


Assessing the presence of sustainability education in the curriculum of medical students and surgical trainees in Africa: A cross-sectional study

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Abstract

Background and Aims: Integrating sustainability principles into medical and surgical curricula raises awareness and empowers future healthcare professionals to adopt sustainable practices, reducing the environmental impact of surgical care. This study aims to assess the presence of sustainability education in African medical schools and surgical residency curricula to inform policymakers and educators in African healthcare systems.

Methods: This cross-sectional study was undertaken through an online survey among medical students and surgical trainees in African countries to describe the presence of sustainability education in surgical training programs and medical curricula across Africa. The results of this survey were reported in accordance with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES).

Results: A total of 141 participants from 17 countries responded to our e-survey, primarily consisting of undergraduate medical students (92.2%, $n = 130$). Only 9.2% of participants reported familiarity with the concept of sustainability in surgical care, and 60.3% stated that they had yet to receive any education on sustainability. Waste management was the most commonly taught sustainability topic among those who confirmed the presence of sustainability education in their curricula. Additionally, 76% of participants reported not participating in sustainability-related projects during their training.

Conclusion: This study highlights the urgent need for comprehensive integration of sustainability principles in surgical care and identifies barriers, such as a lack of awareness and resources to this integration. Addressing these gaps and implementing the suggested approaches can lead to more environmentally conscious and socially responsible surgical systems in Africa.

KEYWORDS

Africa, curriculum development, medical students, surgical trainees, sustainability education

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1 | INTRODUCTION

Surgical care significantly contributes to climate change and global warming through the carbon emissions generated by energy-intensive surgical equipment, waste generation, and the production and disposal of single-use surgical supplies.¹ Despite its high burden of surgical cases, Africa is the continent with the least surgical workforce.² Moreover, there is a need to scale up the volume and quality of surgical care delivered in Africa.^{3,4}

Sustainability in surgical care encompasses environmental stewardship, efficient resource management, ethical decision-making, and community engagement.⁵ Integrating sustainability principles into the curriculum of medical students and surgical trainees is crucial because it raises awareness about the environmental impact of surgical care and encourages adopting sustainable practices.⁶ By equipping future healthcare professionals with knowledge and skills related to sustainable healthcare, they can make informed decisions and take actions to minimize carbon emissions, reduce waste, and promote environmentally friendly alternatives in surgical procedures.⁷ This education empowers them to advocate for sustainable surgical practices, ultimately contributing to the global efforts to mitigate climate change and minimize the healthcare sector's ecological footprint.

Embracing sustainable practices can help Africa address the dual challenges of improving access to quality surgical care while minimizing their ecological footprint.¹ This study assessed the presence of sustainability education in African medical schools and surgical residency curricula to inform on the availability of sustainability education in medical and surgical curricula to help explore opportunities to enhance surgical education to effectively address the unique challenges faced in African healthcare systems. Our objective is to inform policymakers, educators, and healthcare institutions about the state of sustainability education in current medical students and surgical trainees' curricula and explore how to improve the presence of sustainability education in the existing curricula.

2 | METHODS

2.1 | Study design and participants

From May 7 to June 7, 2023, we conducted a cross-sectional study using an online survey distributed among medical students and surgical trainees currently enrolled in training programs in African countries. This ensured representation from diverse geographical locations by recruiting participants from various African institutions.

2.1.1 | Inclusion criteria

1. Medical students or surgical trainees currently enrolled in training programs in African countries.

2. Willingness to participate in the study.
3. Ability to complete the online survey in English or French.

2.1.2 | Exclusion criteria

There were no specific exclusion criteria for this study. All participants who met the inclusion criteria were eligible to participate in our study.

2.1.3 | Sampling method

Convenience sampling was employed for participant selection in this cross-sectional study. All medical students and surgical trainees currently enrolled in training programs in African countries were eligible for inclusion in the study. Due to the unavailability of comprehensive data on the total number of medical schools and students in Africa, it was not feasible to calculate a precise sample size. Therefore, all respondents who accessed the online survey and met the inclusion criteria were included in the study. It is worth noting that some recent estimates published after our data collection period for this study estimated the number of private and public medical schools in Africa to be 444.⁸

2.2 | Questionnaire development and distribution

To collect data, a comprehensive questionnaire was developed, incorporating multiple-choice questions (MCQs), Likert scale questions, and open-ended questions. The questionnaire was designed to assess participants' familiarity with sustainability concepts, the presence of sustainability in their curriculum, the education they received, their participation in sustainability-related projects, and their perceptions about the importance of sustainability education. The questionnaire was carefully crafted based on a thorough review of relevant literature and validated scales, ensuring its validity and reliability. It was made available in both English and French to cater to a broader participant base.

To ensure the questionnaire's effectiveness, pilot testing was conducted before distribution. This step allowed for any potential issues with clarity and validity to be identified and addressed. Participants were then provided with a convenient questionnaire link, distributed through various channels such as email, social media platforms, and online forums. To maximize participation rates, reminders were sent to encourage respondents to complete the survey within the designated timeframe.

