstanding individuals to achieve a credible scholarly base. Institutions that offer allied health curricula should recognize and reward the clinical excellence of the faculty. Based on the nine key aspects of quality improvement activities focused on AHIs, the authors provided several key recommendations for improving the quality of AHIs around the world.

Funding

"This research received no external funding".

Institutional review board statement

Not applicable.

Author contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Informed Consent statement

Not applicable.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The authors would like to extend their gratitude to the National Center for Academic Accreditation and Evaluation (NCAAA); An organization that imparted the concept of Quality Assurance/Improvement in the minds of educators and policy makers of educational institutions in the Kingdom of Saudi Arabia. NCAAA was the true inspiration for the authors in conceptualizing and writing this recommendation paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.imu.2023.101412>.

References

- [1] (US) IoM. Committee to study the role of allied health personnel. Allied health services: avoiding crises. (US). Washington, DC: National Academies Press (US); 1989. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK218850/> [Accessed on August 2023].
- [2] Asahp. Definition of allied health in: the association of schools of allied health professions. Available at URL: www.asahp.org/definition.htm (accessed 10 October 2021).
- [3] Arabia S. National commission for academic accreditation and assessment. (No date) national commission for academic accreditation & assessment. Available at: https://www.iau.edu.sa/sites/default/files/resources/standards_for_institutions.pdf. [Accessed 12 November 2023].
- [4] Ministry of Health FW, Government of India. The national commission for allied and healthcare professions bill. 2020. Ministry of Health and Family Welfare, Government of India. Available from: <https://prsindia.org/billtrack/the-national-commission-for-allied-and-healthcare-professions-bill-2020>. [Accessed 12 October 2021].
- [5] Van Diggele C, Burgess A, Roberts C, Mellis C. Leadership in healthcare education. *BMC Med Educ* 2020;20(Suppl 2):456.
- [6] Cesarone D. Vision, mission, and values: putting it together. *QRB Quality review bulletin* 1993;19(2):47.
- [7] Wu JC, Woo YJ, Mayerle M, Harrington RA, Quertermous T. Stanford cardiovascular institute. *Circ Res* 2019;124(10):1420–4.
- [8] Owens K, Eggers J, Keller S, McDonald A. The imperative of culture: a quantitative analysis of the impact of culture on workforce engagement, patient experience, physician engagement, value-based purchasing, and turnover. *J Healthc Leader* 2017;9:25–31.
- [9] Pearce CL, Manz CC, Sims HP, editors. *Is shared leadership the key to team Success* 2009.
- [10] Maddalena V, Pendergast A, McGrath G. Quality improvement in curriculum development. *Leader Health Serv* 2018;31(4):409–12.
