Integrating environmental sustainability in clinical counselling: a randomised, double-blind, experimental vignette study in the Netherlands

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Summary

Background Integrating environmental sustainability in health-care decision making might be a key strategy to achieve greener clinical practice. We aim to explore whether advising environmentally sustainable treatment options with or without explicitly mentioning sustainability as an argument in clinical counselling affects patients' trust in care, compared with less sustainable standard treatment options, while accounting for differences in severity and types of medical problems.

Methods This randomised, double-blind, experimental vignette study was conducted at the Leiden University Medical Center (Leiden, Netherlands). We recruited a representative sample (based on sex, age, education level, and geographical distribution) of the general Dutch adult population. Participants were masked, randomised, and allocated to one of the eight study groups (four types of advice × two levels of severity) using automatic online software. We used an online survey tool to provide participants with five short descriptions (vignettes) of hypothetical patient–physician interactions based on their allocation to high severity or low severity scenarios and their physician's type of advice; varying in the level of environmental sustainability and whether sustainability is mentioned explicitly. Low severity scenarios described a general practice setting and high severity scenarios described a hospital setting where the patient had been referred. The primary outcome was a practice-based composite score labelled as trust in care (seven-point Likert scale from 1 [strongly disagree] to 7 [strongly agree]).

Findings Between May 16 and 31, 2024, 2694 participants were invited to participate, of whom 1536 were included in the final sample size of the study. The mean age of participants was 51·7 years (SD 17·1). 762 (50%) participants were female and 774 (50%) were male. Participants receiving the Less Sustainable advice (mean 5·6 [SD 1·2]) generally had higher trust scores than participants receiving one of the other three types of advice ($p<0·0001$). Participants receiving the Sustainable made Explicit advice (mean 4·8 [1·6]) generally had lower trust scores than those receiving one of the other three types of advice ($p<0·0001$). Post-hoc analysis indicated that differences in trust scores were primarily driven by high severity conditions and varied across medical problems.

Interpretation Advising more sustainable treatment options for low severity scenarios generally does not affect patients' trust in care, including when sustainability is mentioned explicitly. For high severity scenarios, advising more sustainable treatment options might negatively affect patients' trust; however, the size and presence of the observed effect varied across medical problems.

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Introduction

The health-care sector faces an urgent challenge to reduce its environmental footprint. Considering the intricate link between human and planetary health, future-proof health care should address patients' individual needs and broader environmental considerations. Especially in high-income countries, health-care systems contribute substantially to national CO_2 emissions (6–8%) and natural resource use (13%).[1,2] To date, more than 90 countries have pledged to deliver more environmentally sustainable care.[3] Concurrently, a rapidly growing body of literature supports the inception of evidence-based, sustainable decision making.[4]

Including environmental sustainability as a quality criterion for care delivery is frequently suggested as a key strategy for its incorporation into health care.[5,6] Consequently, clinicians are called upon to consider the environmental impact of health care when choosing between treatment alternatives and designing clinical guidelines.[7] In the case of clinical equipoise, the more sustainable treatment option is preferred; however, expecting patients to respond negatively when considering the environmental option in clinical counselling—eg, due to novelty of the argument or perceived inexpedience in clinical conversations—might be regarded as a barrier.[8,9]

Research in context

Evidence before this study

Previous surveys in the UK and the Netherlands found that patients are generally interested in the environmental impact of health care. We searched PubMed and Web of Science for articles published in English, Dutch, or German between database inception and July 31, 2025, studying patient perspectives on the integration of environmental sustainability in clinical counselling. Additionally, we performed reference and citation screening. We found 12 studies, mostly related to primary care and gynaecology, inquiring about patients' support for climate-friendly treatment options. Although multiple studies reported patients' willingness to consider the environment in their treatment choices, willingness appeared to vary based on the type and severity of their medical problem. Only two studies explored patients' response when exposed to (hypothetical) counselling, of which one was limited to lifestyle-related scenarios and the other was limited to primary care scenarios.

Added value of this study

This study explores the effect of integrating environmental sustainability in clinical counselling and, to our knowledge, is the first to include a diverse set of health problems varying in severity—supporting the differentiation of findings to patients and health-care professionals in different clinical settings. Our findings suggest that primarily for low severity conditions, advising more sustainable treatment options might be an acceptable way to integrate environmental sustainability in clinical counselling. However, our findings also suggest that for high severity conditions, explicitly discussing sustainability does not benefit patients' trust and might affect trust negatively.

Implications of all the available evidence

Evidence suggests that advising more sustainable treatment options could be an acceptable way to integrate environmental sustainability in clinical counselling, depending on the severity of the condition and potentially on the type of clinical setting and patents' familiarity with or expectations around the particular treatment. Clinicians' situational awareness seems key to sense whether environmental sustainability should be discussed or primarily guaranteed through system-level and institutional-level decisions.

A recent experimental vignette study concluded that primary care patients' satisfaction with doctors' visits was not affected when an equally effective and sustainable option was advised for low severity health complaints.[10] Investigated complaints were metered-dose inhalers or dry-powder inhalers for asthma, paracetamol or additional diclofenac for knee pain, and clarithromycin or flucloxacillin for erythema. When environmental sustainability was also explicitly mentioned as an argument for advising the sustainable option, positive or negative effects varied depending on the health complaint. This finding suggests that worries regarding negative patient responses to more sustainable treatment options might not be justified. To date, patients' response to sustainable treatment options for more severe health complaints remains largely unknown.

