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Governance of academic medical centres in changing healthcare systems: An international comparison

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ABSTRACT

We provide an explorative and international comparison of the governance models of academic medical centres (AMCs). These centres face significant challenges, including disruptive external pressures and enduring financial conflicts pertaining to patient treatment, research and education. Therefore, we covered 10 European countries (Cyprus, Czechia, Denmark, Germany, Italy, Latvia, the Netherlands, Norway, Poland and Spain) and one associated state (Israel) in our analysis. In addition, we developed an expert questionnaire to collect data on the governance of AMCs in these 11 countries. Our results revealed no standardised definition of AMCs, with countries combining patient care, education/teaching and research differently. However, the ownership of such institutions is significantly homogeneous and is limited to public or private, nonprofit ownership. Furthermore, significant differences are associated with the (functional) integration level between the hospital and medical school. Therefore, most experts believe that the governance of AMCs will evolve into a more functionally integrated model of patient care, research and education.

1. Introduction

Hospitals are increasingly struggling with the consequences of ageing populations, advances in medical technology, increasing healthcare costs, increased need for chronic illness prevention and increased demand for personalised and person centred care [1]. Additionally, hospitals are important factors in the responses to health shocks owing to major events such as epi- or pandemics, wars and other disasters. Moreover, they are an essential setting for training future cadres of health workers. Academic medical centres (AMCs) continuously shift the frontiers of the health systems toward better healthcare. They gather a relatively large number of patients, including a more extensive stock of complex care, biomedical research, education and training of professionals and knowledge dissemination to other parts of the healthcare system. However, we know little about the organisation of their operations, considering their crucial role and multiple tasks. In Europe, numerous different models of governance of AMCs coexist. These numerous different and complex tasks contribute to the governance and organisational structure of AMCs. However, Davies et al. resolved that the challenges associated with governance and management of AMCs are similar worldwide [2] and that most literature (94.4%) deals with the governance of AMCs in the North American situation [3].

The first conceptual frameworks of AMCs were published in the Flexner Report (1910), based on the connection of three core tasks

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(patient care, education and research) [4]. However, internal and external developments have forced healthcare organisations to review their governance and organisational structure [5–7].

Furthermore, internal and external factors regarding strategic organisational changes challenge the boards of AMCs. Although, not much research has been conducted on the governance of European AMCs. Governance stems from the Latin verb 'gubernare', literally meaning steering (e.g., a vehicle). Governance as a concept has opened to various interpretations in literature over the years [5, 6, 8-12]. In this study, governance refers to leading an organisation from an embedded and underlying vision to organising strategic steering.

Our **aim** is to increase knowledge about the governance models of European AMCs. The **specific objectives** provide (1) an overview of how countries specifically define an AMC; (2) an inventory of their characteristics; (3) a comparison and analysis of their governance; and (4) an exploration by country experts of relevant trends and challenges.

2. Methods

2.1. Study design

This research aims to increase the current knowledge about the governance of European AMCs. We studied available literature and developed a questionnaire to gather expert information on governance models of AMCs to explore the similarities and differences. The governance models used in this study to assess the organisational form and relationship between an AMC and a medical school were based on the classification developed by Weiner et al. [13]. Weiner et al. introduced eight governance models based on a three-pillar framework characterising the relationship between a medical school and an AMC. The three pillars indicate the extent to which 1) the clinical enterprise is similar to an 'organised delivery system', 2) the medical school organises and integrates clinical practice activities of its faculty with other parts of the clinical enterprise and 3) the authority of the chief academic officer/dean over the clinical enterprise. Supplementary File 2 summarizes Weiner's eight different models.

Furthermore, 10 European countries (Cyprus, Czechia, Denmark, Germany, Italy, Latvia, the Netherlands, Norway, Poland and Spain) and Israel were included.

We structured the questionnaire as follows. First, we took stock of the current management and organisational structure. Next, we indicated internal and external factors that might challenge the current governance and organisational structures. Finally, we inquired about the expected trends regarding governance and organisational structures. Two authors (EC and HD) developed the initial questionnaire whereas the others (DB and PJ) verified it. The questionnaire was then shared with the remaining authors and modified according to their feedback. The final questionnaire covered four parts: 1) AMC definitions, 2) general characteristics, 3) the governance and organisational structure (including ownership, governing relationships, the role of the dean, internal and external challenges) and 4) future trends in organisational models. There were both open and close-ended questions. For the latter, a 5-point Likert scale was applied. Supplementary File 1 presents the questionnaire overview.

