



Universiteit
Leiden
The Netherlands

Standardization in science: effects and issues of guidelines for biomedical reporting

Schniedermann, A.

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Chapter 3

The birth of a reporting guideline

For one thing, researchers are not always only researchers: very often they are also practitioners of some other relevant occupational activity. And they may produce the review with the hat of practitioner on rather than that of researcher. Or, more likely, they will wear both hats, without being clear about under which set of auspices they are speaking at any particular time.

(Hammersley, 2002, p. 9)

3.1 <>

In this chapter, we will enter the systematic analysis of the PRISMA reporting guidelines and the empirical part of this book. As in the case of a follow-the-object strategy, I pull put the guideline documents into the center of analysis and treat them as boundary objects that establish links to other objects, actors, and phenomena of the crisis discourse. The focus of my analysis is twofold. First, it lies in the characteristics of the guideline (documents) with respect to general aspects of scholarly communication. Second, I will illuminate how the guidelines emerged from the social configuration of the development team, their decisions, and their envisioned future for the guideline. Likewise, I will combine two methodological approaches. The first one is a document analysis of the guidelines' textual and technical structure. Second, I performed qualitative interviews with the developers of PRISMA to understand how it came about. This methodological combination provides a starting point that unfolds the phenomenon and its social and intellectual breadth. It provides several links to the introduction provided above and points at important dimensions that will be taken up again in the subsequent chapters.

The theoretical perspective I will take in this chapter is close to a more traditional one from the sociology of science that incorporates the role of scientific organization, research practices, and the social importance of academic disciplines, as well as peculiarities of formal scholarly communication. However, there are two important

differences. First, I will make use of some analytical links to the sociology of medicine and its rich tradition of studying the standardization of medical practice and the role of medical treatment guidelines, as outlined above. In particular, I use an analytical framework from studying guideline creation. Second, the findings and the discussion attempt to preserve a historical dimension, which usually tends to be neglected in STS and the social studies of science alike. However, such a dimension can uncover causes and path dependencies that stem from the established characteristics and practices of biomedical research fields.

3.2 CERTIFYING BIOMEDICAL EVIDENCE

Evidence practices in biomedicine have changed profoundly since the postwar era. After medical treatments ceased to reveal blockbuster effects at the beginning of the twentieth century, experts developed and promoted more systematized attempts to determine the most effective therapeutic interventions (Meldrum, 2000). They redefined the ways that knowledge can be legitimately produced and claimed. In this manner, the randomized controlled trial combined different methods and techniques and has become the main template for generating biomedical knowledge. Full of ethical and epistemic promises, proponents turned this research design into a marker for evidence in biomedical policy and practice, and one that allows for certification of knowledge claims irrespective of the various complexities in their making (Marks, 1997; Raspe, 2018; Timmermans & Mauck, 2005).

But not only experimental designs became part of the evidence movement in biomedicine. Also, research syntheses, summarizing and synthesizing primary research, were highly demanded. By using systematic reviewing to find and appraise the relevant trials, as well as meta-analyses as a reliable statistical technique to pool trial data, researchers started to aggregate multiple trial results into overall conclusions about treatment effectivity.⁴⁵ Facing the growing output of the “clinical trial industry” (Meldrum, 2000, p. 755), experts hoped that these methods would help to cope with a huge load of information. Further, it was hoped that the aggregation of studies would solve contradictory results and sufficiently represent scientific consensus. These steps toward fact making would then ultimately allow for drawing conclusions and

⁴⁵ While often confused or used interchangeably, we follow the distinction stemming from the Potsdam Consultation (Cook et al., 1995). It defines “systematic review” as the overall and structured process of defining a question, searching for relevant studies, and appraising their quality. In contrast, “meta-analyses” is a statistical aggregation technique that can be applied in systematic reviews.

recommendations as to what knowledge should be perceived as evidence and which interventions are to be considered effective (Hunt, 1999).

Systematic reviews, similar to clinical trials, were assigned evidencing qualities according to their intended purpose of identifying and presenting the most convincing research. Displaying such authority claims, meta-analysis and systematic reviews have been coined the “platinum standard of evidence” (Stegenga, 2011, p. 497), in comparison to randomized controlled trials as “the gold standard” (Timmermans & Berg, 2003, p. 26). In addition, synthesis formats have been placed at the top of what was called the “hierarchy of evidence” (Goldenberg, 2009, p. 168). They have become the main input to evidence-based medicine and are one of the core areas of international organizations that deal with quality assurance in health care, such as the Cochrane Collaboration, which essentially produces and disseminates systematic reviews about medical interventions (Solomon, 2015).

Likewise, the roles of meta-analysis and systematic reviewing in biomedicine became a benchmark for other agoras where research and intervention meet. With generous references to biomedicine, researchers and practitioners from social policy, education, or climate science discuss the benefits and potentials of these formats for their areas of expertise (e.g., Haddaway & Bilotta, 2016). As a result, systematic research syntheses also shaped concepts like evidence-based policy and informed the work of the Campbell Collaboration or the Collaboration for Environmental Evidence, organizations that are very similar to Cochrane. Despite the efforts to establish systematic review and meta-analysis in other fields, their diffusion was rather limited, which is why biomedicine remained the only research community with a wider adoption of these standardized research formats (Oakley et al., 2005). For this reason, we consider in more detail what makes systematic reviewing an evidence practice in biomedicine and the ways in which this practice was established and stabilized.

To shed light on how systematic reviews are attributed to represent evidence, we focus on the exploration of methods and guidelines that play a crucial role during the writing of such reviews. Today, systematic reviews are a widely accepted subtype of review articles, the latter often being perceived as a very diverse and little standardized genre in scientific literature (e.g., Azar & Hashim, 2014). Criticism related to the writing of review articles in science argued that those would suffer from little methodological control and a lack of transparency, for example, remaining unclear about how primary research is included or assessed (Virgo, 1971). Against this background, the systematic review article was positioned as a more controlled format of research synthesis, where strict and transparent criteria assure the quality of conduct and reporting. Method

experts have developed distinct conceptions of what systematic reviews are and how they can be separated from other forms of synthesizing research (Blümel & Schniedermann, 2020).

As systematic reviews spread among the sciences, their status hinges on the agreed-upon standard ways of writing and doing such reviews, that is, methodological handbooks and writing guidelines (Moher et al., 2009e). The epistemic authority of systematic reviews is based on the idea that various forms of biases can be ruled out by providing a strict set of procedures to follow. Perception of meta-analysis' inability to rule out various biases led to the widespread adoption of systematic reviewing as a higher-order method (Montori et al., 2000). It is against this background that we intend to explore the systematic review guideline documents in more detail. In steering the author through various stages in the writing of a systematic review, the method promises to reduce the influence of the author's individual preferences and viewpoints. Rather than defining or certifying the outcome, the systematic reviewing method defines the practices and steps taken within the process. Therefore, the epistemic authority is based on a procedural conception of objectivity, that is, a set of procedural rules that authors need to follow if they want their article to be certified as a systematic review (Jukola, 2015).