Some studies suggest that patients might be willing to consider the environment in their treatment choices,[11–14] with three also indicating that willingness is lower for more severe medical conditions.[11,14,15] However, all of these studies directly inquired patients' willingness and might not necessarily reflect their responses when exposed to (hypothetical) clinical counselling. Moreover, evidence regarding the effect of explicitly counselling patients on the environmental impact of treatment options is limited to the aforementioned primary care study and a study of lifestyle-related counselling.[10,16] Although patients' trust might not be the primary goal of shared decision making, understanding the effect on trust of including environmental sustainability is important.

Considering these gaps in the literature, we aim to explore whether advising environmentally sustainable treatment options with or without explicitly mentioning sustainability as an argument in clinical counselling affects patients' trust in care, compared with less sustainable standard treatment options. Furthermore, we explore whether a possible effect is influenced by the perceived severity or the type of medical problem (or both).

See Online for appendix

For more on **AsPredicted** see https://aspredicted.org/mhzn-pmv6.pdf

Methods

Study design

This randomised, double-blind, experimental vignette study was conducted at the Leiden University Medical Center (Leiden, Netherlands). We used an online survey tool to provide participants with short descriptions of hypothetical patient–physician interactions. Participants also answered a corresponding set of questions (ie, the dependent variable). The mixed experiment had a 4 (between-group for type of advice) × 2 (between-group for severity) × 5 (within-group for medical problem) design with trust in care as the dependent variable (figure 1), which is a conceptual replication and extension of a primary care study.[10] We explored a different set of medical problems in a general practice setting and added more severe medical problems (appendix pp 4–9) in a hospital setting for variance in severity. The authorised departmental review committee of the Leiden University Medical Center provided ethical approval (number 24–3033). All participants provided online informed consent before participation. All study materials are available via the Open Science Framework. This study and planned analysis were preregistered on AsPredicted (number 173225).

Participants

We recruited a representative sample based on sex (male or female), age (>18 years), education level (low, middle, or

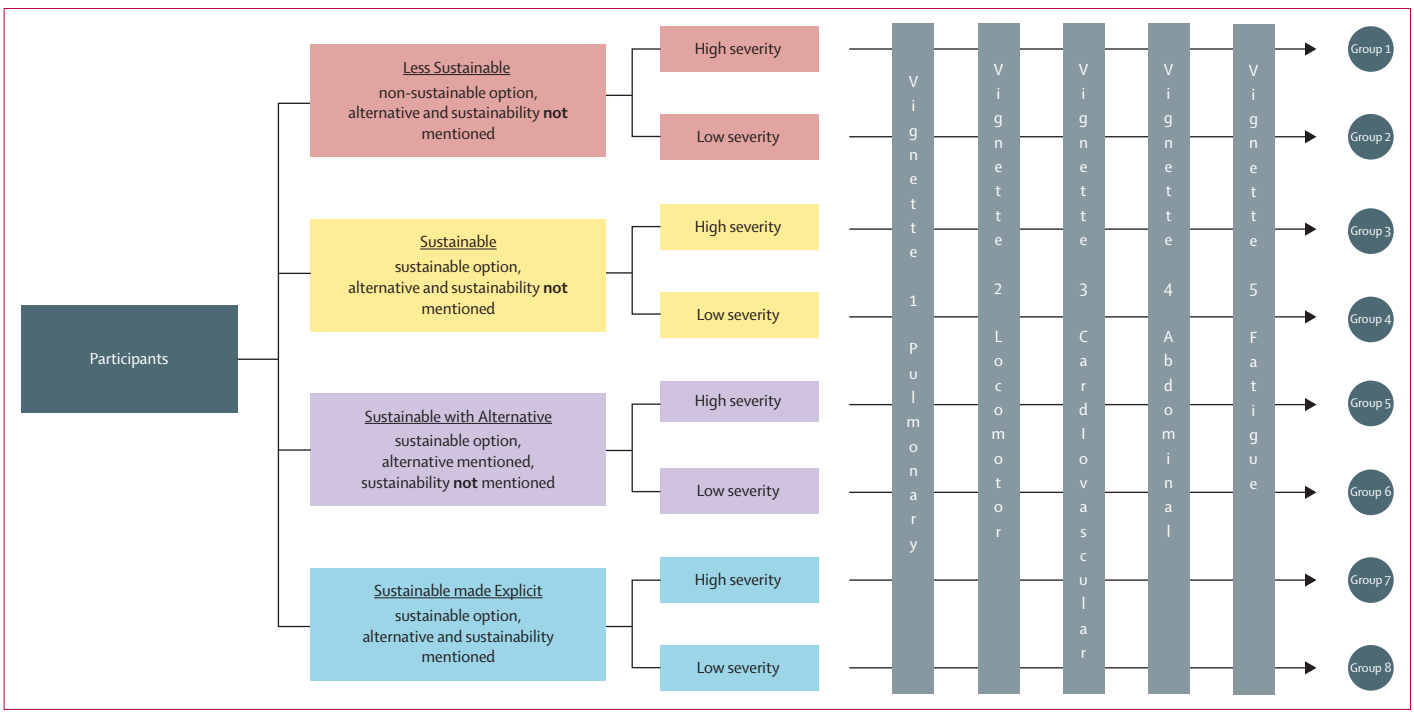

Figure 1: **Flow diagram of the study design**

high), and geographical distribution (each of 12 Dutch provinces) of the general Dutch adult population, able to read and understand the Dutch language. To facilitate access to and quality of our sampling population, we collaborated with the Flycatcher research agency certified by the International Organization for Standardization, guaranteeing privacy requirements, academic training of research agency employees, and presence of transparency and guidelines for every stage of scientific research (appendix p 3). Participants of their pre-existing panel were invited to participate via email, with a maximum of two reminders if participation had not been initiated or completed and received a compensation from the research agency upon completion (equivalent to €2·60). Participants could end participation at any moment, and a debriefing of the research aim and an opt-out possibility were included at the end of the study. Participants who did not meet the survey's preregistered response quality check based on response time, straight lining, and consistency—performed independently by the research agency—were excluded from the analyses (appendix p 3).