2.2. Sample

The respondents of our questionnaire were purposively selected to provide a diverse and rich source of information and perspectives [14]. Respondents were chosen based on their expertise in the topic (e.g., researchers who study health systems), their positions relevant to understanding AMCs (e.g., hospital managers, medicine professors) and their willingness to participate. Leading experts were also identified from the European Observatory on Health Systems and Policies' Health Systems and Policy Monitor network. This network comprises experts with in-depth knowledge and insight on their national health system's organisation and policy processes [15]. A leading expert from each country was responsible for completing the questionnaire, inviting other experts to participate or interview them; therefore, the number of participating experts varied per country. Questionnaires were taken either online or in an editable MS Word file.

2.3. Data collection and analysis

Data were collected between July and December 2020. The data from the questionnaires were uploaded into MS Excel file. Quantitative data are summarised in tables and qualitative data were analysed thematically using a deductive approach. The first author sent the analysed data by country to the leading experts, who examined them and provided their feedback. This process was repeated until the leading experts fully approved the analysis; this was done through bilateral video calls and emails. Several digital plenary sessions were used to verify the overall consistency of the answers to the questions.

3. Results

Twenty-six experts from 11 countries participated in the survey. The total number of respondents varied from one in Cyprus, Czechia, Denmark, Italy, Latvia and Norway; two in Germany, Poland and Israel; six in Spain; and eight in the Netherlands.

3.1. Definition of an AMC

No standardised definition for an AMC exists in all countries studied. Different types of organisations link the three core functions of (1) patient care, (2) education/teaching activities and (3) research (Table 1). Most countries use the term 'university hospital' to describe these institutions. However, numerous other hospitals fulfil these three functions: major regional hospitals in Denmark, several Polish research institutes, major (more than 500 beds) public and non-profit hospitals in Israel and so-called top clinical teaching hospitals in the Netherlands. All hospitals must fulfil these three functions in Norway and Spain, but specific university hospitals cooperate with the university.

We illustrated the diversity between different countries with some examples regarding the balance between core tasks (patient care, research and education), the relationship between university/medical school and AMC and the embedding of research activities:

- For AMCs, the balance amongst patient care, research and education differs. Although patient care is mainly focused on specialised and tertiary care, it also includes primary and preventive care activities. Seven countries (Cyprus, Denmark, Germany, Latvia, the Netherlands, Poland and Spain) indicated the involvement of AMCs in 'primary care and prevention'. For example, in the Netherlands, Germany and Poland, AMCs can be involved in and/or coordinate various health promotion/public health programs. In Spain, primary healthcare centres are formally considered AMCs.
- Various forms of cooperation exist between the AMC and university/medical school. Teaching mainly covers medical professionals or includes other professionals (e.g., in biomedical and health sciences—in the Netherlands and Spain). Teaching hospitals are used for AMCs to educate undergraduate medical students and those with solely postgraduate speciality training (e.g., in Poland, Denmark and Spain). Germany also has smaller hospitals, 'Akademische Lehrkrankenhäuser' (e.g., secondary/tertiary care), collaborating with medical schools to provide internship placements.
- Research activities, including translational and clinical studies, are usually conducted in collaboration with a university. Some AMCs have substantial obligations to develop their research function; for example, research institutes in Poland and the Netherlands. In Italy, some AMCs perform research activities to maintain their recognition

Table 1
Definition of AMCs or institutions with tripartite missions.

