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# Uncovering factors influencing the role of hospital administration in the transformation of online residency training: A systematic review

Yuan Ma<sup>1</sup>, Radduan Bin Yusof<sup>2\*</sup> and Fadilah Binti Puteh<sup>3</sup>

<sup>1,2,3</sup>*Faculty of Administrative Science and Policy Studies, Universiti Teknologi MARA, Shah Alam, Malaysia*

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## ABSTRACT

Informative teaching is an integral part of the current development of post-graduation medical education. Online learning has become a new form of teaching in primary medical schools and institutions at home and abroad, promoting informatisation in post-graduation medical education and an inevitable trend in education in the new era of "Internet+". In recent years, most research on the factors affecting online teaching has come from resident doctors and teaching physicians, with less attention paid to hospital teaching management. This study utilised a systematic review approach based on the PRISMA (The Preferred Reporting Items for Systematic Reviews and Meta-Analyses). Three databases (Scopus, Web of Science, and CNKI) were used to screen the articles in this study. Twenty-two relevant studies were screened to determine the factors influencing the involvement of hospital teaching administration in the effectiveness of online learning implementation. Based on the thematic analysis, the factors influencing the implementation of online learning by hospital teaching management departments were categorised into three primary levels: technical support, information technology's education governance capacity, and budgeting. Three suggestions were made, including 1) providing more educational resources suitable for use by resident physicians; 2) establishing a suitable resident physician and teacher evaluation method for online teaching mode; 3) compensating departmental honorariums for teaching physicians participating in online teaching; and 4) reducing the number of platforms and integrating teaching resources.

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<sup>2\*</sup> Corresponding author. E-mail address: radduan@uitm.edu.my

## 1.0 INTRODUCTION

### 1.1 Background and rationales

With the development of the Internet and other technologies, the policy of integrating information technology with education and teaching practices has become increasingly clear. Meanwhile, influenced by multiple public health events in recent years, online learning as a supplement to traditional teaching has transformed into a regularized mode of teaching in the education system (Shi & Guo, 2012). The use of online learning in higher education institutions (HEIs) worldwide is expanding (Lin & Zhang, 2015). In China, to deepen medical education reform, online learning has become a new form of teaching in major medical schools and healthcare organizations, and as a new development in medical education, online learning has become a topic of common concern for domestic and international medical education researchers.

Online Learning is defined as education, instruction, and learning using an online platform. Online Learning is defined as education, instruction, and learning using an online platform (Bramer, 2020). Choe et al. (2019) described online Learning as implementing different techniques that differ from face-to-face Learning. Developing one described online Learning as implementing different techniques that differ from face-to-face Learning. Developing new lesson plans and application methods was a requirement for successful online Learning. Other key terms that online Learning referred to were e-learning, Web-based Learning, distance learning, and cyber-learning.

This paper uses the theory of Information and Communication Technology (ICT), a theory whose development calls for online learning as a viable and economically appropriate means of expanding quality higher education (Asunka, 2009). The role of ICT in education, especially in higher education, cannot be ignored and it is of great benefit to both teachers and students (Aljaraideh & Al Bataineh, 2019). In the field of education, the integration of ICT involves many interrelated factors such as curriculum, teacher characteristics, training and development, infrastructure, and organisational factors such as school leadership, school culture, and support frameworks (Judge, 2013).

Even before the public health incident, many institutions of higher education had begun to offer hybrid or fully online graduate courses and programs. In 2019, the U.S. Department of Education's National Center for Education Statistics reported that the highest percentage of students participating in distance education was at private, for-profit institutions (73%), followed by public institutions (34.1%) and private nonprofit institutions (30.4%) (Bamoallem & Altarteer, 2022). Online learning has its unique advantages, which are even more pronounced during an epidemic (Bamoallem & Altarteer, 2022). Online teaching has the advantages of not being limited by time and space, more types of students, lower learning costs, and abundant teaching resources (Li et al., 2023). There is a need for online teaching and learning for possible future public health emergencies (Costea et al., 2022).

