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Hindrances to the Effective Pedagogical Use of Innovative Technologies in the MacArthur Clinical Skills Laboratory at the University of Port Harcourt Medical School.

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Abstract

Background: The 21st century has seen rapid advancements in pedagogical technologies in medical education. This study explores barriers to the effective use of innovative technologies in the MacArthur Clinical Skills Laboratory (MCSL) at the University of Port Harcourt Medical School.

Method: A mixed-methods descriptive cross-sectional design was employed, combining open-ended and closed-ended questionnaires to capture quantitative and qualitative data. The study targeted clinical teachers within the Faculty of Clinical Sciences using purposive sampling. A pilot study was conducted among 25 non-participants to assess the tool's face validity. Key variables considered included innovative technologies, teacher training, institutional policies, perceived relevance, time consumption, and support systems.

Results: Out of 128 clinical teachers, 90 participated, 48 males and 42 females, comprised of 23 professors and 51 senior lecturers. Major inhibiting factors were the lack of necessary institutional policies on the use of the laboratory (56.67%), inadequate training of clinical staff (53.3%), and perceived irrelevance of the MCSL (25.56%). A thematic analysis showed various concepts that highlighted key concepts that explained hindrances to using the MCSL, such as “Resource and Infrastructure Issues”, “irrelevance of the MCSL”, “Lack of institutional policies and requirements”, and “inadequate training”.

Conclusion: University management should implement policies mandating the use of the MCSL, provide comprehensive training, upgrade the medical curriculum, and offer incentives to clinical teachers.

Keywords: *Clinical teachers; MacArthur clinical skills laboratory; Pedagogy; Attitudes; Medical school; Innovative technologies; University of Port Harcourt.*



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Introduction

The healthcare environment is becoming more patient-centred, with an increasing student population and changing medical curriculum leading to the need to develop innovative ways of teaching critical clinical and non-clinical skills required to produce competent doctors^{1,2}. In this context, the shift from rote memorisation to problem-based and self-directed learning is not just a trend but a necessity³. Clinical teachers are essential in supporting learners in achieving clinical competence, with clinical learning forming a bedrock of medical education.⁴ Bugaj et al.⁵ and Al-Elq et al.⁶ state that medical education clinical skills laboratories offer a safe space for medical students and professionals to hone their skills before utilising them in real-world settings. Therefore, learning is in a non-threatening environment that is not time-restricted; the process can be monitored and outcomes measured. The learning curve is reduced, and feedback is received with competence assessment. This shift in focus cultivates the essential knowledge, skills, and attitudes required for effective medical practice, making it a crucial aspect of modern medical education.⁶

In keeping with the global use of clinical skills laboratories in medical education, the MacArthur Clinical Skills Laboratory (MCSL) was established in 2011 with funding from the MacArthur Foundation in collaboration with the University of Port Harcourt^{7,8} to facilitate the integration of the innovative use of educational technologies, including audiovisual equipment and various e-learning tools for pedagogy by clinical teachers and students⁷. Despite the laboratory's advanced capabilities, receiving funding and resources, it remains underused by clinical teachers at the university in teaching and learning by both staff and students⁷. Existing literature highlights significant barriers to setting up clinical skills laboratories within developing nations; this includes high operational costs, staffing challenges, maintenance issues, and inadequate technical training.^{9,10} However, a paucity of studies have explored the barriers that prevent clinical teachers from successfully using the clinical skills laboratory and integrating the provided technology into the clinical classrooms in developing countries such as Nigeria^{11,12}. The reasons for the poor use of the MCSL need to be explored to address and improve the use of the laboratory. This study aims to investigate these challenges and offer actionable insights to enhance the use of the MCSL and ultimately contribute to advancements in medical education in Nigeria.

Methodology

Study site.

The MacArthur Clinical Skills Laboratory is located at the University of Port Harcourt and services the medical and nursing schools. Thus, the study was conducted in the Faculty of Clinical Sciences, College of Health Sciences of the university in Rivers State, South Nigeria.

Sample and Sampling Techniques.

A purposive sampling method was used, with the study population being all Clinical teachers from the Faculty of Clinical Sciences teaching clinical students in the 4th-6th year. The population size was known and obtained from the faculty of Clinical Sciences staff list. From the register, 128 active clinical teachers were registered at the time of study as teaching clinical students.