Country	Definition
Cyprus	No academic medical centres (AMCs) as such; larger hospitals can perform the three functions in collaboration with medical schools; private and public hospitals can train medical students.
Czechia	**Teaching hospitals** are owned by the state and subordinated to the Ministry of Health (and the Ministry of Defence—one hospital); such a hospital must be affiliated with a medical school to fulfil the teaching function.
Denmark	**AMCs** provide tertiary care services. Specialised and highly specialised services must integrate research and training, including university and major regional hospitals.
Germany	Hospitals considered **AMCs** are mostly large tertiary hospitals, which are part of a university's medical school or closely affiliated; publicly run by the corresponding university or state ('Bundesland'), with a minority publicly run by another party (e.g., the corresponding city) or a private entity.
Israel	Half (6 out of 13) of general, public and, nonprofit hospitals with more than 500 beds are considered **AMCs**. However, the balance amongst the functions differs in specific units and based on their university affiliation.
Italy	**AMCs** are affiliated with faculties of medicine. Scientific institutes for research, hospitalisation and healthcare have a tripartite mission, but it is impossible to achieve an academic career there.
Latvia	**University hospitals** are legally regulated: a multiprofile inpatient treatment institution that implements academic education and research programmes and projects.
Netherlands	**University medical centres** are established and regulated by public law comprising a university hospital and faculty of medicine (and often biomedical sciences). Top clinical teaching hospitals also have a tripartite mission (although not established under public law); however, they are considerably more focused on secondary patient care, requiring no legal relationship with a university.
Norway	All hospitals have four obligations imposed by law: to treat patients, educate healthcare professionals, conduct research and inform patients and relatives. Additionally, **university hospitals** must legally cooperate with a defined university on research and in educating medical students.
Poland	Two types of hospitals can be considered AMCs: **university hospitals** owned and run by medical universities and **research institutes** owned by the state and supervised by the Ministry of Health. Although more focused on research, the latter also provides tertiary patient care and teaching activities.
Spain	All public and some private hospitals aim for the tripartite mission. When a hospital has an agreement with a university, they are called a 'Hospital Universitario' (**university hospital**).

*(1) patient care, (2) education and (3) research.

and receive funds based on the scientific impact of their research production (measured through peer-reviewed papers).

3.2. Characteristics: Number of AMCs and representation

The quantitative data on the number of AMCs in the included countries must be analysed with caution owing to lack of standardised definitions. Table 2 gives an overview of the number of AMCs per country, based on respondents estimates.

Of the 11 analysed countries, 6 (Czechia, Germany, Italy, Israel, Poland and the Netherlands) exhibited the existence of an umbrella organisation in coordinating and representing the interests of their member AMCs. These included the following: Italy, where the Medical Directors Association and other associations from medical professional categories contribute to the strategy of AMCs; the union of hospital directors, a branch of the Israeli Medical Association in Israel; the Union of Clinical Hospitals (*Polska Unia Szpitali Klinicznych*) gathering most university hospitals in Poland; the Association of Hospitals of the Czech Republic (*Asociace nemocnic ČR*) in Czechia; or *the Nederlandse Federatie Universitair Medische Centra* in the Netherlands. However, the political role varies from being relatively strong in Israel and the Netherlands to being more limited in Poland. Additionally, umbrella organisations for medical facilities focus mainly on the educational and research functions; for example, *Vereniging van Universiteiten* in the Netherlands.

Table 2
General overview of the number of AMCs (or institutions with tripartite missions) and medical schools per country*.

Country	Number of AMCs	Number of medical schools
Cyprus	No data available**	3
Denmark	5	4
Czechia	10	10
Italy	51	42
Germany	36	36
Israel	6	6
Latvia	3	2
Netherlands	8	8
Norway	6	4
Poland	50	13
Spain	57	46

* respondents estimations as of 2019/2020.
** For Cyprus, no data are available on the number of AMCs, beds, or undergraduate students. Hospital doctors and medical school professors strongly disagree on managing academic facilities. Powerful trade unions of hospital doctors (mainly public servants) face the Ministry of Healthcare, medical schools and the teaching staff.

3.3. Governance and organisation

3.3.1. Ownership structure of AMCs and medical schools

Most countries have public, nonprofit ownership systems for AMCs and medical schools. However, Germany, Cyprus and Spain show that some AMCs and medical schools are privately owned entities. There are a few private medical schools in Poland but no privately owned AMCs (Table 3).

Moreover, AMCs are organised by regional departments, whereas the universities are organised/governed by the state in Denmark. Furthermore, the medical schools in Norway are run by a different governmental department than the hospitals.

3.3.2. Relationship between an AMC and a medical school

The organisational form and the AMC/medical relationship of 6 out of the 11 countries were compared with Weiner's typology [13]. The results found that five countries were unable to label their country's situation. For example, Latvia and the Netherlands classified their system as Subsidiary; Italy as Alliance Leader; Spain and Poland as Alliance Partner; and Cyprus as Coalition Leader (the definitions of these classifications can be found in Supplementary File 2). These results highlight the considerable differences in the relationships between AMCs and universities in European countries. Moreover, these are evident from the data in the open field of the questionnaire:

Table 3
Ownership of AMCs and medical faculties.

