

Representation of Ethics in COVID-19 Research: A Systematic Review

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Background: Ethical discourse in the scientific community facilitates the humane conduct of research. The urgent response to COVID-19 has rapidly generated a large body of literature to help policymakers and physicians address novel pandemic challenges. Plastic surgeons, in particular, have to manage the postponement of elective procedures and safely provide care for non-COVID-19 patients. Although COVID-19 research may provide guidance on these challenges, the extent to which ethical discussions are present in these publications remains unknown.

Methods: Articles were identified systematically by searching the PubMed, Embase, Central, and Scopus databases using search terms related to ethics and COVID-19. The search included articles published during the first 9 months of the COVID-19 pandemic. The following data were extracted: presence of an ethical discussion, date of publication, topic of ethical discussion, and scientific discipline of the article.

Results: One thousand seven hundred fifty-three articles were included, of which seven were related to plastic surgery. The ethical principle with the greatest representation was nonmaleficence, whereas autonomy had the least representation. Equity and access to care was the most common topic of ethical discussion; the mental health effects of COVID-19 were the least common. The principle of justice had the greatest variation in representation.

Conclusions: In a systematic review of COVID-19-related articles that were published during the first 9 months of the pandemic, the ethical principles of autonomy and justice are neglected in ethical discussions. As ethical dilemmas related to COVID-19 remain prevalent in plastic surgery, attention to ethical discourse should remain a top priority for leaders in the field. (*Plast. Reconstr. Surg.* 149: 1237, 2022.)

The COVID-19 pandemic presented policymakers and hospital administration with numerous ethical dilemmas, including rationing of medical supplies, delaying nonemergent surgery, and staggering the distribution of vaccines to vulnerable populations.^{1,2} Plastic surgeons cancelled procedures to preserve resources, supplies, and physicians in an effort to curtail the spread of COVID-19.³ Cosmetic procedures, both surgical and minimally invasive, declined by approximately 15 percent in 2020 compared to 2019.⁴ Leaders empowered with fulfilling these responsibilities did not have clear definitions of “elective and nonessential” procedures, and were left to decide which services should be

restricted, leading to variable access to care across the country.⁵ To respond to these and other novel challenges, policymakers and physicians look to COVID-19 research to assist with their decisions and management of the pandemic within their clinic, hospital, and community. As the pandemic continues, complicated by the return of previously postponed activities, it is critical that ethical considerations are articulated alongside new discoveries and guidelines.

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Rapid publication of high-quality research was essential for the development of effective therapeutics and vaccines in the fight against COVID-19. However, the urgency to study COVID-19 and its effects must be balanced with the obligation of researchers to adhere to high ethical standards and consider the moral implications of research findings. In the United States, biomedical ethics is based on the moral theory of principlism, established by Beauchamp and Childress in 1979. They established four ethical principles: respect for autonomy, beneficence, nonmaleficence, and justice. **Table 1** describes each principle and presents corresponding examples.⁶ Given the urgency for COVID-19 research and the novel ethical dilemmas faced by health care systems and policymakers worldwide, recognizing and discussing the ethical implications of COVID-19 research is critical.

We aim to quantify the prevalence of ethical discussions and representation of the four ethical principles in COVID-19 research, and to identify which principles and topics are underrepresented across scientific disciplines. Given the rapid publishing rate and urgent need for guidance, we hypothesize that ethical considerations will be neglected in certain domains. We also hypothesize that original research articles, which will need to consider participant safety and informed consent, will most frequently discuss the principle of autonomy.

PATIENTS AND METHODS

Search Strategy

We performed a systematic review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.⁷ We searched the PubMed, Embase, Central, and

Scopus databases for articles related to COVID-19. A medical librarian assisted in developing the search strategy. Search terms included those related to principlism and SARS-CoV-2 (COVID-19). (See **Appendix, Supplemental Digital Content 1**, which shows the search strategy, <http://links.lww.com/PRS/F32>.) Only articles published from January 1, 2020, to September 30, 2020, were considered, as the unidentified pneumonia outbreak in Wuhan was first reported to the World Health Organization on December 31, 2019.⁸ We included original and nonoriginal research. Nonoriginal research articles were defined as reviews, editorials/commentaries, letters to the editor, position papers/guidelines, and correspondences.