Randomisation and masking

Participants were masked, randomised, and allocated to one of the eight study groups (four types of advice × two levels of severity) using the automatic online software programmed and managed by the research agency. The order in which different vignettes were shown varied across participants. Enrolment continued until the minimum required number of participants per group had been reached. To avoid selection bias, we concealed the exact aim of the study before participation and only informed participants that the research was intended to inquire their opinion about hypothetical doctors' visits.

For more on the **research agency** see https://www.flycatcher.eu/nl/

Procedures

We carefully constructed text-based vignettes in B1 level Dutch, in line with published guidance on vignette validity.[17] All vignettes followed the same structure to describe a hypothetical patient–physician interaction for each of the five medical problems based on the participant's group allocation. We did not use supporting pictures or videos, considering our focus on the content of the counselling. Low severity scenarios described a general practice setting and high severity scenarios described a hospital setting where the patient had been referred (panel 1). Notably in the Netherlands, a referral from primary care is required for consultations in the hospital. Medical problems were related to different origins (panel 2).

Scenarios were directly followed by a corresponding type of advice, drafted in consultation with relevant medical specialists and general practitioners (appendix p 2). The available options were standard, environmentally less sustainable treatment (ie, Less Sustainable); environmentally more sustainable treatment (ie, Sustainable); environmentally more sustainable treatment, while mentioning that there is an alternative (ie, Sustainable with Alternative); and environmentally more sustainable treatment, while mentioning that there is an alternative and that the suggested option is more environmentally sustainable

Panel 1: **Translated example of a low severity and high severity vignette with types of advice**

Vignette 1 (low severity): pulmonary asthma

Scenario

You are visiting your general practitioner because you have a cough and feel somewhat short of breath for a couple of weeks. After the conversation and an examination, the general practitioner concludes that you have asthma. The general practitioner discusses with you what to do next.

Less Sustainable advice

They propose to prescribe you a metered-dose inhaler to make sure that you do not become short of breath again.

Sustainable advice

They propose to prescribe you a dry-powder inhaler to make sure that you do not become short of breath again.

Sustainable with Alternative advice

Different types of medication are available: (1) a metered-dose inhaler, or (2) a dry-powder inhaler. They propose to prescribe you the dry-powder inhaler to make sure that you do not become short of breath again.

Sustainable made Explicit advice

Different types of medication are available: (1) a metered-dose inhaler, or (2) a dry-powder inhaler. They propose to prescribe you the dry-powder inhaler to make sure that you do not become short of breath again and because this medication is less burdensome for the environment than the metered-dose inhaler.

Vignette 1 (high severity): pulmonary lung cancer

Scenario

Your general practitioner has referred you to the hospital because you have been coughing a lot and feeling tired for a couple of weeks. After the conversation and an examination, the physician concludes that you have early-stage lung cancer. The physician discusses with you what to do next.

Less Sustainable advice

They recommend surgery to remove the sick part of your lung.

Sustainable advice

They recommend targeted radiation to kill the cancer cells.

Sustainable with Alternative advice

Two treatments are possible: (1) surgery to remove the sick part of your lung, or (2) targeted radiotherapy to treat the sick part of your lung. They recommend targeted radiation to kill the cancer cells.

Sustainable made Explicit advice

Two treatments are possible: (1) surgery to remove the sick part of your lung, or (2) targeted radiotherapy to treat the sick part of your lung. They recommend targeted radiation to kill the cancer cells and because radiotherapy is less burdensome for the environment than surgery.

(ie, Sustainable made Explicit). From a medical perspective, the quality of care and patient's health outcome were considered equal for the Less Sustainable and Sustainable options.

We piloted the validity of vignettes. First, we consulted two physicians not involved in the research team and two laypersons with different education levels to freely comment on the readability and credibility of vignettes and adjusted accordingly. Second, we asked members of the general Dutch population of a different online panel (n=85; Prolific Academic) to rate severity on two seven-point Likert scales (severity and urgency) and comment on readability. For all vignettes included in the final study, the high severity version was indeed rated as more severe than the low severity version. Additional vignettes intended to vary in urgency were removed, as they were not consistently perceived as such in the pilot study. A description of all vignettes and details on the pilot study are provided in the appendix (pp 4–11).

For more on **Prolific** see https://www.prolific.com/

Outcomes

The primary outcome was a practice-based composite score labelled as trust in care, tailored specifically to the purpose and design of this study (appendix p 2). We operationalised trust in care as the mean score of four statements, inquired directly after participants' exposure to a vignette: "I agree with this treatment", "I trust this physician", "I trust this treatment", and "This physician pays attention to my health". Participants rated items on a seven-point Likert scale (from 1 [strongly disagree] to 7 [strongly agree]) and

Panel 2: **Overview of medical problems and types of advice included in the vignettes***

Vignette 1: Pulmonary
Low severity: newly diagnosed asthma treatment in a primary care setting
Less Sustainable advice: prescription of metered-dose inhaler
More Sustainable advice: prescription of dry-powder inhaler

High severity: early-stage non-small-cell lung cancer treatment in a hospital setting
Less Sustainable advice: surgical removal (with video-assisted thoracic surgery)
More Sustainable advice: stereotactic body radiotherapy

Vignette 2: Locomotor
Low severity: ankle distortion follow-up in a primary care setting
Less Sustainable advice: in-person follow-up in 1 week and movement exercises
More Sustainable advice: self-practice using a national website created by general practitioners