Standardized training for residents (standardized training) refers to the systematic and standardized training that medical graduates receive at accredited training bases focusing on improving clinical competence as residents after completing their medical school education. The training period is three years. Affected by public health emergencies in recent years, residency training in many medical institutions is at a standstill, which will greatly affect the quality of standardized residency training, and more seriously, will affect the complete assessment of resident physicians at this level, making them unable to engage in medical work. The study of online learning can maximize the restoration of teaching work in each department of resident physicians and minimize the impact of process management of training content on the quality of training. This study contributes to the training of qualified clinicians and improves the quality and standard of health care.

Even though online learning is necessary, due to the relatively short period since its implementation, several problems have arisen in the process (Celik et al., 2022). Studies have shown that some government

departments believe that online learning increases financial expenditure and is susceptible to the influence of the online environment, leading to inefficient listening (Mutmainah et al., 2023). The support provided by management at all levels for the teaching and learning environment is likewise seen as an important factor influencing the ability of online learning to achieve results (Bramante et al., 2023).

A study from the Xi'an Air Force Hospital in China showed that the hospital administration plays an important role in the success of online teaching, including the provision of online teaching equipment, ensuring the smooth operation of the teaching network, training of teaching physicians, and monitoring the quality of the classroom and providing feedback, all of which need to be taken into consideration and improved by the administration (Liu et al., 2023).

According to Davidson (2017), questions about whether online learning can be successfully conducted are intertwined with a variety of research priorities. For example, influences and considerations for student success in online learning environments can be found in studies that specifically address online student success, although it is difficult to identify a single factor for learning success (Hachey et al., 2022). While it is difficult (if not impossible) to identify a single factor for online student success, research on success in online learning environments falls into two main categories of influences on online success. The second category is very important, including (a) online preparation, (b) online student services, (c) institutional support and engagement, and (d) online student characteristics, attributes, and attitudes (Saddik, 2022).

Although several studies have confirmed the importance of hospital management for online teaching and learning, hospital management also faces challenges at the same time. A study from Tongji Medical College in China showed that the challenges of online teaching and learning for hospital management include the challenges of the concepts of hospital administrators, the challenges of the quality of hospital staff, the challenges of information security in hospitals, and the challenges of coordination among departments in hospitals (Sun et al., 2023).

This study intends to provide theoretical support for the reform of informatization in hospital management and a reference basis for the innovation and development of current medical education.

This paper is structured as follows: first, existing studies were analysed and categorized to introduce the influencing factors of hospital teaching management in online learning for standardized residency training. Next, the researchers presented the research methodology and discussed the findings. Finally, the researchers explored the framework for future optimization of online learning for standardized residency training, investigated the study's limitations, and drew conclusions.

## **1.2 Purpose of the review**

The researchers conducted a systematic review of the literature using the following questions to identify the factors influencing online learning in standardized residency training, which was summarized in two areas:

Question 1: What are the factors that influence hospital administration on online learning in residency training?

Question 2: To what extent do factors influence the effectiveness of implementing online learning in residency training programs?

## **2.0 METHODS**

The researchers conducted a systematic literature review to obtain complete information on the factors influencing online learning in hospital administration for residency training. A systematic review is a clear and comprehensive process for identifying and synthesizing the results of previous studies to gather

evidence and answer questions (Xiao & Watson, 2019) The researchers followed the PRISMA guidelines, which are designed to improve the reporting of systematic reviews.

PRISMA stands for Preferred Reporting Items for Systematic Reviews and Meta-Analyses. It is a set of evidence-based guidelines and flowcharts that provide a structured approach to conducting systematic reviews and meta-analyses in healthcare and medical research. PRISMA was developed to ensure that the reporting of systematic reviews and meta-analyses is transparent and comprehensive, making it easier for researchers and readers to understand and evaluate the methods and results of these studies.