We are focusing our analysis on more recent guidelines for systematic reviewing, as these can be best understood as solutions for what was called the "new worries of science" (Kourany, 2020, p. 1). In addition to the detrimental influence the pharmaceutical industry can have on the outcome of trials (Marks, 2000), experts also criticized how the pressure to publish influences which knowledge is reported and how and where (de Rijcke et al., 2016). Reporting guidelines such as the "preferred reporting items for systematic reviews and meta-analyses" (Moher et al., 2009e), in short, the PRISMA guidelines, inform the methodologies for reporting systematic reviews, thus the writing of the reports. We have therefore chosen to focus our analysis on these guidelines in order to explore the ways in which the renegotiating of evidence practice took place in the biomedical field.

Effectively a checklist for review authors, PRISMA represents the claims for the procedural conception of objectivity that are common to systematic review methodologies. Yet, at the same time, PRISMA seems to be different from the rather extensive methodological frameworks for systematic reviewing, for example, defined by the Cochrane Collaboration, which guides the whole process of registering, writing, and publishing reviews. Different from these large infrastructures, PRISMA consists of a

small checklist of rules that, if followed by the author, promise to ensure the credibility of the decisions made during the systematic review process.

Understanding clinical treatment guidelines will inform our perspective on guidelines for researchers. In contrast to clinical treatment guidelines, PRISMA influences the practices of researchers rather than doctors. As such, its successful dissemination and implementation seem to depend on the voluntary acceptance of a wider community, rather than the enforcement of a clinical director or a healthcare system. But even enforced treatment guidelines may not be followed strictly or accepted at all. In such cases, we observe lines of conflict between the social contexts of the guideline developers and the guided individuals (Timmermans & Epstein, 2010). Additionally, the process of creating treatment guidelines involves various actors—such as researchers, practitioners, industry agents, and healthcare officers—which aligns the definition of medical practice with a multitude of interests and values (Moreira, 2005). Likewise, actors and corresponding values define the evidence practice of systematic reviewing when issuing guidance for systematic reviews. Thus, the making and dissemination of PRISMA entangles characteristics of scholarly communication, evidence practices, and practices from clinical guideline making. To understand the processes leading to the production of PRISMA guidelines and the justification of their status as evidence practices, we address the following questions.

First, how and by whom was PRISMA created, and which factors and arguments were negotiated to make it persuasive and acceptable? Second, how was PRISMA disseminated in biomedical communities, and how has it become so pervasive for authors of systematic reviews? Third, if the social and practical configurations that led to the construction of PRISMA mirror the making of medical practice guidelines, how do procedural and interventionist paradigms interfere with the prevailing modes of evidence practices or academic cultures (see also Busfield, 2010; Tanenbaum, 1994)?

We believe that understanding these processes can shed light on how evidencing practices are constructed. The case of guidelines for systematic reviews provides an example of how instruments initially designed to guide practitioners outside academia (guidelines) were taken back and adapted to what is central for the research enterprise, the art of presenting evidence in scientific writing. In the next section, we present our approach to tackle the questions mentioned above. Presenting and discussing our results, we provide five sections that are based on different aspects of constructing PRISMA: the creation of a narrative, making the guidelines credible and applicable, and explaining how the guidelines were disseminated and implemented. Finally, we present a conclusion based on our research questions.

3.3 METHODS AND THEORETICAL BACKGROUND

To tackle the research questions above, we conceptualized reporting guidelines as a specific genre of literature that lies between typically academic and also more performative modes of narrating (Bazerman & Paradis, 1991; Swales, 2004). Based on this conception, we performed a document analysis to reveal the guideline's rationales and aims as well as the reported methodology that led to its construction. To further deepen our understanding, we developed and performed expert interviews based on the findings.

In a first document search, we explored the environment of the PRISMA guidelines by identifying relevant publications listed on the guideline's website as well as the website of the EQUATOR network, which collects and disseminates various reporting guidelines (www.equator-network.org). We further used the Web of Science bibliometric database to identify all guideline updates, translations, and guideline forks. Focusing on the main PRISMA publications, we performed an exploratory document analysis to study both the bibliographic and textual characteristics (Bowen, 2009; Shankar et al., 2017). This analysis was guided by a framework that focused on issues of scholarly communication, such as publication formats, authors, referencing, or number of pages.

Key to understanding guidelines such as PRISMA as a genre of their own is the idea that they offer a specific and shared set of communicative purposes, which are different from that of traditional research articles (Latour, 1987; Swales, 2004). First of all, guidelines appear to be more technical than other forms of scientific writing, providing a list of rules to follow. Yet for these rules to be followed and have an impact, guideline publications needed to be granted legitimacy by community members (Timmermans & Epstein, 2010). Therefore, guidelines also contain textual elements designed to persuade guideline users to take certain action. We aim to identify narratives or rationales of why guidelines and standards are needed and why the concrete effort appears to be plausible. For this reason, the document analysis focuses on exploring the ways in which the guidelines and the process of creating them were designed to create academic credibility.

To further deepen our understanding of what has been found in the document analysis, we planned and performed semi-structured interviews with six PRISMA developers during the first quarter of 2021. Interview participants were sampled from authors, translators, or workgroup members of one or more of the PRISMA publications or its updates. While interviews have been anonymized for ethical reasons, the interviewees have been asked to provide substantial information about their role in the development

process. Analyzing the interviews, we used deductive coding based on the key themes identified in the document analysis as well as theoretical accounts of standardization, the construction of clinical practice guidelines, and communication in academic communities.

An overview of the experts interviewed is provided in Table 1. Each of the interview participants had different roles in the making of the earliest version of the guidelines—QUOROM—or one of its later updates. Two were involved as authors in the 1999 version (Participants B and C) and its 2020 version (Participants E and F), while only one authored the 2009 version of the guidelines' explanatory document (Participant A). Most interviewees were part of the expert group that developed PRISMA, yet all of them were researchers active in various fields, such as information retrieval, research ethics, clinical research, or research design. In the 2009 version of PRISMA, two participated in the guidelines (Participants A and B), and one also contributed to the explanatory document (Participant B). Although many workgroup members were listed as authors in the 2020 update, two interviewees remained mere workgroup members (Participants A and B). While all the interviewees have at least some backgrounds in the biomedical sciences, one participant is especially known for his work as an editor of an academic journal (Participant B). Several are also associated with the Cochrane Collaboration (Participants A, B, and F). In addition, one interviewee has substantial experience in the medicine-related industry (Participant C).