High severity: stable Weber A or B ankle fracture follow-up in a hospital setting
Less Sustainable advice: ankle cast and in-person follow-up appointment
More Sustainable advice: ankle brace and self-guided follow-up using the Virtual Fracture Care app

Vignette 3: Cardiovascular
Low severity: hypertension follow-up in a primary care setting
Less Sustainable advice: annual in-person follow-up appointment with a general practice assistant
More Sustainable advice: self-measurement at home using blood pressure monitor

High severity: angina follow-up, hospital setting
Less Sustainable advice: medication and in-person follow-up appointment
More Sustainable advice: medication, digital monitoring, and video call follow-up

Vignette 4: Abdominal
Low severity: uncomplicated cholecystolithiasis treatment in a primary care setting
Less Sustainable advice: referral to the hospital for cholecystectomy
More Sustainable advice: watchful waiting, including an explanation that symptoms will fade and chance that pain persists after surgery

High severity: uncomplicated appendicitis treatment in a hospital setting
Less Sustainable advice: surgical removal
More Sustainable advice: conservative treatment with antibiotics

Vignette 5: Fatigue
Low severity: hyperthyroidism investigations in a primary care setting
Less Sustainable advice: bloodwork and in-person follow-up
More Sustainable advice: bloodwork and e-consultation containing results

High severity: possible malignancy investigations in a hospital setting
Less Sustainable advice: total body scan and in-person follow-up with a family member
More Sustainable advice: total body scan and video call follow-up with a family member

*Reasoning regarding medical problems, treatment options, and level of evidence for environmental sustainability of treatments are reported in the appendix (pp 4–9).

received an open-ended question after the four statements, in which participants could indicate the most important question they might have for the physician after receiving their advice (appendix pp 12–15).

Before presenting the vignettes, we inquired about participants' type of living area, self-rated health status, and baseline trust in physicians. Health status was operationalised as a single, five-point item of the 36-Item Short Form Health Survey (Dutch version).[18] We measured baseline trust in physicians on a five-point Likert scale (from 1 [strongly disagree] to 5 [strongly agree]). Demographics were collected automatically from the online panel database (sex, age, and education level). After completing the vignettes (to avoid influencing the dependent variable), we asked participants to indicate any personal experience with the medical problems and

whether they believed in climate change. For exploratory purposes, all participants responded to three statements inquiring their view on sustainable health care and three statements related to climate change (appendix p 16), rated using a five-point Likert scale.

Statistical analysis

We calculated a required sample size of 1456 participants (n=182 per group) based on an a priori power calculation (α=0·05, power=0·8) to explore a potentially small effect size (Cohen's *f*=0·1) of mentioning environmental sustainability on participants' trust in care using G*Power (version 3.1). We calculated and reported a descriptive sample overview using frequencies, means, and SD for the dependent variable and demographics. The dependent variable consisted of a composite score for the trust in care statements (Cronbach's α=0·93–0·96). Furthermore, we performed a randomisation check for baseline characteristics, personal experience with the medical problems, and belief in climate change using Chi Squared (χ^2) and Kruskal–Wallis tests.

To answer the main research questions, we performed the preregistered three-way (type of advice × severity × medical problem) mixed ANOVA on trust in care. Main effects were presented as estimated marginal means and effect sizes (η_p^2). We decomposed main effects and two-way or three-way interactions with exploratory post-hoc comparisons using Bonferroni corrections, reported as mean differences per medical problem and type of advice including 95% CI. As preregistered, we performed these analyses with and without outliers (defined as three SDs higher or lower than the mean). As this generally did not affect the results (appendix p 17), we reported the findings based on the full sample. We visually compared the type of advice effect patterns for participants of different education levels and with or without personal experience of the medical conditions (appendix p 17). We analysed all data using R (version 4.4.1). All data and code materials are available on the Open Science Framework.

Role of the funding source

The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results

Between May 16 and 31, 2024, 2694 participants were invited to participate, of whom 1536 were included in the final sample size of the study. 1158 participants chose not to participate or were excluded due to incomplete entries (n=90) or not meeting the quality check (n=28). Baseline characteristics were similar between the groups (table 1). The mean age of participants was 51·7 years (SD 17·1). 762 (50%) participants were female and 774 (50%) were male. Participants' previous experience with medical problems in the vignettes or their belief in climate change were not statistically significant (p>0·10), with 1097 (71%) of participants with at least one of the medical complaints (appendix p 17).

Across vignettes, trust in care scores were high with means between 4·1 (SD 1·7) and 6·1 (0·9; table 2). The type of advice × severity × medical problem mixed ANOVA showed statistically significant effects on trust for all three independent variables (all p<0·0001). For type of advice (η_p^2=0·09), participants receiving the Less Sustainable advice (mean 5·6 [SD 1·2]) generally had higher trust scores than participants receiving one of the other three types of advice (all p<0·0001). Moreover, participants receiving the Sustainable made Explicit advice (mean 4·8 [1·6]) generally had lower trust scores than those receiving one of the other three types of advice (all p<0·0001). Sustainable (mean 5·2 [1·5]) and Sustainable with Alternative (mean 5·1 [1·4]) advice were not significantly different (p=1·00). For severity (η_p^2=0·02), participants in the low severity scenario (mean 5·3 [1·4]) had higher trust scores than those in the high severity scenario (mean 5·0 [1·5]). The main effect of medical problem (η_p^2=0·05) showed that various medical problems yielded slightly different trust scores (overall ranging from mean 4·8 [1·6] for abdominal problems to 5·4 [1·3] for cardiovascular problems).