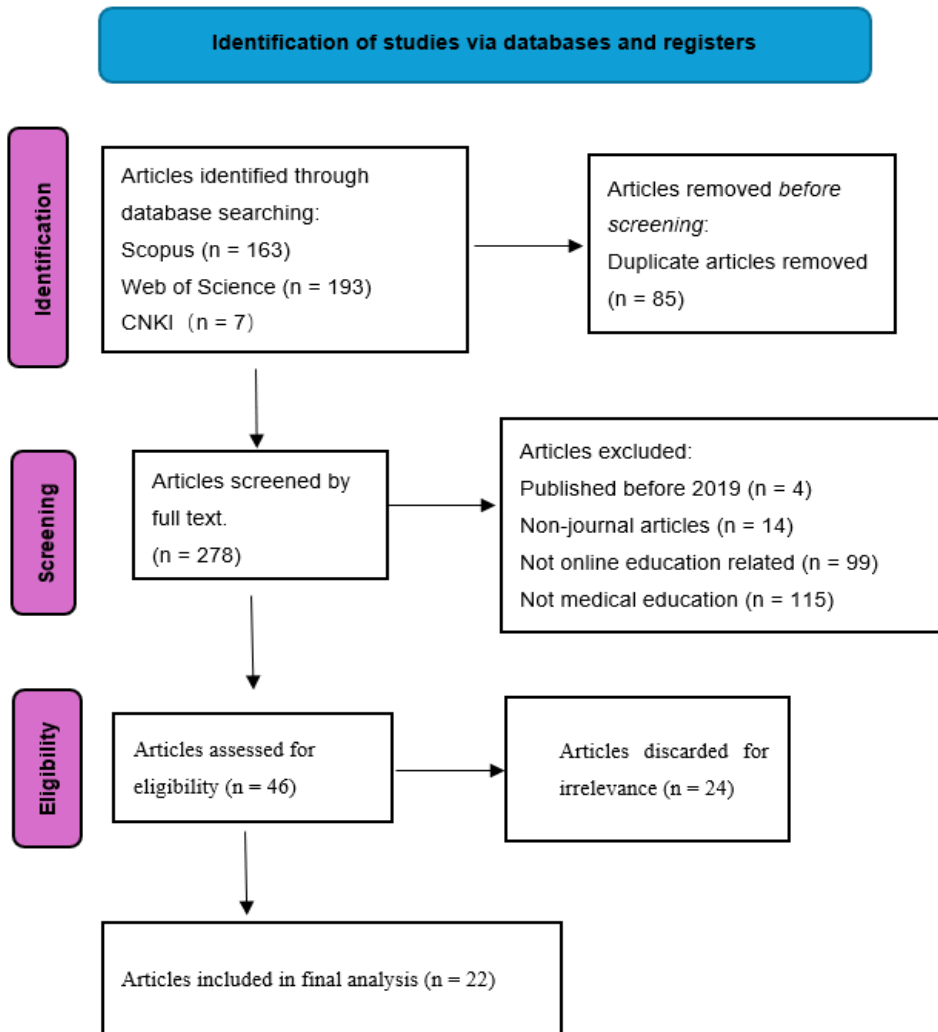


Fig. 1 The process and result of studies selection based on PRISMA.

## 2.1 Data sources and search strategies

The search strategy consisted of three stages-identification, screening, and eligibility-guided by the inclusion and exclusion criteria listed in Table 1.

## 2.2 Identification

The following three journals broadly covering education were searched: SCOPUS, Web of Science, and CNKI, the first two of which can be the leading databases in systematic literature reviews due to their multiple advantages such as advanced search capabilities, comprehensiveness (indexing more than 5,000 publishers), controllable quality of the articles, and having a multidisciplinary focus, including medical education related research (Gusenbauer & Haddaway, 2020). China Knowledge is China's most prominent journal repository, providing Chinese articles.

We used Boolean operations to select papers with high precision using keywords. This search was conducted in September 2023. The search terms were categorised into three groups: study population (residents, residency physicians, resident physicians), learning environment (e-learning, e-teaching, e-education), level of education (medical education, higher medical education), and influencing factors (influence), which produced the following search strings as shown in Table 1. A total of 363 article searches were returned, of which 163 were from the SCOPUS database and 193 from the Web of Science. Meanwhile, China Knowledge, a similar Boolean string and filter, was used to pass the screening, returning seven papers.

