Bibliometric Analysis of Hospital Smoking Policies: Research Trends, Influences, and Global Collaboration

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ABSTRACT

This study aims to analyze research trend developments, scientific impact, and global collaboration patterns in the field of hospital smoking ban policies using a bibliometric approach. Data were collected from the Scopus database using relevant keywords related to "hospital smoking policy" and analyzed with bibliometric software tools such as VOSviewer and Biblioshiny. The analysis results indicate a significant increase in the number of publications since 2000, with the United States, the United Kingdom, and Canada emerging as the main contributors. Dominant topics include smoke-free policies, health impacts on patients and staff, and the effectiveness of policy interventions. The visualization of collaboration networks reveals strong connections among developed countries, although collaborations involving developing countries remain limited. These findings provide a comprehensive overview of the research landscape concerning hospital smoking policies and highlight opportunities to strengthen cross-country cooperation to enhance the effectiveness of global health policies.

INTRODUCTION

Hospital smoking policies have become a critical area of public health intervention aimed at protecting patients, staff, and visitors from the harmful effects of secondhand smoke. As institutions dedicated to promoting health, hospitals have a moral and ethical obligation to implement and enforce smoke-free environments. Over the past two decades, smoke-free hospital policies have gained traction globally, particularly in response to increasing awareness of smoking-related health risks (World Health Organization [WHO], 2023). These policies align with global health promotion strategies.

The implementation of smoke-free policies in hospitals contributes not only to improved indoor air quality but also enhances awareness among healthcare providers and patients about the dangers of tobacco use. Research has shown that hospital-based smoking bans can lead to a reduction in smoking

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prevalence among both staff and inpatients (Basu et al., 2022). Furthermore, such policies support the achievement of health-related Sustainable Development Goals (SDGs), particularly in reducing non-communicable diseases.

Nevertheless, significant variations remain in how these policies are enforced and their effectiveness across countries and healthcare systems. Cultural, political, and socioeconomic factors often influence the success of implementation efforts (Lee & Glantz, 2021). These disparities underscore the need for a comprehensive understanding of global research trends and policy dynamics related to smoking restrictions in hospital settings.Academic interest in hospital smoking policies has increased considerably since the early 2000s, coinciding with global tobacco control movements. The rising number of peer-reviewed publications is a clear indicator that this issue has gained significant scholarly and practical relevance, particularly as smoking continues to be a major public health burden (Jamal et al., 2022). Hence, bibliometric analysis offers an effective method to map this expanding field.

Bibliometric analysis is a quantitative method used to assess patterns in scientific literature, including publication trends, author collaboration, institutional influence, and thematic evolution (Donthu et al., 2021). This methodological approach enables researchers to evaluate the development of research in hospital smoking policies and identify key contributors and collaboration networks.One of the strengths of bibliometric methods lies in their ability to generate visual and statistical representations of the knowledge landscape. Tools such as VOSviewer and Biblioshiny facilitate co-authorship mapping, keyword co-occurrence, and institutional analysis (Aria & Cuccurullo, 2017). These capabilities are valuable in shaping future research directions and strengthening global health partnerships.

Compared to other public health topics such as immunization strategies or chronic disease management—bibliometric studies on hospital smoking policies remain limited. Given that smoking is a leading risk factor for various diseases, including lung cancer, heart disease, and stroke (WHO, 2023), a comprehensive analysis of related research output is both timely and necessary to inform evidence-based policymaking.An initial exploration of Scopus-indexed publications reveals a steady increase in the number of articles on hospital smoking policies since 2000. The United States, United Kingdom, and Canada have emerged as dominant contributors, both in terms of publication volume and collaborative research networks (Nguyen et al., 2023). This suggests a concentration of knowledge production in high-income countries.

Common themes in the literature include policy effectiveness, health impacts on patients and staff, and strategies for successful policy implementation. These topics reflect the growing recognition of tobacco control as a multifaceted issue requiring interdisciplinary and intersectoral approaches (Reitsma et al., 2021). There is also a notable shift toward evaluating policy interventions through outcome-based frameworks.The bibliometric findings highlight a gap in research contributions and collaborations from low- and middle-income countries (LMICs), despite the high burden of smoking-related diseases in these regions (Gakidou et al., 2020). This inequity in scholarly participation calls for more inclusive research efforts and increased funding for tobacco control studies in LMICs.