All two-way interactions were significant: type of advice × severity (η_p^2=0·02; p<0·0001), type of advice × medical problem (η_p^2=0·05; p<0·0001), and severity × medical problem (η_p^2=0·01; p<0·0001). We also decomposed the type of advice × severity interaction in a post-hoc analysis by comparing the effect of the type of advice within high and low severity scenarios separately (figure 2). Within the low severity scenario, trust scores for Less Sustainable advice were significantly higher than those for Sustainable with Alternative (p=0·027) and Sustainable made Explicit (p<0·0001) advice but were not significantly different than Sustainable advice (p=0·11). None of the other comparisons between the Sustainable, Sustainable with Alternative, and Sustainable made Explicit advice were significant (all p>0·13). Within the high severity scenarios, trust scores were significantly higher for Less Sustainable advice than for the three other types of advice (all p<0·0001) and significantly lower for Sustainable made Explicit advice than for Sustainable and Sustainable with Alternative advice (all p<0·0001).

The two-way interactions were further qualified by a significant three-way interaction (p<0·0001), indicating that the type of advice × severity interaction pattern differed across medical problems. We tested the interaction for each of the medical problems separately. We found significant type of advice × severity interactions for the pulmonary, locomotor, cardiovascular, and abdominal problems (all p<0·0001). For fatigue, the interaction was not statistically significant (p=0·65; appendix p 17). Medical problems with significant interactions were decomposed further in a post-hoc analysis by comparing the effect of different types of advice for high and low severity scenarios separately (figure 3). Within the low severity scenarios, generally no effect of the type of advice on trust scores was found, except

	Low severity scenario				High severity scenario			
	Less Sustainable advice (n=202)	Sustainable advice (n=183)	Sustainable with Alternative advice (n=186)	Sustainable made Explicit advice (n=201)	Less Sustainable advice (n=182)	Sustainable advice (n=188)	Sustainable with Alternative advice (n=209)	Sustainable made Explicit advice (n=185)
Sex								
Female	94 (47%)	97 (53%)	91 (49%)	105 (52%)	96 (53%)	92 (49%)	102 (49%)	85 (46%)
Male	108 (53%)	86 (47%)	95 (51%)	96 (48%)	86 (47%)	96 (51%)	107 (51%)	100 (54%)
Age, years	53·0 (17·2)	51·1 (17·2)	54·0 (17·0)	49·5 (17·0)	51·3 (17·5)	52·3 (17·4)	51·7 (17·4)	51·0 (16·3)
Education level								
Low	49 (24%)	44 (24%)	55 (30%)	49 (24%)	49 (27%)	49 (26%)	53 (25%)	48 (26%)
Middle	86 (43%)	82 (45%)	75 (40%)	84 (42%)	81 (45%)	76 (40%)	103 (49%)	75 (41%)
High	67 (33%)	57 (31%)	56 (30%)	68 (34%)	52 (29%)	63 (34%)	53 (25%)	62 (34%)
Living area								
Rural	86 (43%)	77 (42%)	87 (47%)	79 (39%)	80 (44%)	72 (38%)	93 (44%)	71 (38%)
Urban	116 (57%)	106 (58%)	99 (53%)	122 (61%)	102 (56%)	116 (62%)	116 (56%)	114 (62%)
Self-rated health status								
Poor	3 (1%)	3 (2%)	9 (5%)	5 (2%)	6 (3%)	6 (3%)	5 (2%)	7 (4%)
Fair	48 (24%)	40 (22%)	39 (21%)	42 (21%)	43 (24%)	38 (20%)	43 (21%)	45 (24%)
Good	109 (54%)	99 (54%)	92 (49%)	107 (53%)	98 (54%)	102 (54%)	98 (47%)	82 (44%)
Very good	38 (19%)	35 (19%)	41 (22%)	38 (19%)	31 (17%)	40 (21%)	46 (22%)	43 (23%)
Excellent	4 (2%)	6 (3%)	5 (3%)	9 (4%)	4 (2%)	2 (1%)	17 (8%)	8 (4%)
Baseline trust in health professionals	4·1 (0·8)	4·1 (0·8)	4·0 (0·8)	4·0 (0·8)	3·9 (0·8)	4·1 (0·7)	4·0 (0·8)	4·0 (0·8)

Data are n (%) or mean (SD). Baseline trust in health professionals was measured on an ascending five-point Likert scale.

Table 1: **Baseline characteristics stratified by group allocation**

for the low severity locomotor problem with Less Sustainable advice showing significantly higher scores than the other three types of advice (all p<0·0001). In the high severity scenarios, differences between the three Sustainable types of advice and Less Sustainable advice were significant and large for the locomotor problem (all p<0·0001) and significant but less pronounced for the cardiovascular (all p<0·0021) and abdominal problems (all p<0·0001). The patterns for fatigue within low and high severity groups were similar to the general pattern shown in figure 2. Moreover, the pulmonary and abdominal problems showed significantly lower trust in care scores for Sustainable made Explicit advice than for the other Sustainable types of advice (all p<0·0001). A detailed statistical reporting of all post-hoc comparisons is available in the Open Science Framework depository, accessible via the appendix (p 17).

Discussion

In this experimental vignette study, we found that participants' trust in care was significantly lower for the more sustainable advice than for the less sustainable advice (ie, standard treatment options); however, this difference was primarily present for high severity scenarios and varied across medical problems. Explicitly mentioning environmental sustainability in clinical counselling resulted in significantly lower trust in care than the implicitly more sustainable advice for two of the high severity scenarios (lung cancer and appendicitis). For all other low and high severity scenarios included in this study, this comparison yielded non-significant differences in trust scores.