Screening and Data Extraction

The titles and abstracts were uploaded to Rayyan, a systematic review software, for initial evaluation.⁹ Three independent reviewers (A.V.S., S.M.W., and R.L.K.) screened the articles, and disagreement was resolved through discussion among reviewers. We excluded articles that were not explicitly connected to COVID-19 or did not directly relate to or impact humans. This included laboratory studies or basic research that did not involve humans. Furthermore, included articles needed a sufficient ethical discussion, which we defined as having a subheading related to an ethical issue or at least one paragraph dedicated to the discussion of ethical principles.

Full-text articles were obtained of the remaining articles. Three reviewers (A.V.S., S.M.W., and Noreen F. Khan) independently extracted article characteristics using Microsoft Excel (Microsoft Corp., Redmond, Wash.). The following variables were collected: presence of an ethical discussion, month published, type of article, ethical principles

Table 1. Definitions and Examples of the Ethical Principles Defined by Beauchamp and Childress*

Principles	Definition	Examples
Respect for autonomy	Respecting the decision-making capacities of autonomous persons	Informed consent; respecting the freedom of privacy and confidentiality during COVID-19 tracing; transparent communication of risks and benefits of procedures or treatments; transparent communication of risks of elective surgery during COVID-19 surges
Nonmaleficence	Avoiding the causation of harm	Providing innovative COVID-19 treatment only when appropriate and in accordance with guidelines; avoiding undue risk by considering individual risks before performing elective surgery; preventing COVID-19 exposure or risk of spread during care
Beneficence	Providing benefits and balancing benefits against risks and costs	Providing care to patients with aim to benefit them and without undue risk; consideration of all treatment options and weighing of risks and benefits of each; identification of potential adverse events for novel treatments
Justice	Distributing benefits, risks, and costs fairly	Offering equal access to available resources to all patients; ensuring fair allocation of scarce resources; providing fair access to care to all populations and minimizing unequal treatment; respecting individual legal and human rights

*Adapted from Beauchamp TL, Childress JF. *Principles of Biomedical Ethics*. 8th ed. New York: Oxford University Press; 2019.

discussed (autonomy, beneficence, nonmaleficence, justice), topic of ethical discussion, and scientific discipline. “Topic of ethical discussion” referred to the central ethical issues discussed in the article. We retrospectively categorized each article into one of several scientific disciplines: surgery, social sciences, public health, internal medicine and critical care, clinical research during COVID-19, pharmacology/treatments, obstetrics and gynecology and reproductive health, and psychiatry and behavioral sciences. Any disagreements were discussed and resolved among the reviewers. A spreadsheet was used to calculate the frequencies of ethical principles, article characteristics, ethical topics, scientific disciplines, and number of articles published per month. Subgroup analyses were conducted for these characteristics to identify variation in ethical principle representation.

RESULTS

Characteristics of Included Studies

A total of 3958 articles were identified in the initial search; 2658 were included after abstract and title screening. The full texts of the remaining 2658 articles were further evaluated, with 1753 articles remaining for analysis after applying inclusion and exclusion criteria (Fig. 1). Nonoriginal [$n = 1455$ (83 percent)] research made up the majority of included articles compared to original research [$n = 298$ (17 percent)] articles. Editorials [$n = 674$ (46 percent)] and cross-sectional [$n = 85$ (29 percent)] studies were the most common type of nonoriginal and original research articles, respectively. The majority of the research articles, original and nonoriginal, were related to public health [$n = 630$ (36 percent)] and internal medicine specialties and critical care [$n = 531$ (30 percent)]. The remaining articles were distributed relatively evenly across the other scientific disciplines, except for treatments [$n = 66$ (4 percent)]. The most frequently discussed ethical topic was decision-making and resource allocation, which was the central focus of 488 articles ($n = 27$ percent) (Table 2). Finally, COVID-19 research reached peak publication during the month of June ($n = 436$).