The questionnaire encompasses a wide range of topics related to sustainability education in healthcare. It covers participants' self-identification, age, country of origin, familiarity with sustainability in healthcare, the importance of sustainability education for medical and surgical students, exposure to sustainability education during their training, adequacy of sustainability education in their

curriculum, enrollment status, and the institution they are affiliated with. Additionally, the questionnaire explores the duration of participants' programs, the coverage of sustainability-related topics in their curriculum, their experience with theoretical lectures and practical training on sustainability, their involvement in sustainability projects or initiatives, suggestions for better-incorporating sustainability education, barriers to its implementation, observed sustainable practices, and the perceived importance of sustainability education for healthcare professionals.

2.3 | Data collection and analysis

Data collection involved participants completing the online questionnaire (Supporting Information S1: Appendix 1). Before the survey commencement, participants were briefed on the study's objectives and granted informed consent. Response acquisition was conducted anonymously, with data securely stored in a password-protected format to safeguard confidentiality. Each participant was assigned a unique identification number, while the collection of email addresses served to prevent duplicate submissions by individuals.

The results of this survey were reported in accordance with the Checklist for Reporting Results of Internet E-Surveys (Supporting Information S1: Appendix 2), a recognized set of guidelines for reporting results from Internet-based surveys.⁹ Descriptive statistics, such as frequencies and percentages, were used to summarize participants' characteristics, familiarity with sustainability, presence of sustainability in the curriculum, education received, participation in sustainability-related projects, and their perceptions. Using R, a programming language and software environment that is widely used for statistical computing and data analysis.¹⁰ Bivariate analyses were done to investigate the potential relationship between student level, the presence of sustainability education in the curriculum, and participants' perceptions of the importance of sustainability education. The statistical significance of the relationships was determined based on the calculated *p*-values, using an α level of 0.05 ($p < 0.05$).

2.4 | Ethics

Participation was voluntary, and no financial incentivization was involved. The respondents' consent was sought at the beginning of the survey, and they were permitted to discontinue or decline to answer a question whenever they chose. The survey data were stored in a password-protected account, and access to the data was limited to the principal investigator (YZ). The National Health Service (NHS) Health Research Authority decision tool (available at: <http://www.hra-decisiontools.org.uk/research/>) was applied to establish whether or not specific research ethics approval was required for the study. This tool confirmed that our study did not require specific research ethics approval.

3 | RESULTS

3.1 | Participants' characteristics

One hundred and forty-one participants from 17 countries responded to the e-survey, 86 (61%) participants were male, and 130 (92.2%) were undergraduate medical students. With 43 (30.5%) participants, Kenya was the most represented country, followed by Cameroon ($n = 28$, 19.9%) (Table 1). In our study, undergraduate medical students were individuals enrolled in a bachelor's degree program in medicine or a related field at a university or college. Conversely, participants enrolled in surgical training programs were categorized as postgraduates for our study's purposes.

The most represented age group was 20 to 25, with 90 (64%) participants (Figure 1).

3.2 | Sustainability in medical/surgical curricula

A total of 107 participants were familiar with sustainability in surgical care, but only 13 (9.2%) were very familiar with sustainability in surgical care (Figure 2).

Eighty-five (60.3%) participants reported not receiving any education on Sustainability in surgical care during their training, and 87 (61.7%) participants considered inadequate the presence of Sustainability in their training curriculum (Figure 2).

Among the 33 (23.4%) participants who confirmed the presence of sustainability in their curriculum, most were trained in Kenya ($n = 11$), Cameroon ($n = 5$), and Botswana ($n = 4$) (Figure 3).

Among participants who reported receiving education on sustainability in their curriculum ($n = 33$), waste management was the mostly taught Sustainability topic, followed by waste conservation (Figure 4).

Regarding the participation in sustainability-related projects during their training program, 107 (76%) participants reported not participating in any sustainability-related projects (Figure 5).

3.3 | Perception on the importance of sustainability education for medical/surgical trainees

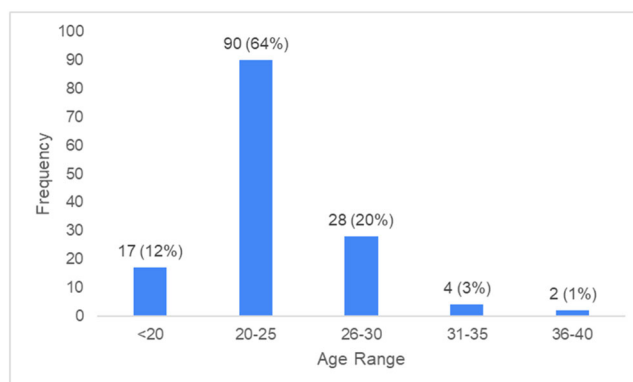
Most ($n = 113$, 80.1%) participants believe it is important for medical students and surgical trainees to receive education on sustainability in surgical care (Figure 6).

