

Environmental Sustainability Studies in US Hospitals from 2015-2025: A Scoping Review of  
Geographic and Clinical Trends

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## 22    **Abstract**

23    The healthcare sector is responsible for an estimated 8% of the United States'(US) total  
24    greenhouse gas emissions, and the US is one of the largest global carbon emitters, responsible  
25    for an estimated quarter of all global healthcare emissions. The primary objectives of this  
26    scoping review are to understand geographic, medical specialty, pre/post-pandemic publishing  
27    trends, and major research areas of environmental sustainability in US hospitals from the past ten  
28    years. Of the articles screened, 41 met inclusion criteria. The Northeast region accounted for the  
29    largest share of studies with 39.5% followed by the Midwest region (21%) and West region  
30    (21%) while the Southern region showed the least number of studies (18.6%). The pre-pandemic  
31    period of 2015-19 accounts for 29% of studies, while the post-pandemic period (2020-25) holds  
32    the majority share with 71%. Surgery and Anesthesia were the primary medical specialties  
33    involved, together accounting for more than half of all studies. The predominant research focus  
34    was healthcare emissions, which accounted for 64% of all studies followed by implementation,  
35    benchmarking, and accounting (31%) and the least was education (5%). Hospital-level  
36    performance metrics and reporting guidelines are still needed to increase transparency and  
37    improve environmental stewardship that can also be easily integrated into business operations.  
38    Although there has been progress in the past decade regarding environmental sustainability in  
39    US hospitals, the lack of regulatory governance structures continues to foster an extremely  
40    fragmented geographic research landscape.

## Introduction

## Rationale

The healthcare sector is responsible for an estimated 8% of the United States' (US) total greenhouse gas (GHG) emissions, and more than three-quarters of that is attributed to indirect activities associated with the supply chain, such as chemicals and pharmaceuticals [1,2]. The US is one of the largest global carbon emitters, responsible for an estimated quarter of all global healthcare emissions [3]. Healthcare sustainability is of increasing importance not only to healthcare professionals but the public as well, considering the stark reality that deaths, both directly and indirectly attributable to healthcare sector pollution were estimated to be equivalent to those from medical errors per year in the US [4]. As well as a recent study by Han et al., 2024 revealed hospitals that prioritized environmental practices had lower readmission rates and higher patient experience ratings compared to their non-environmentally prioritizing counterparts. Over the past few years several voluntary environmental sustainability initiatives have been created for the healthcare sector, but unfortunately some did not survive recent changes in government priorities. The latter being the U.S. Department of Health and Human Services (HHS) Health Sector Climate Pledge [6], leading previous signatories to non-profit organization Healthcare Without Harm's Health Sector CARES Pledge [7]. Voluntary initiatives that remain include The Joint Commission Sustainable Healthcare Certification [8] and the National Academy of Medicine Action Collaborative on Decarbonizing the US Health Sector [9]. Although there are no mandatory regulatory compliance frameworks, or government policies *requiring* hospitals to move in more sustainable directions, as well as fear that new processes

could impact infection control and patient safety, there is still a growing movement amongst healthcare workers.

The Covid-19 pandemic revealed healthcare resilience in the form of rapid adaptability like telehealth for basic evaluation [10], ultimately increasing care access, cost-savings, and convenience, but also reducing infection transmission for a broad patient population. Essentially, more telehealth appointments translated to reduced exposure for both clinicians and patients, but also less cars on the road meant less pollution [11,12]. Operational changes are slow in clinical settings, given intense regulations and standards, without the catalyst of the pandemic, expanded telehealth options may have never been pursued at the scale we see today, eventually leading to more environmentally sustainable care pathways. It proved that there were opportunities to not only reimagine and transform healthcare operations, but also create a culture of sustainability [13].

Previous reviews that focused on healthcare sustainability were performed on a global scale, including multiple countries [14–16]. There has also been little attention given to the diversity in medical specialties undertaking sustainability research and aggregating how each has their own unique challenges and barriers. Recent studies have focused solely on individual specialties and areas of expertise: anesthesiology [17–19], surgery [20,21], radiology [22,23], and dermatology [24]. While the pandemic increased awareness of healthcare sustainability importance [10–12], there have been no metrics to how it has potentially influenced publications in this domain. This review will be the first to focus on studies *exclusively* within the US, characterizing the diversity of medical specialties and study approaches, as well as providing insights into publishing trends pre-/post-Covid.

## 84 Objectives

85 The primary objectives of this review were to understand the geographic, medical specialty, pre-  
86 /post-Covid trends, and research areas of environmental sustainability in US hospital institutions  
87 from the past ten years. This review seeks to explore the themes and trends in the published  
88 literature on environmental sustainability in US hospitals. The research questions guiding this  
89 review were:

- 90 1. What is the geographic distribution of hospital environmental sustainability studies in the  
91 US?
- 92 2. Are there any pre/post-pandemic changes to hospital environmental sustainability  
93 publishing?
- 94 3. What medical specialties are undertaking environmental sustainability studies within US  
95 hospitals?
- 96 4. What are the major research areas of environmental sustainability studies in US  
97 hospitals?

