



## Indicators for Internationalization of Medical Universities: A Scoping Review

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### Abstract

**Background:** The internationalization of universities allows the exchange of knowledge, experiences, attitudes, and cultures across geographical borders, which leads to benefits such as visibility, human resource development, quality improvement and revenue generation for universities. Therefore, the assessment of universities is very important in terms of internationalization. The purpose of this study was to identify the indicators of internationalization assessment for medical universities in a logical framework.

**Methods:** The reporting of this scoping review conforms to the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Review checklist (PRISMA- ScR). Articles were retrieved through the search of related keywords in databases including Web of Science, PubMed, Scopus, Science Direct, and Google Scholar from January 2000 to October 2021 and by searching the references of retrieved articles. After applying the inclusion criteria, 36 papers were selected from a total of 1264. Data analysis is underpinned by the Ritchie and Spencer five-step framework.

**Results:** 102 indicators have been identified and organized in the framework of IPO, which has provided input, process and output indicators in the educational, research, and management dimensions. Most indicators have been classified in the “Education” dimension (n=40) which consists of 6 inputs, 14 processes and 20 Outputs. The “Research” dimension consists of 3 inputs, 9 processes and 12 Outputs, and the “Management” dimension consists of 13 inputs, 16 processes and 9 Outputs.

**Conclusion:** There is no single set of target indicators for the internationalization of all medical universities. Therefore, the selection of target indicators for medical universities to proceed toward internationalization depends on the strengths and weaknesses of universities in each dimension, as well as the feasibility of further ambition according to the national context. Also, the identified indicators are mainly in the four areas of facilities management, visibility, marketing, and networking.

**Keywords:** Internationalization, Indicator, Medical University, Higher Education, Scoping Review

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### Introduction

Internationalization is the response of universities or nations to deal with the inevitable process of globalization (1). Until recently, the internationalization of higher education was largely considered an end in itself, but over the past two decades, it has become a tool for international cooperation, capacity building, and improving the quality

of education and research (2). International branding, human resource development, and income generation are among the benefits mentioned for universities and countries (3), which has made the internationalization of higher education more attractive to policymakers, administrators, and researchers. Also, there are many drivers for the inter-

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#### ↑What is “already known” in this topic:

The success of the internationalization of a medical university depends on the consideration of various indicators. But there is a lack of a comprehensive set of indicators that cover all dimensions.

#### →What this article adds:

In this study, based on the logical framework, a comprehensive set of indicators has been prepared to assess the internationalization of universities.

nationalization of universities such as globalization trends, the need for knowledge exchange, the optimal supervisory system in the university, resource efficiency, reputation, and learning the experiences of foreign partners (4). But the lack of a clear, comprehensive, and practical picture of the university's internationalization has left its implementation and evaluation in ambiguity, especially for developing countries. In addition, many universities around the world take into account limited activities for internationalization such as international student admission and establishing branch campuses in foreign countries, and this has led to little progress in this regard. Also, given that internationalization is a requirement for universities to become the world-class and be among the top universities in the world rankings (5), highlights the importance of it.

In the present era, there are common horizons between countries to solve global events and meet the needs of global markets for sciences, technologies, and specialized human resources. In this regard, achieving the Sustainable Development Goals set at the Rio Conference in 2012 and the progress of countries in the field of health to achieve the SDG's third goal, which is "Ensure healthy lives and promote well-being for all at all ages", require international collaboration between medical universities. In addition, the internationalization of medical education has achievements such as a multi-perspective approach in students, intercultural skills in medical practices, and joint international activities that should be further addressed in a global health event such as the COVID-19 pandemic. Therefore, in the current context of global health, the need for indicators to implement and monitor internationalization activities in medical universities is becoming increasingly apparent.

According to the literature, sporadic efforts and studies have been made in recent years to develop instruments for monitoring and measuring the internationalization of universities in different parts of the world, but they are limited to the national or regional scope and cannot be transferred between countries, or they are designed with a specific purpose and haven't comprehensive approach (6, 7). Gao proposed a framework with six dimensions including research, student, faculty, curriculum, engagement, and governance, that contained 57 quantitative indicators (7). Gao argued this framework covers the key generic areas of internationalization in the broadest possible sense, but we found cultural and welfare management indicators were not considered in that study, and also quantitative indicators were merely provided and process indicators were ignored. Chang and Lin provided a framework for implementing and assessment of university internationalization that classified 22 indicators into four dimensions: context, input, process, and outcome (8). Their study scope was limited to Taiwan and wasn't global. Their framework considered important indicators in the form of the CIPO model but looked limited because it ignored many effective indicators. Kirecci and colleagues have established an index of higher education internationalization in Turkey with five dimensions including university research performance, curricular efficiency, international linkages, student support, and urban sufficiency (9). These

dimensions contained 33 indicators. Process and management-related indicators were not considered adequately in their study. Also, some of their considered indicators do not have direct impact on the internationalization.

It should be noted that ranking systems such as Times Higher Education (THE), Quacquarelli Symonds (QS), Scimago, and Leiden assess academic institutions in terms of internationality by using a number of indicators, including international faculties and staff, foreign students, research collaboration, published papers in English-language journals, English-language facilities and membership of global networks (10-13).

As a result, the above indicated that it is essential to have a comprehensive set of indicators that can be used for all contexts.

The success of the internationalization of a medical university depends on the consideration of various indicators. According to Taylor, indicators provide reliable, strategic and comparable information. That's why they are a perfect tool for better understanding the condition of institutions by managers (14).

This study aims to identify and provide a summary of institutional indicators for the implementation and monitoring of internationalization policies and practices by managers and policymakers of medical higher education. Accordingly, three specific research questions that this study seeks to answer are:

- 1) What institutional indicators are used to implement and assess the internationalization of medical universities?
- 2) What dimensions of internationalization are considered with the identified indicators?
- 3) Which indicators are considered more than the others?

