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Integrating Environmental Sustainability into Clinical Decision-Making: A Systematic Review of Rationale

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Abstract

Globally, healthcare is a major source of greenhouse gas emissions, intensifying the ongoing climate emergency. While strategies to cut emissions are being introduced across health systems, the degree to which environmental sustainability should influence clinical decision-making at the level of individual practitioners remains uncertain. To investigate this question, we carried out a systematic review of published arguments both supporting and opposing the integration of environmental considerations into clinical choices. PubMed was used as the main database, with additional citation searches performed through Web of Science and reference lists. Data were analyzed qualitatively using Kuckartz's combined deductive–inductive framework, and reporting followed the RESERVE guideline. Twenty-three articles met inclusion criteria and were examined in detail. Arguments were initially organized using Beauchamp and Childress's four principles—autonomy, beneficence, non-maleficence, and justice. From the material, new categories also surfaced: adapted notions of autonomy and non-maleficence, environmental justice, professional responsibility, politicization, reasons tied to different levels of decision-making, and miscellaneous considerations. The review revealed that the discussion remains underdeveloped and largely shaped by perspectives from wealthier nations, with voices from low- and middle-income contexts largely absent. Several arguments reflected a shift from an individualistic to a more collective framing of ethical principles. Moreover, the findings underscored the interdependence between individual clinical decisions and broader systemic responsibilities in addressing climate change. Our analysis suggests that established bioethical principles may be undergoing reinterpretation in light of environmental concerns, though such shifts are not yet widely reflected in professional standards or codes of conduct. The review may assist healthcare providers, decision-makers, and patients in articulating their own views, while highlighting the urgent need to incorporate perspectives from low- and middle-income regions.

Keywords: Climate change, Sustainability in healthcare, Clinical ethics, Decision-making, Systematic review

Background

Environmental crises, including climate change, plastic pollution, and biodiversity loss, are increasingly recognized as serious threats to global health and well-being [1, 2]. Rising global temperatures, sea-level rise, and extreme weather events have substantial impacts on human and animal health, as well as ecosystem integrity [3–5]. Many scientists now suggest that limiting global warming to below 1.5 °C compared to preindustrial levels is no longer realistic due to ongoing greenhouse gas (GHG) emissions [6, 7]. Achieving the Paris Agreement target of keeping warming under 2 °C will require swift and substantial emission reductions across all sectors [7].

The healthcare sector is a notable contributor, accounting for approximately 4.6% of global GHG emissions [8]. This raises questions of responsibility and environmental

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justice, especially when comparing high-income countries with low- and middle-income countries. While healthcare systems in the latter emit less GHG, they are more vulnerable to the impacts of climate change [9]. Transforming healthcare to mitigate climate change requires interventions at multiple levels, from macro-level policies to meso-level institutional strategies. For example, the English National Health Service (NHS) set goals in 2008 to continuously reduce GHG emissions and aims to achieve carbon neutrality by 2045 [10], having already reduced its carbon footprint by 26% relative to 1990 by 2019 [11]. Globally, other healthcare organizations and networks, such as the 'Global Green and Healthy Hospitals' initiative by Healthcare Without Harm, are similarly committed to sustainability while maintaining patient care [12, 13].

However, macro- and meso-level measures alone are insufficient. Individual clinical decisions also influence GHG emissions. Examples include substituting metered-dose inhalers (MDIs) with dry-powder inhalers (DPIs) for respiratory conditions [14] and significantly reducing the use of N2O, a potent GHG, in labor and emergency care settings [15]. Implementing such changes requires patient-provider collaboration, raising ethical questions. For instance, should patient autonomy—which traditionally respects their personal values—be reconsidered in light of sustainability concerns? Educating patients on environmental impacts may influence their choices, as their initially expressed preferences may not fully reflect their long-term values or best interests [16]. Conversely, challenges arise when patients decline interventions due to environmental concerns, requiring physicians to balance patient preferences with environmental responsibility. Surveys indicate that while many US primary care providers are willing to discuss climate issues in shared decision-making, a majority worry about straining patient relationships [17]. In Germany, patients are generally receptive to sustainability discussions when relevant to their health [18, 19].

Despite growing attention, the ethical debate on integrating environmental sustainability into clinical decision-making remains nascent. Few publications have addressed the reasons for or against such practice [18, 20, 21], and no comprehensive systematic overview exists. This systematic review of reasons (SRoR) seeks to synthesize published arguments regarding whether healthcare professionals should consider ecological sustainability in clinical decision-making. The findings aim to guide clinicians in addressing the climate crisis during patient care and inform patients, institutions, and policymakers involved in sustainable healthcare initiatives.