Representation of Ethical Principles

Of the 1753 articles included, nonmaleficence was the most common ethical principle [$n = 922$ (53 percent)], followed by beneficence [$n = 854$ (49 percent)], justice [$n = 790$ (45 percent)], and

autonomy [$n = 172$ (10 percent)]. This pattern held true for most scientific disciplines, including general surgery and public health. Although plastic surgery constituted a small percentage of the total articles [$n = 7$ (0.4 percent)], a similar trend in representation of ethical principles was observed. Of the 1753 included articles, 170 (10 percent) contained an ethical discussion that considered all four ethical principles. Table 3 provides an in-depth review of the representation of ethical principles across study types. Beneficence was the most common principle across original research, whereas nonmaleficence was the most common across nonoriginal research. Autonomy remained the least discussed ethical principle by a relatively large margin for both original and nonoriginal research, and across all scientific disciplines (Tables 4 and 5). Nonmaleficence and beneficence were commonly discussed in all fields, whereas the representation of justice varied across disciplines. For instance, justice was discussed in only 11 percent of articles related to treatments, whereas beneficence was represented in 89 percent of treatment articles. Similar to the ethical representation across scientific disciplines, autonomy was substantially underrepresented across ethical topics (Table 6).

DISCUSSION

The four principles of bioethics, first described by Beauchamp and Childress, provide a framework for ethical considerations and facilitate the ethical conduct of research.⁶ Our study aimed to identify the prevalence and distribution of these ethical principles in research publications related to COVID-19; to our knowledge this had not yet been studied. In addition, we determined which topics of ethical discussions have the greatest representation across various scientific disciplines. Among ethical discussions in the COVID-19 literature, we found that the principle of autonomy was neglected across numerous scientific disciplines. Early COVID-19 research focused on epidemiology and public health interventions, with the goal of reducing exposure to the virus, saving lives, and ultimately preventing harm.^{2,10} Therefore, it is reasonable that our study showed that the majority of COVID-19–related articles published in the first 9 months of the pandemic framed ethical discussions around the principle of nonmaleficence. This goal of reducing exposure and preventing harm is relevant to all specialties as procedures are rescheduled and physicians are deployed to assist with COVID-19