- [11] Knapp S. Lean Six Sigma implementation and organizational culture. *Int J Health Care Qual Assur* 2015;28(8):855–63.
- [12] O'Neil M. The importance of leadership for quality improvement. *Healthc Manag Forum* 2011;24(1 Suppl):S4–7.
- [13] Leape LL, Rogers G, Hanna D, Griswold P, Federico F, Fenn CA, et al. Developing and implementing new safe practices: voluntary adoption through statewide collaboratives. *Quality & safety in health care* 2006;15(4):289–95.
- [14] Gifford WA, Squires JE, Angus DE, Ashley LA, Brosseau L, Craik JM, et al. Managerial leadership for research use in nursing and allied health care professions: a systematic review. *Implement Sci : ISCUS* 2018;13(1):127.
- [15] Cooke J, Nancarrow S, Dyas J, Williams M. An evaluation of the 'Designated Research Team' approach to building research capacity in primary care. *BMC Fam Pract* 2008;9:37.
- [16] Alhurishi SA, Aljuraiban GS, Alshaikh FA, Almutairi MM, Almutairi KM. Predictors of students' academic achievements in allied health professions at King Saud University: a retrospective cohort study 2021;21(1):1–7.
- [17] Patterson F, Knight A, Dowell J, Nicholson S, Cousins F, Cleland J. How effective are selection methods in medical education? A systematic review. *Medical education* 2016;50(1):36–60.
- [18] Herrmann-Werner A, Gramer R, Erschens R, Nikendei C, Wosnik A, Griewatz J, et al. Peer-assisted learning (PAL) in undergraduate medical education: an overview. *Zeitschrift fur Evidenz, Fortbildung und Qualitat im Gesundheitswesen* 2017;121:74–81.
- [19] Stenberg M, Mangrio E, Bengtsson M, Carlson E. Formative peer assessment in higher healthcare education programmes: a scoping review. *BMJ Open* 2021;11(2):e045345.
- [20] Stenberg M, Carlson E. Swedish student nurses' perception of peer learning as an educational model during clinical practice in a hospital setting—an evaluation study. *BMC Nurs* 2015;14(1):48.
- [21] Ltd. BB. Answering the call national survey, National mental health and wellbeing study of police and emergency services. 2018. Final report, https://www.beyondblue.org.au/docs/default-source/resources/bl1898-pes-full-report_final.pdf. [Accessed 25 June 2023].
- [22] Kinsella EA, Smith K, Bhanji S, Shepley R, Modor A, Bertrim A. Mindfulness in allied health and social care professional education: a scoping review. *Disabil Rehabil* 2020;42(2):283–95.
- [23] Dyrbye LN, Satele D, West CP. Association of characteristics of the learning environment and US medical student burnout, empathy, and career regret. *JAMA Netw Open* 2021;4(8):e2119110.
- [24] Gibson SJ, Porter J, Anderson A, Bryce A, Dart J, Kellow N, et al. Clinical educators' skills and qualities in allied health: a systematic review. *Medical education* 2019;53(5):432–42.
- [25] Görlitz A, Ebert T, Bauer D, Grasl M, Hofer M, Lammerding-Köppel M, et al. Core competencies for medical teachers (KLM)—A position paper of the GMA committee on personal and organizational development in teaching. *GMS Z Med Ausbild* 2015;32(2):Doc23.