3.4 | Incorporating sustainability education in medical/surgical curricula

Most ($n = 107$, 75.9%) participants believe the lack of awareness on the importance of sustainability education is the major barrier to incorporating sustainability education in medical/surgical curricula (Table 2).

TABLE 1 Sociodemographic characteristics (n = 141).

Characteristic	Frequency (Percentage)
Gender	
Male	86 (61)
Female	54 (38.3)
Nonbinary	1 (0.7)
Country	
Benin	4 (2.8)
Botswana	5 (3.5)
Cameroon	28 (19.9)
Cote d'Ivoire	1 (0.7)
Democratic Republic of Congo	2 (1.4)
Egypt	2 (1.4)
Ethiopia	12 (8.5)
Ghana	3 (2.2)
Kenya	43 (30.5)
Namibia	2 (1.4)
Nigeria	9 (6.4)
Rwanda	1 (0.7)
Somalia	3 (2.2)
South Africa	8 (5.7)
Sudan	2 (1.4)
Uganda	12 (8.5)
Zambia	4 (2.8)
Level of education	
Undergraduate	130 (92.2)
Year 1	7 (5)
Year 2	8 (5.7)
Year 3	11 (7.8)
Year 4	22 (15.6)
Year 5	29 (20.6)
Year 6	30 (21.3)
Year 7	16 (11.4)
>Year 7	3 (2.1)
Postgraduate	11 (7.8)
Year 1	2 (1.4)
Year 3	1 (0.7)
Year 4	5 (3.5)
Year 5	2 (1.4)
Year 7	1 (0.7)

**FIGURE 1** Participants' distribution according to age range (n = 141).

Four main approaches emerged as the principal means by which sustainability education could be incorporated into medical/surgical curricula. These are: (i) developing research and interdisciplinary collaboration on sustainability, (ii) creating partnerships with health-care facilities practicing sustainability in surgical care, (iii) providing hands-on opportunities to practice sustainability in surgical care, and (iv) incorporating sustainability into an existing course in medical/surgical curricula (Table 3).

3.5 | Bivariate analysis

Thirty-two of the 33 participants who reported the presence of sustainability education in their curriculum were undergraduate students. Pearson's chi-squared test, with Yates' continuity correction, resulted in a value of 0.624 with 1 degree of freedom. The corresponding *p*-value was determined to be 0.426 ($p > 0.05$). No significant association was found between participants' education level and sustainability education's presence in their curriculum.

Also, Pearson's chi-squared test, with Yates' continuity correction, was conducted to examine the relationship between the presence of sustainability education in the curriculum and the perception of the importance of sustainability education. The significance of *p* was fixed at 0.05. The test statistic was calculated to be 0.635 with 1 degree of freedom. The resulting *p*-value was 0.434 ($p > 0.05$). Thus, no significant association was found between the presence of sustainability education in the curriculum and participants' perceptions of the importance of sustainability education based on our data.

4 | DISCUSSION

This study surveyed participants from multiple African countries, primarily undergraduate medical students, and identified a lack of sustainability education in participants' curricula. Only a small