Methods

Systematic reviews of reasons (SRoRs) are an established methodology in bioethics, aiming to summarize and structure the current debate on specific ethical questions [22, 23]. In this study, the SRoR was conducted to collate and analyze published arguments concerning whether healthcare professionals should incorporate environmental sustainability considerations into clinical decision-making across prevention, diagnosis, therapy, and rehabilitation. This review does not address climate-sensitive health counselling (CSHC), which covers broader communication about climate change and health, including adaptation strategies [24].

Reporting for this review followed the RESERVE guidelines for SRoRs in ethics research (Supplement 5) [23].

Search strategy and eligibility

Prior to searching, eligibility criteria were defined. The research question was organized around four conceptual categories: healthcare professionals, environmental sustainability, shared or clinical decision-making, and ethical reasoning. Only peer-reviewed journal articles in English or German, published in PubMed from its inception in 1996 up to January 8, 2024, and covering all four categories were considered. No restrictions on article type were applied to capture the full scope of literature on this emerging topic.

Publications focusing exclusively on general CSHC were excluded, as they do not specifically relate to clinical decisions involving environmental sustainability in treatments. Detailed inclusion and exclusion criteria are provided in **Table 1**. The same criteria were applied consistently during both title/abstract and full-text screening stages.

Table 1. Inclusion and exclusion criteria as applied in the title and abstract and full-text screening

Criteria	Details
Publication Date	From the database's start in 1996 to January 8, 2024
Language	English or German
Inclusion	**Exclusion**
Publication Type	Peer-reviewed articles in scientific/scholarly journals (no restrictions on text format)
Content	Studies covering all four semantic clusters of the research question: - Healthcare professionals - Environmental sustainability - Clinical decision-making - Ethical considerations

To identify all pertinent scientific literature, we initially searched PubMed, Web of Science, Google Scholar, and PhilPapers. The first three databases are well-established and comprehensive for medical and scientific research. PhilPapers was included to capture the philosophical dimensions of the topic. Authors SGK and MM developed a search string specifically for PubMed (see Box 1), which was applied on January 8, 2024. Due to the novelty of the topic and database characteristics, a sufficiently precise and sensitive search string could not be formulated for Web of Science or PhilPapers. For Google Scholar, the search string was adapted for an exploratory search; however, screening the titles and abstracts of the first ten pages (out of roughly 1,000) did not yield any additional eligible publications beyond those already identified. Therefore, no further systematic search was conducted in Google Scholar. Additional relevant studies were obtained through hand-searching of references.

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(Counseling[MeSH] OR "Counseling/trends"[Mesh] OR "Clinical Decision-Making"[MeSH] OR "Clinical Decision-Making/ethics"[MeSH] OR counsel* OR "decision-making" OR "Decision Making, Shared"[Mesh] OR "shared decision-making" OR "informed consent" OR communication* OR Communication[MAJR] OR communication[MeSH] OR "patient education" OR "Patient Education as Topic"[MeSH] OR "health counseling" OR "Health Communication"[MeSH] OR "Health Communication/trends"[Mesh] OR "health communication*" OR "Decision Making/ethics"[MeSH Terms] OR "Health Literacy"[MeSH] OR "Health Literacy/trends"[Mesh] OR "health literacy" OR "Office Visits"[MeSH] OR "Office Visits/trends"[Mesh] OR "clinical encounter" OR "Health Personnel"[MeSH] OR "Professional-Patient Relations"[MeSH] OR "Physician-Patient Relations"[MeSH] OR "psychotherap*" OR "psychologist*" OR "public health practitioner*" OR doctor* OR physician* OR midwife* OR "health professional*" OR „general practition*" OR nurse* OR caregiver* OR "health profession*" OR "health care profession*" OR "health practitioner*" OR "health provider*" OR "healthcare provider*" OR "health worker*" OR "healthcare worker*" OR "medical personnel*" OR "medical professional*" OR "medical staff" OR "health personnel*" OR "health-care worker*" OR "health care worker*" OR "care provider*" OR "health care practitioner*" OR "healthcare profession*" OR "medical expert*" OR "medical practitioner") AND ("Climate chang*" OR "climate change"[MeSH] OR "climate-sensitive" OR "environmental justice" OR "Climatic Processes"[MeSH] OR "Global Warming"[MeSH] OR "global warm*" OR "climate crisis*" OR "planetary health" OR "healthy planet*" OR "health co-benefit*" OR "Global Health/ethics"[Mesh]) OR "Global Health/trends"[MeSH] OR "Particulate Matter/adverse effects"[Mesh] OR "Noise/adverse effects"[Mesh] AND (ethic* OR moral* OR bioethic* OR (ethics, clinical*[MeSH]) OR (ethics, medical[MeSH] OR "patient autonomy" OR "Environmental Justice"[Mesh]) OR "Social Responsibility"[Mesh] OR solidari* OR "Social Cohesion"[Mesh])
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Box 1. PubMed search string

Screening of titles, abstracts, and full texts

The initial identification and screening of publications from PubMed, including titles, abstracts, and full texts, were conducted by SGK. Due to the limited number of publications initially retrieved, citation tracking of the included full-text articles was performed in Web of Science. SGK reviewed the titles and abstracts of these additional publications and subsequently examined the full texts for eligibility. Cases of uncertainty during title and abstract screening were discussed with SS until consensus was achieved. Furthermore, SGK examined the reference lists of all articles included in the full-text review. When titles appeared relevant to the research question, abstracts were also screened.