- [26] Huntington J, Dick 3rd JF, Ryder HF. Achieving educational mission and vision with an educational scorecard. *BMC Med Educ* 2018;18(1):245.
- [27] Forbes R, Martin R, Patterson F, Hill A, Hoyle M, Penman A, et al. Exploring allied health professional student and academic teacher experiences of teaching and learning clinical skills online in response to COVID-19 2021;9(1):1–15.
- [28] Jarrar M, Mohamed RB, Al-Bsheish M, Albaker W, Alumran A, Alomran AK. Students' perception of quality of learning experience (structure, process and outcome): discipline versus problem based medical curriculum and the mediation role of process quality. *Healthcare (Basel)*. 2022;10(8):1584.
- [29] OECD. Learning our lesson: review of quality teaching in higher education. 2018. Retrieved from, <http://www.oecd.org/dataoecd/54/26/43961761.pdf> [Accessed on September 2023].
- [30] Yu J, Lee S, Kim M, Lim K, Chang K, Chae S. Professional self-concept and burnout among medical school faculty in South Korea: a cross-sectional study. *BMC Med Educ* 2019;19(1):248.
- [31] Henry-Noel N, Bishop M, Gwede CK, Petkova E, Szumacher E. Mentorship in medicine and other health professions. *J Cancer Educ : the official journal of the American Association for Cancer Education* 2019;34(4):629–37.
- [32] Frenk J, Chen L, Bhutta ZA, Cohen J, Crisp N, Evans T, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world 2010;376(9756):1923–58.
- [33] de Cates P, Owen K, Macdougall CF. Warwick Medical School: a four dimensional curriculum. *Med Teach* 2018;40(5):488–94.
- [34] McCoy L, Lewis JH, Dalton D. Gamification and multimedia for medical education: a landscape review. *J Am Osteopath Assoc* 2016;116(1):22–34.
- [35] Yoo HH, Kim MK, Yoon YS, Lee KM, Lee JH, Hong S-J, et al. Change of accreditation standards of medical schools by the Korean institute of medical education and evaluation from 2000 to 2019. *Journal of educational evaluation for health professions* 2020;17:2.
- [36] Shah S, McCann M, Yu C. Developing a national competency-based diabetes curriculum in undergraduate medical education: a delphi study. *Can J Diabetes* 2020;44(1). 30-6.e2.
- [37] Maaz A, Hitzblech T, Arends P, Degel A, Ludwig S, Mossakowski A, et al. Moving a mountain: practical insights into mastering a major curriculum reform at a large European medical university. *Med Teach* 2018;40(5):453–60.
- [38] McKimm J, Jones PK. Twelve tips for applying change models to curriculum design, development and delivery. *Med Teach* 2018;40(5):520–6.
- [39] Asokan GV. Evidence-based practice curriculum in allied health professions for teaching-research-practice nexus. *J Evid Base Med* 2012;5(4):226–31.
- [40] Uy J, Lizarondo L, Atlas A. ASPIRE for quality: a new evidence-based tool to evaluate clinical service performance. *BMC Res Notes* 2016;9:306.
- [41] Grimmer K, Lizarondo L, Kumar S, Bell E, Buist M, Weinstein P. An evidence-based framework to measure quality of allied health care. *Health Res Pol Syst* 2014;12: 1–10.
- [42] Greiner ACKE. Health professions education: a bridge to quality. Washington, D.C: Institute of medicine, National Academies Press; 2003.
- [43] Sackett DSS, Richardson W, Rosenberg W, Haynes R. Evidence-based medicine: how to practice and teach EBM. second ed. Edinburgh: Churchill Livingstone; 2000.
- [44] Arja SB, Arja SB, Venkata R M, Nayakanti A, Kottathveetil P, Acharya Y. Integrated curriculum and the change process in undergraduate medical education. *Med Teach* 2018;40(5):437–42.
- [45] Fischer Q, Nhan P, Picard F, Varenne O. Social network as teaching material in medical school: review and perspectives. *Archives of Cardiovascular Diseases* 2018;111(2):71–3.
- [46] Sharma N. How Twitter can move the medical education debate forward? *Med Teach* 2018;40(5):532.
- [47] Al Kury LT, Mahgoub M, Howarth FC, Oz M. Natural negative allosteric modulators of 5-h₂ receptors. *Molecules* 2018;23(12).
- [48] Stalmeijer RE, Whittingham JRD, Bendermacher GWG, Wolfhagen IHAP, Dolmans DHJM, Sehlbach C. Continuous enhancement of educational quality – fostering a quality culture: AMEE Guide No. 147. *Med Teach* 2022;1–11. <https://doi.org/10.1080/0142159X.2022.2057285>. Available from.