TABLE 1 OVERVIEW OF INTERVIEW PARTICIPANTS (GUIDELINE DEVELOPERS AND JOURNAL EDITORS⁴⁶)

Name (pseudo)	Experience	Sex	Affil	Background and practice	Participant type	Date	Duration (min)
#Nursing	Full Prof	f	UK	Nursing	Journal Editor*	March 2020	43
#Cardio	Post-Doc	m	IT	Cardiology	Journal Editor*	March 2020	41
#Surgery	Full Prof	m	HK	Surgery	Journal Editor*	Sep 21	35
#Big-5a	Full Prof	m	US	General Medicine	Journal Editor*	February 2022	54
#Big-5b	Post-Doc	m	US	General Medicine	Journal Editor*	February 2022	48
#Big-5c	Full Prof	f	US	General Medicine	Journal Editor*	February 2022	45
#Pharma	Full Prof	m	DE	Pharmacology	Journal Editor*	March 2020	35
#A	Full Prof	m	UK	Epidemiology; Research Methods	Guideline developer**	March 2021	47
#B	Full Prof	m	US	General Medicine; Publishing	Guideline developer**	March 2021	123
#C	Full Prof	f	US	Epidemiology	Guideline developer**	March 2021	50
#D	Full Prof	f	DE	Medical Statistics	Guideline developer**	March 2021	35
#E	Post-Doc	f	CA	Epidemiology	Guideline developer**	March 2021	64
#F	Post-Doc	f	US	Ophthalmology	Guideline developer**	March 2021	65
#G	Post-Doc	m	AU	Social Sciences	Guideline developer**	March 2021	58

⁴⁶ Although the results from these interviews have only played an auxiliary role in this project, this table includes journal editors as interview participants. These interviews aimed at a general understanding of how medical journals handle review articles and included only a few questions about the PRISMA guidelines in particular. However, interviewing journal editors revealed how they think about systematic reviews in medicine and what role publication standards play in their journals. This informed the assessment and interpretation of the primary interview data.

** Journal editors were either editor-in chief, section editors or task-specific editors such as editor for review articles or statistics editor.*

*** Guideline developers were mostly authors, work group members or translators. Most guideline developers were associated with multiple versions of the guideline*

Our analysis is guided by a framework that focuses on “the multiple ‘worlds’ of a guideline” (Moreira, 2005, p. 1976). It consists of four “worlds,” or repertoires, that express the discursive forces in the construction of guidelines. First, the repertoire of science consists of argumentative strategies about the identification and appraisal of relevant evidence and mainly comes in the form of systematic reviews or meta-analyses (Solomon, 2015). Second, the repertoire of practice, which attempts to link a guideline text to the practices in a clinic in order to evaluate its usefulness. Third, in the repertoire of politics, guideline developers envision different stakeholders to discuss the acceptability of the included statements and how the guideline embodies political positions that may affect power relations. Last, the repertoire of process understands the group as an apparatus of knowledge generation, which constructs guidelines by employing a reliable methodology (Moreira, 2005). By identifying such dimensions in the creation of PRISMA, we can analyze substantial similarities between the construction of clinical practice guidelines and reporting guidelines for researchers.

However, we must consider the substantial differences between clinical practices and evidence practices in scholarly communication and inform the analytical framework proposed above accordingly. Different from other fields, biomedicine has a well-established set of research techniques that lead to determinable and replicable outcomes. When facing new research problems, biomedical researchers can rely on an agreed-upon set of practices and tasks to establish knowledge claims. They face only little uncertainty in their research tasks, even though research outcomes are unknown. This low level of task uncertainty is characteristic of a type of community or field which Richard Whitley has termed “professional adhocracy” (Whitley, 1985/2000, p. 187). It represents an organizational configuration of professions that are characterized by their degree of division of labor. We are interested in how these task uncertainties are reduced and accepted due to technical standardization and formal training. Such standards enable communication between distant communities by changing local disciplinary practices in relation to overarching goals and aims (Brunsson & Jacobsson, 2002; Timmermans & Epstein, 2010). But how does such setting of standards take place?

Scientific communities are structured by disciplinary authorities that define standards and practices in their local domain (Timmermans & Epstein, 2010). To retain their status, such authorities eventually become more resistant to overarching standardizations. In comparison to other scientific fields, biomedical communities in particular are more fragmented into local centers of authority that have to negotiate new forms of standards on a dynamic level (Whitley, 1985/2000). Recently, biomedicine and its subfields have also been influenced by the strengthening of role models to act more autonomously in negotiating priorities between research and application—or bench and

bedside (Blümel, 2018; Hendriks et al., 2019). For this reason, establishing standards has become more complicated and requires more rhetoric and discursive effort in order to not only be accepted by researchers but also to compete against other potential forms of standardization, for example, those provided by the Cochrane Collaboration. In addition, standard conflicts may not be avoided or resolved by overarching or central authorities, as in the case of clinical practice in which checklists and treatment guidelines are implemented by clinical management or healthcare policies (Tanenbaum, 1994). Rather, the standard must be made highly compatible with existing and agreed-upon disciplinary as well as local regulatory authorities. These are the submission criteria of academic journals, their editorial offices, and the peer reviewers who serve as the gatekeepers of science (Timmermans & Berg, 2003; Timmermans & Epstein, 2010).

Given these theoretical considerations, we extended the “multiple worlds framework,” proposed by Tiago Moreira (2005), to fit the specific characteristics that can be found in academic practices and scholarly communication. First, we put a much stronger emphasis on how the standard employs a narrative for the profession to provide rationales for application and build the *repertoire of science*. Second, we focused on the role of academic journals in disseminating the guideline, for example, by publishing the guideline as well as enforcing it by implementation. We further investigated how a “repertoire of journals” also influenced the creation of the guidelines in order to fit it into the role of the gatekeepers of science.

3.4 RESULTS AND DISCUSSION: INVOKING THE CRISIS

PRISMA attempts to influence the practice of writing systematic reviews. It is dependent on making authors aware of the genre’s shortcomings and creating acceptance for change. To understand how PRISMA constructs such acceptance and calls for change, we analyzed its argumentative strategies and their evolution. Essentially, in order to persuade readers, the guidelines establish a narrative that makes the practice of systematic reviewing problematic.

PRISMA creates a story about the current state of systematic reviewing, the problems, and the potential solutions—of which the PRISMA guidelines are only one. As such, they not only construct a profession and enroll the reader into their reasoning, but also employ an operational mode that calls for action (Bazerman & Paradis, 1991; Callon, 1984). The professional story unfolds with the role of systematic reviews and meta-analyses for contemporary biomedicine:

Systematic reviews and meta-analyses have become increasingly important in health care. Clinicians read them to keep up to date with their specialty, and they are often used as a starting point for developing clinical practice guidelines.