	Less Sustainable advice	Sustainable advice	Sustainable with Alternative advice	Sustainable made Explicit advice	Pooled
Low severity scenario	202	183	186	201	772
Pulmonary	5·4 (1·2)	5·4 (1·3)	5·3 (1·2)	5·2 (1·4)	5·3 (1·3)
Locomotor	5·9 (1·0)	5·1 (1·4)	5·2 (1·4)	5·0 (1·6)	5·3 (1·4)
Cardiovascular	5·5 (1·4)	5·8 (1·0)	5·6 (1·0)	5·5 (1·2)	5·6 (1·2)
Abdominal	4·9 (1·5)	4·6 (1·5)	5·0 (1·4)	4·6 (1·7)	4·8 (1·6)
Fatigue	6·1 (0·8)	5·7 (1·0)	5·3 (1·3)	5·2 (1·5)	5·6 (1·2)
Pooled	5·6 (1·3)	5·3 (1·3)	5·3 (1·3)	5·1 (1·5)	5·3 (1·4)
High severity scenario	182	188	209	185	764
Pulmonary	5·2 (1·3)	5·6 (1·1)	5·4 (1·1)	4·6 (1·6)	5·2 (1·4)
Locomotor	6·1 (0·9)	4·1 (1·7)	4·5 (1·6)	4·3 (1·6)	4·7 (1·7)
Cardiovascular	5·6 (1·1)	5·2 (1·4)	5·1 (1·4)	5·0 (1·5)	5·2 (1·4)
Abdominal	5·8 (1·2)	4·8 (1·7)	4·9 (1·6)	4·1 (1·8)	4·9 (1·7)
Fatigue	5·8 (1·0)	5·2 (1·3)	4·9 (1·4)	4·7 (1·6)	5·1 (1·4)
Pooled	5·7 (1·1)	5·0 (1·6)	5·0 (1·4)	4·5 (1·7)	5·0 (1·5)
Pooled severity	384	371	395	386	1536
Pooled	5·6 (1·2)	5·2 (1·5)	5·1 (1·4)	4·8 (1·6)	5·2 (1·5)

Data are n or mean (SD). Trust in care was measured on a seven-point Likert scale (from 1 [strongly disagree] to 7 [strongly agree]).

Table 2: **Trust in care according to the type of advice, severity, and medical problem**

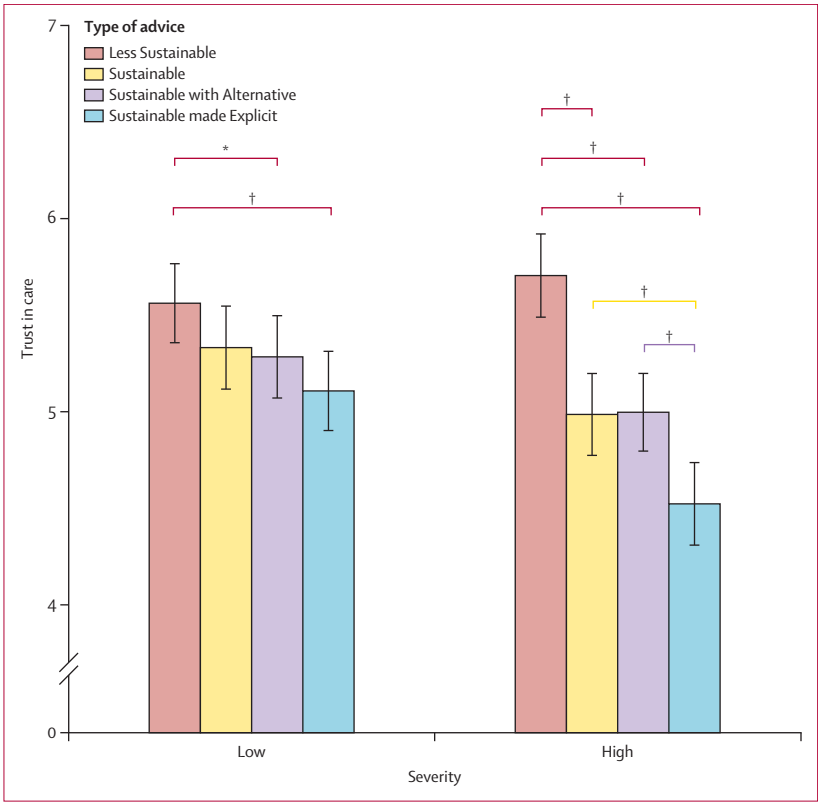

***Figure 2*: Trust in care according to severity and type of advice**
Bars indicate 95% CIs. p value brackets above the bars indicate significance levels of pairwise comparisons in the post-hoc analysis. Trust in care was measured on a seven-point Likert scale (from 1 [strongly disagree] to 7 [strongly agree]). *p=0·027. †p≤0·0001.

When specifically looking at low severity scenarios, our findings largely corroborate the primary care study by Visser and colleagues,[10] which found no difference in satisfaction with doctors' visits between more sustainable and less sustainable advice. Notably, this study included a similar vignette of prescribing asthma inhalers. Contrary to the primary care study, we found significantly lower trust in care for the locomotor problem with sustainable advice—possibly reflecting participants' expectation of a physical follow-up as standard care or doubts regarding self-efficacy to use eHealth based on open question responses (appendix pp 12–15). Overall, these results indicate that patients are less likely to respond negatively to environmental sustainability considerations when being recommended treatment for low severity conditions in a general practice setting.

Results for high severity scenarios indicated that advising sustainable treatment options leads to lower trust in care in most cases. Hospital studies of gynaecology and cardiology patients reported a lower willingness to consider the environmental impact of care for more severe medical problems.[11,14,15] However, in one of the gynaecology studies up to 62% (129 of 208) of patients self-reported that they would generally choose the more sustainable treatment option in case of clinical equipoise.[11] This contrasting finding compared with our results might be explained by social desirability bias or overestimation of climate conscious decisions when patients self-report willingness in non-blinded study designs.[19,20] An additional explanation might be patients' underlying preference for the less sustainable standard treatment options in our study because of familiarity, perception of the effectiveness, or the feeling that health is not the recommending clinician's only priority if sustainability was mentioned explicitly.