Methods of Data Collection/Instrumentation

The study employed a cross-sectional, descriptive design using a mixed-method approach to collect and analyse quantitative and qualitative data. Quantitative data were gathered through closed-ended questions. The qualitative data were collected through open-ended questions in the same online questionnaire and analysed and categorised into themes. The questions were crafted to gain deeper insights into the participants' experiences and beliefs about using the MCSL. The questionnaire design was informed by the author's first-hand experiences, informal conversations with clinical teachers and administrative staff of the laboratory, and discussions with colleagues. Content experts reviewed and validated the questionnaire to assess its relevance and clarity for the target respondents, and a pilot study was conducted on a random selection of ten clinical teachers before data collection began. Participants in the pilot study were excluded from the main study. This approach ensured the questionnaire's relevance and suitability for the study context and its participants¹³. It helped refine the instrument, ensuring that questions were well understood and that the intended variables were effectively measured¹³. The final questionnaire was hosted online and distributed to 118 clinical teachers between November 2021 and May 2022 using a web-based survey tool- Google Forms. However, 90 clinical teachers responded resulting in a response rate of 73%.

Quantitative Data Collection

The quantitative component comprised closed-ended questions. This survey aimed to quantify clinical teachers' perspectives on using the MCSL and identify specific barriers affecting its usage. The questions were designed to gauge variables such as:

- **Training Sufficiency:** Whether participants felt they had received adequate training on using the MCSL.

- **Institutional Policies:** Responses regarding the perceived necessity of MCSL in the curriculum.
- **Relevance:** Understanding if participants considered the resources offered by MCSL relevant to their teaching practices.
- **Time Considerations:** Insight into whether participants viewed MCSL as time-consuming in their teaching schedules.
- **Others,** such as staff behaviour and institutional support.

Qualitative Data Collection

In addition to the quantitative survey, the study included open-ended questions embedded within the same instrument. This qualitative component allowed participants to elaborate on their experiences and provide in-depth insights regarding the barriers to MCSL usage. Open-ended responses drew attention to specific hindrances beyond the framework of closed-ended questions.

Methods of Data Analysis

The quantitative results were compiled, and SPSS 21.0 for Windows (SPSS, Inc., Chicago, USA) was used for statistical analysis using frequency tables and charts. The frequency and percentages of the statement items were calculated and presented in tables. The qualitative data collected through open-ended questions in the online questionnaire was analysed using themes to identify, analyse, and report patterns within the data. Themes were chosen as it is a versatile method accommodating various viewpoints and offers a systematic framework to identify patterns in qualitative data.⁹

Braun et al.¹⁴ and Kiger et al.¹⁵ outlined a series of phases that researchers must pass to produce a thematic analysis. Thus, the thematic analysis of the qualitative data was conducted systematically and in a structured manner. Below is a detailed description of how the themes were analysed in the context of the study:

Thematic Analysis of Qualitative Data

1. **Data Familiarisation:** The first step in the analysis process involved familiarisation with the qualitative data collected from the open-ended questions in the survey. Participants' responses regarding their experiences and opinions related to the MacArthur Clinical Skills Laboratory (MCSL) were read multiple times to identify initial patterns and insights about the hindrances to practical MCSL usage.
2. **Initial Coding:** Initial coding was performed on the qualitative data after familiarisation. This involved identifying specific segments of text that

were particularly relevant to the research questions. Each data segment received labels or codes that encapsulated vital ideas expressed by participants. For example, comments regarding insufficient training opportunities were coded as "inadequate training," while mentions of logistical issues were coded as "resource limitations".

3. **Identifying Themes:** Once the initial codes were established, the next step was to group these codes into broader themes. The codes were reviewed, and patterns or commonalities were looked for. Themes such as "**Inadequate Training,**" "**Institutional Policies,**" "**Resource Limitations,**" and "**Staff Behaviour**" were developed from the coded data. Each theme represented a key barrier identified by the participants that hindered the effective use of the MCSL.
4. **Reviewing Themes:** The identified themes were reviewed and refined to ensure they accurately represented the data. This involved checking the relevance and robustness of each theme against the original qualitative data. Refinements were made to clarify theme definitions and eliminate any overlap.
5. **Defining and Naming Themes:** After confirming the themes, each was defined with clear descriptions explaining what it represented in the study's context. For instance, the theme "Inadequate Training" was defined as the lack of relevant training opportunities for clinical teachers, which contributed to their reluctance to use the MCSL effectively.
6. **Integration with Quantitative Findings:** To enrich the analysis, findings from qualitative themes were integrated with the quantitative data obtained from the closed-ended questions in the survey. This comparative approach allowed the researchers to contextualise the quantitative results by providing qualitative narratives that explained respondents' perceptions. For example, if a significant percentage of respondents indicated "inadequate training" as a barrier in quantitative data, qualitative responses elaborating on specific training deficits were used to provide depth and clarity.
7. **Presenting the Findings:** The themes and representative quotes from participants were organised and presented in the results section of the article.
8. **Interpretation and Discussion:** The themes were interpreted using existing literature in the discussion section.