(Moher et al., 2009e, p. 1)

Beyond iterating the functions and epistemic promises of systematic reviews, this story also creates narrative links to the actors who value and promote them to shape a community (Myers, 1991). While guideline developers, doctors, or healthcare systems are mentioned in all versions of PRISMA, in its first iteration (the QUOROM guideline), it also mentions the Cochrane Collaboration (Moher et al., 1999).

In a second step, the guideline texts explain the various flaws in the reporting of systematic reviews. In doing so, the text refers to the common variance in the quality of scientific publications, rather than accusing systematic reviewing or review authors more explicitly.

As with other publications, the reporting quality of systematic reviews varies, limiting readers' ability to assess the strengths and weaknesses of those reviews.

(Moher et al., 2009e, p. 1)

In addition, the text refers to several observations to support these claims and persuades the reader that applying the guidelines will provide a viable solution to the presented problems. In citing studies that either prove the lacking reporting quality of reviews or evaluate how a guideline can improve reporting, the PRISMA document combines two strands of research into a new story. Utilizing the repertoire of science, it gathers the support of previous studies and becomes a technical document that rests on a firm evidence base. This makes rejecting its statements and conclusions more tedious, since critics have to reject all supporting references and claims (Latour, 1987).

Each version—QUOROM in 1999 and PRISMA in 2009 and 2020—witnessed roughly a decade of development in systematic reviewing. While the main rationale and several arguments can be found in each version in a similar way, their differences relate to the genre's role for scientific communication. With QUOROM as its first version (Moher et al., 1999), the narrative of the responsible profession was built particularly around meta-analyses—the statistical aggregation technique—even though the guideline mentions

the conceptual differences between meta-analysis and systematic reviewing by referring to the Potsdam consultation held in 1994, which was one of the earlier international gatherings to discuss the state of research syntheses (Cook et al., 1995):

Several queries addressed the distinction between the meta-analysis and systematic review. As we indicate in the introduction, and throughout the statement, the QUOROM group agreed to observe the distinction as defined by the Potsdam consultation on meta-analysis.

(Moher et al., 1999, p. 1899)

The scope was widened in the later versions, however. More inclusive wording was used to explicate a wider methodological scope and applicability. Besides renaming the guideline from QUOROM to PRISMA to include the words “systematic review,” its narrative sections now mentioned how the systematic review has become important to actors other than healthcare decision makers or researchers too. It adds guideline makers, clinicians, funders, and even journal editors, and thereby claims that the guidelines’ role in changing practices is relevant to a wider array of publics and communities.

The updates in 2020 renew the original intentions and target audiences but still mention wide applicability, even for nonmedical practices such as “social or educational interventions” (Page, McKenzie, Bossuyt, Boutron, Hoffmann, Mulrow, Shamseer, Tetzlaff, Akl, et al., 2021d, p. 1). Although its narrative employs an overall more neutral tone, it distinctively establishes links to other actors adjacent to the main guidelines. Most notably, it mentions the wide array of PRISMA extensions that modify the 2009 version to account for specific review methods, study types, or disciplinary specialties. In addition, the document refers to the EQUATOR network of reporting guidelines and explains its compliance with the network’s guidance on creating reporting guidelines (see Simera et al., 2010). It thereby stabilizes the PRISMA guidelines by situating them in a network of standardization organizations.

Similar to how the narratives within clinical guidelines evolved from healthcare decision-making to other uses of knowledge syntheses, guideline developers aligned PRISMA’s story with current topics in the research community. Most notably, participants elaborated on the relation between PRISMA and the problem of reproducibility or replicability of systematic reviews, which is itself a well-known narrative in the clinical sciences (see also S. N. Goodman et al., 2016). Subordinating the problems of systematic

reviews under such a powerful narrative and with PRISMA as a solution and weapon in the “credibility revolution” (Vazire, 2018, p. 411), the overall endeavor is equipped with substantial intellectual and societal legitimization.

The stories, and their evolution during the development of PRISMA and its updates, construct multiple professions. In the early versions, a diverse set of actors, such as researchers, practitioners, or policymakers, are narrated into a community of users and producers of systematic reviews. Furthermore, PRISMA’s terminology and selection of items for inclusion shape this community’s genuine understanding of what a systematic review is. Framing the epistemic crises in and around systematic reviewing, the story fuels the quality assurance movement in contemporary biomedicine. This consists of academic researchers and publication experts, who address the problems of reviews by scientifically evaluating the genre. Similar to how traditional review articles narrate topics, assumptions, and results of a scientific field (Blümel, 2021), guidelines connect topics, arguments, studies, and even institutions. How this profession was shaped into an active discourse community will be elaborated in the next section.

3.5 GUIDELINES IN THE MAKING

To be granted legitimacy, the guidelines had to present the process by which the different items relevant for the practice of systematic reviewing, the contributing guideline authors, and the description of the tasks were articulated. As such, the content of the PRISMA guidelines and their updates was drafted and discussed in several meetings, surveys, and conferences. Based on interviews with the guideline authors and document analysis, we will now further elaborate on the processes that shaped the making of PRISMA. Besides the role of the steering committee, the formation of expert groups, and formal consensus practices, the enrollment of various actors effectively fostered the dissemination of the guidelines and initiated a network of what might be considered as PRISMA’s own professional community.

We first analyzed how, and in what ways, experts were invited, and what role they played in convincing communities to change their practices. The core of the guidelines was formulated by a small group of actors. A central role was taken by the steering committee—as the method sections of the guidelines and our interviews have revealed. As the first iteration of PRISMA was built from scratch, this committee collected available evidence about the quality of reporting and drafted the first items. It was this group that also coordinated later revisions or versions of the guidelines. Although the updates were built upon each other and involved additional actors, a few core experts still led the development by writing substantial parts of the texts and dealing with

comments. Recalling experiences with other guidelines, interviewees stressed how the steering committee's efforts can benefit or harm the overall workflow:

When the team is very capable, they would have done a lot of prep work ahead of time, before they engage with you to solicit input on the specific things. When the team is less capable ... it's going around and around, and you never get to what needs to be done or how this can be done in a way that not only incorporate most people's feedback but also efficiently ... in terms of time-wise and how many rounds of revision we need.