- [49] Sreedharan J. Quality improvement in respiratory care education: implications for curriculum change. *Respir Care* 2022;67(1):154–5.
- [50] Arruza E, Chau M. The effectiveness of cultural competence education in enhancing knowledge acquisition, performance, attitudes, and student satisfaction among undergraduate health science students: a scoping review. *J Educ Eval Health Prof* 2021;18:3.
- [51] Germann CA, Strout TD, Park YS, Tekian A. Senior-year curriculum in U.S. Medical schools: a scoping review. *Teach Learn Med* 2020;32(1):34–44.
- [52] Borkowski D, McKinstry C, Cotchett M, Williams C, Haines T. Research culture in allied health: a systematic review. *Aust J Prim Health* 2016;22(4):294–303.
- [53] Illott I, Bury TJP. Research capacity: a challenge for the therapy professions 2002; 88(4):194–200.
- [54] Condell SL, Begley C. Capacity building: a concept analysis of the term applied to research. *Int J Nurs Pract* 2007;13(5):268–75.
- [55] Harding KE, Stephens D, Taylor NF, Chu E, Wilby A. Development and evaluation of an allied health research training scheme. *J Allied Health* 2010;39(4):e143–8.
- [56] Golenko X, Pager S, Holden L. A thematic analysis of the role of the organisation in building allied health research capacity: a senior managers' perspective. *BMC Health Serv Res* 2012;12(1):276.
- [57] Holden L, Pager S, Golenko X, Ware RS, Weare R. Evaluating a team-based approach to research capacity building using a matched-pairs study design. *BMC Fam Pract* 2012;13:16.
- [58] Grange A, Herne S, Casey A, Wordsworth L. Building research capacity. *Nursing management* (Harrow, London, England 2005;12(7):32–7. 1994.
- [59] Petrella JK, Jung AP. Undergraduate research: importance, benefits, and challenges. *Int J Exerc Sci* 2008;1(3):91–5.
- [60] Perry L, Grange A, Heyman B, Noble P. Stakeholders' perceptions of a research capacity development project for nurses, midwives and allied health professionals. *J Nurs Manag* 2008;16(3):315–26.
- [61] Holden L, Pager S, Golenko X, Ware RS. Validation of the research capacity and culture (RCC) tool: measuring RCC at individual, team and organisation levels. *J Australian Journal of Primary Health* 2012;18(1):62–7.
- [62] Smith H, Wright D, Morgan S, Dunleavy J, Moore M. The 'Research Spider': a simple method of assessing research experience. *Prim Health Care Res Dev* 2002;3(3):139–40.
- [63] Van Mullem C, Burke LJ, Dohmeyer K, Farrell M, Harvey S, John L, et al. Strategic planning for research use in nursing practice. *J Nurs Adm: J Nurs Adm* 1999;29(12).
- [64] Bakr RH, Abumadani MS, Al Sultan AI, Larbi EB. Effect of leadership support, work conditions and job security on job satisfaction in a medical college. *Saudi journal of medicine & medical sciences* 2019;7(2):100.
- [65] Foss ML, Breannan Moore S. Evolution of quality management: integration of quality assurance functions into operations, or "quality is everyone's responsibility". *Transfusion* 2003;43(9):1330–6.
- [66] RG H. Tools and strategies for quality improvement and patient safety. In: Hughes RG, editor. Patient safety and quality: an evidence-based handbook for nurses. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008 Apr [Chapter 44]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK2682/> [Accessed on: August 2023].
- [67] AHRQ technical reviews. In: Shojania KG, McDonald KM, Wachter RM, Owens DK, editors. Closing the quality gap: a critical analysis of quality improvement strategies (vol 1: series overview and methodology). Rockville (MD): Agency for Healthcare Research and Quality (US); 2004. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK43908/> [Accessed on: November 2023].
- [68] Geriaine J. Six Sigma plan delivers stellar results. *Mater Manag Health Care* 2007; 16(4):20–2. 4, 6.
- [69] Varkey P, Reller MK, Resar RK. Basics of quality improvement in health care. *Mayo Clin Proc* 2007;82(6):735–9.
- [70] Horbar JD, Plsek PE, Leahy K. NIC/Q 2000: establishing habits for improvement in neonatal intensive care units. *Pediatrics* 2003;111(4 Pt 2):e397–410.
- [71] Guinane CS, Davis NH. The science of Six Sigma in hospitals. *Am Heart Hosp J* 2004;2(1):42–8.