Further comparison with the literature is limited to general surveys inquiring about participants' willingness to consider the environmental impact of their treatment (64% of the general population in the UK and 73% of a Dutch patient panel were willing to do so).[21,22] Our finding of lower trust in care for some high severity scenarios when environmental sustainability was mentioned explicitly seems contradictory to the findings of previous survey studies. Multiple interpretations are possible, such as methodological differences, bias, and the way environmental sustainability is addressed in the conversation. More medical problem-specific studies are necessary to understand whether and how environmental sustainability should be context-tailored in clinical counselling. Explicitly mentioning environmental sustainability possibly has a stronger negative effect in high severity scenarios concerning a choice between two medical treatments (pulmonary and abdominal vignettes), as opposed to choices concerning in-person or digital follow-up (locomotor, cardiovascular, and fatigue vignettes). Notably, a multicentre trial similarly reported non-inferiority of patient satisfaction for digital follow-up.[23]

Our study suggests that, primarily for low severity scenarios, advising more sustainable treatment options could be an acceptable way to integrate environmental sustainability in clinical counselling. However, explicitly discussing sustainability might negatively affect patients' trust for more high severity scenarios. A recent study investigating lifestyle-related counselling also indicated a negative effect of mentioning climate change.[16] Opinions might vary regarding the importance to avoid a decrease in patients' trust when exploring the integration of environmental sustainability in deliberative shared decision making. Clinicians might also ethically question whether explicitly discussing the environmental impact of a treatment is warranted. Varying opinions exist in the literature. Those in favour of green-informed consent stress the importance of a proactive approach to elicit patients' preferences in respect of potential ecological values and to fulfil clinicians' social responsibility to promote environmentally friendly health care.[24–26] Those against considering sustainability in shared decision-making argue that information on the environmental impact of treatments can be persuasive and potentially erodes the patient's autonomous decision making or the patient–provider relationship.[27,28]

Considering the generally less disputed notion that clinical care needs to become more sustainable,[7,29] we argue that participants' lower trust scores for mainly the high severity scenarios in our study should not be a