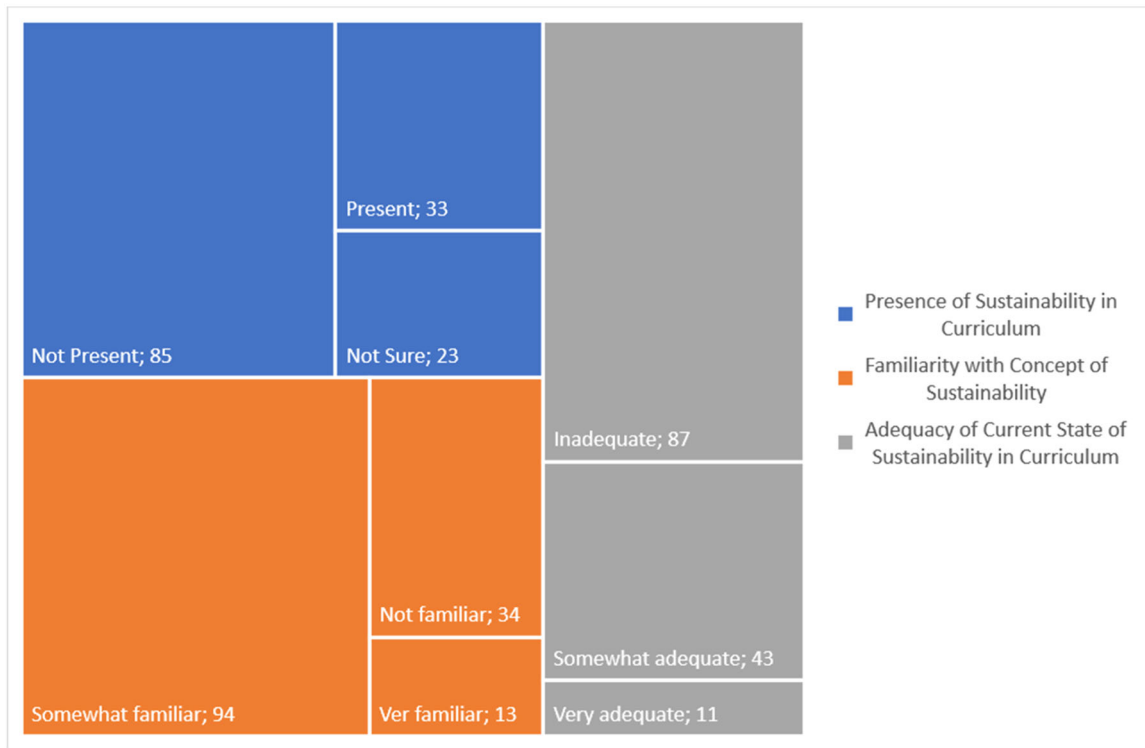
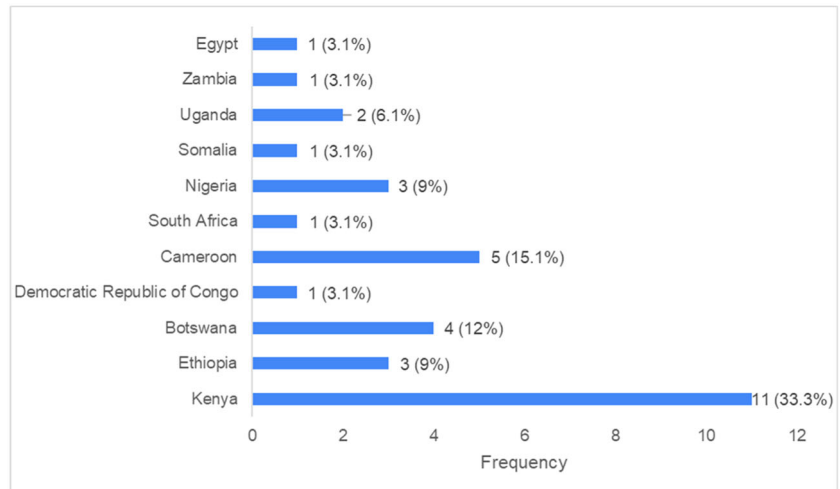


FIGURE 2 Treemap of the presence of sustainability in participants' medical/surgical training curriculum, participants' familiarity with the concept of sustainability in surgical care delivery, and the adequacy of sustainability education in participants' current curriculum (n = 141).

FIGURE 3 Location of participants reporting the presence of sustainability in their curriculum (n = 33).



percentage of participants were familiar with sustainability, and the majority reported no education on sustainability during their training. Barriers to incorporating sustainability education included awareness, time constraints, resource limitations, and faculty disinterest. Proposed solutions included research collaboration, partnerships with sustainable healthcare facilities, and integration of sustainability into existing courses. The results of the chi-square tests of independence revealed no significant associations between student level and the presence of sustainability education in the curriculum,

as well as no association between the latter and participants' perceptions of the importance of sustainability education.

A notable finding is the participants' limited familiarity with sustainability in surgical care. Only 9.2% reported a high level of familiarity with sustainability concepts in the context of surgical care. This indicates a need for more awareness and understanding of the relevance and implications of sustainability for surgical practices among trainees. It is essential to bridge this knowledge gap through targeted education and training initiatives emphasizing the

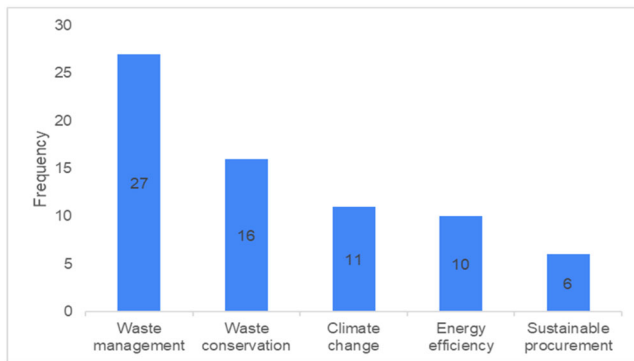


FIGURE 4 Sustainability topic taught to participants who received education on Sustainability in surgical care ($n = 33$).

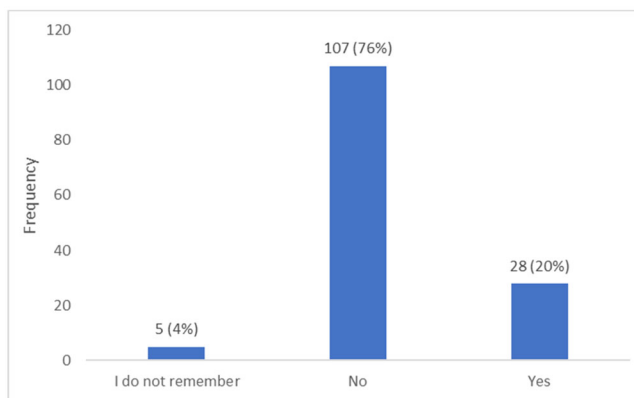


FIGURE 5 Participants' participation in sustainability-related projects in their medical school.