Data extraction and analysis

From each publication, descriptive details were collected, including publication year, first author's name, affiliation, professional background, journal title, text type (both as reported by the journal and categorized by SGK), subject matter, language, target audience, and method of scientific validation.

Data were analyzed following Kuckartz's qualitative analysis principles [25] using MAXQDA 2020. Entire sections of each publication were available for coding. A combined deductive-inductive strategy was employed to organize the reasons provided in the publications. Deductive categories were drawn from Beauchamp and Childress' biomedical ethics framework [26], encompassing respect for patient autonomy, beneficence, non-maleficence, and justice, as the research question pertains to ethical decision-making in clinical encounters. Additional categories were generated inductively during analysis to capture emerging themes. Subcategories were developed to refine the classification of the main categories. AH, CQ, and SS provided feedback on category formation and clarified ambiguities.

Due to the lack of established quality assessment tools for normative ethics literature [27], formal appraisal of study quality was not conducted. Inclusion was limited to peer-reviewed journal publications, assuming a baseline level of scientific quality. No patient or public involvement was applicable to this review.

Results

Sample characteristics

The PubMed search yielded 904 articles. Citation tracking of these full texts in Web of Science identified 758 additional publications, bringing the total to 1,662 records screened by title and abstract. Of these, 1,602 were excluded, and one could not be retrieved. Fifty-nine full-text articles were assessed for eligibility, with 17 meeting the inclusion criteria. An additional 12 articles were identified through manual searches and reference checks, six of which were excluded after full-text review. In total, 23 publications were included in the final analysis **(Figure 1)**.

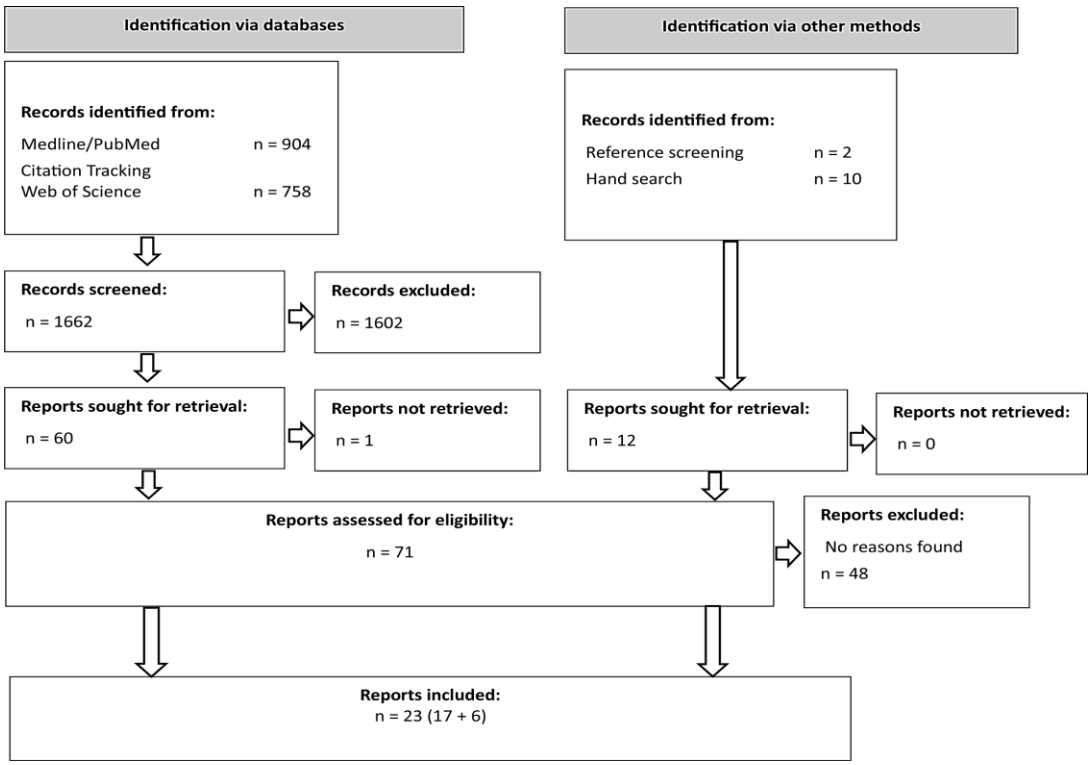

Figure 1. Flow diagram for study selection

A summary of the metadata for the 23 publications included in this review is provided in **Table 2**, with additional details available in Supplement 2. It is noteworthy that all first authors were affiliated with institutions based in high-income countries.