## Methods

### Study design

This study is a scoping review that was designed and conducted in 2021. Scoping review study is secondary research to combine the findings of original research studies. This type of review was chosen to summarize and disseminate findings of studies in the research area to policymakers which have not been reviewed comprehensively before (15). Arksey and O'Malley's framework was used for conducting this review study.

### Search strategy, inclusion, and exclusion criteria

The following search terms were used in Web of Science, Scopus, Google Scholar, Science Direct, and PubMed:

(international\* OR global\*) AND (university\* OR high education) AND (indicator\* OR rank\* OR criteria OR factor).

Primary and secondary research articles, which were full text and published in English from 2000 to 2021 and dealt with university internationalization, met the inclusion criteria in this study.

We used resource management software Endnote to organize the study references and the PRISMA-ScR checklist to screen the identified resources and distill the final relevant studies. Papers with poor methodology and non-

English ones were excluded.

### Study selection

The preferred reporting items for the systematic reviews and meta-analyses extension for scoping review checklist (PRISMA-ScR) was used in the retrieval process (16). The search effort resulted in studies from which we selected relevant articles for the review. After removing the duplicates, by reviewing of titles and abstracts of the remaining papers, we excluded articles that were irrelevant to the research objective. In the next step, two authors independently assessed the full papers of the remaining articles, including those deemed relevant and those that had insufficient information in the title or abstract, to enable an eligibility decision to be made. In this step, those articles that were relevant to the study question were finally included in the study. Figure 1 shows a flowchart of the study screening and selection process according to the PRISMA-ScR checklist. Whereas a scoping review is less likely to assess the quality of included studies, the selected articles during the study were not evaluated for quality (15).

### Data extraction and Synthesis

Reviewers developed a primary data extraction template that included the following data: title, author(s), year, country, and identified indicators. For data analysis, Ritchie and Spencer framework analysis (17) was used, and the data was analyzed in five following steps:

1) Familiarization: Two authors reviewed the identified data several times to immerse in the information obtained in order to identify key concepts of the data and examine how they relate to the research objective.

2) Identifying a Framework: The IPO model was used

for organizing framework. As Malechwanzi pointed out this model is based on the systems theory of science and society which states that any group of objects that work together produce some result (18). The IPO model provides a coordinated set of performance indicators that describe the connection between each type of indicator (19). Accordingly, a framework with three categories of input, process and output indicators was developed.

3) Indexing: Two reviewers indexed the data into the relevant category of the IPO framework.

4) Charting: Two reviewers worked through each category of the IPO framework to thematically analyze the data that has been indexed to each category. Then they condensed and sorted the data according to key issues and themes to provide a more manageable framework. Microsoft Excel software was used for data charting and management. In this step, all three study questions were clearly answered.

5) Mapping and Interpretation: The authors summarized and outlined the findings based on the logical framework of IPO in three classifications and three dimensions.

All steps of screening for article titles, abstracts, and full text of identified articles, also data extraction were conducted by two reviewers independently. Discussion resolved the disagreement, and where no consensus was reached, a third party acted as an independent party and resolved discrepancies by discussion and adjudication.

## Results

### Characteristics of the included studies

A total of 1264 articles were identified, and 36 studies met the inclusion criteria of the study. Figure 1 shows a flowchart of study selection according to the PRISMA-

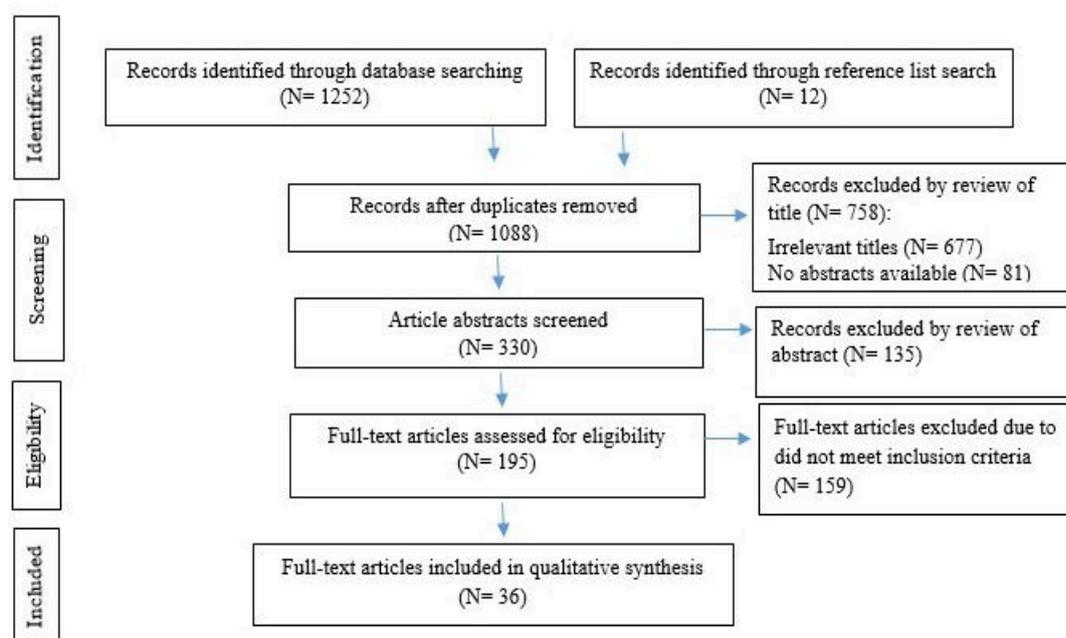


Fig. 1. Study screening and selection flowchart according to PRISMA-ScR checklist