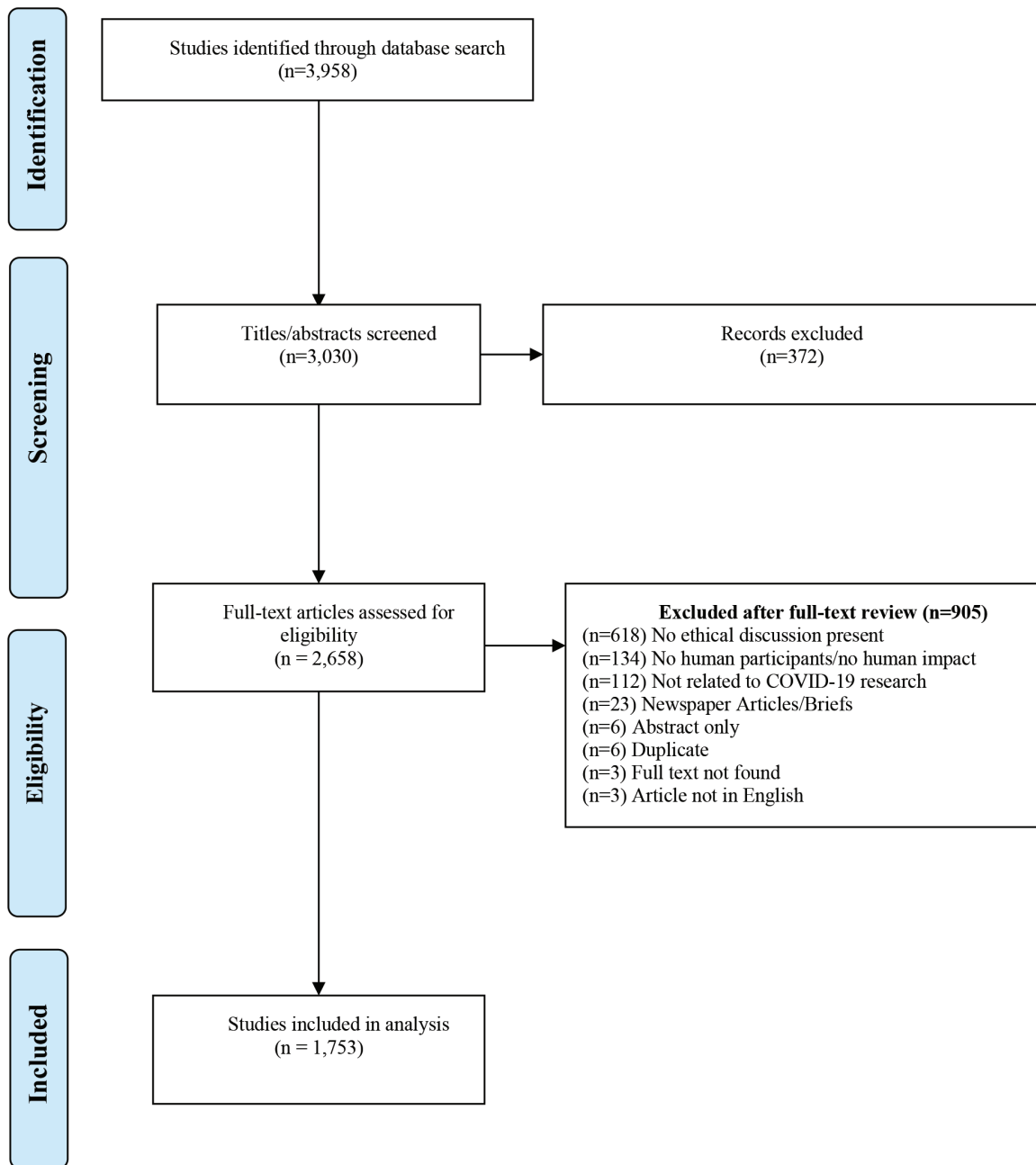


Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram of included studies. (From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 2009;6:e1000097.)

surges.¹¹ Articles related to plastic surgery demonstrated a similar pattern, although only seven articles related to the specialty were identified. Discussions of ethical issues in plastic surgery related to the COVID-19 pandemic included decision-making and resource allocation, equity and access to care, and minimizing COVID-19 exposure. This remarkably low subset of articles in plastic surgery indicates the urgent need for increased research and guidance for plastic

surgeons to navigate ethical dilemmas related to the ongoing pandemic.

Although it may be necessary to postpone elective procedures to increase resource availability for COVID-19 patients, it is also critical to ensure that non-COVID-19 patients are not suffering from inadequate treatment. Elective procedures in plastic surgery can reduce discomfort and increase quality of life, and in some health care systems plastic surgery accounts for

Table 2. Article Characteristics

Characteristics	No.	%
Article type		
Nonresearch	1455	83.0
Original research	298	17.0
Types of original research		
Cross-sectional	85	28.5
Case study/series	67	22.5
Retrospective cohort	46	15.4
Mixed methods	29	9.7
Model/simulation	21	7.1
Prospective cohort	18	6.0
Systematic review	13	4.4
Content analysis	10	3.4
Meta-analysis	7	2.3
RCT	2	0.7
Types of nonresearch		
Editorial/commentary	674	46.3
Position/guidelines	372	25.6
Review	239	16.4
Letter to editor	118	8.1
Correspondence	52	3.6
Scientific disciplines		
Public health	630	36.0
Internal medicine specialties and critical care	531	30.3
Social sciences	155	8.8
Surgery	110	6.3
Clinical research during COVID-19	104	5.9
Psychiatry and behavioral sciences	101	5.7
Treatments	66	3.8
Obstetrics/gynecology and reproductive health	56	3.2
Topics*		
Decision-making and resource allocation	488	27.8
Equity and access to care	381	21.7
Rights of patients and essential workers	341	19.5
Minimizing COVID-19 exposure	210	12.0
COVID-19 diagnosis, treatments, and complications	178	10.2
Communication and informed consent	162	9.2
Mental health effects of COVID-19	48	2.7

RCT, randomized controlled trial.

*This percentage will not equal 100 percent as an article may represent multiple topics.

the largest proportion of elective cases across subspecialties.¹² With no end in sight of the current pandemic, it may be impractical to continue cancelling all nonemergent procedures when COVID-19 cases surge; rather, physicians and patients may work together to find new solutions to safely provide elective care. This may be accomplished by adopting a standardized and explicit definition of all procedures that are considered “elective” and creating a strategy to continuously weigh the risk and benefit of providing nonemergent surgery during the COVID-19 pandemic.