Table 2 presents the topics of the included publications, as categorized by SGK. A prominent focus is the debate surrounding inhalers, specifically the use of environmentally preferable dry-powder inhalers (DPIs) instead of metered-dose inhalers (MDIs) for chronic respiratory conditions. Another significant area concerns professionalism, addressing healthcare professionals' attitudes toward incorporating ecological sustainability into practice, including discussions on the positions of professional organizations and guideline recommendations. The publications on reproductive medicine center on antinatalism, a contemporary ethical issue that has gained attention in the context of the climate crisis. The principal argument in this debate opposes procreation, highlighting that population growth contributes to increased greenhouse gas emissions and exacerbates climate change [28].

Table 2. Characteristics of publications included

Characteristics	Subgroups	Number of articles in the sub-groups (*n*)
Year	2024 (Search string applied on January 8, 2024)	1
	2023	14
	2022	3
	2021	1
	2020	1
	2017	1
	2009	1
	2008	1
Article type	Argumentative text	9
	Commentary	7
	Case presentation	2
	Quantitative data analysis	2
	Informative text	2
	Editorial	1
Country*	United States of America	8
	United Kingdom	6
	Switzerland	1
	Norway	1
	Mexico	1
	Sweden	1
	Belgium	1
	Netherlands	1
Journal	Journal of Medical Ethics	10
	Medicine, Health Care and Philosophy	3
	Journal of the American Board of Family Medicine	2
	AMA Journal of Ethics	2
	British Medical Journal	1
	British Journal of General Practice	1
	Die Dermatologie	1
	Hebamme	1
	International Journal of Environmental Research and Public Health	1
	The Lancet	1
Review mode	Peer Review	10
	Editorial review	10
	No peer review	3
Group of healthcare professionals addressed**	Physicians	18 Physicians in general (14) General practitioners (4) Gynecologists (3) Dermatologists (1)

	Bioethicists	12
	Midwives	1
	Global Health Professionals	1
Topics**	General	13
	Inhaler	7
	Professionalism	3
	Reproductive medicine	3
	Gynecology	2
	Dermatology	1

*As one author was affiliated with two countries, the total number is higher than the number of studies included
**Several studies addressed more than one group, respective topic

A total of 67 ethical reasons were identified concerning the research question, categorized as supporting, opposing, or ambivalent toward integrating environmental sustainability into clinical decision-making. Of these, 30 reasons supported such integration, 27 reasons opposed it, and 10 reasons were considered ambivalent, as the authors' stance was unclear. A detailed overview of these reasons is provided in Supplement 3, and the associated code tree is available in Supplement 4.

Reasons relating to respect for patient autonomy

The largest number of reasons fell under the deductive category of respect for patient autonomy **(Figure 2; Table 3)**, with the majority arguing against incorporating environmental sustainability into clinical decision-making. These objections were rooted in the traditional individualistic view of patient autonomy, which focuses on the single patient, as outlined by Beauchamp and Childress. Concerns were raised about the potential erosion of trust if a patient's inhaler were switched without their consent, or if their refusal to accept a proposed change was not respected [29]. One ambivalent argument stated that "[w]hat is morally right or wrong for patients to choose is normally not seen as relevant for the issue of whether or not their autonomy should be respected" [30].

Within the subcategory of shared decision-making, both ambivalent and opposing reasons were frequent. Arguments against highlighted the importance of not "impos[ing] environmental protection values on [a patient's] decision-making" [31]. Ambivalent reasons focused on the context in which these discussions occur, emphasizing sensitive, patient-centered communication [29] or the need for collaborative decision-making [32, 33], rather than paternalistic approaches. Positive reasons also emerged, noting that withholding environmental information from patients could itself constitute a violation of autonomy [34].

Some authors proposed a modification of the classical autonomy concept. For example, it was argued that "when self-interest and inadequate resources harm others, autonomy loses integrity" [35], suggesting that patient autonomy should meet certain moral criteria to be meaningful. This perspective broadens the scope of autonomy and provides ethical justification for integrating environmental sustainability into clinical decision-making, highlighting a tension between autonomy and justice.