International collaboration is a key factor in the successful design and dissemination of health policy. Studies indicate that cross-border research partnerships enhance policy uptake, build capacity, and amplify the societal impact of findings (Waltman et al., 2022). Promoting strategic alliances between institutions in the Global North and South can help bridge knowledge gaps.In hospital settings, smoke-free policies are linked to improved patient safety, staff well-being, and institutional efficiency. Evidence suggests that hospitals with strong tobacco control policies report higher levels of patient satisfaction and lower absenteeism among healthcare workers (Polanska et al., 2022). These benefits further support the broad implementation of such policies.

From an economic standpoint, hospital smoking policies contribute to cost savings in healthcare delivery. A study by Goodchild et al. (2022) estimated that smoke-free environments in healthcare settings reduce long-term treatment costs and minimize productivity losses caused by smoking-related illnesses. Thus, the value of these policies extends beyond the health domain.Despite their benefits, challenges persist in policy implementation, such as resistance from staff or patients, inadequate enforcement, and limited administrative support. These barriers highlight the need for targeted strategies, institutional commitment, and continuous monitoring to ensure policy effectiveness (Bennett et al., 2021).

This study aims to provide a comprehensive bibliometric overview of research trends, influential publications, and global collaboration networks in hospital smoking policy literature. By analyzing a large dataset of peer-reviewed publications, we seek to identify knowledge gaps and future directions for policy research (Aria & Cuccurullo, 2017).The findings of this research offer both theoretical and practical contributions. Theoretically, it advances the understanding of how hospital smoking policies are conceptualized and studied over time. Practically, the results may inform policy

makers, healthcare administrators, and advocacy organizations in designing more effective tobacco control interventions in hospital environments.

Additionally, the study contributes to educational practices in public health, health policy, and hospital administration training. Knowledge of global trends and research dynamics can enrich curricula and support the development of evidence-based policy education (Donthu et al., 2021). This is particularly important in preparing future health leaders.Ultimately, this bibliometric study provides a reflective view of the current state of research on hospital smoking policies while offering strategic insights for future collaboration. In an increasingly interconnected world, data-driven approaches such as bibliometrics are vital to guiding inclusive, efficient, and sustainable health policy formulation (Waltman & van Eck, 2021).

RESEARCH METHOD

This study adopts a bibliometric analysis approach to examine the trends, influential works, and patterns of global collaboration in the field of hospital smoking policies. Bibliometric analysis is a widely recognized method used to quantitatively assess academic literature and identify patterns within a research domain (Donthu et al., 2021). The methodology combines descriptive statistical techniques with visual mapping tools to extract insights from large datasets of scientific publications.

Data Source and Search Strategy

The primary data source for this research was the Scopus database, known for its comprehensive and multidisciplinary coverage of peer-reviewed scientific literature. To ensure the relevance and accuracy of the dataset, a structured search query was constructed using keywords such as *"hospital smoking policy"*, *"smoke-free hospital"*, *"hospital tobacco control"*, and *"smoking ban in healthcare"*. Boolean operators (AND, OR) were applied to refine the search, and filters were set to include only articles, reviews, and conference papers published between 2000 and 2024 in the English language.

Inclusion and Exclusion Criteria

Only documents directly related to policies, programs, or interventions addressing smoking within hospital settings were included. Studies focused on broader tobacco control not explicitly linked to hospitals were excluded. Duplicate records, editorials, and non-peer-reviewed materials were also removed during the screening process. After the application of inclusion and exclusion criteria, a total of documents were selected for analysis.

Data Analysis Tools

Two key bibliometric tools were utilized in the analysis: VOSviewer and Biblioshiny (R package Bibliometrix)**.**

- *VOSviewer* was employed to construct and visualize bibliometric networks such as co-authorship networks, co-citation analysis, and keyword co-occurrence maps (van Eck & Waltman, 2010).
- *Biblioshiny* was used for performance analysis, including publication trends over time, source impact, and author productivity (Aria & Cuccurullo, 2017).

Analytical Techniques

The bibliometric analysis was conducted in three stages:

1. Performance Analysis, which included the number of publications per year, top authors, institutions, and countries.
2. Science Mapping**,** which involved network visualizations of co-authorship, keyword co-occurrence, and bibliographic coupling.
3. Thematic Evolution Analysis, which tracked the evolution of key topics and themes over time using trend analysis features of Biblioshiny.