Ethical Approval

The University of Port Harcourt Research Ethical Committee granted ethical approval. Additionally, informed consent was obtained. All respondents were informed of the details of this study prior to their consent, and they checked the box that they understood and agreed to take part in this survey. The research team did not keep respondents' personal details.

Results

Demographics and Cadre of Clinical Teachers

Table 1 presents demographic information regarding the clinical teachers involved in the study, providing insights into their age, gender, teaching experience, and professional cadre.

Age Range

The age distribution among the clinical teachers indicates a predominance of those over 45, with 63.4% (n=57) falling into this category, while 36.6% (n=33) are between 36 and 45 years old.

Gender

The gender distribution shows a slight majority of male clinical teachers at 53.3% (n=48), compared to 46.7% (n=42) who are female.

Years of Teaching Experience

The clinical teachers' experience levels reveal a significant concentration of teachers with intermediate experience. Specifically, 33.3% (n=30) of the teachers have 11 to 15 years of experience, followed closely by those with 16 to 20 years (22.2%, n=20). Notably, only a tiny fraction (11.1%, n=10) has 1 to 5 years of teaching experience, indicating that most staff possess considerable expertise.

Cadre of Clinical Teachers

The distribution among the professional cadre shows that the majority of clinical teachers are senior lecturers (56.7%, n=51), with a smaller proportion being professors (25.6%, n=23) and others (17.8%, n=16).

Table 1: Demographics and Cadre of Clinical Teachers (n=90)

| Parameter | Category | Number of clinical teachers(n) | Percentage (%) |
|------------------|---------------|--------------------------------|----------------|
| Age Range | 36 - 45 years | 33 | 36.6 |
| | Over 45 years | 57 | 63.4 |
| Gender | Male | 48 | 53.3 |
| | Female | 42 | 46.7 |

| Parameter | Category | Number of clinical teachers(n) | Percentage (%) |
|-------------------------------------|------------------|--------------------------------|----------------|
| Years of Teaching Experience | 1 - 5 years | 10 | 11.1 |
| | 6 - 10 years | 15 | 16.7 |
| | 11 - 15 years | 30 | 33.3 |
| | 16 - 20 years | 20 | 22.2 |
| | Over 20 years | 15 | 16.7 |
| Cadre of Clinical Teachers | Professors | 23 | 25.6 |
| | Senior Lecturers | 51 | 56.7 |
| | Others | 16 | 17.8 |

Table 2: Inhibiting factors on the use of the MacArthur Clinical Skills Laboratory for teaching and learning at the University of Port Harcourt (n=90)

| Variable: Inhibiting factors on the use of the Clinical skill lab for teaching and learning (n=255) (Multiple response applicable) | Response Frequency | Percent (%) |
|--|--------------------|-------------|
| Use of the MacArthur Clinical Skills Laboratory is not a college /faculty compulsory requirement for teaching medical students. Its use is optional. | 51 | 56.67 |
| I do not have enough training on how to use the MacArthur Clinical Skills Laboratory | 48 | 53.33 |
| sing the MacArthur Clinical Skills Laboratory is too time-consuming for teaching. | 24 | 26.67 |
| The MacArthur Clinical Skills Laboratory is irrelevant to my departmental requirements for teaching medical students. | 23 | 25.56 |
| I think I should be paid to use the MacArthur Clinical Skills Laboratory for teaching. | 15 | 16.67 |
| MacArthur Clinical Skills Laboratory is only for use by students during some postings. | 15 | 16.67 |
| I do not know where the MacArthur Clinical Skills Laboratory is in the university. | 14 | 15.56 |
| The MacArthur Clinical Skills Laboratory is too difficult to use. | 13 | 14.44 |