Reasons relating to justice

Concerns were raised that discussing climate issues during consultations could exacerbate existing injustices, particularly for vulnerable populations, as seen in debates around reproductive medicine and coerced sterilization [31]. Some scholars argued that, in the context of climate change, there may be an ethical obligation to limit reproduction, reflecting the principles of antinatalism [36–38]. These arguments illustrate the potential conflict between individual autonomy and justice, as patients' choices might be constrained by environmental considerations.

Conversely, a broader interpretation of justice suggested that integrating environmental sustainability into clinical decision-making aligns with global public health responsibilities, emphasizing the "global ethical priority" of reducing greenhouse gas emissions [34]. This approach shifts the focus from individual-centered justice toward a more global perspective, potentially benefiting future generations or distant communities, even if it imposes limits on individual patient autonomy.

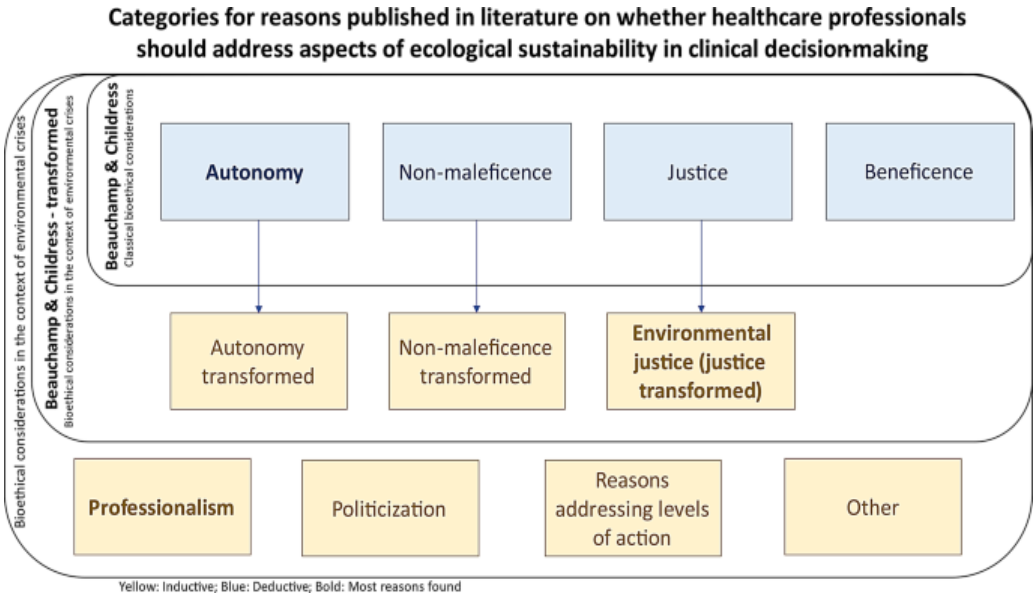

Figure 2. Illustration of deductive and inductive categories

Table 3. Table of reasons

Main Category	Subcategory (if applicable)	Reason	Publication(s)
Respect for Patient Autonomy		Origin of valuing patient autonomy (+)	[45]
		Morals have limited relevance to patient autonomy (+/-)	[30]
		Debate in reproductive medicine: Significant challenge to patient autonomy (-)	[54]
		Overriding a patient's refusal undermines trust in physicians (-)	[29]
	Informed Consent	Educating patients aligns with sustainable healthcare practices (+)	[55]
		Physicians may withhold certain information (+)	[31], [45], [34] (2x)
		Patients should be informed about the environmental impact of healthcare interventions (+)	[34]
		No need to provide specific details if both options are standard practice (-)	[55]
		Physicians should prioritize patients' best interests (-)	[39]
	Shared Decision-Making	Incorporating patients' preferences and values into decisions (+)	[31] (2x), [45], [40], [29]
		Patients appear open to learning about the environmental impact of healthcare (+)	[45]
		Uncertainty about what sustainable healthcare entails (+/-)	[54]
		Shared decision-making is effective only when patients show interest (+/-)	[49]
		The manner of conducting discussions is critical (+/-)	[29]
		In some cases, patients should not be given a choice (+/-)	[49]