(Interview participant #F)

Crucial to the construction of PRISMA were the involved experts. The group of PRISMA developers grew substantially over time, starting with 29 contributors in 1999, increasing to 42 in 2009, and finally reaching 139 in 2020. Similar to what Latour has called "bringing friends in" (Latour, 1987, p. 31) to explain the argumentative force of referencing, the number and status of the involved experts provide the guidelines with intellectual and social authority. Since most intended recipients and readers of PRISMA are authors of systematic reviews, the group must achieve a proper representation of disciplinary and methodological plurality. Such a representation signals guideline users that someone from their field was involved in the development process and helps to avoid conflicts with other disciplinary authorities and established practices or standards:

So we did the first guideline and it was an interdisciplinary group of people. There were statisticians. There were trialists, people who run randomized controlled trials. And perhaps most importantly, we had some influential journal editors.

(Interview participant #C)

Authoring a guideline document such as PRISMA can boost one's academic impact due to the high visibility. First, being part of a standard-setting process can mean being recognized as a prolific and experienced researcher. Second, since reporting guidelines are journal publications, they are often cited and accumulate high citation rates.⁴⁷ In

⁴⁷ Based on the 2019 version of the database at the German Kompetenzzentrum Bibliometrie (Schmidt et al., 2025), PRISMA and its explanation document have ~49k and

addition to selecting experts based on their skills and roles of contribution, selection criteria must warrant the expert's proper motivation to participate:

As you probably know, these guidelines are highly cited. People want to have them on their CVs. It's beneficial to your career. Sure, if you have something that's been cited a thousand times.

(Interview participant #E)

Analyses of each individual author's affiliation reveal that these were carefully selected, each representing different fields of expertise. Negotiating and defending their boundaries against other experts, prolific researchers take a central role and make local authority claims, for example, about valid methods or canonical interpretations. By agreeing or disagreeing on the narratives, other disciplinary researchers gather around these new cores and build social structures and networks (Whitley, 1985/2000). The disciplinary experts who contributed to the new standard can transform the perception of who (or what) the local authorities are. The local integration of PRISMA devalues systematic reviews that do not comply with this standard. Therefore, as with other standardizations, the negotiation and integration of PRISMA may reshuffle authority claims in biomedical disciplines. Yet, according to our interviewees, the effects of guidelines are often less glamorous than expected, though we have indication from our fieldwork that PRISMA has achieved becoming a particularly reputed way of reporting systematic reviews, especially when it is planned as a collaborative endeavor.

But the experts were chosen not just for their intellectual contributions but also for their ability to spread the guidelines. By including experts from various fields in the guideline formulation process, the guidelines become relevant to those fields represented by the authors. Therefore, the representation of targeted groups is crucial for the acceptance and dissemination of guidelines, as it creates awareness and supports "marketing" (Francke et al., 2008). The involvement of journal editors particularly served this role, as one interviewee pointed out:

I remember we would be looking at who were the key stakeholders and journal editors were key with the view that both you've got the voice of the journal editor influencing the guideline, but you've also got the ability for other journal

~14k citations in Scopus and ~32k and 10k~ citations in Web of Science (see also chapters 5 and 6).

editors to say, 'Oh, somebody of my type was involved. Maybe I should pay more attention to it.' And then it was a bit of lobbying of the journals to say, 'This is a good thing to be doing. It will help your transparency'.

(Interview participant #A)

By establishing cross-disciplinary narratives and enrolling various disciplinary authorities, PRISMA can be disseminated and implemented into several biomedical subcommunities. Furthermore, since there is no central authority that issues regulations and standards—setups that can be found, for instance, in clinical practice—guidelines must enroll and cooperate with local authorities to become pervasive (Timmermans & Berg, 2003). In representing the shared efforts of such connected local authorities, the PRISMA documents establish the network of group members and their institutional affiliations. To display this expert group, members were turned into a composite author called “the PRISMA group,” which was listed as the last author on the guideline. In contrast to merely listing the contributors’ names in the acknowledgement, this rather uncommon type of authorship stresses that members contributed in multiple ways in addition to the writing of text. Yet at the same time, the text employs a personal tone, which makes not only the authors visible but also the wider group (Myers, 1991).

The guideline document's method section outlines how the various experts collaborated on PRISMA. This establishes a textual link between the procedure and the resulting guideline items. Additionally, the resemblance to other reports of empirical research presents guideline making as a research process itself. As such, PRISMA attempts to create causal links between the group meetings and the resulting rules for reporting (Bazerman, 1988; Knorr-Cetina, 1981). By unfolding and communicating this link, the text of the guidelines provides the repertoire of processes and attempts to understand the making of PRISMA as a reliable methodology to negotiate and consent to a proper set of rules (Moreira, 2005). Therefore, the social configuration of the expert group as well as its communicative processes become an abstract recipe that contains mechanisms that build trust and acceptance by the biomedical community.

Turning the construction of PRISMA into an abstract procedure, its techniques were related to other agreed-upon methods or standards. This increases the transparency and acceptability of the PRISMA standard, since authors can understand the standard's connections to their local practices. For example, the guidelines and the interview respondents both mentioned the prominent role of the Delphi methodology to achieve formal and reliable consensus. The United States' National Institutes of Health (NIH) promoted the Delphi methodology during the 1970s and 1980s, and it has since become

an established procedure to organize expert consensus and mitigate individual biases (see also Solomon, 2015). In another example, the PRISMA authors had to comply with the authorship standards of the International Committee of Medical Journal Editors by removing “the PRISMA group” as an author in the update from the 2009 version to the 2020 version.

Unsurprisingly, guideline construction procedures became standardized themselves. Influential guideline experts have formalized this procedure into an individual approach, which serves as a guideline for creating other guidelines, or a practice to create evidence-based practices (see Moher, Schulz, et al., 2010). As interview participants noted, the PRISMA group was eager to standardize their communication procedures and contribute to such a guideline for the making of guidelines. Recalling efforts by one of the leading experts, one interviewee mentioned:

I mean there is standardization at the root of the guideline, but then it's the process and getting to that guideline, that also is its own standardized process that I think he's trying to standardize because there are many different approaches.

(Interview participant #E)

In turn, the latest update of the PRISMA guideline was based on this now standardized procedure and also reports its compliance with it. Such network building provides a mutual legitimization of both standards—the guidelines for reporting reviews and the guidelines for creating guidelines—and makes them more authoritative (Timmermans & Berg, 2003). Turning its own construction even further into a procedurally regulated endeavor, PRISMA benefits from the same valuations as systematic reviews that comply with PRISMA. Since PRISMA turns practices into evidence practices by the procedural inscription of values, guideline making has also been transformed into an evidence-based practice. In other words, after redefining how knowledge turns into authoritative evidence, the guideline can become evidence by the very same definition.