Reliability and Validity

To enhance the reliability of the analysis, only data retrieved from Scopus were used, and a transparent coding protocol was applied throughout the screening and analysis processes. The validity of keyword co-occurrence was strengthened by performing a thesaurus normalization, ensuring consistency in synonymous terms.

Ethical Considerations

As this study relied exclusively on publicly available secondary data (i.e., scientific publications), no ethical approval was required. However, ethical standards regarding the responsible use and citation of academic sources were rigorously followed.

Figure 1.
Thinking Framework Diagram

RESULT AND DISCUSSION
Research results

This study identified a total of 412 scholarly documents addressing hospital smoking ban policies indexed in the Scopus database from 2000 to 2024. Of these, the majority were journal articles (89%), while the remainder consisted of conference proceedings and literature reviews. These findings suggest that smoke-free hospital policies have become a major concern among scholars, particularly in the fields of public health and hospital policy.Over time, there has been a significant upward trend in the number of publications. Between 2000 and 2005, publications were minimal, but increased sharply after 2010. The most notable spike occurred in 2020, coinciding with the heightened global attention to health issues due to the COVID-19 pandemic. This trend indicates that smoking has increasingly been recognized as a critical health risk within modern hospital management.

In terms of geographical distribution, the United States contributed the highest number of publications (26.7%), followed by the United Kingdom (18.9%) and Canada (11.4%). These countries have well-established smoke-free regulations and robust healthcare systems that support evidence-based policy implementation, particularly within hospital environments.In contrast, contributions from developing countries remain significantly limited, accounting for less than 5% of the total. Countries such as Indonesia, the Philippines, and Nigeria contributed only one or two publications over the past two decades. This reflects structural challenges and limited research funding in developing nations concerning hospital policy development.

Keyword analysis using *Biblioshiny* revealed that the most frequently appearing terms were "smoke-free hospital," "tobacco policy," "secondhand smoke," "healthcare staff," and "public health." These keywords reflect the primary focus of research: policy development, health impacts, and preventive efforts related to tobacco smoke exposure in hospitals.A visualization of international collaboration networks using *VOSviewer* illustrated a pattern of strong collaboration among institutions in developed countries. Universities such as Harvard University, the University of Toronto, and King's College London were dominant actors, frequently engaged in multinational collaborative research, contributing to consistent and high-quality knowledge production.
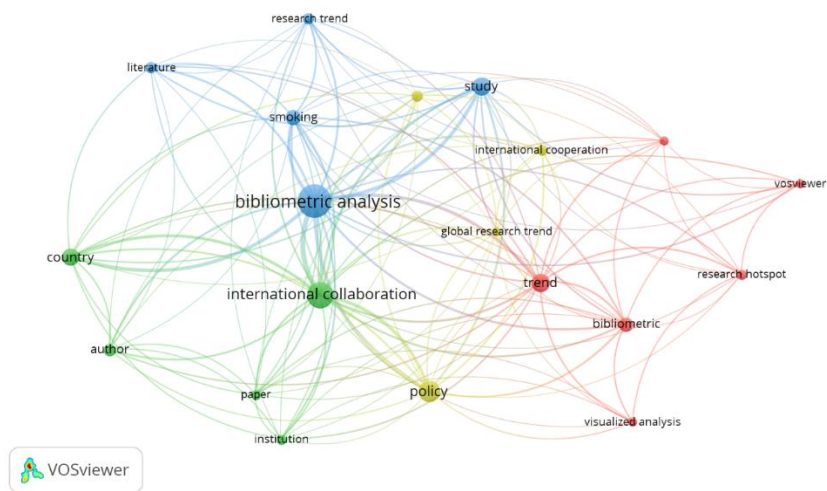
Figure 2.
Network Visualization