98 The secondary aims of this study were to identify limitations that hinder the progress of  
99 environmental sustainability initiatives in US hospitals, as well as future research avenues. Due  
100 to the extremely disruptive nature of the pandemic in 2020 on healthcare operations and care  
101 delivery, analyzing the past decade from 2015 until 2025 aims to show both pre- and post-  
102 pandemic trends regarding published research. Despite the increased interest and desire to  
103 perform more sustainable care in the US [5], strict regulations and tough operating margins for  
104 hospitals create a difficult landscape to navigate [16]. By examining the literature in terms of  
105 geography, specialty, and research area, this study sought to assess the diversity in of US

environmental sustainability efforts over a 10-year period. A preliminary search of Web of Science and Google Scholar was conducted and no current reviews, systematic or scoping on the topic were identified.

## Methods

### Protocol and registration

To identify environmental sustainability initiatives in US hospitals a scoping literature review was conducted, using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews [28]. A scoping review was adopted to explore the current trends and themes due to the relatively emerging area of research in the US. This protocol was registered with the Open Science Framework on 23 July, 2026 (<https://osf.io/8uqcw/overview>), and full details for replication can be viewed in the Supporting information.

### Eligibility criteria

Only papers published within the last decade, from January 1, 2015 to December 31, 2025 were considered, to capture the pre- and post-Covid eras equally. Despite the federal Covid-19 Public Health Emergency (PHE) declaration by the US Centers for Disease Control and Prevention (CDC) ending on 11 May, 2023 [29], many Covid-19 adaptations persisted well past this date [30]. Healthcare sustainability science is defined as improving quality, safety, and value by exploring dimensions of resource consumption and environmental emissions from healthcare activities [16].

## Search strategy and selection of sources

The database search was conducted using Web of Science and PubMed/MEDLINE with the keywords “hospital environmental sustainability”. Targeted mapping of literature where hospitals and researchers explicitly labeled their work under the term “environmental sustainability” was important for capturing the context of the studies, where it was a primary objective and not a broad outcome. This led to the very specified search string. The following search queries were used, first Web of Science, followed by PubMed/MEDLINE (no filter for geographic region/country):

*“hospital environmental sustainability (Topic) AND Article (Document Types) AND English (Languages) AND USA (Countries/Regions) AND 2025 or 2024 or 2023 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2015 or 2016 (Final Publication Year)”*

*((hospital environmental sustainability) AND (("2015/1/1"[Date - Publication] : "2025/12/31"[Date - Publication]))) AND (English[Language])*

The search was started in October 2025, with the date of last database search on March 13, 2026. One independent reviewer (KF) screened and extracted the data, while the second reviewer verified the results (TG), and any discrepancy was rectified through discussion. No additional references were identified through other sources or citation searching.

Manual screening of abstracts for relevance, using the following criteria: (1) study involved a US hospital, (2) the article was empirical research and not a review, conference report, perspective, technical report, dissertation, book, or commentary, and (3) the major subject of the study must be related to ‘environmental sustainability’ (Table 1). Papers not available in English and papers

that were not accessible were excluded. No automation tools were used in the screening and selection process.

**Table 1.** Review justification for article inclusion and exclusion criteria.

| Criteria               | Inclusion                                                                                                           | Exclusion                                                                           | Justification                                               |
|------------------------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Publication Type       | Peer-reviewed journal articles, original research                                                                   | Conference report, commentary, dissertations, books, and review articles            | For scientific rigor and integrity                          |
| Language               | Articles published in English                                                                                       | Articles in languages other than English                                            | Ease of analysis                                            |
| Country                | Articles where the setting was a US-based hospital                                                                  | Articles with a setting outside a US-based hospital                                 | To focus on US-based research                               |
| Publication Date       | Articles from 2015 to 2025                                                                                          | Articles published outside this time range                                          | To compare publications evenly from pre-Covid to post-Covid |
| Topic Relevance        | Articles involving US hospital operations, with the major theme/research relating to ‘environmental sustainability’ | Articles not relevant to environmental sustainability of hospital operations topics | Narrow focus to answer the research questions proposed      |
| Full-text Availability | Articles accessible with full text                                                                                  | Articles that could not be accessed or without full text                            | To ensure reliability                                       |

All selected papers identified were retrieved in full-text using Zotero 9.0.6 (2025) for organization and citation management. Citations from both databases were downloaded into Excel and duplicates were removed manually. The first reviewer (KF) performed the initial screening of titles and abstracts while adhering to the pre-defined inclusion and exclusion criteria, then to ensure agreement the second reviewer (TG) verified the results by discussion consensus. The complete selection process is documented in the PRISMA flow diagram (Fig 1).

**Fig 1.** Flowchart depicting the article selection process, according to the Preferred Reporting item for Systemic Reviews and Meta-Analyses (PRISMA).

## **Data charting process and data items**

Data extraction included author(s), year, title, geographic location, medical specialty involved, research area, environmental metrics, limitations (if applicable), and key findings. Qualitative data consisting of direct quotes pertaining to environmental sustainability research and associated themes related to the research questions were recorded. This was performed by the first reviewer (KF) using a Microsoft Excel form containing all previous data variables to chart the breadth of evidence relating to hospital environmental sustainability. No formal quality or risk of bias assessment was conducted.

## **Synthesis of results**

Articles were then mapped and categorized based on several criteria: medical specialty associated, US state where the study took place, research area, and the publishing year. In the case of a study not specifying a location or including an aggregate of multiple hospitals across the US, the state was recorded as N/A. If a study included multiple hospital sites and specified states included, each site was recorded independently. A qualitative analysis was conducted to synthesize themes, key findings, and temporal trends from the literature. Final research area contributions were mapped as either a) healthcare emissions (HE), b) implementation, benchmarking, and accountability (IBA), or c) education: communicating clinical sustainability (Ed), based on the overall goal of the study using The Green Print's narrative review organization [16] (Table 2).