Table 3. Overall Ethical Principle Representation

Ethical Principle	No.	%
All	170	9.7
Autonomy	172	9.8
Beneficence	854	48.7
Nonmaleficence	922	52.6
Justice	790	45.0

This strategy may be guided by all four ethical principles; for example, Brown et al. developed a triage algorithm for delivering surgical care during the COVID-19 pandemic that maintained the goal of prioritizing beneficence and nonmaleficence, while respecting patient autonomy and justice.¹³ This was accomplished by adapting an existing triage protocol, which focused primarily on procedure type and risk factors, to account for local variability in resources and disease burden to improve justice. Furthermore, these authors recognize the challenge of preserving autonomy when individual decision-making may impact the safety of others. They suggest respecting autonomy by giving patients the decision *not* to receive care, reducing strain on their health care system.¹³ Although each health care and hospital system is unique, a similar algorithm may be used to ensure that elective care decisions are ethical and consider the complexities of COVID-19.

Postponing elective procedures, such as gender-affirming surgery, can adversely impact patient mental health and well-being.¹⁴ Marginalized groups, such as lesbian, gay, bisexual, transgender, and queer or questioning populations, face worse mental health disparities and disproportionate effects of COVID-19.¹⁴ In addition to affecting vulnerable individuals, COVID-19 has worsened existing mental health conditions and increased anxiety and depressive symptoms in those without previous mental health conditions.¹⁵ It is therefore concerning that mental health effects of COVID-19 was the least represented ethical topic. In January of 2021, approximately four in 10 adults in the United States reported symptoms of anxiety or depressive disorder, up from one in 10 during 2019.¹⁵ Furthermore, it has been reported that an additional 75,000 deaths could result from alcohol and drug abuse during COVID-19.¹⁶ Despite the known impacts of COVID-19 on mental health, much of the related discourse is dedicated to describing the problem rather than proposing concrete intervention methods.¹⁷ Some researchers have attempted to minimize the mental health effects for these vulnerable populations. For example, Drabble and Eliason advocate for the recategorization of gender-affirming care as nonelective to ensure access to therapy, hormones, and treatment during the pandemic.¹⁸ Other researchers have developed an app designed to target emotional skills, healthy lifestyle behavior, burnout, and social support for health care workers.¹⁹ Mental health challenges will continue after the pandemic has subsided; it is necessary that research confronts this and

Table 4. Representation of Primary Ethical Principles per Article Type

Article Type	Overall	All Principles	Autonomy	Beneficence	Nonmaleficence	Justice
Original research	298	6	11	173	142	65
Cross-sectional	85	1	6	43	39	28
Case study/series	67	1	3	37	38	2
Retrospective cohort	46	1	1	33	16	5
Mixed methods	29	1	1	17	16	16
Model/simulation	21	0	0	13	9	6
Prospective cohort	18	0	0	9	9	3
Systematic review	13	0	0	9	7	4
Content analysis	10	1	0	6	5	1
Meta-analysis	7	1	0	4	2	0
RCT	2	0	0	2	1	0
Nonresearch	1455	164	162	680	780	725
Editorial/commentary	674	84	86	279	337	372
Position/guidelines	372	40	48	211	220	181
Review	239	28	16	122	132	95
Letter to editor	118	11	10	44	55	54
Correspondence	52	1	2	24	36	23
Total	1753	170	173	853	922	790

RCT, randomized controlled trial.

Table 5. Ethical Representation of Scientific Disciplines

Scientific Disciplines	Total	All Principles		Autonomy		Beneficence		Nonmaleficence		Justice	
	No.	No.	%	No.	%	No.	%	No.	%	No.	%
Public health	630	51	8.1	69	11	268	42.5	288	45.7	332	52.7
Internal medicine specialties and critical care	531	57	10.7	38	7.2	304	57.3	323	60.8	159	29.9
Social sciences	155	15	9.7	18	11.6	52	33.6	64	41.3	120	77.4
Surgery	110	10	9.1	11	10	46	41.8	83	75.5	32	29.1
Clinical research during COVID-19	104	16	15.4	14	13.5	57	54.8	59	56.7	36	34.6
Psychiatry and behavioral sciences	101	9	8.9	12	11.9	52	51.5	48	47.5	54	53.5
Treatments	66	6	9.1	3	4.5	59	89.4	32	48.5	7	10.6
Obstetrics/gynecology and reproductive health	56	9	16.1	10	17.9	19	33.9	28	50	21	37.5

determines interventions that can mitigate these effects.