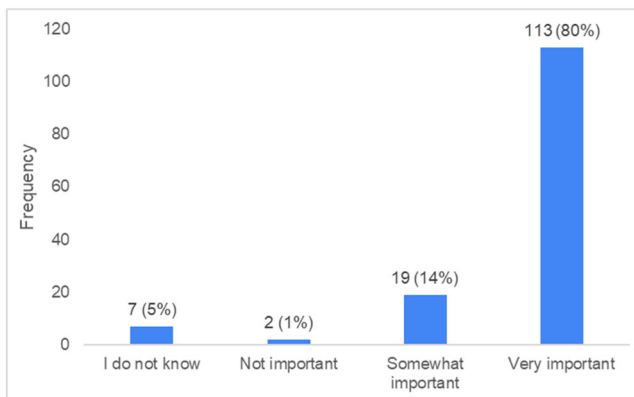


FIGURE 6 Participants' perception of the importance of educating medical/surgical trainees on Sustainability in surgical care ($n = 141$).

environmental, social, and economic dimensions of sustainability in surgical care.¹¹

Addressing familiarity with sustainability in surgical care among the undergraduate population is pertinent for several reasons. First,

TABLE 2 Barriers to the incorporation of education on sustainability into medical/surgical curricula ($n = 141$).

Barriers	Frequency (Percentage)
Lack of awareness on the importance of sustainability education	107 (75.9)
Lack of interest from faculty	59 (41.8)
Lack of resources	53 (37.6)
Lack of time in the curriculum	50 (35.5)

TABLE 3 Approaches to better incorporate sustainability education in medical/surgical curricula ($n = 141$).

Approach	Frequency (Percentage)
Research and interdisciplinary collaboration on Sustainability	82 (58.2)
Partnership with healthcare facilities practicing sustainability	81 (57.4)
Hands-on opportunity to practice sustainability in healthcare	81 (57.4)
Incorporate sustainability into existing courses	79 (56)
Case studies on sustainability in healthcare	57 (40.4)
Separate course or module on sustainability	2 (36.9)

even if most undergraduates may not become surgeons, they are still future healthcare professionals who will contribute to various aspects of patient care and healthcare delivery. Thus, raising awareness and understanding of sustainability principles early in their education can instill a mindset of environmental responsibility and social consciousness that can be applied across all healthcare roles. Additionally, sustainability in healthcare is a multidisciplinary issue that extends beyond surgical practice alone, encompassing aspects such as waste management, resource utilization, and ethical considerations, which are relevant to all healthcare disciplines. By educating undergraduates about sustainability in surgical care, we can foster a broader understanding of sustainability within the healthcare sector and promote interdisciplinary collaboration towards more sustainable healthcare practices overall.

Another noteworthy finding is the low participation rate (24%) in sustainability-related projects during medical/surgical training. This indicates a missed opportunity for hands-on learning and practical application of sustainability principles within surgical care settings. Active engagement of students in sustainability projects can foster the development of crucial skills, knowledge, and attitudes necessary for advocating sustainable surgical practices.¹²

Developing research and interdisciplinary collaboration, creating partnerships with sustainable healthcare facilities, providing

hands-on opportunities, and integrating sustainability into existing courses¹³⁻¹⁵ could help increase trainees' familiarity with sustainability in surgical care and improve their hands-on experiences to cultivate a culture of sustainability in surgical care.

The participants' overwhelming perception of the importance of sustainability education (80.1%) is similar to what Gupta et al.¹³ observed in the United Kingdom. Medical/surgical trainees recognize the significance of sustainability in improving surgical outcomes, minimizing waste, and addressing environmental challenges,¹⁴ and this underscores the demand for change within the surgical community.

Additionally, our study uncovered a concerning reality: most participants (60.3%) reported needing more sustainability education in their medical/surgical training. Without a solid foundation of sustainability education, these future practitioners may lack the necessary knowledge and skills to address the environmental and societal challenges that impact surgical care. Therefore, sustainability education is necessary to ensure future surgical professionals' capacity to contribute to sustainable healthcare systems.

Furthermore, the participant's perception of the need for sustainability integration in their medical/surgical training curricula (61.7%) reveals a significant shortcoming in educational institutions' commitment to sustainability in surgical care. This deficiency perpetuates a cycle of inaction, hindering progress toward sustainable surgical practices.