Country	AMC public/private	AMC profit/nonprofit	Medical faculty public/private	Medical school profit/nonprofit
Cyprus	Both	both	both	both
Czechia	Public	nonprofit	public	nonprofit
Denmark	Public	nonprofit	public	nonprofit
Germany*	Public	nonprofit	public	nonprofit
Israel	Both	nonprofit	public	nonprofit
Italy	Both	nonprofit	both	nonprofit
Latvia	Public	nonprofit	public	nonprofit
Netherlands	both	nonprofit	public	nonprofit
Norway	public	nonprofit	public	nonprofit
Poland	public	nonprofit	public/few private	nonprofit
Spain	both	both	both	both

* The overwhelming majority of German AMCs are publicly run, with a few exceptions. All exceptions are small facilities and are not considered 'full university medical facilities or an AMC.'.

- Italy added that the relationship between the academic and clinical authority is solid. Decision makers are mainly academics of the faculties of medicine. The administrations are separated and report to the Ministry of Health or University and Research (research activities).
- In Poland, all strategic decisions require permission from the owner (the university). However, these interests hold a decisive informal say since the clinical activity gets the most resources. From a legal perspective, Poland has no dedicated regulations for university hospitals; therefore, they are treated as standard medical providers.
- However, in Spain, medical schools and clinical organisations belong to different institutions linked by an agreement, including functional aspects of teaching and research. Therefore, the medical school exercises moderately little authority in the management of the clinical enterprise.

3.3.3. Role of the dean

The university's position in the network of relations is majorly concentrated in authority given to the dean, which varies significantly per country. For instance, in German and Dutch AMCs, the dean is embedded in the hospital's governance and participates in the AMC management board. In Czechia, the dean appoints the chief clinicians, who report educational aspects. This is also applicable for Israel, where some research collaborations establish joint research centres between universities and hospitals. In Latvia, the dean has several roles in the university and hospital. In comparison, intermediating deputy deans participate as university representatives in the hospital committees and meetings in Norway and Spain. Furthermore, the dean oversees the strategy and organisation of the scientific departments of the faculty of medicine in Italy.

3.3.4. Internal challenges to governance

The most challenging internal issues are the inability to steer and rebalance the three core missions and financial conflicts. Latvia and Poland consider financial conflicts amongst the three missions a great challenge, although, in Czechia and Denmark, it is not a major challenge. Five countries scored moderately or highly on the collision of cultures between medical and academic topics. Five countries deemed lack of strategic focus and inability to respond effectively to change as major organisational challenges. Furthermore, Germany encounters problems because most doctors are employed under the 'Wissenschaftszeitgesetz/Hochschulrahmengesetz' that does not permit employment at academic hospitals for more than 15 years. Therefore, numerous middle-career doctors must search for positions outside AMCs, taking with them valuable expertise. The role of the professional in an academic organisation with the focus that lies more on the field of expertise than on the organisation's interests is considered challenging in the Netherlands. Similar to Latvia, the separation of training and healthcare processes has stimulated the simultaneous employment of medical practitioners in AMCs and universities. Furthermore, in Czechia, concurrent employment is common and different remuneration schemes for university and hospital employment pose tensions owing to the different pay. Finally, Italy stated the low level of leadership skills and lack of systemic vision as the main barriers to effective governance. Table 4 summarises the internal challenges.

3.3.5. External challenges to governance

These pressing challenges focus on financial sustainability and human resources (Table 5). For example, nine countries perceive expensive technologies as a threat to the control of AMCs, directly followed by human resource issues relating to workforce shortages of highly skilled staff (eight countries). In addition, country-specific external challenges were mentioned, such as follows:

- A regionalised healthcare system (Italy).
- An unstable financing and regulation, absence of long-term planning and strong political involvement (Israel).
- Increasing personnel costs and decreasing revenues, competition with other hospitals for public funds for research and education and a discussion about the number of AMCs (the Netherlands).
- Political interference, bureaucratic regulation of personnel and Workers Union pressures and demands (Spain).
- Pressure to restructure owing to an unstable financial situation, absence of regulation for university hospitals to control the high cost of teaching and tertiary care (Poland) [16, 17].
- A conflict about regulation and certification of medical professionals, training capacity suffering from severe shortages and lack of

Table 4
Internal issues challenging the governance of AMC by country.