Table 1 The search string

Databases	Search Strings	No of Document
SCOPUS	Scopus: ("standardised training of residents" OR "standardised training of resident doctors" OR "standardised training of resident physicians") OR ("resident doctors" OR "resident physicians" OR "self-efficacy") AND ("medical education" OR "graduate medical education" OR "E-learning" OR "web-based learning") AND ("online learning" OR "online teaching" OR "online training") AND ("influence" OR "influence factors" OR "impact" OR "determinants")	163
Web of Science	("standardised training of residents" OR "standardised training of resident doctors" OR "standardised training of resident physicians") OR ("medical education" OR "graduate medical education" OR "E-learning" OR "web-based learning") AND ("online learning" OR "online teaching" OR "online training")	193
CNKI	AND ("influence" OR "influence factors" OR "impact" OR "determinants").	7
Other Filter	(a) Year of publication: 2013-2023, (b) Document type: journal, (c) Field of study: Medical education.	
Total document		363

## 2.3 Screening

In this phase, the 363 articles identified in the initial phase were manually screened. First, 85 duplicate articles were removed, leaving 278 articles. Next, the titles, abstracts, and keywords of the selected articles were screened, and articles were proposed based on inclusion and exclusion criteria, leaving 46 articles.

Table 2 Inclusion and exclusion criteria.

Criteria	Inclusion	Exclusion
Publication date	From January 2013 to July 2023	Before 2013
Language	English, Chinese	Other languages
Publication Type	Peer-reviewed journal articles	Non-peer-reviewed journal articles, book chapters, reports, dissertations, or proceedings
Research focus	Online learning	No online learning
Context of study	Medical Education Standardized Resident Training	Other Education, No Standardised Resident Training

## 2.4 Eligibility

The full text of the articles was then read to assess their eligibility. It turned out that 24 articles were found to be irrelevant (e.g., conceptual papers, opinion pieces, no mention of online learning influencers, no mention of resident participation). Therefore, after screening, 22 articles were finally available for systematic analysis. The PRISMA flowchart (Figure 1) illustrates the identification, screening, and eligibility process researchers used.

## 2.5 Data coding and analysis

Before starting the comprehensive review, the researchers created a coding system using Microsoft Excel, as shown in Table 3. It included coding elements and their specific descriptions. Data analysis included descriptive statistics and content analysis. The data were organized according to title, author, year of publication, discipline, and online learning influences (Table 3). The researchers read these articles in depth to highlight the sections describing the factors influencing the effectiveness of online learning implementation by the hospital's teaching administration and organized them into three categories of influencing factors: technical support aspects, information technology education governance capacity aspects, and budgetary aspects. Table 3 only organizes the various types of factors, and the specific classification information of the factors is reflected in the results later.

Table 3 Coding elements for the full review of the selected article

Element	Description
Publication information	Article title, author(s), year of publication, abstract and journal name
Article type	Scholarly Journal Article
Data sources	Country, content area, the participant (resident doctors/teaching physicians/hospital administrators), and sample size
Research methods	Quantitative, qualitative, or mixed methods
Research foci	Themes will emerge from the open coding
Research results	Hospital administration, teaching physicians, and resident doctors influence the effectiveness of online learning implementation for standardised residency training

## 3.0 RESULTS

The results of this systematic literature review are divided into two parts. The first part aims to illustrate the factors influencing the effectiveness of online learning implementation through descriptive statistics, while the second part focuses on answering the research questions based on a content analysis of the reviewed articles.

Through the study, it was found that the influencing factors of hospital management on online learning for standardized residency training were classified into the following three categories: technical support aspect, information technology education governance capacity aspect, and budget aspect.

### 3.1 Technical support

With regard to technical support, four studies indicated that technical resources and infrastructure were the main challenges in implementing distance education, "*The technical issue most frequently encountered (Q2) was a poor internet connection (N = 8/21.05% and N = 25/43.1%, respectively)*". "*reported that the lack of infrastructure, technology, internet access, and poor quality of internet services could impact both learners and faculty members (Costea et al., 2022)*". and in one report, program directors perceived that

technical support was also weak when problems were encountered in distance learning. However, it was also reported that local administrations provide adequate technological resources for resident physicians. The majority of trainees had smartphones (n = 287, 96%) or laptops (n = 267, 96%), and they primarily used mobile data to connect to the Internet (n = 274, 92%).

Three studies reported that the most common technical problem encountered in online learning was poor Internet connectivity, and poor Internet access and Internet service quality affected both learners and faculty. Online teaching, especially real-time interactive lectures, requires a high level of network environment, but network conditions vary widely in different regions. One study found that 26.87% of students had poor or unstable network signals that could not well support the implementation of online teaching.