ScR checklist. The included studies were composed of 10 original articles, 12 reviews and 14 theoretical or conceptual modeling studies. The studies were focused on different fields related to the research topic. Eighteen articles focused on identifying internationalization indicators and features, six articles described internationalization assessment, four articles examined indicators of leading universities, and eight articles analyzed indicators of international rankings. Most studies were conducted in 2018. The number of studies has increased since 2014. About 81 percent of the studies were conducted from 2014 to 2021. The included studies were conducted in 25 countries of the world and two numbers of the studies were joint research. Most studies were conducted in Russia (n=4) and the USA (n=3). After that, the most number of studies were conducted in Hungary (n=2), Spain (n=2), Taiwan (n=2), Turkey (n=2), Ukraine (n=2), and Uzbekistan (n=2). Subsequently, Australia, Canada, China, Croatia, England, Hong Kong, India, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, Northern Cyprus, Romania, and Serbia each had one study in this area. Also, there were two joint articles, one of which was co-authored by Greece, Spain, and the USA, and the other was co-authored by Bulgaria, and Spain (Table 1).

#### Indicators characteristics

Overall, we have identified 102 indicators in this study. The identified indicators were classified by the logical framework of IPO in three classifications of input, process, and output, and in three dimensions of management, education, and research (Table 2).

Most indicators have been classified in the "Education" category (n=40) consists of six inputs, 14 processes and 20 Outputs. Then the category of "Management" contained the next most identified indicators (n=38) consisting of 13 Input, 16 processes and 9 Output. After that, the category of "Research" contained the lowest identified indicators (n=24) consists of three Inputs, nine processes and 12 Outputs.

#### Education indicators

The input indicators of education that were mostly mentioned in the studies were related to technological facilities for education, such as new teaching technologies, virtual teaching, and distance education services. A few studies have reported "library collections in other languages", and "educational information availability for international students" as important facilitating indicators. According to de wit, integrating online education modes with onsite education by using new virtual technologies create the opportunity for universities to visit the world outside the classroom and connect them to international students and partners (24).

In the education Process and Output dimension, most of the studies have focused on indicators related to the recruitment or exchange of international students and faculties. In addition, many of the studies have considered indicators related to the promotion of English language use. But the indicators of intercultural education have been considered in a few studies. Based on the literature, stu-

dent exchange programs by increasing the international students on campus and international parties lead to the consolidation of cultural relations and the development of intercultural competencies of university students and staff (36). It has been considered a necessary action by universities of many European countries and also by many Asian countries such as China, Singapore, and Taiwan in recent years (48). Erasmus agreements have increased international mobility programs such as student exchange between developing countries and European Union (23, 39). Also, programs for enhancing English language skills are being implemented by many universities in non-Anglophone countries (8). But in many universities in these countries, faculties and students have problems for using English, which often separates international students' classes from local students (20).

#### Research indicators:

The research input category has included a small number of indicators and these indicators are often overlooked in internationalization studies. The indicator of "Modern and well-equipped laboratories" was considered in a number of studies. According to studies, innovative ideas and unique training opportunities are provided in well-equipped and modern laboratories of flagship universities (41). Also, global ranking systems take into account the quality of education and research. Thus the indicator of well-equipped laboratories is one of the primary indicators that universities consider for internationalization (12, 37).

In the research Process and Output dimension, the focus of the studies has been on indicators that promote networking such as joint international research, and few studies mentioned indicators that enhance the visibility of universities, such as the "Number of the international scientific meeting hosted by the university", "Number of papers presented in international conferences", "Number of articles published in international journals".

Literature shows that research collaboration between developing countries with top universities has led to many achievements in recent years. Expanding the geographical scope of research, attracting international financial support, and increasing the synergy of the world's universities are among the benefits of joint international research (9, 45). In addition, studies show the publication of articles in English, which leads to the global recognition of academics and universities, is increasing in universities of non-Anglophone countries (38)

#### Managerial indicators:

In the management dimension, the Input indicators that were considered more than the others in the studies were mainly related to the availability of sufficient resources including facilities, physical space, design, budget, staff, and information. A study that conducted in 2020 concluded the provision of standard facilities for foreign students, staff, and lecturers is important for university internationalization (34). The managerial Input indicators that have been less considered in the internationalization studies are related to marketing, visibility, promotion of democracy, as well as institutional and personal development.