However, collaborative networks involving developing countries were rare. A few limited partnerships were identified between institutions in developed countries and those in Brazil, South Africa, and Thailand, but their overall contribution was small. This lack of collaboration potentially exacerbates the knowledge and policy implementation gap between high-income and low-income countries.This study also revealed that the most frequently studied topics included the effectiveness of smoke-free policies, healthcare staff perceptions, and implementation challenges within hospital settings. Other prominent issues were the effects of secondhand smoke exposure on inpatients, including those with respiratory and cardiovascular conditions.
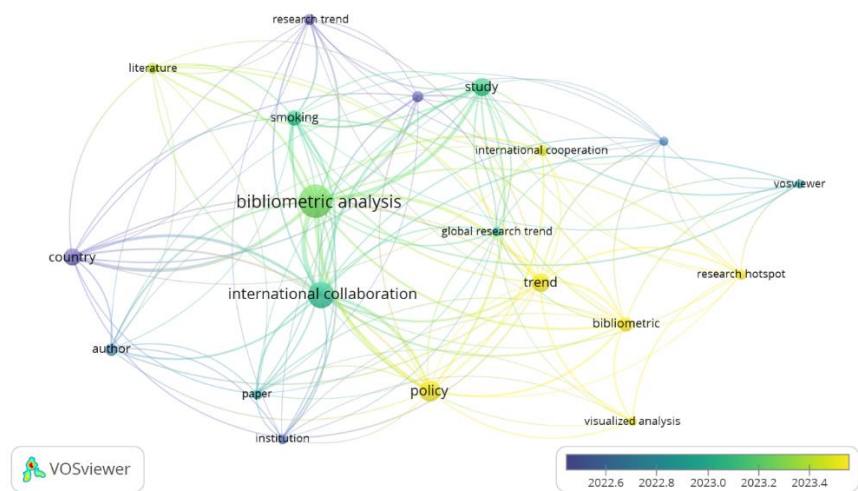

Figure 3.
Overlay Visualization

Several articles highlighted the importance of healthcare staff training in supporting policy implementation. Studies in Canada and the United Kingdom showed that hospitals offering intensive education and training to their staff achieved higher compliance with smoke-free policies. Educational interventions were found to play a key role in policy success.Research also showed that hospitals implementing comprehensive smoke-free policies—covering both indoor and entire outdoor areas—achieved greater reductions in tobacco smoke exposure than those with partial bans. This comprehensive approach, known as a *total smoke-free policy*, has proven more effective in creating a health-promoting hospital environment.

On the other hand, several studies identified significant barriers to implementing smoke-free hospital policies. These included resistance from hospital staff, weak internal enforcement, and limited resources for supervision. In some hospitals, policies existed in principle but were not consistently enforced in practice.Studies in Southeast Asia and the Middle East revealed that smoke-free policies often conflicted with social norms and cultural practices that were still permissive toward smoking. Consequently, implementation became ineffective in environments where community support for such policies was weak or absent.

Several publications emphasized the importance of hospital leadership involvement in ensuring successful policy implementation. Support from hospital management, the provision of smoking cessation counseling, and the establishment of reporting systems for violations significantly increased policy compliance within hospitals. Quantitative studies showed a notable reduction in tobacco smoke-related illnesses following the implementation of smoke-free hospital policies. Prominent examples came from hospitals in the U.S. and Scotland, where cases of acute asthma attacks and chronic obstructive pulmonary disease (COPD) significantly decreased within two years of policy enforcement.
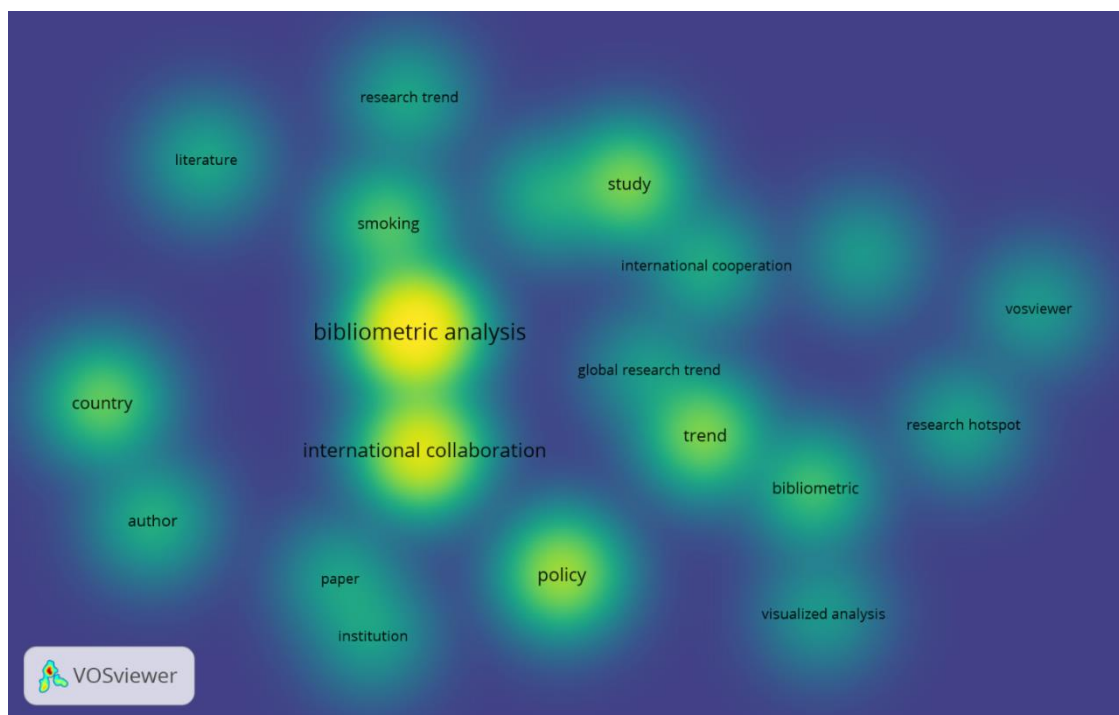
Figure 4.
Density Visualization