To drive meaningful change, curricula must be revised to prioritize sustainability education and ensure its comprehensive integration at all levels of medical/surgical training.¹⁵ Fellowships and other adjuvant training programs could be developed to bridge this gap.¹⁶ Educational institutions, governmental and non-governmental organizations, and policymakers should efficiently incorporate sustainability education as an integral component of medical/surgical training.¹⁵

Our findings present some barriers to integrating sustainability education into medical and surgical curricula, including limitations in time, resources, faculty interest, and awareness. Various factors can justify these barriers. The constrained curriculum time may be attributed to the extensive content already required for medical and surgical trainees, leaving limited room for additional subjects like sustainability.¹¹ Inadequate resources and faculty expertise¹⁷ may arise from the need for more adaptation of African medical curricula to address contemporary needs,¹⁸ including sustainability in surgical care, which is a relatively new and evolving field even in more developed regions like Europe. The faculty's lack of interest may be rooted in insufficient awareness or understanding of the importance of sustainability in healthcare.¹³ Overcoming these barriers necessitates raising awareness and advocating for the value of sustainability in surgical care, involving initiatives led by students/trainees and incorporating sustainability into National Surgical, Obstetric, and Anesthesia Plans (NSOAPs). NSOAPs can enhance faculty awareness but also promote stakeholder engagement.

Among participants who reported receiving sustainability education, most were undergraduate students, suggesting a potential

concentration of sustainability education at that level; nonetheless, this relationship did not reach statistical significance. This prompts reflection on the distribution and consistency of sustainability education throughout medical training, particularly in advanced programs like surgical residencies. While it hints at an early integration of sustainability principles into the curriculum, further investigation is necessary to understand the nuances and effectiveness of sustainability education at different stages of medical training. Such exploration is crucial for identifying gaps and informing strategies to comprehensively integrate sustainability principles across medical and surgical curricula, ensuring that future healthcare professionals are equipped to address environmental and social challenges within healthcare systems. Additionally, no significant association was found between the presence of sustainability education in the curriculum and participants' perception of its importance. These findings highlight the presence of complex dynamics that influence individuals' attitudes toward sustainability education and underscore the need for further research to understand these factors and explore additional variables that may impact perceptions and attitudes toward sustainability education.

The perception of sustainable priorities among healthcare workers is essential, particularly in the operating room, as it often falls short. While the study highlights trends in sustainability education within medical training, understanding how these principles are perceived and acted upon in real-world healthcare settings is equally important. Inadequate awareness or understanding of sustainable practices among healthcare workers, especially in critical areas like the operating room, can impede efforts to implement sustainable initiatives effectively. Therefore, it is crucial to delve into healthcare workers' perceptions of sustainable priorities in clinical settings, identifying barriers and opportunities for improvement. By addressing these perceptions and integrating them into education and training initiatives, healthcare systems can better equip their workforce to prioritize and implement sustainable practices in their daily clinical activities, ultimately contributing to more environmentally conscious and socially responsible healthcare delivery.

While our study provides valuable insights, it is essential to acknowledge the limitations of the cross-sectional design, which restricts our ability to establish causality and assess the long-term effects of sustainability education. Future research should utilize longitudinal studies to track changes over time and gain a more comprehensive understanding of the impact of sustainability education. Moreover, the limited representation of diverse African countries in our sample highlights the need for more extensive and diverse samples to enhance the generalizability of findings. Subsequent studies should explore regional variations within Africa and propose context-specific strategies for integrating sustainability into surgical care curricula. This approach will facilitate the evaluation of different approaches and provide comprehensive recommendations for integrating sustainability principles into medical and surgical training programs across the continent.

Another limitation of our study is the limited participation of surgical trainees, with only a small number ($n = 11$) included in the

sample. This can be attributed to factors such as their busy schedules and demanding training requirements, which may have limited their availability to participate in the survey. Additionally, the recruitment process may have encountered challenges in reaching out to a larger number of surgical trainees due to their involvement in clinical rotations and other intensive training activities. The focus on undergraduate medical students in our study was likely influenced by their accessibility within academic institutions. To address this limitation in future research, stronger collaborations with surgical training programs, engaging relevant stakeholders, and providing greater incentives may be necessary to encourage higher participation rates among surgical trainees. These efforts would help ensure a more representative sample and provide a more comprehensive understanding of sustainability education among both medical students and surgical trainees in Africa.

We did not verify the enrollment status of medical students or surgical trainees in their respective medical schools. No formal documentation of enrollment was requested to facilitate participation in our survey. While this approach may raise concerns regarding the reliability of our findings, we have confidence in the enrollment status of our participants based on the dissemination method employed, which targeted individuals within medical training programs.

5 | CONCLUSION

The study revealed significant gaps in sustainability education among medical students and surgical trainees in Africa. Limited familiarity, lack of education, and low participation in sustainability-related projects were prevalent. Integrating sustainability education is crucial for equipping future surgeons with the knowledge and skills to navigate surgical care while minimizing environmental impact and improving patient outcomes. This is essential for optimizing health-care delivery and promoting sustainable practices. To address the observed gaps, educational institutions, and policymakers should prioritize sustainability education in medical and surgical training programs. This can be achieved by developing comprehensive and standardized sustainability curricula, incorporating hands-on opportunities for sustainability practice, fostering interdisciplinary collaboration, and establishing partnerships with healthcare facilities practicing sustainable surgical care.