Table 1. Studies included in the qualitative synthesis

Row	Author & Year	Country	Type of Study	Scope of Study	Aim
1	Aydinli and Mathews, 2020 (20)	Turkey	Original study	Identifying internationalization indicators and features	To investigate the ways of "internationalization" in Turkish universities and how a country's condition of status (in)consistency may be linked to its internationalization practices
2	Bengoetxea and Buela-Casal, 2013 (21)	Bulgaria & Spain	Conceptual modelling	Identifying internationalization indicators and features	To provide a new user-driven tool for higher education institutions ranking
3	Chin and Ching, 2009 (22)	Taiwan	Original study	Identifying internationalization indicators and features	To develop a set of performance indicators for internationalization
4	Dabija, Postelnicu et al., 2014 (23)	Romania	Conceptual modelling	Identifying internationalization indicators and features	To develop a methodology for assessing the degree of internationalization of academic study programs
5	De Wit, 2020 (24)	England	Conceptual modeling	Identifying internationalization indicators and features	To analyze the future of university internationalization in the changing global economic, ecological, and political context
6	Erden, 2018 (25)	Northern Cyprus	Original study	Identifying internationalization indicators and features	To identify students' intercultural perceptions in African universities
7	Gao, 2018 (7)	Australia	Conceptual modeling	Identifying internationalization indicators and features	To develop an indicator framework for measuring university internationalization
8	Ishikawa, 2012 (26)	Japan	Review	Identifying internationalization indicators and features	To analyzes the emergence of dominant models in higher education in non-Western and non-English language universities
9	Ivančević and Luković, 2018 (27)	Serbia	Conceptual modeling	Identifying internationalization indicators and features	To provide a set of indicators for university ranking
10	Kireççi, Bacanlı et al., 2016 (9)	Turkey	Original study	Identifying internationalization indicators and features	To test the validity and reliability of the Internationalization Index of Higher Education in Turkey
11	Knight, 2015 (28)	Canada	Conceptual modeling	Identifying internationalization indicators and features	To examine key characteristics of three generic models of international universities
12	Lakshmi and Ramachandran, 2018 (29)	India	Original study	Identifying internationalization indicators and features	To examine the learning and social difficulty issues of the international students
13	Lee and Kuzhabekova, 2018 (30)	Kazakhstan	Original study	Identifying internationalization indicators and features	To examine faculty mobility in a reverse direction: from the core to Kazakhstan
14	Marjanovic and Pavlovic, 2018 (31)	Croatia	Conceptual modeling	Identifying internationalization indicators and features	To provide student's decision-making process model on a globalized higher education market
15	Mizintseva, Komarova et al., 2016 (32)	Russia	Review	Identifying internationalization indicators and features	To assess the major aspects of improvement of the student's satisfaction with the educational process in the higher education institutions
16	Nicholls, 2018 (33)	USA	original study	Identifying internationalization indicators and features	To explore what factors influence international students' choices of where to study
17	Rosyidah, 2020 (34)	Indonesia	Conceptual modeling	Identifying internationalization indicators and features	To elaborate on the university's promotion strategies to building international trust
18	Sharipov, 2020 (35)	Uzbekistan	Conceptual modeling	Identifying internationalization indicators and features	To investigates the concept of higher education internationalization
19	Chang and Lin, 2018 (8)	Taiwan	Original study	Internationalization assessment	To examine the perceptions of students and faculty regarding implementing internationalization in universities

## Indicators for Internationalization of Medical Universities

Tabel 1. Continued

Row	Author & Year	Country	Type of Study	Scope of Study	Aim
20	Horn, Hendel et al, 2007 (36)	USA	Conceptual modeling	Internationalization assessment	To develop an empirical approach to evaluating the international dimension of research universities in the United States
21	Krechetnikov and Pestereva, 2017 (37)	Russia	Review	Internationalization assessment	To examine international aspects of the development of the present-day national education systems in two countries of the Asia-Pacific region: Japan and the Republic of Korea
22	Tan and Goh, 2014 (38)	Malaysia	Original study	Internationalization assessment	To examine the responses of a Malaysian public university to the impact of globalization
23	Uralov, 2020 (39)	Uzbekistan	Review	Internationalization assessment	To study the peculiarities of internationalization of higher education in the Republic of Uzbekistan
24	Vyas, 2018 (40)	Hong Kong	Review	Internationalization assessment	To investigate the development of higher education internationalization in Hong Kong in the recent two decades
25	Douglass , 2014 (41)	USA	Conceptual modeling	Examining indicators of leading universities	To provide a model for flagship universities
26	Liu, Moshi et al., 2019 (42)	China	Conceptual modeling	Examining indicators of leading universities	To analyze the sustainability indicators of universities included as newly formed world-class universities (NFWCUs) in the top 100 from 2010 and 2018
27	Shehatta and Mahmood, 2016 (43)	Hungary	Conceptual modeling	Examining indicators of leading universities	To identify the key features of world-class universities
28	Sitnicki, 2018 (44)	Ukraine	Review	Examining indicators of leading universities	To identify the main characteristics of 25 world-class research universities and propose strategic directions for the development of research universities in the European Union
29	Avrlev and Efimova, 2014 (45)	Russia	Review	Analyzing indicators of international ranking	To improve the competitiveness of universities
30	Buela-Casal, Gutiérrez-Martínez et al., 2007 (46)	Spain	Review	Analyzing indicators of international ranking	To compare different international rankings of universities in order to explore academic indicators to be reliably used in cross-national university comparisons
31	De Filippo, Casani et al., 2012 (47)	Spain	Review	Analyzing indicators of international ranking	To examine universities' position in international ranking and strategies to gain greater international visibility
32	Dembereldorj , 2018 (48)	Mongolia	Review	Analyzing indicators of international ranking	To examine the impact of higher education rankings on the institutions' competencies
33	Safon, 2013 (12)	Hungary	Conceptual modeling	Analyzing indicators of international ranking	To investigate the existence of hidden education and research factors or profiles in the two most influential global university rankings (ARWU and THE)
34	Shakirova and Smolnikova, 2017 (49)	Russia	Original study	Analyzing indicators of international ranking	To study the relationship between the level of internationalization of universities and their position in authoritative world rankings
35	Shyulina, Gryshchenko et al., 2016 (50)	Ukraine	Review	Analyzing indicators of international ranking	To explore the importance of universities' participation in international ranking
36	Taylor, Perakakis et al., 2014 (13)	Greece & Spain & USA	Review	Analyzing indicators of international ranking	To perform a critical and comparative analysis of 6 of the most popular global university ranking systems