| Variable: Inhibiting factors on the use of the Clinical skill lab for teaching and learning (n=255) (Multiple response applicable) | Response Frequency (n-90) | Percent (%) |
|---|------------------------------|-------------|
| There is no copyright patency in the videos I produce, leading to a financial loss on my part. | 13 | 14.44 |
| I do not want to use the MacArthur Clinical Skills Laboratory. | 11 | 12.22 |
| Using the MacArthur Clinical Skills Laboratory for learning is too time-consuming for students. | 9 | 10.00 |
| I see no benefit in using the MacArthur Clinical Skills Laboratory to teach clinical students. | 8 | 8.89 |
| The MacArthur Clinical Skills Laboratory has always been locked all the time I have been there. | 8 | 8.89 |
| I do not want to share the knowledge I have on the internet. | 3 | 3.33 |

Percentages exceeded 100% due to multiple responses.

Table 3. Other open-ended factors inhibiting using the MacArthur Clinical Skills Laboratory for teaching and learning

| |
|---|
| Lack of training on the use of the laboratory. |
| The unwillingness of the clinical teachers to use the laboratory. |
| Lack of equipment needed for the course. |
| There is no power supply/ no power to the laboratory. |
| It's not user-friendly. |
| Lack of knowledge. |
| Too time-consuming. |
| The unfriendliness of the staff in the laboratory. |
| The willingness to be trained on its use and training is not forthcoming. |

Analysis of qualitative and quantitative Data.

The thematic analysis process was used to analyse the quantitative data in Table 2 and the qualitative data in Table 3, revealing the critical concepts presented below in Table 4. This table presents a thematic analysis of clinical teachers' hindrances' to utilising the MCSL, integrating qualitative insights and quantitative data. Each theme outlines critical challenges, supported by participant representative quotes and relevant statistical findings.



Table 4. Hindrances to Effective MCSL Use: Themes, Definitions, and Quotes

| Theme | Definition | Qualitative data | Quantitative data |
|--|--|--|--|
| 1. Inadequate Training | Clinical teachers lack sufficient training and knowledge on how to use the MCSL and its technologies effectively. This hinders their confidence and willingness to integrate it into their teaching. | "The willingness to be trained on its use and training which is not forthcoming." "Lack of training on the use of the laboratory." "Lack of knowledge." | The responses also reflected this, as 53.3% of teachers felt they had not received sufficient training. 14% The MacArthur Clinical Skills Laboratory is too difficult to use" |
| 2. Lack of Institutional Policies and Requirements | The MCSL's use is not mandatory, leading to a perception of irrelevance and lack of incentive for clinical teachers to utilise it. | "Use of the MacArthur Clinical Skills Laboratory is not compulsory for college /faculty teaching medical students. Its use is optional." , "The unwillingness of the clinical teachers to use the laboratory." | 56.67% of participants mentioned that the MCSL was not a faculty requirement, and the statement showed that its use was optional. This optional status, combined with the belief that the laboratory's use did not align with departmental needs, further reduced its use |
| 3. Perceived Irrelevance | Clinical teachers perceive the MCSL as irrelevant to their departmental requirements or too time-consuming to integrate into their teaching practices. | "Using the MacArthur Clinical Skills Laboratory is too time-consuming for teaching." "The MacArthur Clinical Skills Laboratory is irrelevant to my departmental requirements for teaching medical students." | 26.67% of teachers considered the MCSL too time-consuming, and 25.56% considered it irrelevant to their departmental requirements. These beliefs significantly hinder the adoption of MCSL as a regular teaching tool. |
| 4. Resource and Infrastructure Issues | Inadequate power supply, lack of necessary equipment, and maintenance issues hinder the MCSL's functionality and reliability. | "Lack of equipment needed for the course.", "There is no power supply/ no power to the laboratory." | Inadequate power supply and a lack of necessary equipment were reported as significant obstacles. These limitations question the reliability and effectiveness of the MCSL in enhancing clinical teaching. |
| 5. Staff Behaviour, Support, and Incentives | Unfriendly staff, a lack of support from MCSL personnel, and the absence of incentives for using the laboratory discourage clinical teachers from using it. | "The unfriendliness of the staff in the laboratory." "I think I should be paid to use the MacArthur Clinical Skills Laboratory for teaching." I see no benefit in using the MacArthur Clinical Skills Laboratory to teach clinical students. | Unfriendly staff and insufficient engagement from the staff were identified as deterrents. This was seen in the open statement, "Unfriendliness of the staff in the laboratory." The lack of a supportive environment within the MCSL discourages teachers from using it. Introducing incentives, such as rewards and recognition for integrating the MCSL into teaching practices, was suggested as a potential solution. This underscores the need for institutional support and reward systems to enhance MCSL adoption |



Discussion

The MacArthur Clinical Skills Laboratory (MCSL) at the University of Port Harcourt Medical School represents a significant investment in innovative educational tools to enhance the teaching and learning experience using videos, cameras, computers, and the internet^{7,8}. However, the optimal utilisation of MCSL remains unachieved⁷, with several inhibiting factors emerging prominently. This discussion delineates these factors based on key themes identified from the study.