The function of the online platform restricts the implementation effect of online teaching. A research report shows that the key to the implementation of online learning is still to create a reasonable and effective informatization platform, and the imperfect function of the platform will directly affect the learning experience of online teaching. At present, the quality of offline platforms used by institutions varies, and they cannot play a role in enhancing the ability of information technology to serve medical education and optimize education management, and they cannot fully support the open sharing of high-quality educational resources and the construction of networked learning platforms (Zheng et al., 2021).

### 3.2 Informational education's governance capacity

There were seven studies that focused on information on the governance capacity of information-based education. Two of the studies showed that the current educational administrators are not able to innovate in a timely manner due to the inherent thinking in their concepts and methods of work. *"The informatization education governance capacity needs to be optimized. The current working concepts and methods of education managers still have inherent thinking and cannot be innovated in time"* (Wasser et al., 2020). and one study also pointed out this problem and stated that due to the impact of the Covid-19 epidemic, the teaching administration of the hospital had hastily organized the adjustment of the curriculum without anticipating the need for checking the attendance or continuously assessing the knowledge.

Three studies focused on the construction quality of online learning. One of the studies found that an important connotation of e-learning is the availability of resources, and that e-learning resources are currently abundant, but the quality of construction varies, hence, there is an urgent need for authoritative organizations to screen resources and recommend their use by different types of institutions. One study showed that, according to the design of the study, the management also did not assess the objective quality of the e-learning provided or the efficiency of the training.

The study concluded that structured online education programs are an important part of residency education that promotes resident engagement, and that reforms in hospital teaching administrations urgently need to focus on the following areas:

Revisiting training programs and expanding the application of blended teaching models.

Establishing a scientific and effective teaching evaluation system and strengthening the evaluation indexes of formative evaluation and design technology interactive network teaching.

Improving the safeguard and incentive policies, providing incentives to teaching physicians who participate in online teaching reform, compensating teaching physicians who participate in online teaching reform with departmental honorariums, and giving them an inclination in the identification of teaching workload and the evaluation of their titles.

Table 4: The themes and the subthemes

Author(s), year	Discipline	Technical Support						Informational education governance capacity				Budgetary constraints		
		PI	LI	PQ	TG	TR	FD	TR	MP	PC	IG	SE	NA	LC
(Ienghong et al., 2021)	Medical												/	
(Nguyen et al., 2022)	Medical			/										
(Almufarriji et al., 2021)	Medical		/											
(Costea et al., 2022)	Public Health	/												
(Chénard-Roy et al., 2021)	Medical				/									
(Arora et al., 2022)	Medical Education				/									
(Oğuzülgen et al., 2022)	Medical													/
(Kruse et al., 2022)	Medical Education											/		
(Baessler et al., 2021)	Medical								/					
(Obaid et al., 2021)	Medical Education									/				
(Wasser et al., 2020)	Medical						/				/			
(Kurniawati & Rahmawati, 2021)	Public Health					/								
(Wittayanakorn et al., 2020)	Medical											/		
(Motte-Signoret et al., 2021)	Medical Education								/					
(Bracho Blanchet et al., 2022)	Medical Education					/					/			
(Wang et al., 2021)	Medical Education									/				
(Xu, 2020).	Medical Education												/	
(Xie et al., 2022).	Medical Education													/
(Zhao et al., 2020)	Medical Education							/				/		
(Liu et al., 2021).	Medical Education				/									
(Zhang et al., 2021)	Medical Education		/											
(Li et al., 2020)	Medical Education	/										/		
<b>Technical Support</b>		<b>Informational education governance capacity</b>						<b>Budgetary constraints</b>						
PI-poor internet connection		MP-managers' perceptions						NA-Can not affordable						
LI-lack of infrastructure		PC-a platform of communication						LC-Reducing the organisational and logistical costs						
PQ-Poor quality of Internet services		IG-The informatisation education governance capacity												
TG-technical glitches		SE-structured educational curriculum												
TR-Technical resources														
FD-family disturbances														
TR-no need to access technological resources														



### **3.3 Budgetary constraints**

For the influencing factors of the implementation effect of online learning for standardized residency training, the impact of budgetary constraints should not be ignored. Studies have shown that some government departments believed that online learning increases financial expenditure and is susceptible to the influence of the online environment, leading to ineffective listening (Doyumgaç et al., 2021). Studies have reported that effective medical education development is a crucial consideration. However, in low- and middle-income countries, the greatest constraint to healthcare and education is the budget.