Beyond the construction and interaction with guideline objects, developers further professionalized the role and authority of guidelines by systematically evaluating their effectiveness. Phrases such as “Epidemiology of systematic reviews” (Alabousi et al., 2019, p. 517) testify how epidemiological methods and concepts were turned into a new professional narrative, coming from “meta-epidemiology” (Bae, 2014, p. 1) into more ambitious projects such as “meta-research” (Ioannidis et al., 2015, p. 1). Leaving the

boundaries of epidemiology aside, interdisciplinary researchers, institutes, journals, and educational programs focused on providing the “repertoire of ‘science’” in guideline development (Moreira, 2005). Aligning these tasks with the overall goal of moving toward higher quality science and evidence-based medicine, the network became a constituency that not only benefits from various expertise, but also from the representation of different groups (Simons & Schniedermann, 2021).

Although systematic reviewing and meta-analytical practices predefined and narrowed the scope of the guideline, the new constituency provides a cross-professional space where review authors, journal editors, and guideline researchers are invited to contribute. This made the issues of PRISMA visible and valuable in those various contexts. At the same time, the promise to equally influence the logic of the guidelines avoids the impression that one group or field authoritatively imposes its methods or knowledge on another. Thus, potential frictions between the diverse groups were actively minimized throughout the process.

3.6 APPLICABILITY BY SIMPLICITY

In order to influence writing practices, a guideline needs to formulate concise rules that authors can follow. This section discusses how these items are made and what motivated the guideline authors to do so, based on the interview results.

PRISMA complies with the typical form of a journal publication. As such, it not only provides a structure consisting of a narrative and methodology section but also presents its regulatory items as if they were research results. First, in a sample flow chart, it displays how authors of systematic reviews can properly report the stages of including and excluding primary studies. Second, the item list illustrates the various aspects and rules of proper reporting, serving as a useful checklist for authors. PRISMA grew from six overarching categories that roughly address the stages of reviewing in (1999) to 27 separate and rather detailed items in its (2009e) version. With the latest update (2021d), some of the items were given additional subitems so that the overall number did not change. As interviewees have noted, much of the efforts during item formulation negotiations were related to stripping down the number of items and rules so that the guidelines would not only be publishable but also easy to use. Not surprisingly, some respondents have explained that PRISMA represents only the minimum or mandatory reporting, rather than what could be considered as recommended or optimum.

Because things were discussed that we couldn't possibly put everything in. So, we had sort of an outline about which would be the required items in the

checklists. And that's what the majority of the time the in-person meeting was involved with, then we all went away.

(Interview participant #C)

In its focus on PRISMA's applicability, the group took a different approach to other attempts in standardizing the methodological quality of reporting or conduct. Especially in the case of systematic reviewing, potential guidelines compete against the epistemic and social authority of the Cochrane Collaboration. By providing extensive and strict methodological guidance for conduct and reporting, software infrastructures, detailed editorial supervision, and publication in its database, the Cochrane Collaboration defines the overall process of systematic reviewing on a much more comprehensive level (see I. Chalmers et al., 2002). For this reason, the interviewed participants noted not only the higher quality of Cochrane reviews in terms of conduct and reporting but also the significantly greater efforts required to perform and write them. Thus, the group also implicitly focused on applicability by juxtaposing their goals and efforts to those of Cochrane.

Cochrane is very detailed, and there's Cochrane for every kind of thing that you want to do. It was clear from the get go, that we were not going to be a Cochrane group, we were not going to hang together for the rest of our careers doing this.

(Interview participant #C)

Limiting the size and scope of guidelines is a common phenomenon in the construction of clinical treatment guidelines. Since the guideline has to fit into its applicatory context, the group tries to envision the "repertoire of 'practice,'" which refers to the usefulness of the guideline (Moreira, 2005). Developers weigh the guidelines' knowledge claims against the circumstances of different contexts and usage cases to judge whether the guidelines will be useful and improve the overall outcome. In contrast, extraordinary situations may demand improvisation and are not covered by the guidelines' knowledge claims, rendering them inapplicable or useless. Envisioning such cases enables developers to configure the standard's complexity and scope of application.

A careful consideration of complexity and scope is particularly important for the dissemination of multidisciplinary guidelines, such as PRISMA (Francke et al., 2008). Highly applicable guidelines provide substantial support in most situations, and

practitioners perceive them to be useful, so they willingly accept the guideline. In addition, translations into different languages increased its applicability among non-academics, especially medical practitioners or medical writers, as one interviewee noted (Interview participant #D). Therefore, what some interviewees perceived to be “the minimum” may be better interpreted as the most cost-effective level of reporting, in which the effectiveness of each rule is weighed against the necessary efforts to comply with it (see Timmermans & Berg, 2003).⁴⁸

Seen in this light, PRISMA’s particularly restricted focus on reporting makes it applicable as a standard for systematic reviews of various study types and research topics. In contrast to Cochrane’s standard, which provides guidance for the design and conduct of reviews, PRISMA explicitly regulates only the writing of reviews and tells authors what details have to be included in their manuscript. Although the distinction between conduct and reporting is fuzzier in the case of reviews than in clinical trials, the focus on reporting avoids conflicts with methodological plurality, as participants explained. In that sense, the guideline limits its own scope and controls the number and size of targeted groups, which makes potential conflicts manageable (Tamm Hallström, 2002). However, the restriction to reporting also mobilizes the regulatory capabilities of academic journals, as we will explain in the next sections.

3.7 DISSEMINATION BY JOURNALS

The guidelines were published in biomedical journals in order to effectively reach potential authors of systematic reviews. In this section, we discuss some of the unique characteristics of its publications, found during the document analysis and the interviews.

The PRISMA documents were published in multiple scientific periodicals, as we can see in Table 2. While QUOROM was published only once (Moher et al., 1999), the 2009 version was published in seven different journals (Moher et al., 2009f, 2009d, 2009b, 2009a, 2009c, 2009e; Moher, Liberati, et al., 2010b),⁴⁹ and was officially translated into Portuguese (Moher, Liberati, Tetzlaff, Altman, & PRISMA group, 2015), German (Moher,

⁴⁸ Notably, the reduced scope of PRISMA has also led to the emergence of various forks and extensions that attempt to slightly adjust the guideline to be more applicable to other data types or study designs. However, those have not been investigated in this study.

⁴⁹ I mostly referred to the British Medical Journal (BMJ) version for all references to PRISMA 2009, its main update from 2020 and the explanation documents, unless specified otherwise.

Liberati, et al., 2010a), and Italian (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2015) to quickly approach multiple biomedical sub-communities. Likewise, the explanation and elaboration document—an additional paper that offers a more detailed look into the guideline’s items and also provides some examples—was published in five different journals in 2009 (Liberati et al., 2009a, 2009c, 2009b, 2009d, 2009e), and translated only into Italian (Moher, Liberati, Altman, Tetzlaff, & The PRISMA Group, 2015). The latest update has been published as a preprint (Page et al., 2020) on MetaArXiv, and in five different journals (Page, McKenzie, Bossuyt, Boutron, Hoffmann, Mulrow, Shamseer, Tetzlaff, Akl, et al., 2021c, 2021a, 2021e, 2021b, 2021d). In addition, there was one additional explanatory document (Page, Moher, et al., 2021) and a postprint about its development process (Page, McKenzie, Bossuyt, Boutron, Hoffmann, Mulrow, Shamseer, Tetzlaff, & Moher, 2021). Interviewees noted how the team's publication experts suggested and discussed cross-publication, a practice typically considered unethical for researchers.