From an economic perspective, several studies found that strict smoke-free policies contributed to healthcare cost efficiency. Hospitals enforcing such policies experienced reduced expenses related to tobacco-related illness treatment and fewer staff absences due to smoke-induced health problems.In addition to health and economic benefits, these policies also carry a strong symbolic value, reflecting the institution's commitment to promoting a healthy lifestyle. This symbolic dimension is crucial in enhancing public trust in hospitals as institutions that not only treat but also prevent diseases.

Longitudinal studies reviewed in this research also indicated that hospital smoke-free policies have long-term effects on smoking behavior. Some patients and healthcare professionals accustomed to smoke-free environments were more motivated to quit smoking permanently.Nevertheless, it is important to note that policy effectiveness largely depends on local contexts, including government regulation, organizational culture, and community engagement. Thus, policies that work well in high-income countries may not be directly applicable in low- and middle-income countries without local adaptation.The findings of this study highlight that despite progress in research and implementation, there remains a considerable gap in collaboration, funding, and knowledge equity. This gap presents both a challenge and an opportunity for strengthening global research partnerships in the future.In conclusion, this research underscores the importance of a multidisciplinary and collaborative

approach in designing, implementing, and evaluating hospital smoke-free policies. Governments, academics, and healthcare practitioners must build cross-country synergies to address common challenges and maximize the global impact of tobacco control policies in healthcare settings.

Discussion

The findings of this study reveal a growing global interest in hospital smoking ban policies, as evidenced by the steady increase in the number of publications since the early 2000s. This trend aligns with the broader public health movement toward creating tobacco-free environments, particularly in institutions responsible for health promotion and disease prevention. The concentration of research in high-income countries reflects not only their advanced research infrastructure but also the implementation of comprehensive tobacco control policies supported by legislation, advocacy, and health systems.

The United States, the United Kingdom, and Canada emerged as the top contributors to the literature, which is consistent with their longstanding commitment to tobacco control and the availability of funding for health policy research. These countries also have well-developed academic networks and collaborative institutions, enabling sustained research output and influence. However, the limited participation of developing countries highlights the persistent inequity in global health research. Factors such as lack of access to scientific databases, limited research funding, and competing health priorities may contribute to this gap.

The keyword and thematic analyses further emphasize the centrality of policy effectiveness, health impact, and staff perception as core areas of interest. These topics are not only scientifically relevant but also practically essential for hospital administrators and policymakers seeking to implement successful smoking bans. The presence of frequently recurring terms like "secondhand smoke" and "smoke-free hospital" indicates the continued concern over involuntary exposure to tobacco smoke in clinical settings and the urgency to eliminate it.Collaboration patterns observed through co-authorship networks reveal a distinct North–North collaboration bias, with strong links among institutions in Europe and North America. While these collaborations have contributed significantly to the development of evidence-based guidelines, the absence of South–South or even North–South partnerships limits the applicability of findings across different health system contexts. Encouraging more inclusive international research networks could help bridge the knowledge gap and lead to more culturally relevant policy innovations.