AUTHOR CONTRIBUTIONS

Yvan Zolo: Conceptualization; methodology; data curation; investigation; software; validation; formal analysis; supervision; visualization; project administration; resources; writing—original draft; writing—review and editing. **Mihret A. Demissie:** Methodology; data curation; investigation; validation; writing—original draft; writing—review and editing. **Emmanuel M. Echengi:** Methodology; data curation; investigation; validation; writing—original draft; writing—review and editing. **Banturaki Davis:** Methodology; investigation; writing—original draft; writing—review and editing. **Pokam F. Ornella:**

Methodology; investigation; writing—original draft; writing—review and editing. **Dawin Sichimba:** Methodology; investigation; writing—original draft; writing—review and editing. **David U. Dalle:** Methodology; writing—original draft; writing—review and editing; investigation. **Flora Simo:** Writing—original draft; writing—review and editing. **Chidiebere I. Sunday:** Writing—review and editing; writing—original draft; investigation; validation. **Yanelisa Pulani:** Validation; investigation; writing—review and editing. **Ignatius Esene:** Project administration; writing—original draft; writing—review and editing.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author (YZ) upon reasonable request.

TRANSPARENCY STATEMENT

The lead author Yvan Zolo affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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APPENDICES

1. Data Collection Form

Introduction

Dear Medical students and Surgical trainees,

We invite you to participate in this survey titled "Assessing the Presence of Sustainability in the Curriculum of Medical Students and Surgical Trainees in Africa." This survey aims to evaluate the extent to which sustainability education is present in medical and surgical training across Africa.

Your participation is voluntary and confidential, and the survey will take approximately 5–10 min to complete. Your responses will provide valuable insights into the state of sustainability education in medical and surgical training in Africa and may help improve the sustainability curriculum for future healthcare professionals.

Thank you for your time and participation in this important study. This study is conducted by SurgiFinder, an international NGO promoting safe, affordable surgical care, sustainable development, and eco-friendly innovations through education, research, and entrepreneurship.

LinkedIn Profile: SurgiFinder- <https://www.linkedin.com/company/surgifinder/>

Part 1: Consent

Title: "Assessing the Presence of Sustainability Education in the Curriculum of Medical Students and Surgical Trainees in Africa: A Descriptive Cross-Sectional Study"

Introduction

You are being invited to participate in a survey on the presence of sustainability in the curriculum of medical students and surgical trainees in Africa. This study is being conducted to evaluate the extent to which sustainability education is integrated into medical and surgical training in Africa.

Procedure

Your participation in this survey is voluntary, and you are free to withdraw from the study at any time. Your responses will be kept confidential and anonymous, and no personally identifiable information will be collected. The survey will take approximately 5–10 min to complete.

Risks and Benefits

There are no anticipated risks associated with participating in this survey. However, your participation in this survey may contribute to improving the sustainability curriculum for future healthcare professionals.

Consent

By clicking on the "next" button below, you acknowledge that you have read and understood the information provided above and agree to participate in this survey.

Part 2: Questions

1. What is your self-identification?

- Male
- Female
- Nonbinary/Other
- I prefer not to say

2. How old are you?

- <20
- 20–25
- 26–30
- 31–35
- 36–40
- >40

3. Which country are you from?

- Algeria
- Angola
- Benin
- Botswana
- Burkina Faso
- Burundi
- Cabo Verde

- Cameroon
- Central African Republic (CAR)
- Chad
- Comoros
- Democratic Republic of Congo
- Republic of Congo
- Cote d'Ivoire
- Djibouti
- Egypt
- Equatorial Guinea
- Eritrea
- Eswatini
- Ethiopia
- Gabon
- Gambia
- Ghana
- Guinea
- Guinea-Bissau
- Kenya
- Lesotho
- Liberia
- Libya
- Madagascar
- Malawi
- Mali
- Mauritania
- Mauritius
- Morocco
- Mozambique
- Namibia
- Niger
- Nigeria
- Rwanda
- Sao Tome and Principe
- Senegal
- Seychelles
- Sierra Leone
- Somalia
- South Africa
- South Sudan
- Sudan
- Tanzania
- Togo
- Tunisia
- Uganda
- Zambia
- Zimbabwe

4. How familiar are you with the concept of sustainability in healthcare?

- Not familiar
- Somewhat familiar
- Very familiar

5. How important do you think it is for medical and surgical students to receive education on sustainability in healthcare?

- Not important
- Somewhat important
- Very important
- I do not know

6. Have you received any sustainability education in your medical or surgical training?

- Yes
- No
- I do not remember

7. How would you rate the level of sustainability education currently provided in your medical or surgical curriculum?

- Inadequate
- Somewhat adequate
- Very adequate

8. Are you enrolled in a medical or surgical program?

- Undergraduate (Medical program)
- Postgraduate (Surgical program)

9. Name the institution whose medical or surgical you are currently enrolled in (Example: Faculty of Health Sciences, University of Cape Town).