**Table 2.** The Green Print definitions of environmental sustainability research areas.

| Research Area                                                | Definition                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Healthcare Emissions (HE)</b>                             | Measuring and mitigating healthcare environmental emissions, with particular emphasis on greenhouse gases to identify pollution hotspots and comparative advantages of clinical alternatives.                                                                     |
| <b>Implementation, benchmarking, and accounting (IBA)</b>    | Development of robust, standardized metrics that define environmental performance and gauge progress to optimize performance. Capturing important psychosocial and organizational impacts with qualitative research to incorporate patient and staff preferences. |
| <b>Education: Communicating clinical sustainability (Ed)</b> | Medical educators integrating core learning objectives for planetary health and healthcare sustainability science into pre-clinical and clinical training and fostering the notion of environmental stewardship as a core professional responsibility.            |

## Results

### Selection of sources of evidence

The full study selection process is detailed in the PRISMA flow diagram in Figure 1, detailing inclusion/exclusion at each step. The initial Web of Science search returned 138 papers that included topics “hospital environmental sustainability”, of which 18% (n = 35) were located at hospitals in the US that met the parameters of this review. PubMed/MEDLINE returned 2603 papers, of which only 0.2% (n = 6) were eligible for inclusion. During the screening process of 294 articles retrieved, 253 were excluded for the following: 250 did not pass the abstract screen to be relevant to US-based studies or hospital environmental sustainability; 2 papers could not be accessed for download; and 1 was not in English. PubMed/MEDLINE does not have a filter function for country; therefore, each paper was title and abstract screened for relevance. Only peer-reviewed articles that were research studies on environmental sustainability taking place in hospitals within the US were considered. After a title, keyword, publishing date, and abstract screen, 41 papers met all criteria and were ultimately included in the final review. These studies

were selected as sources for mapping broad geographic and clinical trends in support us this review.

## **Characteristics of sources of evidence and results of individual sources of evidence**

This scoping review included a total of 41 articles of peer-reviewed research, all published between 2015 and 2025, and revealing the topic of US hospital environmental sustainability as an emerging field of research. Across all studies, both qualitative and quantitative methods were employed, with a majority of the articles utilizing methods such as life cycle assessment (LCA) (n = 10, 24%) [23,31–39], waste audits (n = 9, 22%) [20,35,40–45], and surveys and/or interviews (n = 11, 27%) [18,21,46–53]. The key environmental metrics measured in the literature were waste (kg) (n = 16, 39%), Greenhouse Gases (kg CO<sub>2</sub>eq) (n = 17, 41%), water (gal) (n = 3, 7%), and energy (kWH) (n = 5, 12%).

Common challenges and limitations were present in each article’s discussion, which were further analyzed and categorized within their research area (HE, IBA, Ed). HE and IBA were the most prevalent research areas making up 95% of total. Since there were only 2 Ed studies [48,52], drawing conclusions from their survey-based research was a challenge in itself, but the main findings of both were the importance of awareness for issues related to environmental sustainability and physician leadership. Recurring challenges and limitations identified by HE studies related to emissions analysis were, whether to include or exclude pre-/post-op operations [21,38,43,54], data variability of inputs [11,12,19,32,34,35,39,55–59], and overall generalizability of study outcomes [20,31,36,37,39,41,42,44,45,50,56,60–63]. When estimating emissions data, deciding where boundaries are drawn and what input data will be collected will

have a direct effect on the final quantitative results. Without a standard framework for these boundaries or data inputs in a surgical context, it makes it difficult to compare studies, apply quantitative results, or generalize findings about specific medical specialty's emissions as a whole. The top limitations for IBA studies were limited sample sizes [18,21,49–51,53] and risk of participant bias [47,51]. Similarly to HE studies, IBA studies also suffered from generalizability concerns due to homogeneity of survey and interview participants.

## Synthesis of results

### *What is the geographic distribution of hospital environmental sustainability studies in the US?*

There were 41 studies that matched our research criteria from 1/1/2015 – 12/31/2025. Over the past decade there has been an uneven distribution in US states (Fig 2). The Northeast region accounted for the largest share of studies with 39.5% (n=17). The Midwest (n=9) and West (n=9) followed, each contributing 21%, while the Southern region showed the least number of studies at 18.6% (n=8). Northeastern states have published more than twice as many studies than West, Midwest, or Southern states. More than half of US states did not publish a study in the past decade. Analysis of geographic distribution included multi-site scenarios, where each state was counted individually rather than as one of the 41 studies. Although there was a clear leader in terms of quantity of studies, another metric for comparison was how engaged each region was in publishing. Table 3 details engagement percentages for each of the four regions, revealing the Northeast as not only a leader in publishing, but also regional engagement with 78% states within the Northeast (7 out of 9) participating in research generation. Northeastern states had more than double the regional engagement of Western and Southern states. It is noteworthy to

add that the Northeast has the least number of total states out of the four regions with 9, and the South has the most with 16 states. Alaska and Hawaii were included in the search, but neither of them was named as a location in any of the studies included in this review, therefore they were omitted from the graphical figure for brevity purposes.