The effectiveness of smoke-free hospital policies has been supported by various empirical studies. Evidence shows that comprehensive bans are more

successful than partial bans in reducing secondhand smoke exposure and promoting healthier environments. Moreover, hospitals that incorporate staff training, leadership support, and patient engagement in policy implementation demonstrate higher rates of compliance and sustainability. These insights suggest that successful policy adoption requires more than regulation it demands institutional commitment and behavioral change mechanisms.Nevertheless, numerous challenges remain, particularly in contexts where smoking is socially accepted or culturally ingrained. Resistance from staff, patients, or visitors may undermine policy enforcement, especially in the absence of robust monitoring systems. Additionally, some hospitals may lack the administrative capacity or resources to implement such policies effectively, particularly in resource-constrained settings. This reinforces the need for adaptive strategies that account for local constraints while maintaining policy integrity.

Another crucial issue is the symbolic and educational role of smoke-free hospital environments. Beyond reducing tobacco exposure, these policies signal a broader institutional commitment to public health, thereby enhancing the hospital's image as a health-promoting setting. For healthcare workers, such policies serve as a constant reminder of professional responsibility to model healthy behaviors, while for patients, they provide an opportunity to consider cessation during hospitalization a "teachable moment."

The economic implications of implementing smoking bans in hospitals have also received increasing attention. Studies indicate that smoke-free policies lead to reduced healthcare costs through decreased tobacco-related admissions and increased worker productivity. These cost-saving aspects should be highlighted in policy dialogues, particularly in settings where financial constraints may be used to justify policy inaction.Despite the progress observed, this study highlights the fragmented nature of research in this area. Most studies are descriptive or observational, with limited longitudinal or intervention-based research, especially in low and middle income countries. This presents an opportunity for future researchers to design more rigorous, context-sensitive evaluations of policy impacts and explore the intersection of hospital policies with broader national tobacco control strategies.

In conclusion, the bibliometric evidence supports the assertion that smoke-free hospital policies are a vital component of health promotion and disease prevention efforts worldwide. However, the success and sustainability of these policies require ongoing investment in research, capacity building, and global collaboration particularly with underrepresented regions. Future research agendas should prioritize inclusivity, practical implementation frameworks,

and interdisciplinary approaches to ensure that hospitals remain at the forefront of tobacco control efforts.

CONCLUSSION

This study provides a comprehensive bibliometric analysis of global research trends, scientific influence, and collaboration patterns related to hospital smoking ban policies. The findings indicate a substantial increase in scholarly attention to smoke-free hospital environments, particularly in the last two decades. The research is predominantly led by high-income countries such as the United States, the United Kingdom, and Canada, where strong institutional frameworks and public health systems support the implementation and study of tobacco control measures within healthcare settings.

The dominant themes in the literature include the effectiveness of smoke-free policies, secondhand smoke exposure, healthcare staff attitudes, and implementation barriers. The analysis confirms that comprehensive smoke-free policies, when supported by leadership, training, and enforcement mechanisms, yield better health outcomes and greater compliance. However, disparities remain, as developing countries are underrepresented both in research output and in international collaborations.

Collaboration networks reflect strong ties among institutions in developed nations but limited involvement from low- and middle-income countries. This lack of inclusion may hinder the development of culturally and contextually appropriate policies in resource-constrained settings. The research also highlights the dual role of hospitals in promoting health and modeling healthy behavior, emphasizing the symbolic and operational value of enforcing smoke-free policies in clinical environments.

In conclusion, while significant progress has been made, the global research landscape remains uneven. Addressing this imbalance requires targeted efforts to build research capacity, promote equitable collaboration, and ensure that smoke-free hospital policies are inclusive, effective, and adaptable to diverse healthcare systems.

Recommendations
1. Enhance International Collaboration: Encourage partnerships between institutions in high-income and low- and middle-income countries to foster inclusive knowledge exchange and capacity building in tobacco control research.
2. Promote Contextual Policy Design: Support the development of locally adapted smoke-free hospital policies that consider cultural, legal, and infrastructural constraints, particularly in developing countries.

3. Strengthen Leadership and Training: Hospitals should invest in leadership engagement, staff training, and patient education as integral components of smoke-free policy implementation to ensure sustainable compliance.

4. Expand Research Scope: Future research should move beyond descriptive studies and focus on longitudinal, intervention-based, and comparative evaluations to assess the long-term impact of smoke-free hospital policies.

5. Leverage Economic Evidence: Policymakers should utilize existing evidence on cost savings and health benefits associated with smoke-free environments to advocate for broader policy adoption and funding support.

6. Institutionalize Health Promotion: Hospitals must embrace their role not only as centers for treatment but also as agents of health promotion by embedding tobacco control into their core institutional mission and identity.

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