		Collaborative decision-making is essential (+/-)	[32], [33]
		Physicians should avoid imposing personal values on patients (-)	[31]
		Autonomy takes precedence when a patient is resolute (-)	[14]
		Risk of harming the patient-provider relationship (-)	[49]
		Physicians feel restricted in their practice (-)	[43]
		General practitioners report no patient inquiries on this topic (-)	[17]
Respect for Patient Autonomy – Transformed		Autonomy is not absolute and exists in context (+)	[52]
		Autonomy is valid only if it does not harm others (+)	[35]
Non-Maleficence		Avoiding over-diagnosis or over-treatment (+)	[34]
		Preserving trust and protecting patient health to prevent harm (-)	[29]
		Failing to provide optimal treatment causes harm (-)	[39]
Non-Maleficence – Transformed		Linking healthcare delivery to reducing greenhouse gas emissions (+)	[40], [43], [34]
		Obligation to prevent foreseeable harm (+)	[14], [29] (2x)
Beneficence		Benefits of environmentally conscious prescribing (+)	[29]
		Assisting patients in clarifying their preferences (+)	[31]
Justice		Higher costs for reducing emissions without immediate patient impact (+/-)	[29]
		Potential to reinforce inequities through counseling (-)	[31]
Environmental Justice (Justice Transformed)		Accepting higher costs for broader health benefits in low- or middle-income countries (+)	[29]
		Ensuring sustainable living standards for all (+)	[61]
		Recognizing responsibilities for local and global public health (+)	[52], [35], [45], [34], [41]
		Addressing health consequences for all stakeholders (+)	[52]
		Patients reducing emissions to offset physicians' conference-related travel (-)	[38]
	Polluter Pays	Those responsible for harm must address it (+)	[29]
		Identifying the polluter is challenging (-)	[29]
		Subsistence-related emissions are exempt (-)	[29]
Politicization		Raising patient awareness of the climate crisis through discussion (+)	[45] (2x)
		Politicization is a familiar issue for clinicians (+)	[45]
		Reproductive issues are highly sensitive and contentious (-)	[47]
Reasons Addressing Levels of Action		Focusing solely on systemic issues does not resolve all challenges (+)	[48]
		Pharmaceuticals and chemicals are major contributors to healthcare's climate impact (+)	[43]

		Emphasizing individual actions weakens the argument (-)	[30]
		Decisions should be made by society, not physicians (-)	[39]
		Healthcare providers should prioritize systemic approaches (-)	[49]
Professionalism	**Healthcare Professionals' Role in General**	Concerned individuals, including healthcare professionals, care about the climate crisis (+)	[45]
		Ethical duty to uphold planetary health principles (+)	[61]
	Physicians' Role	Expertise includes understanding and teaching climate protection (+)	[52], [46] (2x), [32] (3x), [41] (3x)
		Building trust through transparent climate-related disclosures (+)	[45], [46]
		Overlapping responsibilities create challenges (-)	[39]
		Patient preferences take priority (-)	[39]
		Physicians are bound by confidentiality obligations (-)	[39]
		Risk of eroding trust (-)	[39]
		Significant ethical decisions should occur outside the physician-patient dynamic (-)	[39]
	Professions' Codes / Initiatives	Medical codes encourage environmentally responsible practices (+)	[54], [41]
		Updates to codes could be perceived as binding (+)	[41]
		Physicians are responsible for individual patients, not systemic issues (-)	[43], [39]
Other		Openness to new knowledge and perspectives (+)	[61]
		Complex cause-and-effect dynamics of the climate crisis (+/-)	[32]
		Relevance depends on the consultation topic (+/-)	[45]
		Ethical tensions between individual and public interests (+/-)	[32]
		Challenges in measuring emissions accurately (-)	[52]

List of abbreviations:
(+) = positive reason, for implementing aspects of environmental sustainability in clinical decision-making
(-) = negative reason, against implementing aspects of environmental sustainability in clinical decision-making
(+/-) = ambivalent reason regarding implementing aspects of environmental sustainability in clinical decision-making
The frequency of the reason identified in the publication is indicated after publication number (for example: Publication [14] (3x)); if no number of reasons is indicated, the reason was identified once in the named publication
See Supplement material 1 for a list of articles included in the review in alphabetical order.

Reasons related to non-maleficence

Within the non-maleficence category, Wiesing highlights a potential conflict: "if the best intervention is not chosen for environmental reasons and the patient is not treated optimally and worse off, then there is a serious conflict" [39]. In other words, prioritizing environmental concerns over optimal patient care could result in harm, violating the principle of non-maleficence.

However, some authors extend the concept of non-maleficence to include future generations. For example, Parker introduces the duty to "minimise expected harm" [14], referring to environmental damage from healthcare interventions that could negatively affect third parties, such as future populations. This perspective supports engaging patients in discussions about sustainability as part of ethically responsible care [40].

Reasons related to beneficence

The category of beneficence was less prominent, with only two positive reasons identified. In the context of reproductive medicine, it was argued that allowing

patients time to reflect on the potential environmental impact of a future pregnancy aligns with the principle of beneficence, supporting ethically responsible guidance [31].