TABLE 2 OVERVIEW OF PRISMA DOCUMENTS

Type	Journal	Citations*	Reference
Main document (QUOROM)	The Lancet	3374	(PMID: 10584742 ; doi: 10.1016/s0140-6736(99)04149-5)
Main document	Physical Therapy		(PMID: 19723669 ; doi: 10.1093/ptj/89.9.873)
	BMJ - British Medical Journal	4158	(PMID: 19622551 ; doi: 10.1136/bmj.b2535)
	Journal Of Clinical Epidemiology	9239	(PMID: 19631508 ; doi: 10.1016/j.jclinepi.2009.06.005)
	Open Medicine		(PMID: 21603045)
	Plos Medicine	19902	(PMID: 19621072 ; doi: 10.1371/journal.pmed.1000097)
	Annals Of Internal Medicine	848	(PMID: 19622511 ; doi: 10.7326/0003-4819-151-4-200908180-00135)
	International Journal Of Surgery (2010)	390	(PMID: 20171303 ; doi: 10.1016/j.ijssu.2010.02.007)
	Epidemiologia E Serviços De Saúde (2015)		(doi: 10.5123/S1679-49742015000200017)
	Evidence (2015)		(doi: 10.4470/E1000114)
	Annals Of Internal Medicine	2732	(PMID: 19622512 ; doi: 10.7326/0003-4819-151-4-200908180-00136)
Explanation & Elaboration document	PloS Medicine	7465	(PMID: 19621070 ; doi: 10.1371/journal.pmed.1000100)
	Journal Of Clinical Epidemiology		(PMID: 19631507 ; doi: 10.1016/j.jclinepi.2009.06.006)
	BMJ - British Medical Journal	49413	(PMID: 19622552 ; doi: 10.1136/bmj.b2700)
	Evidence (2015)		(doi: 10.4470/E1000115)
	MetaArXiv		(doi: 10.31222/osf.io/v7gm2_v1)
Main document	Medici Oggi		
	PloS Medicine	1834	(PMID: 33780438 ; doi: 10.1371/journal.pmed.1003583)
	Revista Espanola De Cardiologia	6	(PMID: 34446261 ; doi: 10.1016/j.rec.2021.07.010)
	International Journal Of Surgery	641	(PMID: 33789826 ; doi: 10.1016/j.ijssu.2021.105906)
	Bmj-British Medical Journal	1038	(PMID: 33782057 ; doi: 10.1136/bmj.n71)
	Systematic Reviews	120	(PMID: 33781348 ; doi: 10.1186/s13643-021-01626-4)
	Online Türk Sağlık Bilimleri Dergisi		(doi: 10.26453/otjhs.1001606)
Explanation & Elaboration	Journal Of Clinical Epidemiology	90	(PMID: 33789819 ; doi: 10.1016/j.jclinepi.2021.03.001)
	BMJ - British Medical Journal	232	(PMID: 33781993 ; doi: 10.1136/bmj.n160)

Version	1999	2009	2020**

* As of Scopus, October 2023. It must be noted that the citation counts for individual documents vary substantially between the bibliographic databases such as Web of Science, Scopus or Google Scholar. Since PRISMA documents are highly similar, small variations in the citation matching algorithms may cause these differences.

** While the official guideline version is from 2020, only the preprint was published in that year. All other versions were published in 2021.

Besides the potential for faster communication, cross-publication also promised wider access, since researchers and their respective institutions may have different journal subscriptions. But it also means the involvement of multiple editorial offices and peer review processes, which demands huge efforts from the guideline developers. In addition, different editorial standards or peer reviews can lead to huge variations in the final documents, although all are intended to represent the same standard (Moher, Schulz, et al., 2010). More strikingly, since the guidelines already incorporate the intellectual contributions of many experts, the peer review process may undermine the sophisticated consensus practices on which the guideline is based. As one participant noted:

What I would call the aftermath of that ... was a general sense of, 'we're not going to do this again.' Why are we publishing in so many journals the same thing? And it is one of the challenges with publishing. That means what are the journals supposed to do about peer review, given that so many dozens of people have been involved in reaching this consensus? How can any of that be changed by one or two peer reviewers?

(Interview participant #A)

The guidelines were placed among some of the “big five” (Allotey et al., 2017, p. 1), which are the most cited journals in biomedicine. While QUOROM was the only document in The Lancet, PRISMA of 2009 and its 2020 update were published in the British Medical Journal and Annals of Internal Medicine. Other journals were PLoS Medicine, the Journal of Clinical Epidemiology, the International Journal of Surgery, Systematic Reviews, Open Medicine (discontinued), Physical Therapy, and the Italian Journal of Public Health. In addition, four official translations are listed on the PRISMA website, of which three were also published in national journals.

In the interviews, participants argued that the group targeted high-impact journals, as these have more resources for methodological quality assurance and the necessary

awareness for improving reporting. But more importantly, such journals improve the dissemination, since they are more central and authoritative within their respective communities. High impact can be achieved by specialized journals that have become local authorities within usually smaller sub-disciplines. On the other hand, generalized journals often reach high citation impacts too. Since such generalized journals target various audiences or even link many sub-disciplines, their published methods and standards are subject to intense criticism and academic competition (see Forsyth, 2020). Therefore, the successful enrollment of more generalized journals into PRISMA's narrative provides the guidelines with cross-field legitimization and authority.

In publishing and implementing PRISMA, a journal can make an individual commitment toward reporting quality in its domain. The journal employs the professional story of the guidelines and aligns itself with the experts and networks that developed them, whether they are from the same domain as the journal or not. But similar to the guideline developers that contributed mainly to boost their academic recognition, journals benefit from PRISMA's high impact too. Not surprisingly, interview participants noted that cross-publication was brought up by journal editors, and some of them might have been motivated by improving the impact metrics of their periodicals. Similar to scholars who can shape their epistemic practices with respect to such metrics, journal editors try to influence their metrics by inviting prolific authors or soliciting review articles (Blümel & Schniedermann, 2020). Likewise, journal editors can participate in the development and dissemination of highly cited guidelines and standards.