**Table 3.** Percent engagement in hospital environmental sustainability research across US geographic regions.

| US Region | States w/ studies | Total # states in region | % Engaged |
|-----------|-------------------|--------------------------|-----------|
| Northeast | 7                 | 9                        | 78%       |
| Midwest   | 5                 | 12                       | 42%       |
| West      | 4                 | 13                       | 31%       |
| South     | 5                 | 16                       | 31%       |

**Fig 2.** Density of hospital environmental sustainability studies by state from 2015 to 2025 (Not shown, AK or HI)

*Are there any pre/post-pandemic changes to hospital environmental sustainability publishing?*

Analysis of the 41 included studies reveals a dramatic temporal shift in publication frequency over the past decade. The pre-pandemic period of 2015-19 accounts for 31% (n=12) of studies, while the post-pandemic period (2020-25) holds the majority share with 69% (n=29) (Table 3). It is noted that there was an exponential increase of publishing during/after the 2020 pandemic.

**Table 4.** Distribution of intervention strategies for pre/post-pandemic time periods.

| Research Area | Overall Frequency (n) | Pre-Pandemic (2015-19) | Post-Pandemic (2020-25) |
|---------------|-----------------------|------------------------|-------------------------|
| HE            | 26                    | 6                      | 20                      |
| IBA           | 13                    | 5                      | 8                       |
| Ed            | 2                     | 1                      | 1                       |
| Total         | 41                    | 12                     | 29                      |

This trend suggests a growing interest in hospital environmental sustainability, with the rate of published research more than doubling in the latter five-year period (Fig 3). In terms of the distribution of research areas, there is a clear shift from the pre-pandemic period where there were essentially equal parts HE (n=6) and IBA (n=5) studies published, to the post-pandemic period where HE (n=20) has overtaken IBA (n=8) by more than double. Ed studies at such a small share (n=2, 5% of total) are dwarfed by the volume of HE and IBA studies, regardless of pre- or post-pandemic era. This indicates a large gap in research, revealing a disparity in who is leading these environmental sustainability initiatives, primarily physicians and academic researchers. Highlighting the underutilization of not only diverse healthcare staff but also patient populations within hospitals.

**Fig 3.** Number of studies published per year from the last decade (2015-25) included in review.

***What medical specialties are undertaking environmental sustainability studies within US hospitals?***

The distribution of medical specialties across studies is highly concentrated (Fig 4). The percentages ranged widely from 3% to 37% among named specialties, with the median representation being low (~5%) across the distribution. Surgery and Anesthesia were the primary focus of research, together accounting for more than half (51%, n=21) of all studies. Studies that focused on Surgery or Anesthesia were more likely to be physician-led than any other specialty.

76% of Surgery and Anesthesia studies had a physician as the lead author, while 30% of all other specialties named a physician as the lead author. Other specialties, including Pharmacy, Dietary, Radiology, Internal Medicine, Hospitalist, Emergency Medicine, Dermatology, Dentistry, Lab Medicine, Gastroenterology, Rehabilitation, and OB/GYN, represented a small minority of the research landscape, with each contributing approximately 3% to 5% of the total studies.

**Fig 4.** Percentage of papers by medical specialty that lead sustainability studies.

### ***What are the major research areas of environmental sustainability studies in US hospitals?***

Research areas in the literature are heavily focused on quantification and intervention. The predominant focus was on HE, which accounted for 63% (n=26) of all studies. IBA studies followed at 32% (n=13), and the least frequent focus was Ed at 5% (n=2) (Table 3). The distribution varied by medical specialty. Although the leading specialties, Surgery and Anesthesia, were heavily concentrated in HE studies, IBA studies represented a 14% (n=3) share, and a single Ed study accounting for a less than 1% share of the total. HE studies typically sought to establish an environmental footprint for a product, procedure, department, hospital, or healthcare system, utilizing methods such as life cycle assessment and waste audits. As well as mitigating environmental impacts through the results of intervention efforts, such as medical device reprocessing [50] or switching to low emission anesthetic gases and quantifying their impacts [19,57,60].

## Discussion

### Geographic Disparity and Policy Imperatives

The most striking finding is the profound geographic disparity in research output, with the Northeast contributing over twice as many studies and regional research engagement as the South. This observation underscores the fact that there is a much higher concentration of academic institutions and medical centers in the Northeast in comparison to the South, which ultimately leads to more dedicated research infrastructure, climate focused policies, and institutional funding initiatives that drive sustainability research. The Commonwealth Fund's State Scorecard on Climate, Health, and Health Care was designed to emphasize how the environment impacts healthcare and public health as well as, consequently, how healthcare systems impact the environment. According to this report, the Northeastern region of the US has some of the highest-ranking states, based on a combination of lower risk to environmental hazards, better environmental policies, and lower health sector emissions, while Southern region states have some of the lowest ranked states. This combination highlights the structural fragility of these health systems, as well as the widening care disparity between rural and urban healthcare. Geographic findings from this review suggest that Southern states are not only some of the most vulnerable to climate impacts, but also some of the *least resilient* to them, due to their low participation in environmental sustainability studies [64], heightened by the negative feedback loop of policy absence and lack of institutional support. This geographic gap creates a major blind spot in national efforts, suggesting that current research is driven by proactive regional policies and academic density, rather than greatest need.