COVID-19 is the first pandemic in which social media played a central role in the spread of information, which introduced the novel challenge of an “infodemic” of misinformation.²⁰ This infodemic is associated with reduced public compliance with safety measures, such as social distancing or vaccinations.²⁰ Even brief exposure to vaccine-critical websites has been shown to heighten the perception of vaccine risk.²¹ In addition, many individuals are spending more time on social media during COVID-19.²² These

individuals are at a greater risk of being exposed to misinformation and the associated negative effects. Physicians have a responsibility to avoid contributing to the spread of misinformation and directly address COVID-19 inaccuracies. Plastic surgeons—many of whom are active on social media—may be in a unique position to promote awareness of evidence-based COVID-19 information for their followers. All physicians, regardless of specialty, can use their platform to influence COVID-19 messaging by encouraging vaccination, promoting updated mask and distancing policies, and addressing false beliefs. By replacing

Table 6. Principle Representation of Ethical Topics

Ethical Topics	Total	All Principles		Autonomy		Beneficence		Nonmaleficence		Justice	
	No.	No.	%	No.	%	No.	%	No.	%	No.	%
Decision-making and resource allocation	488	61	13	125	26	204	41.8	207	42.4	181	52.7
Equity and access to care	381	40	11	70	18	162	42.5	178	46.7	111	29.9
Rights of patients and essential workers	341	42	12	127	37	140	41.1	136	39.9	306	77.4
Minimizing COVID-19 exposure	210	21	10	26	12	113	53.8	155	73.8	52	29.1
COVID-19 diagnosis, treatments, and complications	178	6	3.4	35	20	100	56.2	88	49.4	153	34.6
Communication and informed consent	162	15	9.3	62	38	83	51.2	77	47.5	66	53.5
Mental health effects of COVID-19	48	4	8.3	16	33	20	41.7	22	45.8	22	10.6

misinformation with neutral, evidence-based facts, providers can ensure that patient decision-making remains rooted in the best available evidence.

The principle of justice was largely underrepresented in original research and articles related to COVID-19 treatments, appearing in 77 percent of social science articles but only 11 percent of COVID-19 treatment-related articles. As treatments are better understood for their effectiveness and safety, a greater emphasis should be placed on resolving unequal access to care and improving outcomes in these populations. COVID-19 exacerbated existing inequities among minority groups and contributed to worse outcomes for people of color.²³ Other factors such as discrimination, access to care, and housing conditions impact individuals' exposure to COVID-19 and quality of treatment.²⁴ The Centers for Disease Control and Prevention recognized the effect of social factors on health outcomes and created the Social Vulnerability Index to identify communities that may need support before, during, or after disasters. Originally developed to guide decision-making in natural disasters, the Social Vulnerability Index has been adapted to include COVID-19 metrics.^{25,26} Similar initiatives can be used to continue this collaborative effort in areas such as treatment allocation and access to care. Fair distribution of essential resources and treatments can help to improve overall COVID-19 outcomes, especially for the most vulnerable individuals.

This study has several limitations. Although multiple databases were included, fewer than expected original research articles were retrieved. One reason may be the timing of the search, which ended in September of 2020. Between January and July of 2020, 44,013 articles on COVID-19 had been published; this number increased to 87,515 by September of 2020.²⁷ Nevertheless, it is worthwhile to determine the representation of ethical principles in COVID-19 research at the start of the pandemic, as this is a critical time for information spread. Another limitation is the use of principlism as our guiding framework for evaluating ethical discussions. Although this framework is routinely applied to bioethics, alternative frameworks such as narrative ethics, which prioritizes the history and desires of an individual throughout the decision-making process, have been cited as being more useful in a clinical setting.²⁸ Therefore, articles that interpreted ethical dilemmas in other frameworks may have been excluded from our search, which focused specifically on the theory of principlism.

CONCLUSIONS

As the COVID-19 pandemic persists, new ethical dilemmas in health care continue to emerge. We found that several ethical issues, such as resource allocation and access to care, were addressed across a variety of specialties; however, there are gaps in the literature that require additional attention. Now that the management of COVID-19 has improved and multiple vaccines exist, increased focus should be given to topics such as mental health effects and postponement of elective care, which remain relevant after immediate concern for the virus has decreased. Furthermore, prioritizing research of known vulnerable populations, such as children and minority groups, can support the principle of justice in the public health response. As new COVID-19 variants emerge and novel challenges remain unresolved, policymakers and physicians can improve their responses by approaching all research and care with an ethical, evidence-based focus.

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