The sociodemographic data of the clinical teachers revealed that the majority had over six years of experience as clinical teachers. A high percentage were experienced teachers, as over 80% were above the senior lecturer level. All clinical teachers were present when the MCSL was set up and put into use, with 67% being employed as clinical teachers at the initial setting up of the skills laboratory. Thus, this study's clinical teachers' perceptions were based on their experiences.

A pervasive lack of adequate training and knowledge among clinical teachers emerged as a primary barrier to MCSL use in this study. The study revealed that 56.67% of teachers felt they had not received sufficient training on using the MCSL, which resulted in difficulties and a lack of confidence in utilising this facility. This is consistent with the literature. Alkan et al.¹⁶ observed that training significantly enhances cognitive attitudes towards technology and its application in teaching. The absence of adequate training might indicate that clinical teachers were not involved in the initial setup of the MCSL, echoing Rogers¹⁷ assertion that educators must recognise the benefits of technology to adopt it fully. This gap in understanding the benefits of the MCSL to pedagogy by the clinical teachers contributes to its underuse, as many teachers did not even know the laboratory's location or appreciate its relevance to their teaching. Furthermore, the lack of a consistent and ongoing training program for clinical teachers and the need for up-to-date instructions on using the clinical skills laboratory further complicates the situation.

Enhancing staff engagement through continuous professional development is crucial in motivating educators to utilise educational resources effectively¹⁸. Guskey et al.¹⁹ emphasised that sustained professional development improves educators' skills and positively influences their beliefs and attitudes toward teaching practices. This improvement can significantly enhance their willingness to integrate tools like the MacArthur Clinical Skills Laboratory (MCSL) into their teaching. The steady reduction in skill proficiency over time underscores the importance of continual training²⁰. It is

crucial to consider the addition of new staff with a structured training regimen to bring them up to par with their colleagues, as a percentage of clinical teachers were employed more than six years after the laboratory was set up. This was noted in research by Kyndt et al.²¹, who postulated that new university teachers, often lacking teaching experience and training, are particularly vulnerable to stress and low motivation, impacting their teaching performance. This leads to difficulties using the MCSL and a lack of confidence, which translates into the belief that it is not beneficial for their teaching, thus discouraging its use. Studies in Nigeria indicate the effectiveness of professional development and collaborative practices in enhancing educational outcomes. For instance, Akindutire et al.²² found that professional development programs significantly improved teachers' effectiveness and technology integration in classrooms, including practical settings such as clinical skills laboratories.

Lack of Institutional Policies and Requirements

The optional nature of MCSL use, highlighted by 56.67% of participants indicating it is not a faculty requirement, underscores an institutional policy gap. Darley et al.²³ noted that a clear mandate or university policy is essential for successfully implementing new technology in academic settings. Such policies provide direction, ensure resource allocation, and establish utilisation guidelines, crucial for integrating the MCSL into teaching practices. Inefficiently organised centres result in less-than-optimal utilisation.²⁴ Without institutional mandates, the perception that the MCSL is irrelevant or only for occasional use persists, reducing its perceived value.

Perceived irrelevance.

The findings of this study are consistent with the "Technology Acceptance Model", which suggests that individuals are more likely to adopt new technology if they perceive it as valuable and easy to use.²⁵ 25.56% of teachers considered the MCSL irrelevant to their departmental requirements and 26.67% found it too time-consuming. These perceptions are significant hindrances to the adoption of the MCSL. The lack of departmental understanding of the potential benefits of the laboratory suggests that more effective communication and demonstration of its applicability to various courses are needed. This also supports the study that resistance to using the clinical skills laboratory, according to Zimmerman¹⁸, can be due to cognitive resistance and non-integration or incorporation into departmental curricula. Re-aligning departmental teaching strategies to include the MCSL could highlight its relevance and integrate its use into the curriculum,

making it a compulsory component of student training. This was also noted by Aggarwal et al.²⁶, who documented that a skill centre not incorporated into the curriculum would not be optimally used.