Internal challenges	Not at all	Slightly	Somewhat	Moderately	Extremely
Cultural					
Clash of cultures between organisations		Czechia, Italy, the Netherlands, Norway, Poland	Denmark, Germany, Latvia, Spain	Israel	Cyprus
Collision of culture medical/ academical		Czechia, Norway	Denmark, Israel, the Netherlands, Spain	Cyprus, Germany, Italy, Latvia, Poland	
Organisational					
Lack of strategic focus		the Netherlands	Czechia, Denmark, Germany, Latvia, Norway	Israel, Italy, Poland, Spain	Cyprus
Lack of enterpreneurialism		Czechia, Latvia	Cyprus, Denmark, Germany, Israel, Italy, the Netherlands, Norway	Poland, Spain	
Inflexibility	Italy		Czechia, Denmark, Germany, Latvia, the Netherlands	Cyprus, Israel, Norway, Spain	Poland
Ability to respond effectively to change			Czechia, Denmark, Germany, Italy, Latvia, the Netherlands	Israel, Norway, Spain	Cyprus, Poland
Ability to act collectively as a whole		Czechia, Denmark, Latvia	Cyprus, Germany, the Netherlands, Norway, Poland, Spain	Israel	Italy
Multiple/conflicting tasks	Israel	Czechia, Italy, Norway	Denmark, Germany, the Netherlands, Spain	Latvia, Poland	Cyprus
Relation between affiliates		Czechia, Israel, Latvia, the Netherlands	Denmark, Germany, Italy, Norway, Poland, Spain		Cyprus
Financial					
Financing conflicts amongst three missions	Czechia, Denmark		Italy, the Netherlands, Norway, Spain	Cyprus, Germany, Israel	Latvia, Poland
Leadership					
Leadership skills	Israel	Czechia, Norway, Poland	Denmark, Germany, Latvia, the Netherlands, Spain	Cyprus, Italy	

Table 5
External issues challenging the governance of AMC by country.

External challenges	Not at all	Slightly	Somewhat	Moderately	Extremely
Demographic					
Ageing population		Cyprus, Czechia, Latvia, Norway, Poland	Germany, the Netherlands, Spain	Denmark, Israel, Italy	
Organisational					
Complexity of care		Czechia, Norway, Poland	Cyprus, Denmark, the Netherlands, Spain	Germany, Israel, Italy, Latvia	
Legislation		Germany, Norway	Czechia, Denmark, Israel, Latvia, the Netherlands, Spain	Italy	Cyprus, Poland
Financial sustainability					
Captial investment		Germany	Czechia, Denmark, the Netherlands	Cyprus, Poland, Spain	Israel, Italy, Latvia, Norway
Decreasing reimbursements	Cyprus, Czechia	Spain	Denmark, Italy, the Netherlands		Gerany, Israel, Latvia, Norway, Poland
Expensive technologies	Czechia		Italy	Cyprus, Denmark, Germany, the Netherlands, Spain	Israel, Latvia, Norway, Poland
Human resources					
Workforce shortages			Cyprus, Czechia, Denmark	Germany, Italy, the Netherlands, Norway, Poland, Spain	
Shortages of highly skilled personnel	Czechia		Cyprus, Denmark	Germany, Italy, Latvia, the Netherlands, Norway, Poland, Spain	
Provision of care					
Competition of other (private) hospitals/chains	Czechia, Denmark, Poland	Italy, Israel, Spain	Cyprus, Germany	Israel, the Netherlands	Norway

coherence between the Ministry of Health and Education regarding undergraduate and residency study places (Latvia).
- Problems regarding sustainability when academic hospitals employ more expensive diagnostic/therapeutic tools. The structure of reimbursements generates similar revenues independent of whether treatment was delivered in a non-academic or academic hospital (Germany).

3.4. Future trends

The participants were asked to specify how they perceive the future design of the AMC governance. They were presented with four models of integration of patient care, research and education: 1) a more functionally integrated model, 2) a less functionally integrated model, 3) a more institutionally integrated model and 4) a less institutionally integrated model. It was found that eight out of 11 countries believed that their AMC governance will facilitate toward more functional integration with separate governing bodies and legal entities for the academic and clinical parts. However, the responses indicate that it is driven at different levels with different emphases.