- [72] Coles E, Anderson J, Maxwell M, Harris FM, Gray NM, Milner G, et al. The influence of contextual factors on healthcare quality improvement initiatives: a realist review. *Syst Rev* 2020;9(1):94.
- [73] Antonacci G, Reed JE, Lennox L, Barlow J. The use of process mapping in healthcare quality improvement projects. *Health Serv Manag Res* 2018;31(2): 74–84.
- [74] Campbell SM, Braspenning J, Hutchinson A, Marshall M. Research methods used in developing and applying quality indicators in primary care. *Quality & safety in health care* 2002;11(4):358–64.
- [75] Joss R. What makes for successful TQM in the NHS? *Int J Health Care Qual Assur* 1994;7(7):4–9.
- [76] Colligan L, Anderson JE, Potts HWW, Berman J. Does the process map influence the outcome of quality improvement work? A comparison of a sequential flow diagram and a hierarchical task analysis diagram. *BMC Health Serv Res* 2010;10(1):7.
- [77] Amaratunga T, Dobranowski J. Systematic review of the application of lean and Six Sigma quality improvement methodologies in radiology. *J Am Coll Radiol : JACR*. 2016;13(9). 1088-95.e7.
- [78] Shah KP, Goyal S, Ramachandran V, Kohn JR, Go JA, Wiley Z, et al. Efficacy of quality improvement and patient safety workshops for students: a pilot study. *BMC Med Educ* 2020;20(1):126.
- [79] Alshamsi AI, Thomson L, Santos A. What impact does accreditation have on workplaces? A qualitative study to explore the perceptions of healthcare professionals about the process of accreditation. *Front Psychol* 2020;11:1614.
- [80] Greenfield D, Braithwaite J. Health sector accreditation research: a systematic review. *Int J Qual Health Care : journal of the International Society for Quality in Health Care* 2008;20(3):172–83.
- [81] Devkaran S, O'Farrell PN. The impact of hospital accreditation on quality measures: an interrupted time series analysis. *BMC Health Serv Res* 2015;15:137.
- [82] Greenfield D, Lawrence SA, Kellner A, Townsend K, Wilkinson A. Health service accreditation stimulating change in clinical care and human resource management processes: a study of 311 Australian hospitals. *Health Pol* 2019;123(7):661–5.
- [83] Lutfiyya M, Sikka A, Mehta S, Lipsky M. Comparison of US accredited and non-accredited rural critical access hospitals. *Int J Qual Health Care : journal of the International Society for Quality in Health Care / ISQua*. 2009;21:112–8.
- [84] Halasa Y, Zeng W, Chappay E, Shepard D. Value and impact of international hospital accreditation: a case study from Jordan 2015;21(2).
- [85] Jarrar MT, Al-Bsheish M, Dardas LA, Meri A, Sobri Minai M. Adverse events in Malaysia: associations with nurse's ethnicity and experience, hospital size, accreditation, and teaching status. *Int J Health Plann Manag* 2020;35(1):104–19.
- [86] Clinch CR, Violato C. Continuous review of accreditation standards and quality improvement in a medical education program—practical recommendations for implementing a program. *MedEdPublish* 2016 Aug 25;5:72.
- [87] WHO. World Health Organization. Regional Office for the Western Pacific. District health facilities : guidelines for development and operations. WHO Regional Office

- for the Western Pacific; 1998. Available at, <https://apps.who.int/iris/handle/10665/207020> [Last Accessed on: October 2023].
- [88] Who. Building security and fire protection. WHO, https://cdn.who.int/media/docs/default-source/medicines/norms-and-standards/guidelines/distribution/trs961-annex9-supp4.pdf?sfvrsn=d3c6a190_2 [Last Accessed on: October 2023].
- [89] LEED. Leadership in energy and environmental design Washington, DC: U.S. Green Building Council. Available from: (<https://new.usgbc.org/leed>) [Last Accessed on: November 2023].
- [90] ISO. Standards catalogue: 91 – Construction materials and building Geneva: International Organization for Standardization. Available from: (<https://www.iso.org/ics/91/x/>) [Last Accessed on: October 2023].
- [91] Center ILaR. UI greemetric world university rankings 2021 Indonesia: UI GreenMetric secretariat. 2021 [Available from: <https://greenmetric.ui.ac.id/publications/guidelines/2021/english> [Last Accessed on: October 2023].