Reasons related to professionalism

Professionalism emerged as the most comprehensive inductive category **(Figure 2; Table 3)**. While physicians' roles were frequently discussed, other health professions were less represented. Concerns against integrating sustainability included the potential overload of responsibilities for healthcare providers and the unsuitability of the patient-provider interaction for resolving complex ethical challenges that may extend beyond the individual level [39]. Conversely, arguments supporting sustainability framed it as part of the physician's professional responsibilities [41]. Changes in professional identity—similar to previous shifts regarding patient autonomy—could normalize discussions about climate protection in clinical encounters, making them more acceptable to patients [41].

Several authors highlighted professional codes. Some, such as the World Medical Association's International Code of Medical Ethics (2022 revision), emphasize environmentally sustainable medical practice [41, 42]. In contrast, other codes, including the Declaration of Geneva (2006, 2017) and UNESCO's Universal Declaration on Bioethics and Human Rights (2006), prioritize the individual patient's welfare as the physician's foremost duty [43, 44].

Reasons related to politicization

The potential politicization of medical consultations was also considered. Physicians commonly navigate politically sensitive topics, including abortion, transgender care, reproductive health, lifestyle counseling, and end-of-life decisions [45]. Cohen *et al.* argue that climate change discussions would merely extend this list, and consultations can serve as opportunities to educate patients and encourage environmentally responsible behaviors [46]. However, one qualitative study indicated that general practitioners were hesitant to discuss reproductive health as a climate-related measure, perceiving it as excessively politicized [47].

Reasons related to appropriate levels of action

Some authors emphasize that focusing solely on structural or institutional approaches in healthcare is insufficient, as the interactions between clinicians and patients remain critical [48]. Still, providers are encouraged to advocate for systemic changes in healthcare financing, organization, and delivery while exercising discretion when raising environmental issues with patients [49]. Herlitz *et al.* caution that concentrating exclusively on individual-level interventions may reduce the appeal of promoting "green" bioethics [30].

Other reasons

Finally, one reason against incorporating environmental sustainability into clinical decision-making concerns the difficulty of quantifying emissions. Challenges include both technical calculations [50, 51] and ethical considerations, as assessing emissions involves value-laden and morally complex decisions [52].

Discussion

This systematic review of reasons examined healthcare professionals' justifications for integrating—or not integrating—environmental sustainability into clinical decision-making. The analysis revealed a roughly equal number of arguments supporting and opposing such integration, with some reasons being classified as ambivalent. Notably, certain reasons indicated a potential shift in traditional bioethical principles, particularly respect for patient autonomy, non-maleficence, and justice **(Figure 2)**. These arguments predominantly supported the inclusion of environmental sustainability considerations. In contrast, reasons related to professionalism, politicization, and the appropriate levels of climate action were more evenly distributed. Overall, the discourse on this topic remains nascent, with discussions concentrated on specific issues, such as the debate surrounding inhaler prescriptions [29, 30, 33, 46, 49].

A discernible transformation of the classical Beauchamp and Childress principles—except beneficence—was observed, though the degree of change varied depending on the complexity and number of reasons presented. This transformation can be characterized as a movement away from a purely individualistic understanding of patient autonomy toward a perspective that situates the individual within their broader environmental context,

with implications across all four bioethical principles. Christina Richie's *Principles of Green Bioethics* [53] reflects a similar shift, presenting four principles culminating in "green informed consent," which involves providing patients with environmental information about diagnoses and potential interventions while considering their clinical and personal values [34].

Both these transformed principles and Richie's framework indicate a decreased focus on the individual alone. Nevertheless, in clinical decision-making, the individual cannot be disregarded, particularly in the interplay with institutional and systemic factors in healthcare. Ultimately, system-level outcomes are the result of individual healthcare professionals making decisions and taking action regarding the climate crisis. This tension is evident in existing debates, such as: how should clinicians respond to patients who decline switching from MDIs to DPIs [29]? Is the use of assisted reproductive technologies ethically justifiable under the climate crisis, especially when state-subsidized [54]? Can the use of disposable products be ethically defended [55]?

The first scenario illustrates the tension between autonomy and justice: a patient's choice not to switch from an MDI to a DPI contributes to greenhouse gas emissions, even though the individual's responsibility is minimal. Framing emission reductions as both climate mitigation and disease prevention may reconcile this tension, aligning with the principle of beneficence [56].

At the system level, discussions of professionalism and health policy were prominent in the literature. Recent revisions of professional guidelines, such as those by the General Medical Council (2024), increasingly consider environmental sustainability [57]. However, critics argue these revisions remain insufficiently comprehensive [58], often omitting explicit consideration of the individual provider-patient relationship and emphasizing broad systemic goals, e.g., suggesting that healthcare professionals "should consider supporting initiatives to reduce the environmental impact of healthcare" [57]. Similarly, WHO publications largely address sustainability at the institutional or system level, with limited guidance for patient-level decision-making [59, 60].