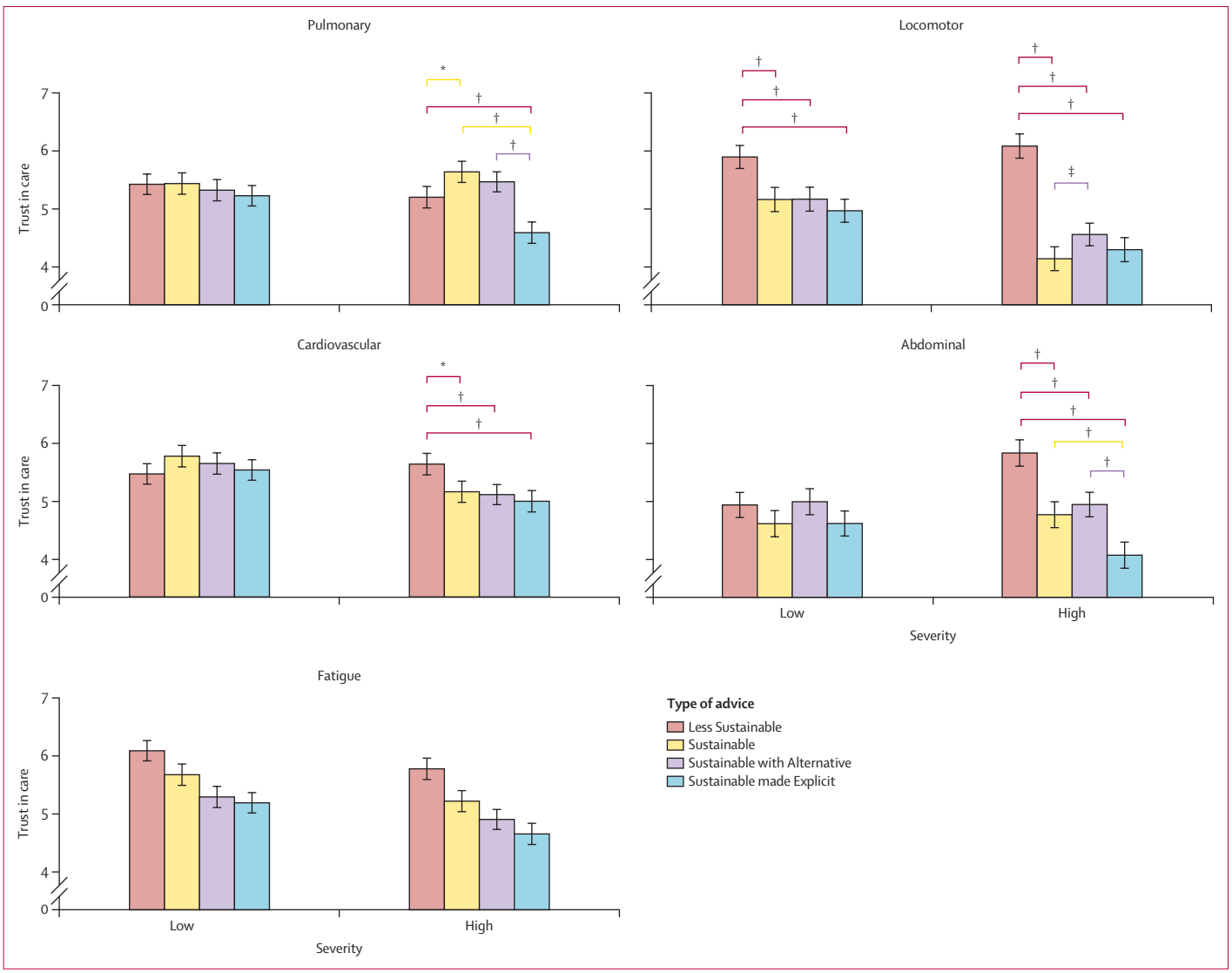

***Figure 3*: Trust in care according to severity, type of advice, and medical problem**

Bars indicate 95% CIs. p value brackets above the bars indicate significance levels of pairwise comparisons in the post-hoc analysis. Pairwise comparisons for low and high severity fatigue vignette were not performed in the absence of a type of advice × severity interaction. Detailed results of the post-hoc analysis are available in the appendix (p 17). Trust in care was measured on a seven-point Likert scale (from 1 [strongly disagree] to 7 [strongly agree]). *p≤0·060. †p≤0·0003. ‡p=0·023.

counterargument to environmentally sustainable counselling. Mean scores still signified a positive response to the underlying trust statements and negative reactions might decrease when the novelty of discussing environmental sustainability in clinical counselling wears off. Moreover, although we considered sustainable and less sustainable treatments to be sufficiently equal in value, participants might not necessarily have shared the same perception based on the brief information provided.[30,31] Differences between treatments could be influenced by multiple factors (including participants' expectation of standard care). Physicians might need further clarification and more nuanced insight into the types and context of environmentally sustainable counselling that affect patients' trust. Furthermore, if trust is affected, when a decline in trust becomes too large and what level of environmental benefit justifies a potential loss of patient trust or choice, remain open questions.

From a practical point of view, our findings suggest that clinicians' situational awareness is key to understand when environmentally sustainable counselling might have undesired effects. A 2024 focus group study including patients and physicians suggested a "delicate balance between informing and burdening".[12] Our results add that this balance might differ according to the context and health condition and be most pronounced for severe health concerns. Should clinicians aim to avoid individual assessments of risking patients' trust, high severity scenarios might appear more favourable for guideline or institutional-level sustainability decisions. Yet, eliciting patient preferences and collaboratively deliberating a treatment option

might contribute to long-term integration of environmental sustainability in value-based medical care. Based on our findings, clinicians might regard low severity scenarios as a more favourable starting point.

Our study was a randomised, double-blind vignette study exploring how participants reacted to environmentally sustainable treatment options and the integration of environmental impact in hypothetical clinical counselling. This design decreased the risks associated with self-reporting, such as social desirability bias and overestimation of climate-conscious behaviour. To our knowledge, this study was the first to include a diverse set of health problems varying in severity, supporting the differentiation of findings to patients and health-care professionals in different clinical settings.

This study has some limitations. First, we recruited a representative sample of the general Dutch population using an online research panel, which might have unintendedly excluded participants with low digital literacy or migrant populations unable to respond in Dutch. The online panel might have reduced the ability of participants to fully grasp the complexity and emotional aspects of the situations described; however, most participants indicated personal experience with the vignettes (71% had at least one of the medical problems). Exploratory subgroup analysis of the type of advice effect patterns did not show apparent differences (appendix p 17). Moreover, healthy participants still offer valuable insights into patient perspectives in this novel research field. Second, we used experimental vignettes to measure differences between groups. Vignette studies are considered a valid approach to identify drivers of variation in quality-of-care studies,[17,32] yet their approximation of more extensive, face-to-face counselling might yield different trust in care outcomes than a real-life study. We aimed to study the relative differences between groups rather than absolute scores for trust in care and formulated our conclusions accordingly. Future clinical studies could more accurately measure how high or low the patient's trust in care is and how their underlying preferences can be addressed, when exposed to environmentally sustainable treatment options in real-life clinical counselling. Third, our study was done in the Dutch context and we did not collect additional data to investigate how the socioeconomic status of patients influences integration of environmental sustainability in clinical counselling. Future comparisons of different health-care systems or designs powered to investigate specific demographics might help to elucidate whether and how these characteristics influence patients' perspectives.

Our findings suggest that advising more sustainable treatment options for low severity scenarios generally appears unlikely to affect patients' trust in care, even when sustainability is mentioned explicitly. For high severity scenarios, advising more sustainable treatment options might negatively affect patients' trust; however, the presence and size of the observed effect varied across medical problems and was not always accompanied by a negative effect of explicitly mentioning environmental sustainability. Future research should confirm our findings in more extensive real-life counselling and clarify how the context and form of environmentally sustainable counselling impact such an effect. Considering previous reports of patients' interest in the environmental impact of health care, we call upon the situational awareness of clinicians to sense whether environmental sustainability should be discussed or primarily guaranteed through system and institutional-level decisions.

Contributors

Conceptualisation: EMvB, EHV, EAB, and MAA. Funding acquisition: EMvB, EHV, JJA, EAB, and MAA. Project administration: EMvB and JJA. Data curation: EMvB and LCvG. Formal analysis: EMvB and LCvG. Investigation: EMvB. Methodology: EMvB, LCvG, EHV, and MAA. Supervision: LCvG and MAA. Validation: LCvG and MAA. Visualisation: EMvB. All authors contributed to writing, reviewing, and editing the original draft. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Declaration of interests

EMvB is a board member and EAB is a chair of the Dutch Green Health Alliance (Groene Zorg Alliantie). All other authors declare no competing interests.

Data sharing

All materials related to this study, including anonymised patient data and the statistical code used in the analysis, are available from the Open Science Framework.

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