Resource and Infrastructure Issues.

The Medical Clinical Skills Laboratory (MCSL) faces significant challenges in its implementation, primarily due to inadequate power supply and a lack of essential equipment. These infrastructural issues raise concerns about the facility's reliability and effectiveness. Ensuring a consistent power source and equipping the laboratory with modern tools are crucial to enhance its utility. However, it is essential to acknowledge that these limitations are not unique to this setting, as similar challenges are observed internationally. The high equipment and maintenance expenses often hinder the sustained use of clinical skills laboratories, as highlighted in a study by Madlala et al.²⁷ on medical educators' use of the MCSL in South Africa. The study concluded that insufficient funding and inadequate infrastructure were the primary obstacles to the laboratory's effective utilisation.

Staff Behavior, Support as well as need for Incentives and Rewards

Insufficient engagement from personnel managing the MCSL and unfriendly staff were identified as deterrents to using the skills laboratory. While unfriendly staff attitudes have been observed in Nigeria, they are not unique. Various studies indicate that negative staff behaviours can be prevalent in educational institutions worldwide, mainly where institutional support and faculty development are inadequate. For example, Watson²⁸ noted that similar issues arose in higher education settings in the UK, where inadequate support systems led to strained faculty interactions. The findings regarding unfriendly staff and barriers to technology use are not limited to the MacArthur Clinical Skills Laboratory (MCSL) but can be seen in various departments within educational institutions.

Several empirical factors contribute to unfriendly staff behaviours in educational settings, including high workload and job stress, which can lead to negative interactions with colleagues and students. Akinmayowa et al.²² found that increased stress among academic staff could create a less supportive environment for students. An unsupportive institutional culture may perpetuate unfriendly attitudes, discouraging staff from engaging constructively with students and peers²³. Insufficient training and development opportunities for staff can lead to frustration and a lack of confidence in their roles,

resulting in unfriendly behaviour towards students and peers.¹⁶ Furthermore, Henderson et al.²⁹ conducted a meta-analysis that highlighted the importance of faculty support and enthusiasm in fostering an environment conducive to the utilisation of educational technologies. The analysis concluded that negative staff attitudes often led to diminished student interest and engagement with new pedagogical tools.

A supportive and proactive staff can significantly influence the acceptance and use of new technology. Enhancing staff engagement through professional development initiatives and fostering a collaborative environment could motivate teachers to utilise the MCSL more effectively. Addressing dysfunctional school cultures and poor leadership is crucial for the success of professional development initiatives. Recommendations include developing a policy framework for teacher development and encouraging regular participation in professional development activities.^{30,31} This is especially important considering research by Shien et al.,³² who found that professional learning communities are essential for enhancing faculty development initiatives in higher education settings.

Additionally, introducing incentives and rewards for integrating the MCSL into teaching practices was suggested as a potential solution to increase its use. A study by Kumar et al.,³³ showed that incentives can significantly influence the adoption of new technologies. Rewards could include monetary compensation, professional recognition, or opportunities for career advancement, thus addressing concerns such as financial loss from producing instructional videos without copyright patents. Such incentives could motivate teachers to invest the additional time and effort required to incorporate the MCSL into their teaching methods.

The “Japa syndrome,” characterized by the emigration of numerous medical professionals to developed countries, has led to staff shortages, increased workload, and elevated stress levels among the remaining faculty members.³⁴ This phenomenon detracts from the quality of teaching and limits the ability to integrate new tools like the MCSL effectively³⁵. Managing increased student intake and overcrowded classes exacerbates these challenges. Addressing manpower shortages through recruitment and retention strategies, along with equitable workload distribution, can mitigate these impacts, enabling teachers to engage with the MCSL more effectively.³⁵ However, the potential for increased and effective use of the MacArthur Clinical Skills Laboratory (MCSL) in this condition is significant, especially if the MCSL is further developed to

incorporate advanced technologies such as artificial intelligence (AI) and robotic models³⁶. Integrating these technologies could facilitate the simultaneous training of more students, thereby optimising instructional efficacy and allowing lecturers to focus on assessing students' skills. Waqar et al.,³⁶ argue that AI-enhanced tools can offer personalised learning experiences and immediate feedback, which is essential for skill acquisition in medical education. Furthermore, Suh et al.,³⁷ illustrate that robotic simulators can provide high-fidelity training environments, allowing for repeated practice without resource limitations, which is particularly advantageous in overcrowded educational settings.