Norway, Czechia and Denmark mentioned no immediate changes and that patient care, research and education would remain a part of the (highly) specialised services. In 2014, Czechia unsuccessfully sought to bring AMCs under the formal control of universities. The strengthening of highly specialised care concentration continues but is not limited to the teaching hospitals [18]. Conversely, in Norway, the balance between hospitals and universities is adequate. Nevertheless, a shift toward greater cooperation is expected. In the specific situation of Poland and Israel, it is stated that in the future both a functionally and institutionally integrated model is seen as a possibility. However, some mergers and/or organisational consolidations between university hospitals have occurred in Poland [16]. As the government proposes to increase the overall hospital sector centralisation, further integration of highly specialised providers (including AMCs) is expected. Furthermore, Israel designs a plan that captures the hospitals' transformation into a 'comprehensive medical campi' with diverse settings and services, where research and training are expanded and diversified ('national master plan for the healthcare system 2048'). In Germany, strategic goals for AMCs are set for more functionally integrated models of patient care, research and education but no large reform plans concerning institutional changes are expected. Spain works on plans for hospitals and medical schools to improve the quality of teaching, healthcare and research, generating synergies that meet the institutions' needs. The Netherlands and Poland forecast growing institutionalisation of regional care networks, research and education (e.g., the oncological care network in Poland). The Dutch AMCs changed toward a less hierarchical organisational structure. Moreover, clustering departments must bring better alignment in strategy and policies. The integration and collaboration with other faculties will be more pronounced owing to the growing need for interdisciplinary solutions. This trend also applies to Latvia's strategy to develop joint medical education programmes' supervision and cooperating strategies between AMCs and universities.

4. Discussion

This study corresponds to the conclusion of French et al. [3], who stated that there is no universal or even European definition of an AMC. However, this study shows that organisational types, contents and legal frameworks of the collaboration between faculty and hospitals vary considerably. Such differences likely relate to the design of regional and national healthcare systems. Thus, the question arises whether we can speak in a general sense about AMCs at the European level?

Therefore, this study demonstrates that the linkage of (complex) patient care, research and education in AMCs is weak in some European countries. There are substantial differences and varieties from the governance's perspectives of such institutions. There is no standard definition, but the three core functions are (loosely) tied. The main differentiator is the formal level of integration between the hospital and medical school. However, it can be complete, such as in the Netherlands, but it is more horizontal with a strong university position. In some countries, the resulting dual employment (e.g., as a doctor in a hospital and as a lecturer at a university/faculty) is a shared source of tension. Moreover, the threshold for becoming an AMC varies between countries, with Spain appearing to be a country with a slightly lower threshold. Hospital–university relations are different, but almost all of these institutions are government-owned or nonprofit organisations, thereby increasing political influence.

Although our study showed substantial differences in the organisation and governance of AMCs, institutions also face similar challenges [19–22]. The major challenges identified in the study ranged between staff shortages, changing patient populations and financial pressures, including new treatments and technologies. Therefore, solutions might

include new organisational structures and collaborations. Raus et al. [23] hypothesise that the current model primarily results from gradual institutionalisation of the academic mission within university hospitals. However, most experts in this study perceive further functional integration as the most logical way forward.

4.1. Strengths and limitations

This study is the first to provide an international comparison of AMC organisation and governance, thereby bridging the gap in the extant literature. The main limitation of this study was the general and open-ended nature of the questionnaire, making it challenging to differentiate between countries beyond common themes. Accordingly, each expert has formed their judgement concerning the national organisation model with the classification of Weiner et al. [13]. Another limitation was the limited countries included in this comparison. Moreover, when answering the questions, the respondents did not intend to give an exact picture of the organisation of all AMCs in their country. This trend means that these study results cannot be applied one-to-one to all AMCs in a specific country, thereby limiting the general applicability of the findings of this study. Therefore, robust follow-up studies are required for which our study can serve to generalise and strengthen the results.

5. Conclusions

Our exploratory study provides the first international comparison of the organisation and governance models of AMCs. We found a lack of standardised definitions of AMCs and substantial differences in medical schools and universities' organisations under an AMC umbrella. However, most of our respondents agree that further functional integration is the logical way forward. Additionally, the balance amongst the three core functions of patient treatment, research and education can differ depending on the country. Most participating countries have public, nonprofit ownership systems for AMCs and medical schools. The primary internal challenges focus on the inability to respond to change and ongoing financial conflicts amongst the three core tasks. Furthermore, crucial external challenges are related to financial sustainability and staff shortages. Therefore, further research on these essential institutions is warranted. Finally, the variety implies that the policymakers and administrators of the AMC tap for exercises on mutual learning. Flexner encouraged AMCs to learn about '*ambulando discimus*' more than a century ago [4]. Currently, the need and desire to learn from each other are as timely as ever [24].

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Declaration of competing interest

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Supplementary materials

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