Two other studies reported that online training methods should provide convenience for scholars and students while reducing organizational and logistical costs.

## **4.0 DISCUSSION**

In order to deepen the reform of medical education and further promote the new form of informatized education, online learning has become a hot spot of concern for major institutions of higher education and medical institutions. Analysing and studying the influencing factors of online learning and exploring optimization measures are crucial to further enhance the implementation of online learning. In this systematic literature review, the influencing factors of hospital teaching management departments on online learning for standardized residency training are studied in depth from three levels: (1) online platform support; (2) information technology education governance capacity; and (3) budgetary constraints.

### **4.1 Technical support**

In the research related to technical support, we concluded that some users, i.e., resident physicians and instructors, consider single platform support and unstable network environment as one of the important factors affecting online teaching. In this regard, the researchers believe that medical institutions should provide more educational resources suitable for resident physicians, such as high-quality medical databases, e-books, medical atlases. according to the teaching needs. At the same time, hospital teaching management departments can reduce the number of course platforms according to the reliability and convenience of teaching platforms to avoid resident physicians switching various software during the learning process; optimize the campus informatization infrastructure and improve the network performance to ensure the smoothness of teaching.

Through the study, it is shown that Tencent meeting, nail online meeting and the smart teaching established by the major universities themselves have the highest frequency of use among resident physicians. Among them, Tencent meeting has a more stable network, which is more suitable for trainees who listen to lectures at home or in dormitories; Nail online meeting can support group discussion and multiple speakers, which is more suitable for classes with more trainees and better classroom effects (Yuan, 2021); regarding the smart teaching platforms established by major universities themselves, take Ningxia Medical University as an example, its "Wisdom Tree" platform, for example, has sufficient teaching resources and has established links with advanced universities in southern China, which can support online viewing of online classes of other advanced universities, which is more helpful to improve the learning ability of resident physicians and improve the quality of teaching (Wu et al., 2019).

### **4.2 Informational education governance capacity**

In the online learning process, the training program is not perfect, and the teaching evaluation system is not sound enough is the problem involved in the large sector of the study. In this regard, the teaching management department of the hospital should establish the assessment method of resident physicians and teacher evaluation method suitable for the online teaching mode. The medical course has more knowledge points and involves clinical practice, and the assessment method should be comprehensively considered and flexibly formulated under the premise of guaranteeing fairness and justice; the evaluation method of

teachers should be combined with the online video recording, the communication and interaction between teachers and students online, and the subjective evaluation of the resident physicians for comprehensive consideration.

In addition, regarding the aspect of teaching physicians, the hospital teaching management department should take a tolerant and supportive attitude and should not use the online teaching standard of a few teachers to require the whole odd-even implied and be ready to provide teachers with Q&A on online teaching techniques at any time during the teaching time. Try to avoid hard and fast rules and detailed management, allow diversity, tolerate the rate of error, and encourage exploration and innovation of teaching methods under the premise of quality and quantity of teaching tasks, when dealing with specific problems in a concrete manner. In terms of improving protection and incentive policies, incentives are given to teaching physicians who participate in online teaching reform, and departmental honorarium compensation is given to teaching physicians who participate in online teaching reform, and tilts are given in the identification of teaching workload and the evaluation of titles.

### **4.3 Budgetary constraints**

Several studies have reported that budgetary constraints are also an influencing factor in the development of online teaching in developing countries. The online teaching support platforms of some healthcare organizations are frequently replaced, and each replacement of the system adds an expense to the local finance. In this regard, the researcher believes that the investment in pre-examination for the use of online teaching platforms should be increased, and market research should be fully conducted before purchasing the platforms and online teaching resources, so that the most cost-effective platforms can be selected for purchase. In addition, it should be suggested to local government departments to integrate teaching resources and put some public courses into the same teaching platform, which not only reduces the hospital budget but also reduces human resources.