10. In which country is the medical or surgical program you are currently enrolled in?

- Algeria
- Angola
- Benin
- Botswana
- Burkina Faso
- Burundi
- Cabo Verde
- Cameroon
- Central African Republic (CAR)
- Chad
- Comoros
- Democratic Republic of Congo
- Republic of Congo
- Cote d'Ivoire
- Djibouti
- Egypt
- Equatorial Guinea
- Eritrea
- Eswatini
- Ethiopia

- Gabon
- Gambia
- Ghana
- Guinea
- Guinea-Bissau
- Kenya
- Lesotho
- Liberia
- Libya
- Madagascar
- Malawi
- Mali
- Mauritania
- Mauritius
- Morocco
- Mozambique
- Namibia
- Niger
- Nigeria
- Rwanda
- Sao Tome and Principe
- Senegal
- Seychelles
- Sierra Leone
- Somalia
- South Africa
- South Sudan
- Sudan
- Tanzania
- Togo
- Tunisia
- Uganda
- Zambia
- Zimbabwe

11. How many years have you been enrolled in your program?

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- >7

12. Which of the following sustainability-related topics have been covered in your medical or surgical curriculum? (select all that apply)

- Climate change
- Waste management
- Energy efficiency
- Water conservation

- Sustainable procurement
- None
- Other

13. Have you received any theoretical lecture on the following sustainability-related topics in your medical or surgical curriculum? (select all that apply)

- Climate change
- Waste management
- Energy efficiency
- Water conservation
- Sustainable procurement
- None
- Other

14. Have you received any practical training on the following sustainability-related topics during your medical or surgical training? (select all that apply)

- Climate change
- Waste management
- Energy efficiency
- Water conservation
- Sustainable procurement
- None
- Other:

15. Have you participated in any sustainability-related projects or initiatives during your medical or surgical training?

- Yes
- No
- I do not remember

16. How do you think sustainability education could be better incorporated into medical and surgical curricula?

- Incorporate sustainability into existing courses.
- Offer a separate course or module on sustainability in healthcare.
- Provide case studies and examples of sustainability in healthcare.
- Offer hands-on opportunities for students to practice sustainability in healthcare.
- Encourage partnerships with healthcare facilities to integrate sustainability practices.
- Encourage research and interdisciplinary collaboration on sustainability in healthcare.
- Other:

17. What do you perceive to be the main barriers to incorporating sustainability education into medical and surgical curricula? (select all that apply)

- Lack of time
- Lack of resources
- Lack of interest from faculty
- Lack of awareness of the importance of sustainability education
- Other:

18. What sustainable practices have you observed during your medical or surgical training?

- Paperless records
- Energy conservation
- Single-use reduction
- Waste reduction
- Sustainable transportation

- Sustainable food
- Eco-friendly cleaning
- Energy-efficient buildings
- Sustainable purchasing
- Reusable equipment.
- Other:

19. How important do you think sustainability education is for healthcare professionals?

- Not important
- Somewhat important
- Very important
- I do not know

2. The Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

CHERRIES Checklist for Reporting Results of Internet E-Surveys

	Page
Introduction	
- Provide a clear introduction to the study, including the background and objectives of the survey.	3
- Explain the rationale for conducting an internet-based survey and any specific considerations related to the online nature of the survey.	3
Methods	
- Describe the sampling methods used to recruit participants and any inclusion or exclusion criteria applied.	3 and 4
- Specify the survey administration mode (e.g., web-based, email) and the platform or software utilized for data collection.	3 and 4
- Detail the data collection period and any incentives or rewards provided to participants.	3 to 5
Participants	
- Report the sample size and response rate of the survey, along with any demographic information collected from participants.	3-7
Survey Content	
- Provide a comprehensive description of the survey questions and response options used.	4
- If applicable, explain any validation or reliability measures implemented for the survey instrument.	4
- Mention any additional modules or sections included in the survey beyond the main research objectives.	
Data Analysis	
- Explain the statistical methods employed for data analysis, including any software or programming languages used.	4
- Discuss the handling of missing data, if applicable, and any imputation or exclusion methods utilized.	/
- If relevant, describe any subgroup or sensitivity analyses performed during the data analysis process.	/
Results	
- Summarize the key findings of the survey in a clear and concise manner.	5-11
- Present the results using appropriate tables, figures, or other visual representations.	5-11
- Provide statistical measures of central tendency and dispersion, such as means, medians, standard deviations, or confidence intervals, as necessary.	5-11
Discussion	
- Interpret the results in the context of the study objectives and previous research in the field.	11-13
- Discuss the implications of the findings and any limitations of the study.	11-13
- Propose recommendations for future research or potential applications of the results.	11-13
Conclusion	
- Summarize the main findings of the survey and their implications.	13-14
- Provide a clear and concise conclusion that aligns with the study objectives.	13-14