Some exceptions exist. The Planetary Health Pledge [61], initiated by individuals rather than associations, emphasizes individual-level responsibility and promotes an integrative approach. In Germany, specific guidelines encourage climate-conscious inhaler prescriptions [62], and a guideline on "Climate-sensitive health advice for GP practices" is expected to be finalized by the end of 2025 [63]. Outside these examples, German-speaking countries lack guidelines explicitly addressing climate-sensitive health counseling. In the UK, "greener surgery" guidelines include multi-stage checklists to promote sustainability in surgical procedures [64]. While these guidelines raise awareness, they do not provide explicit guidance on patient communication regarding sustainable healthcare choices.

To address these gaps, the development of additional guidelines is essential, alongside the incorporation of compulsory modules on environmental sustainability into medical curricula. Although some universities offer optional courses on planetary health [65, 66], mandatory integration into national medical education frameworks would ensure consistent knowledge transfer and promote widespread competency in climate-conscious clinical decision-making.

Implications for research and practice

A central aim of this study is to provide healthcare professionals with guidance on addressing environmental sustainability within routine clinical decision-making, based on a comprehensive synthesis of reasons reported in the scientific literature. The following recommendations are derived from the reasons identified in the included publications.

All first authors of the reviewed studies were affiliated with institutions in high-income countries, suggesting that the current discourse is largely shaped by a "Western" perspective. Future research should incorporate the viewpoints of low- and middle-income countries. Although healthcare systems in these regions currently contribute less to global greenhouse gas (GHG) emissions [8], strengthening their climate-conscious healthcare capacity is essential. Addressing environmental sustainability in clinical consultations is therefore a globally relevant issue. Recent publications indicate growing interest in this topic [67], yet further studies are needed to examine the ethical challenges, particularly for vulnerable populations and indigenous groups in resource-limited settings.

Effective patient-provider communication regarding the environmental impacts of prevention, diagnosis, and treatment is essential. Reliable data on emissions associated with medical interventions are critical to support these discussions. Future empirical research

should aim to fill gaps in knowledge regarding the environmental effects of healthcare, especially GHG emissions. Ethical analyses should explore potential transformations of classical bioethical principles—particularly autonomy and justice—and clarify tensions between them. Moreover, the responsibilities of healthcare professionals should be examined in the context of the climate crisis, with attention to the interaction between individual- and system-level actions. Given the profound implications of climate change and the challenges faced by healthcare providers [48], developing authoritative, evidence-based guidelines by broadly representative professional bodies could help ensure that these recommendations are perceived as normatively binding and capable of guiding real-world practice.

In clinical practice, healthcare professionals should remain attentive to patient preferences within the shared decision-making process. Consultations should allow sufficient time and occur in a supportive, calm environment. Professionals must avoid imposing their own values on patients, instead carefully considering whether environmental sustainability is relevant to the patient's circumstances, including diagnosis, treatment options, and individual preferences. A strong pre-existing patient-provider relationship facilitates such discussions. Tools like the Choosing Wisely questions [68] can encourage active patient participation in shared decision-making. On the systemic level, healthcare professionals should develop ethically informed positions on integrating environmental sustainability into practice and engage in professional and societal discourse, including within associations, to contribute to the creation of concrete guidelines.

Limitations

This study faced several limitations. Identifying all relevant publications was challenging due to inadequate indexing in medical databases, likely reflecting the novelty of the topic and the lack of standardized terminology. Language restrictions were another limitation, as only English and German publications were included. Additionally, perspectives from non-physician healthcare professions were underrepresented, potentially because the focus on "clinical decision-making" primarily aligns with physicians' roles. It is important to note that this SRoR does not evaluate the quality of the arguments, but rather provides a comprehensive overview of the current scientific discourse. Therefore, the collected reasons can serve as a foundation for further critical analysis and research.

Conclusions

To our knowledge, this SRoR is the first to systematically examine reasons for and against healthcare professionals addressing environmental sustainability in clinical decision-making—an area of substantial importance for planetary health. By employing the four classic bioethical principles proposed by Beauchamp and Childress, we categorized the identified reasons and further developed additional inductive categories during analysis. The findings indicate that decisions regarding the inclusion of environmental sustainability considerations are context-dependent, influenced by patient characteristics, clinical circumstances, and treatment specifics, rather than allowing for a universal recommendation. A robust patient-provider relationship and a well-defined professional stance on environmental sustainability support both clinicians and patients. Nonetheless, responsibility for sustainability cannot rest solely on the individual level. Professional organizations should develop guidelines offering specific recommendations for integrating environmental sustainability into clinical practice, while universities should incorporate mandatory training on healthcare's environmental impact to educate future healthcare professionals. Effective climate action requires coordinated efforts across individual, institutional, and global levels to promote planetary health.

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