## **The Pandemic as an Accelerant for Change**

The shift in publication rate from 29% pre-pandemic to 71% post-pandemic suggests that the Covid-19 pandemic served as a critical accelerant for sustainability research. The disruptions in global supply chains, hospital operations, and overall care delivery required rapid response to resource shortages. Although performed out of necessity, it showed the potential that hospitals hold in terms of making more sustainable changes like increased telehealth operations [11–13], resource optimization [38,42,50,53,55,59,61], and waste mitigation [19–25]. In addition to these efforts, the vulnerability of the global supply chain was uncovered, emphasizing the reliance on single-use personal protective equipment (PPE), diagnostic testing kits, and disposable but not necessarily recyclable packaging. Tangible and visible increases in the amount of waste generated daily potentially led healthcare providers to question these practices and seek alternatives, such as medical device reprocessing and waste diversion initiatives. The reassessment of status quo waste operations via waste audits has been a powerful driver in mitigation and circular solutions, especially in the resource intensive OR. Institutional climate resilience as an enduring motivator for more sustainable practices was merely exacerbated by the operational desperation imposed during the pandemic. This temporal trend solidifies the growing interest and importance of this nascent field, demonstrating that clinical urgency can swiftly overcome institutional inertia.

## **Focus on High-Impact Clinical Areas**

The high concentration of research in Surgery and Anesthesia (55% of studies) and the dominance of HE (64%) and IBA (31%) studies reflect a strategically rational, yet narrowly focused research collection. Both Surgery and Anesthesia primarily work in operating rooms

(ORs), which are among the most resource intensive and waste generating spaces within hospitals [40]. Furthermore, it is worth adding that physicians who work in the OR, namely surgeons and anesthesiologists, fundamentally have a different clinical scope versus other medical specialties that reside outside of this boundary. They are focused on patient care in a very controlled context, which could also be a driver of research output in this area, since these physicians hold greater control over the resources and consumption within this context. This research cluster represents clinicians targeting high-impact and quantifiable areas, such as replacing environmentally harmful anesthetic gases with low emission alternatives, or surgical medical device reprocessing. In addition to the large disparity between research areas, an increase in HE studies over IBA could be suggestive of research progress and maturity, possibly indicating that institutions are moving past benchmarking and onto measuring outcomes of sustainable interventions. The extremely low frequency of Ed studies (5%) suggests that while interventions are being developed, the mechanism for widespread behavioral adoption and cultural change is underdeveloped in the current published literature. The low participation from other specialties, such as OB/GYN (3%), is a notable gap. Despite its services also involving the resource intensive operating room to perform two common surgical procedures (Caesarean section birth and hysterectomy) [27], the lack of published research suggests a misalignment between environmental burden, research output, and priority in several clinical areas.

## **Future Research Avenues**

While our review shows the progress in environmental sustainability initiatives in the US over the past decade, there remain significant research and policy gaps that must be addressed in the future. First, expand research in the Midwestern, Western, and Southern US in order to adapt to challenges that are unique to these areas by strengthening regional network collaboration.

Regional-specific agendas and frameworks will work to address local policy and research challenges. Second, developing standardized carbon footprint and LCA accounting protocols that designate specific boundaries including pre- and post-operative care that can be easily generalized for OR-specific cases and increase comparability of studies between other medical specialties. Third, adding sustainability metrics as key performance indicators (KPIs) to clarify financial and operational environmental impacts that can be easily tracked and embedded into routine business operations. In the future, a health equity lens will also need to be adopted, considering the negative feedback loop that healthcare operations continue perpetuating through public health and environmental degradation, future measures of success should seek to include community-level health indicators. A nuanced approach to analyzing environmental sustainability initiatives in US hospitals might be in the form of understanding the impact to public health at the community level. Identifying if the surrounding communities that these large hospital systems reside in are directly benefiting from these changes, or if the results are merely felt as lower carbon emissions on a dashboard. Going forward, health systems hold an ethical obligation to advance environmental health equity.

## Limitations

This scoping review on US hospital environmental sustainability was subject to several methodological parameters, including only the past ten years (2015-2025), articles in English, specified search string, and using two major databases (Web of Science & PubMed). Given the broad scope of literature that could span healthcare operations, a specified search string was needed to maintain alignment with the setting and context of the scoping review. It is possible that relevant studies were not captured, as successful projects may be documented solely as internal hospital policy, operational guides, or strictly Quality Improvement (QI) projects rather

than published for scientific dissemination. The exclusion of commentaries, conference papers, and previous reviews limits the ability to capture preliminary or consensus-based findings but ensures that the examination of the literature is focused on fully executed, peer-reviewed research to understand the emerging environmental studies landscape in the US.

## **Conclusion**

This scoping literature review provides the first consolidated, quantitative evidence detailing the rapid, yet uneven, evolution of environmental sustainability research in US hospitals. The findings confirm that while a significant movement is evolving, particularly within the OR and catalyzed by pandemic era disruptions, action is heavily concentrated geographically (Northeast region) and clinically (Surgery/Anesthesia). The transition toward a sustainable healthcare system is not merely an environmental goal, but a critical component of public health, institutional resilience, and health equity. By addressing regional and specialty silos, standardizing accounting protocols, and integrating community-level health as an indicator for success, US hospitals can fulfill their fundamental ethical obligation of safeguarding both patient and planetary health.