Table 2. IPO indicators for internationalization of medical universities

Category	Theme	Input	Process	Output
Education		<ul style="list-style-type: none"> <li>▪ Investing in new educational technologies for teaching (31, 41, 44, 46, 47, 50)</li> <li>▪ Setting up distance learning facilities (8, 23, 45)</li> <li>▪ Percentage of library collection in other languages (7, 36, 42)</li> <li>▪ Providing the required information regarding educational processes (by study guides), professors' work calendar (13, 25, 31)</li> <li>▪ Number of student admissions per year (27, 31)</li> <li>▪ Availability of college graduation documentation without leaving one's home (37)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Performing student exchange programs (7, 12, 20, 22, 33, 37, 39, 40)</li> <li>▪ Using English as a teaching language (22, 23, 26, 25, 33, 38, 48, 50)</li> <li>▪ Offering scholarship programs (7, 12, 22, 33, 34, 37)</li> <li>▪ Holding international workshops/ Joint international training (with leading world universities) (33, 39)</li> <li>▪ Recruiting overseas students from different countries of the world (41)</li> <li>▪ Performing faculty exchange program with overseas universities (37, 41)</li> <li>▪ Offering summer study abroad programs (9, 23)</li> <li>▪ Planning study tours for students to offshore during the semester or the summer vacation (40)</li> <li>▪ Integrating online education modes with onsite education (24, 44, 50)</li> <li>▪ Number of courses teaching in English or other foreign languages (7, 8, 21, 22, 37)</li> <li>▪ Setting up English language center in the university (12, 43)</li> <li>▪ Assessing English language fluency of domestic and international students/ faculty members/ administrative staff (25)</li> <li>▪ Involving highly qualified teachers and scientists from foreign institutions into pedagogical activities (39)</li> <li>▪ Transferring skills and knowledge to foreign students that are relevant to the issues of their own localities (35)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ratio of international students (7, 8, 20-23, 27, 28, 31-33, 37-39, 41, 43, 44, 46, 48-50)</li> <li>▪ Ratio of international faculty members/ international visiting faculty (by nationality) (7, 9, 21-23, 26, 28, 36, 37, 41-43, 46, 49, 50)</li> <li>▪ Number of international joint degree programs (7, 21, 23, 26, 28, 40, 41, 48)</li> <li>▪ Number of lessons taught by virtual methods (7, 27, 28, 37)</li> <li>▪ Number of students sent abroad through various education programs (20, 22, 36)</li> <li>▪ Ratio of outbound students to inbound students (7, 21, 27)</li> <li>▪ Ratio of international curricula and courses (9, 22, 37)</li> <li>▪ Number of registrants in international workshops/ joint international degree programs (7, 36)</li> <li>▪ Percentage of university graduates working overseas (7, 21)</li> <li>▪ Number of international workshops (41)</li> <li>▪ Number of intercultural educational activities performed at the university (9)</li> <li>▪ Percentage of students who take courses offered in a foreign language (7)</li> <li>▪ Number of studies with a mandatory course abroad (7)</li> <li>▪ Number of faculties sent abroad for academic purposes (20)</li> <li>▪ Percentage of faculties with at least one month of overseas academic experience (27)</li> <li>▪ Percentage of international students by region (Europe, Africa, Asia, North America, South America and Pacific) (7)</li> <li>▪ Number of student internships in regional enterprises (21)</li> <li>▪ Percentage of faculty members who are fluent in English (25)</li> <li>▪ Percentage of faculty members with at least one degree awarded by an institution abroad (7)</li> <li>▪ Percentage of faculty members who awarded their highest academic qualification by an institution abroad (7)</li> </ul>

Table 2. Continued

Category	Theme	Input	Process	Output
Research		<ul style="list-style-type: none"> <li>▪ Modern and well-equipped laboratories (12, 21, 37, 41, 44)</li> <li>▪ Funding for international research projects (7, 48)</li> <li>▪ Funding for international visiting scholars (7)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Promoting international joint research/ R&amp;D programs (7-9, 20, 40, 41, 46, 50)</li> <li>▪ Employing international researchers in team projects (37, 48)</li> <li>▪ Increasing research centers focused on international studies (7, 36)</li> <li>▪ Promoting studies to provide solutions for global or regional issues (9, 24)</li> <li>▪ Encouraging students and faculties to give a lecture at international conferences (38, 43)</li> <li>▪ Using English as the language of research (24)</li> <li>▪ Involving foreign professors in Ph.D. and postdoc research programs (23)</li> <li>▪ Inviting prominent foreign professors to give lectures at the university (41)</li> <li>▪ Exchanging education and research materials and technologies (9)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Percentage of international joint research publications (23, 24, 27, 28, 31, 32, 40, 45-47, 49)</li> <li>▪ Percentage of international researchers (and postdocs) (7, 22, 26, 36)</li> <li>▪ Number of visiting scholars for academic purposes (7, 8, 36, 41)</li> <li>▪ Number of international scientific conference/ consortia / symposia / seminar / meeting hosted by the university (7, 30, 40, 41)</li> <li>▪ Number of papers presented (lectures) in international conferences (7, 8, 46)</li> <li>▪ Number of articles published in international journals (8, 12, 26)</li> <li>▪ Number of researchers sent abroad for research (22, 36)</li> <li>▪ Ratio of research projects funded by overseas institutions, governments, international agencies, professional associations and international NGOs (7, 9)</li> <li>▪ Number of scholarships for international postdoctoral researchers (7)</li> <li>▪ Number of co-editorships in international journals (7)</li> <li>▪ Percentage of faculty members who hold a visiting lectureship abroad (7)</li> <li>▪ Number of lectures by foreign professors at the university (32)</li> </ul>