Other hindrances noted from the study show that faculty attitudes towards new technology and support services significantly influence the adoption rate of innovative teaching modalities and the overall academic environment. For instance, Ugboma et al.,³⁸ in their study on attitudes of clinical teachers towards innovative technologies, found that clinical educators' attitudes towards technology play a crucial role in determining their willingness to integrate these tools into their teaching, not just in clinical skills laboratories but across educational platforms in medical schools. This is often noted when adopting new technologies.¹⁶ Changing this mindset requires institutional support and a shift towards a culture of innovation, as noted by Rogers.¹

Limitations

This study's findings are limited by its cross-sectional, descriptive design, which only examines correlations at a single point in time and cannot establish causal relationships. Future research should consider longitudinal designs and in-depth qualitative methods, such as interviews, to gain a more comprehensive understanding of the factors influencing MCSL use over time.

Purposive sampling offers valuable qualitative insights but has limitations, including potential selection bias. Non-random selection may result in a sample not representing the broader population of clinical teachers, leading to overgeneralisation. Predominantly including experienced educators may exclude perspectives from newer faculty with different challenges.

The reliance on self-reported data collected via questionnaires introduces potential biases such as recall bias and social desirability bias, despite efforts to mitigate these through anonymity³⁹. These biases may affect the validity of the findings, reflecting perceptions more than objective reality.

Moreover, the study's focus on the University of Port Harcourt Medical School limits the generalizability of the findings. Different medical schools may have varying resources, policies, and environmental factors that could influence the utilisation of clinical skills laboratories. Future studies should adopt a multi-institutional approach to enhance external validity and capture a broader range of influencing factors.

Implications of the findings

Several key recommendations are proposed to enhance the utilisation and effectiveness of the MacArthur Clinical Skills Laboratory (MCSL) at the University of Port Harcourt Medical School. Firstly, implementing comprehensive training programs is essential. These programs should be designed to educate clinical instructors on the innovative technologies within the MCSL, thereby promoting a deeper understanding and better utilisation of these resources. Additionally, the University management should enact and enforce policies that mandate the use of the MCSL by all adequately trained clinical teachers. This will ensure the consistent utilisation of the technological equipment provided within the laboratory.

Resource allocation is another critical aspect. Ensuring the MCSL is well-equipped with the necessary tools and supported by a reliable power supply is crucial for its optimal functioning and effectiveness in training programs. Furthermore, introducing incentives and rewards can significantly motivate teachers. Developing an incentive structure to recognize and reward those who actively integrate the MCSL into their teaching practices could include monetary awards, professional recognition, or opportunities for career advancement.

Addressing workload management is also vital. Efforts should be made to alleviate staff shortages and workload issues, ensuring faculty members are not overburdened. This allows them to engage with new teaching tools more effectively, such as the MCSL. Finally, curriculum integration is of paramount importance. A thorough review and revision of the curriculum to seamlessly incorporate the use of the MCSL will ensure it becomes an integral part of student training across all relevant departments. This integration will enhance the overall educational experience and skill development for both medical students and clinical teachers.

Conclusion

The underutilization of the MacArthur Clinical Skills Laboratory at the University of Port Harcourt Medical School is primarily driven by the lack of training and

knowledge on its use, compounded by the absence of institutional mandates making its use compulsory. Additionally, perceptions of irrelevance, resource limitations, staff attitudes, lack of incentives, and increased workload due to staff shortages contribute to these challenges.

To address these issues, the University management must implement comprehensive training programs, such as "train the teacher" initiatives and establish clear policies mandating the use of the MCSL in the curriculum at all levels and departments. Providing adequate resources, ensuring a stable power supply, and enhancing staff engagement are also crucial. Additionally, introducing incentive structures to reward teachers for utilising the MCSL can motivate adoption and integration into teaching practices. Finally, measures to address staff shortages and distribute workload more effectively are essential to create an environment conducive to the optimal use of the MCSL.

Declarations

Authors' Contribution: Concept/Design: (UEW, EI), Definition of Intellectual content (UEW, EI), Literature search, data acquisition (UEW), Manuscript preparation, editing and review (UEW, EI).

Conflict of interest: The authors declare that there is no conflict of interest.

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