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## Supporting information

**S1 PRISMA-ScR Fillable Checklist**

**S2 Table. Studies included in review with extracted information.**

**S3 Analysis for figures spreadsheet**

**Fig 1.** Flowchart depicting the article selection process, according to the Preferred Reporting item for Systemic Reviews and Meta-Analyses (PRISMA).

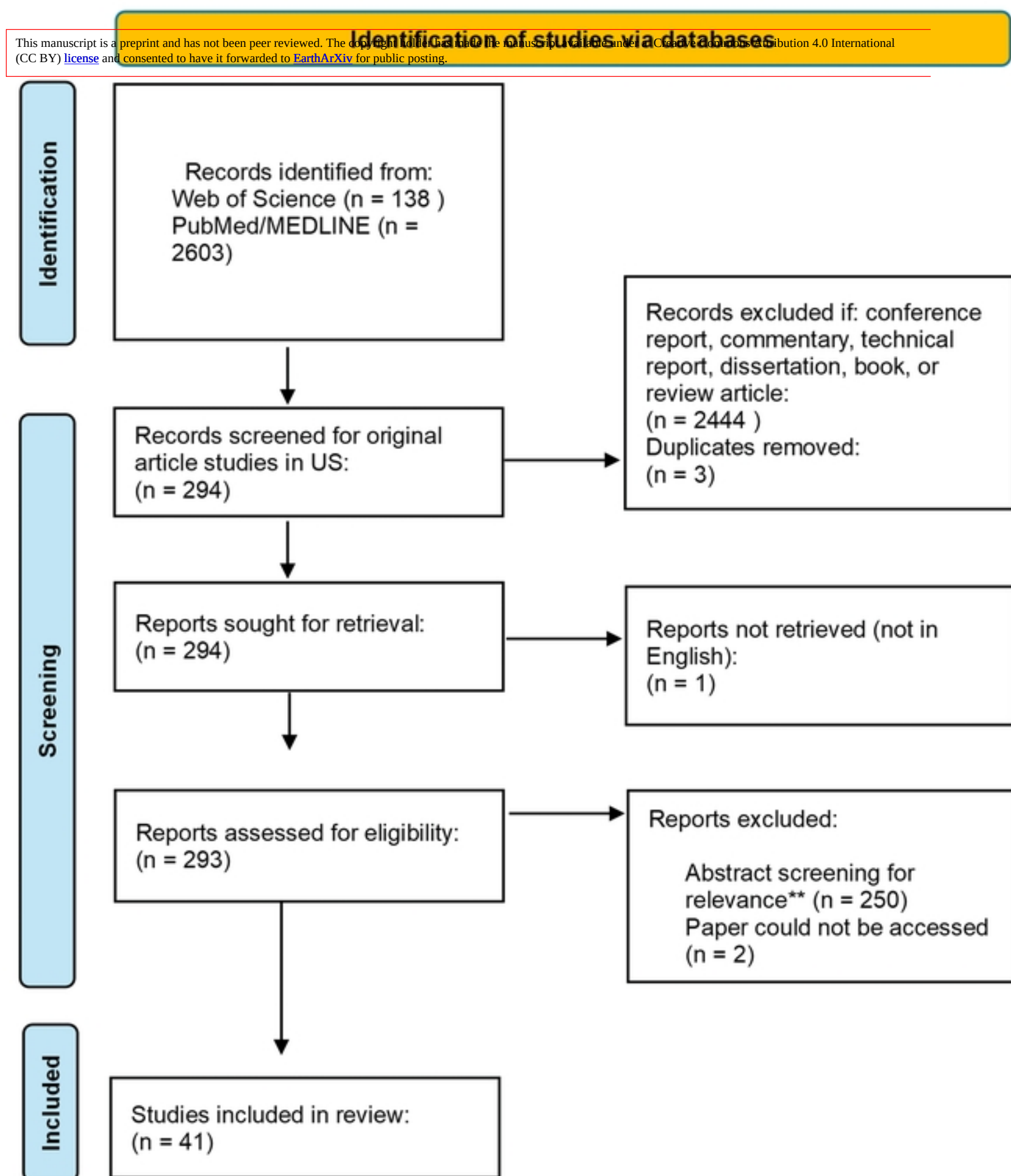


**Figure 1**

**Fig 2.** Density of hospital environmental sustainability studies by state from 2015 to 2025 (Not shown, AK or HI)

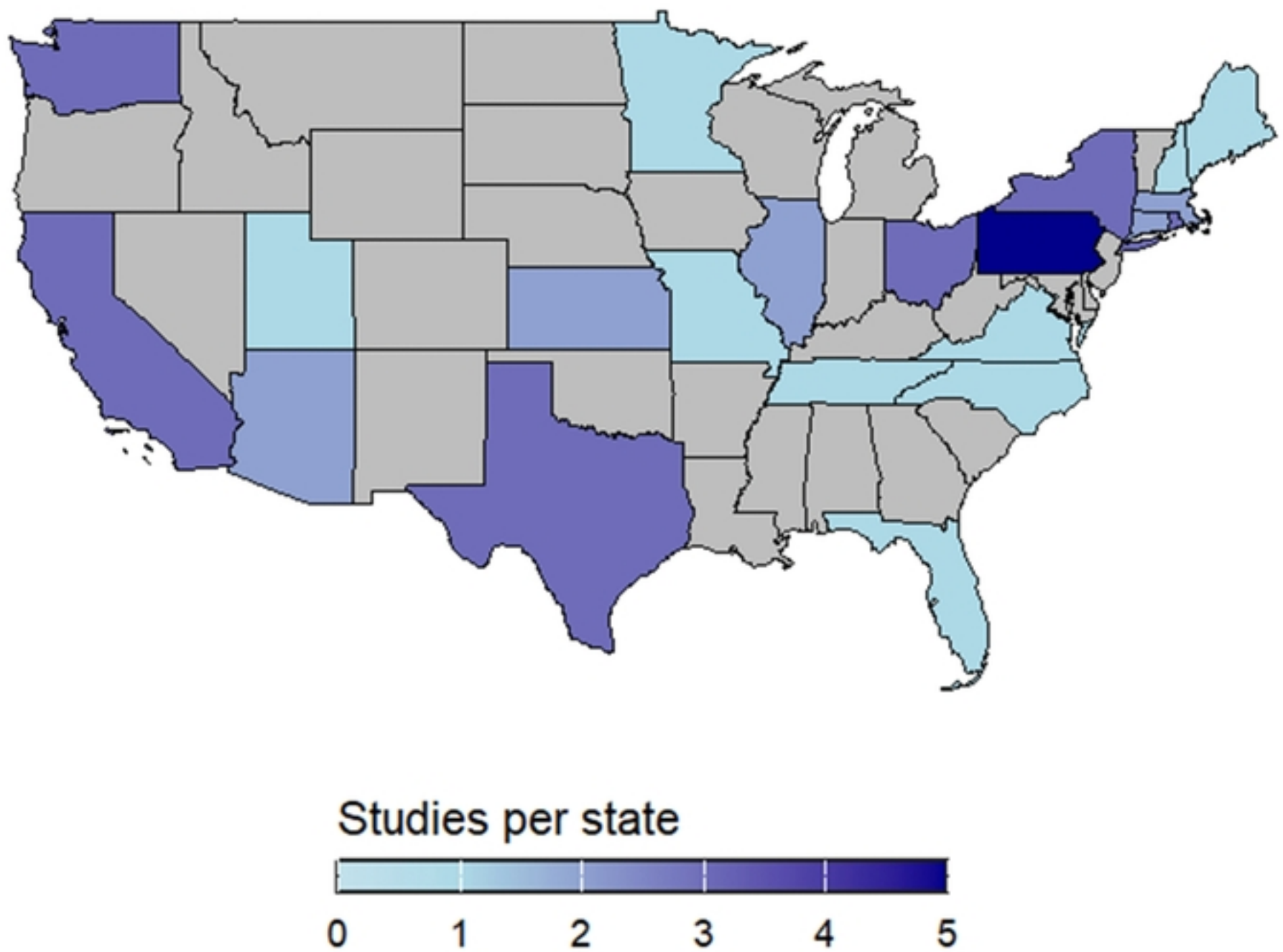


Figure 2

**Fig 3.** Summary of annual publications per year by research area from 2015 - 2025 included in review.

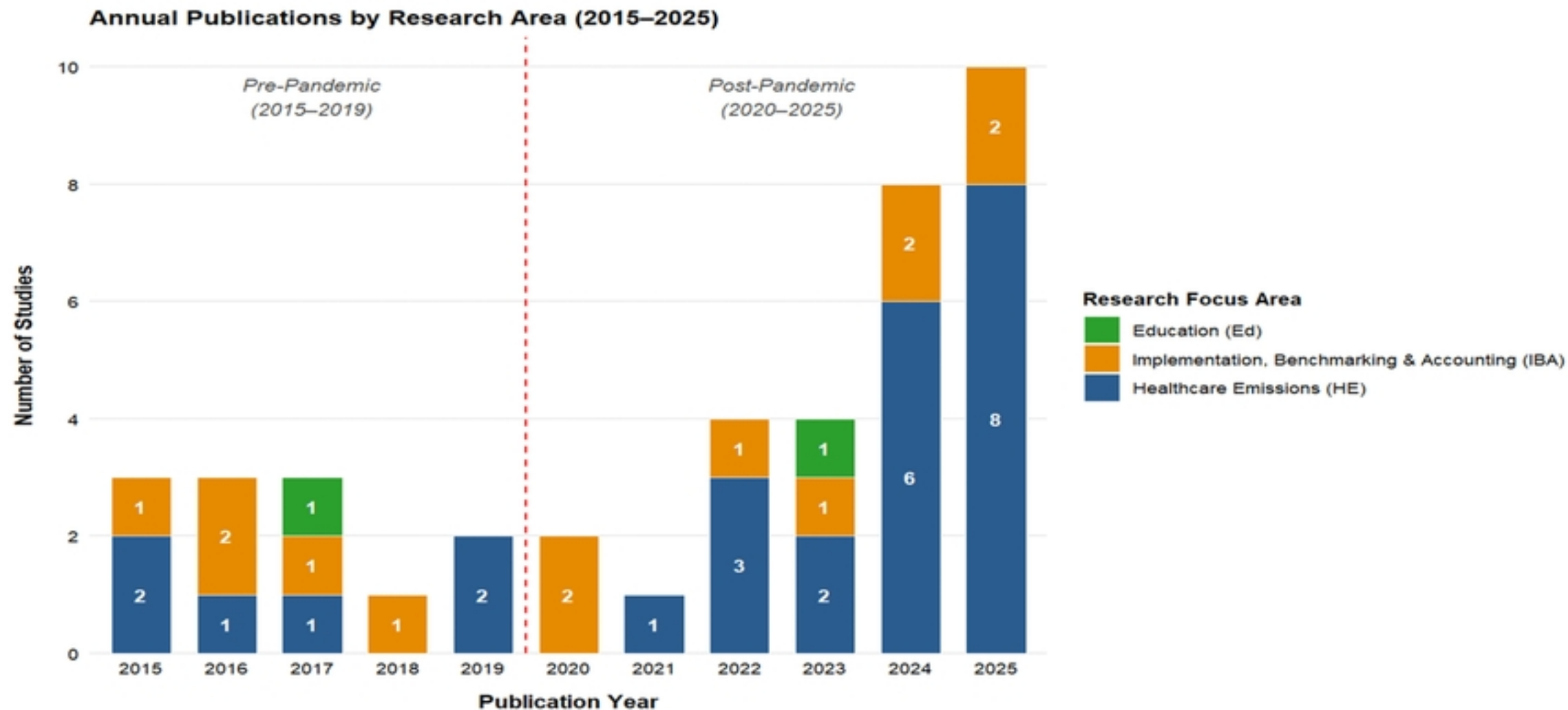