Table 2. Continued

Category	Theme	Input	Process	Output
Management		<ul style="list-style-type: none"> <li>▪ Availability of student facilities including dormitory, health care &amp; insurance, counseling, sport (9, 13, 25, 37, 40)</li> <li>▪ Size of institution/ campus/ class (13, 31, 42, 46)</li> <li>▪ Appearance/ design of the campus (31, 33, 44)</li> <li>▪ Setting up an international affairs office (31, 33, 44)</li> <li>▪ Investing in required staff at the international affairs offices (8, 9, 22)</li> <li>▪ Proportion of total budget available for internationalization activities (7, 8, 22)</li> <li>▪ Provide information regarding campus facilities and support services to international students by leaflets, brochures and other printed materials and also on the university website (31, 32, 13)</li> <li>▪ Strategic plan for internationalization and periodic self-performance evaluation (8, 22)</li> <li>▪ Active presence on social media platforms like Facebook and Twitter (31, 33)</li> <li>▪ Clear process in application, admission, and enrollment for international students and respectful and prompt response from staff (31, 13)</li> <li>▪ Information accessibility (English version of university website) (22)</li> <li>▪ National, gender and racial justice in the university environment (32)</li> <li>▪ Culture of personal development in the university (41)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Establishing branch campus, research centers and administrative office abroad for monitoring of international joint projects/ alumni relations/ student recruitment/ consultancy purposes (8, 28, 36, 37, 40, 42)</li> <li>▪ Memberships in the international associations and consortia (7, 12, 23, 40)</li> <li>▪ Creating a multicultural environment on campus (22, 32, 41, 42)</li> <li>▪ Implementing programs that show respect for the culture of other countries (28, 29, 31, 33)</li> <li>▪ Financial support for full-time international students (25, 29, 38)</li> <li>▪ Creating competitive tuition fees for international students (33, 34, 37)</li> <li>▪ Publishing the university's annual reports on the university website and social media (20)</li> <li>▪ Increasing the number and distribution of overseas partners for academic activities (mobility program, research, education) (7, 40)</li> <li>▪ Recruiting staff from an international market (41, 43)</li> <li>▪ Visiting universities with a high degree of internationalization (23, 45)</li> <li>▪ Creating various competitions for student teams from different international universities (40)</li> <li>▪ Implementing programs to reduce stress and create a sense of social belonging in international students (29)</li> <li>▪ Assisting international students in transactions such as renting or buying a home or car (25)</li> <li>▪ Include international students' favorite foods in the university menu (25)</li> <li>▪ Training personnel in cooperation with international organizations (39)</li> <li>▪ Hosting international specialized exhibitions at the university (30)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Number of educational and research cooperation agreements with universities abroad (8, 9, 23, 28, 31, 36, 43, 45)</li> <li>▪ Percentage of international staff (8, 23, 28, 31, 46)</li> <li>▪ Percentage of staff who have international experience (minimum 3 months) (7)</li> <li>▪ Percentage of international staff (by nationality) in institutional senior management team (7)</li> <li>▪ Number of international awards (per faculty members) (9, 23, 26, 27, 47)</li> <li>▪ Number of overseas branch campuses and research centers (8, 28, 37, 40)</li> <li>▪ Number of intercultural extracurricular activities (23, 30)</li> <li>▪ Percentage of partnerships by region (Europe, Africa, Asia, North America, South America, Pacific) (7)</li> <li>▪ Proportion of total research income generated by international collaborations (7)</li> </ul>

Process indicators in the management dimension that were widely considered in the studies are related to initiatives that expand visibility and international networks, such as setting up overseas campuses, membership in international associations, developing overseas partners in academic activities, and respect for the culture of other countries. According to the studies, networking increases the credibility of universities around the world and leads to attracting qualified students, faculties, and staff (12). Also, in a number of studies, indicators of financial support and competitive tuition have been mentioned, which have been considered as marketing indicators in this study. China's fiscal and marketing policies over the past three decades have attracted large numbers of students from developed countries such as the United States, the United Kingdom, Canada, and Australia (42). The managerial process indicators that were less pointed out in the studies were relevant to social support and extracurricular activities.

The indicators of managerial Output mentioned in most of the studies were the number of international cooperation agreements, international staff, and awards. Literature shows the signing of cooperation agreements with foreign universities and international organizations is increasing. For more than three decades, European universities have implemented joint degree programs with foreign universities and in recent years with Russia, Singapore, and Arab countries (1, 4, 48). The universities of Uzbekistan have developed international cooperation with many international partners. They included double degree programs with universities of Asian and European countries, personnel training programs in cooperation with the European Union, UNESCO, and the World Bank, mobility programs with the corporation Erasmus, and also exchange and scholarship programs with developed countries (39).

### Discussion

This study aimed to identify internationalization indicators for the assessment of medical universities. All of the 102 indicators were identified with a qualitative approach and analyzed using the Ritchie and Spencer five-step framework method. The indicators were classified within the IPO logical framework comprising three categories (Input, Process, and Output) and sorted into three dimensions according to key issues (Education, Research, Management). This set of indicators can be applied by medical universities to implement and monitor internationalization policies and practices. The input indicators identified during this study are the requirements of internationalization that need to be monitored permanently. The process indicators indicate the internationalization activities that should be undertaken by universities. Finally, the output indicators are used to measure the achievements of the activities performed. The results of the study show the identified indicators are mainly in the four areas of facilities management, visibility, marketing, and networking.

The present review of the literature shows that universities are proceeding towards internationalization step by step and some indicators are more appropriate than others according to how mature the university is in each dimen-

sion as well as how feasible further ambition is possible according to national frameworks. Furthermore, the literature shows that universities cannot pretend to be the best in all aspects of internationalization and that they need to make strategic choices on priorities. In this regard, the review of the activities carried out by universities for internationalization shows some differences in various geographical locations, which seems to be rooted in the goals and priorities of internationalization in different regions. Studies show universities in North America, Western Europe, Australia, and New Zealand focus primarily on the economic and organizational goals of higher education internationalization (3, 51, 52), which seems to be able to justify the high number of international students and staff in these universities. In contrast, universities in South Korea and Japan prioritize educational, social and cultural goals over economic ones. Perhaps that is why these universities are more successful in some international activities such as "using English as the medium of instruction" and "outbound mobility" compared to "attracting foreign students and staff" (53, 54). Also, universities in the Arab countries of the Middle East, including Saudi Arabia, Qatar and the United Arab Emirates, are mainly pursuing the political, educational and socio-cultural goals of internationalization (55), which has recently led to the recruitment of international students and joint ventures with foreign partners in these countries (1).