For the General Hospital of Ningxia Medical University, the standardized training of residents has a national allocation of 20 million per year, and the investment in online teaching pointed out that only 1%, should be increased for online teaching support costs, the proportion rose to about 5% (Li et al., 2021).

## **5.0 LIMITATION AND FUTURE DIRECTION**

First, this study focused only on peer-reviewed journal articles, excluding some relevant literature from non-peer-reviewed journals, book chapters, dissertations, or theses. Second, this study focused only on articles published in the last 5 years from 2019-2023, but before 2019, many institutions of higher education have begun to offer hybrid or fully online graduate courses and programs (Skulmowski & Rey, 2020). Articles published before 2019 may yield different results. Third, the language of the study was limited to English and Chinese. Fourth, this study only analysed the factors influencing the effectiveness of online learning implementation at the hospital's teaching administration level. The study did not analyse the factors influencing it at other levels, such as instructors and residents. Therefore, future research could examine the influencing factors on the effectiveness of online learning implementation from a longer time period, different languages and geographic regions, and other dimensions other than teachers, which may yield other results.

## **6.0 CONCLUSION**

This study was conducted through a systematic review of 22 studies on the factors influencing the effectiveness of hospital teaching administration on the implementation of online learning for standardized residency training. The studies included the effects of technical support, informational education governance capacity, and budgetary constraints on implementation effectiveness. Among them, technical support and informational education governance capacity should be given more attention. Based on the

results of this study, the impacts and challenges of hospital instructional management's involvement in online teaching and learning on the effectiveness of implementation are evident. In this regard, this study has put forward three optimization suggestions: to provide more educational resources suitable for resident physicians; to establish assessment methods for resident physicians and evaluation methods for teachers suitable for online teaching modes, and to provide departmental honorarium compensation for teaching physicians who participate in online teaching reform; and to reduce the number of platforms and integrate teaching resources. It is hoped that the above research and optimization suggestions can provide theoretical support for the reform of information technology in the hospital management department and provide relevant reference basis for the innovation and development of current medical education.

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## 9.0 CONFLICT OF INTEREST STATEMENT

All authors have declared that they have no conflicts of interest.

## 10.0 CONTRIBUTION OF AUTHORS

The authors confirmed the equal contribution in each part of this work. All authors reviewed and approved the final version of this work.

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### About the Authors

*Ma Yuan* is a graduate student at the Faculty of Administrative Sciences and Policy Studies (FSPPP), UiTM Malaysia. She holds a bachelor's degree from Xi'an Medical College, China and works at the General Hospital of Ningxia Medical University, China. Her research areas are online teaching, residency training management and hospital policy research. The author has published in school journals and hospital-based journals. She can be reached through her email address at [mayuannx001@gmail.com](mailto:mayuannx001@gmail.com).

*Radduan Bin Yusof* is a senior lecturer at the Faculty of Administrative Science and Policy Studies (FSPPP) UiTM. He holds a bachelor's degree in economics, specialising in Public Administration and a master's in public administration from the University of Malaya. He obtained his PhD in Family Economics and Management from Universiti Putra Malaysia. Most of his research is in Social Security, Gerontology and Knowledge Management. He is currently focusing on Sustainable Development Goals and integrating them with his research area. The author has published various papers and articles in reputable journals and chapters in books. He can be reached through his email at [radduan@uitm.edu.my](mailto:radduan@uitm.edu.my)

*Fadilah Puteh* is an Associate Professor at the Faculty of Administrative Science and Policy Studies, Universiti Teknologi MARA (UiTM) MALAYSIA. She holds a PhD in HRD from University of Nottingham. Her research interests are in HRD, HRM, KM, Strategic Management and Adult Learning. She is also an active consultant for various firms and government agencies. She has published books, chapters in book, and various papers in reputable journals. She is the honorary secretary for Malaysian Social Science Association (PSSM), a professional body that encompasses various academicians locally and internationally, promoting and highlighting contemporary issues relating to social sciences and humanity in Malaysia. She can be contacted through her email address at [fadilahputeh@uitm.edu.my](mailto:fadilahputeh@uitm.edu.my).



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