Figure 3

**Fig 4.** Percentage of papers by medical specialty that lead sustainability studies. Specialties included in the pie chart, but not the legend are: Internal Medicine, Hospitalist, Emergency Medicine, Dermatology, Dentistry, Lab Medicine, Gastroenterology, Rehabilitation, and OB/GYN.

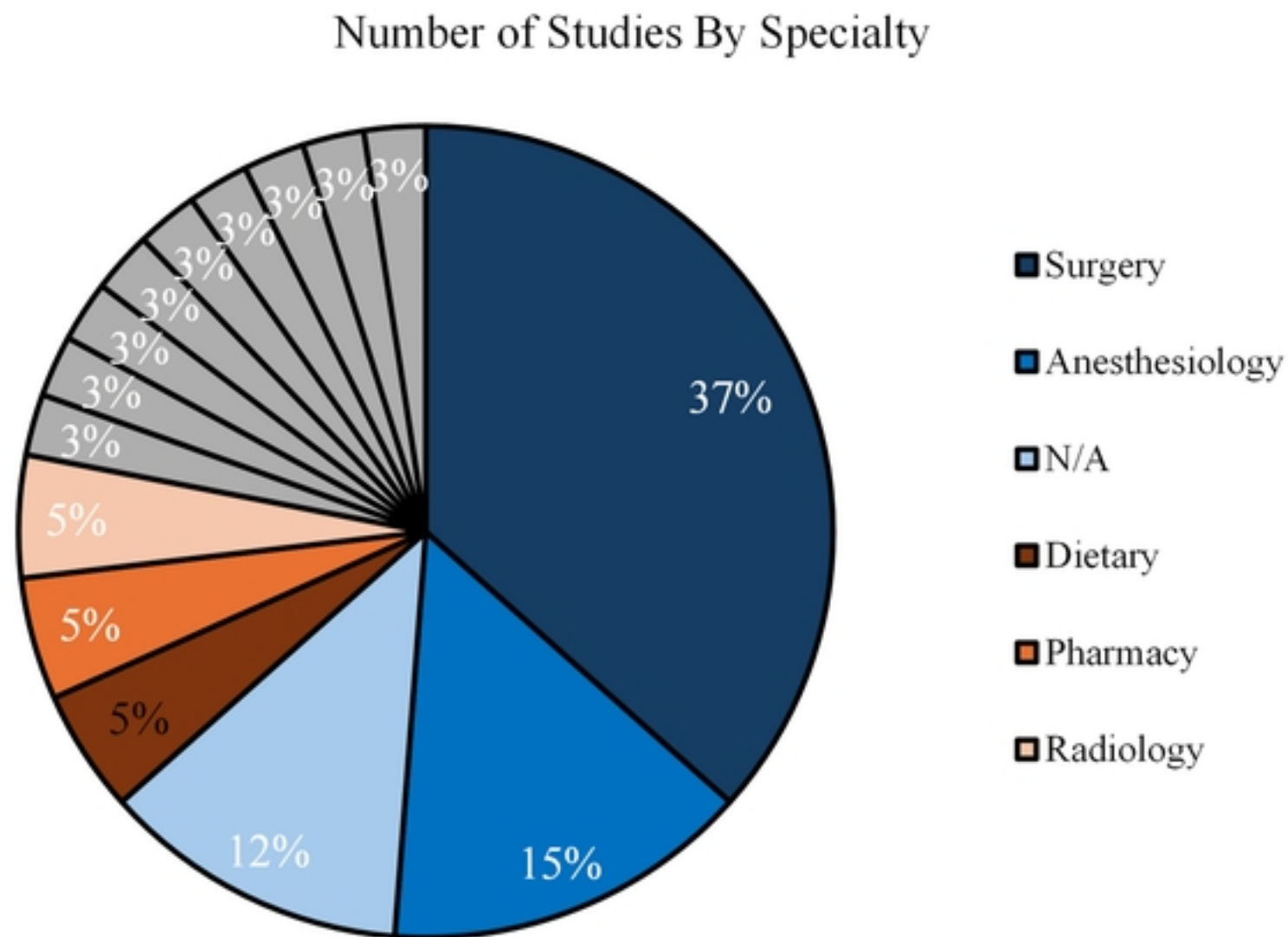


Figure 4