Therefore, it is concluded that medical universities should make an assessment of their internal and external environment to prioritize their international indicators. In this regard, establishing international branch campuses would be a logical activity for universities with sustainable financial resources. The "increasing the percentage of international staff" must be considered as a crucial indicator by universities with the complex hierarchical recruitment process and the lack of administrative positions for foreign employees. Also, the universities of developing countries should notice the indicators that result in international visibility and connection such as holding and attending international scientific forums and international visiting programs. According to studies, the poor quality of education and welfare services are the main factors that lead to negative flows of students in some Asian countries (29, 54, 56). Thus, the indicators of facilities management should be more addressed by universities that need to reverse student mobility and enhance the inflow of foreign students. This is the case in countries with declining domestic student populations that are a source of remittances for students and money to high-income countries.

### Limitation

This scoping review study included articles published in English. Also, we did not contact any researchers or experts for additional studies we may have missed.

### Conclusion

This study's results help to understand how medical universities are involved in internationalization and what dimensions and indicators they consider in this process. In

this scoping review, we systematically identified and analyzed relevant studies to identify institutional indicators that are considered in higher education internationalization across the globe. This study provides a collated and summarized set of institutional indicators for the internationalization of medical universities with the IPO framework. This set of 102 indicators can be used by higher education institutions to implement and monitor internationalization. In order to implement internationalization, managers should select their priority aspect(s) and indicators according to their international position, weaknesses, capacities and resources, as well as the national context and various external influencing factors.

In order to implement the indicators, it's suggested that universities prepare indicator identification for their desired indicators and monitor their performance based on them. Indicator identification can be included monitoring method, calculation method and formula, unit of measurement, the direction of indicator, source of data collection, time of measurement and data collection, reporting period and preferred rate of the indicator.

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### Ethical approval

This study was part of a health policy Ph.D. dissertation that was registered with code "IR.TUMS.SPH.REC.1401.075" in Tehran University of Medical Sciences.

### Abbreviation

PRISMA-ScR: Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for scoping review checklist, IPO: Input, Process and Output, THE: Times Higher Education.

### Conflict of Interests

The authors declare that they have no competing interests.

### References

1. Altbach PG, Knight J. The internationalization of higher education: Motivations and realities. *J Stud Int Educ*. 2007;11(3-4):290-305.
2. Giorgio M, Eva EP, Madeleine G. A changing view of the benefits of HE internationalization [Internet]. United Arab Emirates University; 2019 Feb 1. Available from: <https://www.universityworldnews.com/post.php?story=20190128144240325>.
3. De Wit H. Globalisation and internationalization of higher education. *RUSC*. 2011;8(2):241-7.
4. Kompanets V, Väättänen J. Different, yet similar: Factors motivating international degree collaboration in higher education. The case of Finnish-Russian double degree programmes. *Eur J Eng Educ*. 2019;44(3):379-97.
5. Tayeb O, Zahed A, Ritzen J. *Becoming a world-class university: The case of King Abdulaziz University*: Springer Nature; 2016.
6. John K, Hudzik JK, Stohl M. Modelling assessment of the outcomes and impacts of internationalization. *EAIE Occasional Paper* 22.

- 2009;22:9-21.
7. Gao Y. A set of indicators for measuring and comparing university internationalization performance across national boundaries. *J Higher Educ*. 2018;76(2):317-36.
8. Chang D-F, Lin N-J. Applying CIPO indicators to examine internationalization in higher education institutions in Taiwan. *Int J Educ Dev*. 2018;63:20-8.
9. Kirecci MA, Bacanlı H, Erisen Y, Karadag E, Celikoz N, Dombayci MA, et al. The Internationalization of Higher Education in Turkey: Creating an Index. *Egitim ve Bilim*. 2016;41(187):1-28.
10. Mussard M, James AP. Engineering the global university rankings: gold standards, limitations and implications. *IEEE Access*. 2018;6:6765-76.
11. Cazzolle M, Perchinunno P, Ricci V, editors. *The Positioning of Italian Universities in the International Rankings*. International Conference on Computational Science and Its Applications; 2018: Springer.
12. Safon V. What do global university rankings really measure? The search for the X factor and the X entity. *Scientometrics*. 2013;97(2):223-44.
13. Taylor M, Perakakis P, Trachana V, Gialis S. Rankings are the sorcerer's new apprentice. *Ethics Sci Environ Polit*. 2014;13(2):73-99.
14. Taylor BE, Meyerson JW, Massy WF. *Strategic indicators for higher education: Improving performance*: Petersons; 1993.
15. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Meth*. 2005;8(1):19-32.
16. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med*. 2018;169:467-473.
17. Ritchie J, Spencer L. Qualitative data analysis for applied policy research. *Analyzing qualitative data*: Routledge; 2002. p. 187-208.
18. Malechwanz JM. *Effects of Engagement and Resources on Learning Outcomes in Vocational Colleges: Emerging Research and Opportunities*: IGI Global; 2019.
19. Child health and development: Types of indicators [Internet]. WHO:EMRO; 2014 .Available from: <http://www.emro.who.int/child-health/research-and-evaluation/indicators/Type-of-indicators.html>.
20. Aydinli E, Mathews J. Searching for Larger Status in Global Politics: Internationalization of Higher Education in Turkey. *J Stud Int Educ*. 2020;1028315320932325.
21. Bengoetxea E, Buela-Casal G. The new multidimensional and user-driven higher education ranking concept of the European Union. *Int J Clin Health Psychol*. 2013;13(1):67-73.
22. Chin JM-C, Ching GS. Trends and indicators of Taiwan's higher education internationalization. *Asia-Pac Educ Res*. 2009;18(2):185-203.
23. Dabija DC, Postelnicu C, Pop NA. Methodology for Assessing the Degree of Internationalization of Business Academic Study Programmes. *Amfiteatru Econ*. 2014;16(37).
24. De Wit H. The future of internationalization of higher education in challenging global contexts. *ETD – Educ Temat Digit*. 2020;22(3):538-45.
25. Erden H. African University Students' Intercultural Experiences with Impeding Factors: Case from Northern Cyprus. *Eurasian J Educ Res*. 2018;18(77):81-104.
26. Ishikawa M. University rankings, global models, and emerging hegemony: Critical analysis from Japan. *Universities and the public sphere*: Routledge; 2012. p. 95-114.
27. Ivančević V, Luković I. National university rankings based on open data: a case study from Serbia. *Procedia Comput Sci*. 2018;126:1516-25.
28. Knight J. International universities: Misunderstandings and emerging models? *J Stud Int Educ*. 2015;19(2):107-21.
29. Lakshmi VS, Ramachandran S. Examining and demystifying the social and learning issues of international students at Indian educational institutions. *J Soc Sci Res*. 2018 Dec; Special Issue 5:501-9.
30. Lee JT, Kuzhabekova A. Reverse flow in academic mobility from core to periphery: motivations of international faculty working in Kazakhstan. *J Higher Educ*. 2018;76(2):369-86.
31. Marjanovic B, Pavlovic DK. Factors influencing the high school graduates' decision to study abroad: toward a theoretical model. *Int J Contemp Manag*. 2018;23(1):221-41.
32. Mizintseva MF, Komarova TV, Sardarian AR, Yakubova TN. Key aspects of managing the students' satisfaction with the learning

- environment at the international university. *Indian J Sci Technol.* 2016;9(36):1-14.
33. Nicholls S. Influences on international student choice of study destination: Evidence from the United States. *J Int Stud.* 2018;8(2):597-622.
  34. Rosyidah N. Internationalization in Higher Education: University's Effective Promotion Strategies in Building International Trust. *Eur J Educ Res.* 2020;9(1):351-61.
  35. Sharipov F. Internationalization of higher education: definition and description. *Tziuj (Online).* 2020;2020(1):127-38.
  36. Horn AS, Hendel DD, Fry GW. Ranking the international dimension of top research universities in the United States. *J Stud Int Educ.* 2007;11(3-4):330-58.
  37. Krechetnikov K, Pestereva N. A Comparative Analysis of the Education Systems in Korea and Japan from the Perspective of Internationalization. *Eur J Contemp Educ.* 2017;6(1):77-88.
  38. Tan YS, Goh SK. International students, academic publications and world university rankings: the impact of globalisation and responses of a Malaysian public university. *High Educ.* 2014;68(4):489-502.
  39. Uralov OS. Internationalization of higher education in Uzbekistan. *Int j soc sci humanit.* 2020;2(1):100015.
  40. Vyas A. A policy review of internationalization of higher education in Hong Kong: motivation, advancement and development. *J Asian Public Policy.* 2018;11(1):46-66.
  41. Douglass JA. Profiling the flagship university model: An exploratory proposal for changing the paradigm from ranking to relevancy. University of California Research and Occasional Paper Series, CSHE.5.13. 2014 Apr 1.
  42. Liu Z, Moshi GJ, Awuor CM. Sustainability and Indicators of Newly Formed World-Class Universities (NFWCUs) between 2010 and 2018: Empirical analysis from the rankings of ARWU, QSWUR and THEWUR. *Sustainability.* 2019;11(10):2745.
  43. Shehatta I, Mahmood K. Correlation among top 100 universities in the major six global rankings: policy implications. *Scientometrics.* 2016;109(2):1231-54.
  44. Sitnicki MW. determining the priorities of the development of Eu research universities Based on the analysis of rating indicators of World-class universities. *Balt J Eur Stud.* 2018;8(1):76-100.
  45. Avralev N, Efimova I. Global university rankings as indicators of the implementation of the integration process and competitive tool in the context of globalization of higher education. *Life Sci.* 2014;11(10):648-52.
  46. Buela-Casal G, Gutiérrez-Martínez O, Bermúdez-Sánchez MP, Vadillo-Muñoz O. Comparative study of international academic rankings of universities. *Scientometrics.* 2007;71(3):349-65.
  47. De Filippo D, Casani F, García-Zorita C, Efraín-García P, Sanz-Casado E. Visibility in international rankings. Strategies for enhancing the competitiveness of Spanish universities. *Scientometrics.* 2012;93(3):949-66.
  48. Dembereldorj Z. Review on the Impact of World Higher Education Rankings: Institutional Competitive Competence and Institutional Competence. *Int J High Educ.* 2018;7(3):25-35.
  49. Shakirova JA, Smolnikova EV. Influence of university internationalization on their positions in world rankings. *Revista QUID.* 2017(1):859-64.
  50. Shypulina YS, Gryshchenko OF, Bilenko VO. The international and national university rankings as a constituent of university's competitiveness. *Int Mark Manag Innov.* 2016(1):183-195.
  51. Knight J. Internationalization remodeled: Definition, approaches, and rationales. *J Stud Int Educ.* 2004;8(1):5-31.
  52. Knight J. Higher education crossing borders: A guide to the implications of the general agreement on trade in services (GATS) for cross-border education. Commonwealth of Learning, Vancouver and UNESCO; 2006.
  53. Jon JE. 'Interculturality' in higher education as student intercultural learning and development: a case study in South Korea. *Intercult Educ.* 2009;20(5):439-49.
  54. de Wit H, Hunter F, Howard L, Egron-Polak E. Directorate-General for Internal Policies, Policy Department B: Structural and Cohesion Policies: Culture and Education. *Int J High Educ.* 2015.
  55. Romani V. The politics of higher education in the Middle East: Problems and prospects. Middle East Brief, Brandeis University Crown Center for Middle East studies. 2009.
  56. Kim SK. Redefining internationalization: Reverse student mobility in South Korea. *Redefining Asia Pacific higher education in contexts of globalization: Private markets and the public good.* New York: Palgrave Macmillan; 2015. p. 41-56.