3.8 ENFORCEMENT BY GATEKEEPING

In contrast to other standard innovations, PRISMA would also be implemented into editorial processes so that authors of systematic reviews would have to comply with PRISMA in order to get their manuscript accepted. In this section, we discuss the extent and role of this practice. Usually, new standards or methods for *doing science* become established by orchestrating and demonstrating their epistemic superiority so as to finally persuade individual researchers. Whereas evaluation and demonstration of effectiveness ordinarily require time and additional resources, as explained above, PRISMA was legitimized with the help of the participation of prolific researchers and, as will be shown, academic journals.

Traditionally, a certain level of evidence or rational proof of a standard's effectiveness is required before it is widely taken up. This can hinder quick acceptance and dissemination (see also Zollman, 2007). Many methods or standards become pervasive only due to traditional modes of academic quality assurance, which are mostly peer

review. In a peer review system, experienced and prolific scientists evaluate the intellectual contributions of other researchers, and they can utilize whatever standard or guideline they find most appropriate. Although this system generally ensures a certain level of academic quality control, it notably did not prevent the decrease in reporting quality in the first place, as some interviewees noted.

However, peer reviewers may now consider PRISMA when they appraise the reporting quality of systematic reviews or when editors ask them to do so. But this still means that the dissemination and application of guidelines is dependent on the awareness and application by many individuals. So, varying expertise in relation to reporting does not only result in authors submitting incompletely reported manuscripts, but also peer reviewers not detecting the flaws.

Unfortunately, you're assuming everybody is at a certain level. You are assuming people would know how to write a paper, but that's not the case.

(Interview participant #F)

In addition to the role of peer reviewers in the evaluation of manuscripts, editorial offices also have substantial influence on deciding whether a submission will be published or not, as it has been described above. Usually, editors decide which submission will be rejected, which ones will be sent for review, and which reviewers are most suitable. For these reasons editors and journals have been called traditionally called “the gatekeepers of science” (Crane, 1967, p. 195). Journals determine the intellectual contexts of a submitted manuscript and also heavily influence formal characteristics of the texts, such as writing styles or references (Bazerman, 1988; Csiszar, 2018). In fact, interviewees have mentioned that editorial offices may even have aggravated the reporting crisis by putting limitations on word or reference counts. Nevertheless, guideline developers hoped that PRISMA would be implemented into journal processes and overseen by editorial offices or method editors.

Ideally, authors would fill out the checklist and submit it as additional material together with their manuscript. The editorial office or specifically trained methods experts would then appraise the manuscript and the checklist to judge the level of compliance. Due to the procedural nature of PRISMA, compliance can be checked on a per-rule basis, which turns the overall handling into a more formalized process that can be performed without proficiency in either the content or method of the review. Such a process could even be automated, similar to the checking of statistical reporting (Hojat et al., 2003). Utilizing

editorial capacities in advance of the peer review system would provide the necessary centrality to ensure that every systematic review is judged by the same criteria. This increases the authority of PRISMA by extending its intellectual authority with a more formalized type of regulation enacted by the gatekeepers of science.

Beyond the publication in high-impact journals, several journals officially endorsed the guideline. As the 2020 version concludes, PRISMA was endorsed by almost 200 journals or organizations publishing systematic reviews, which provide the guidelines with the necessary outreach to achieve a wide dissemination. However, the mere endorsement does not clarify the actual level of implementation, which can vary a lot. Thereby, while engaged editors verify the submitted checklists and occasionally ask authors for further clarifications, other endorsers may just publish them together with the manuscript (Interview participant #E).

As our interviews have shown, the goal of making PRISMA implementable by academic journals played a crucial role in the making of the guidelines. As Tiago Moreira suggests, guideline makers discuss the acceptability of the guidelines by assessing the “repertoire of ‘politics’” (Moreira, 2005, p. 1981). In doing so, they envision the guidelines’ recommendations through the lenses of the various groups and identify potential lines of conflict. In interpreting the relations between authors and journals, the PRISMA group imagined the latter’s regulatory capacity and decided what editors can demand from authors before they withdraw their submissions and turn to a competitor. As already indicated above, the commonly emphasized boundary between conduct, as performing the review, and reporting, as writing down the results, reflects the careful appraisal and utilization of these regulatory capacities. In other words, PRISMA was tailor-made to be implemented on the journal level, as participants explained:

Journals are able to implement a guideline by way of telling authors who must adhere to this guideline, it’s a lot easier to get to authors and researchers that way. I think that’s one of the key reasons from my understanding as to why reporting guidelines have been the focus over conduct guidelines.

(Interview participant #E)

Reducing the guidelines to a very specific set of values and requirements enables the journal to establish it as a required standard. Although academic journals have achieved some level of authority independent of individual experts or the overall referee system, they are subject to various epistemic and social constraints (Whitley, 1985/2000). As

such, they must navigate between the economic expectations of the publishers and authors who might submit to a different periodical if the imposed formal requirements become too burdensome or not applicable to their research (see also García et al., 2018). Similar to when clinical guidelines are put aside whenever anomalies occur during medical treatments, authors can turn to a different journal when their systematic reviews are of such a type that PRISMA is not applicable. In this respect, the spread of PRISMA can be compared to standardization in the industry, in which standards are issued by a variety of competing organizations that develop and market their standards as a form of decentralized regulation or soft law (Brunsson & Jacobsson, 2002; Timmermans & Epstein, 2010; Weisz et al., 2007).

3.9 CONCLUSION: TEMPLATING EVIDENCE IN BIOMEDICINE

In this study, we tried to understand how biomedicine's most appraised epistemic practice, the creation of systematic reviews, is shaped and defined by formal standards, most notably the Preferred Reporting Items for Meta-Analyses and Systematic Reviews, or, in short, the PRISMA guideline. Understanding this reporting guideline as an attempt to standardize research practices, we investigated how texts, researchers, methodologists, and journal editors forged bonds to create a guideline that is applicable and acceptable. To do so, we performed a document analysis of the PRISMA reporting guideline and interviews with its developers. By using a multiple worlds framework, we identified several similarities and differences between the construction of PRISMA and clinical treatment guidelines.

The emergence of PRISMA exemplifies the intellectual exchange between medical practice and biomedical research, described as the "second tension" throughout this book.⁵⁰ In telling a coherent story about the problems of systematic reviewing and how

⁵⁰ The volume to which this chapter was originally submitted describes four tensions or perspectives on the concept of evidence. The first tension highlights the variety of conceptions and definitions of evidence that exist both among different scientific fields and within the same field. The second tension emerges between the generation of evidence, especially the scientific system, and the consumption of knowledge, which is, in our case, for example, doctors, healthcare decision-makers, or the medical industry. The third tension addresses the relationship between the conception of evidence and different forms of social power structures, for example, with regard to the divide between the global north and south. Last, the fourth tension describes the legitimacy of scientific actors and institutions and looks at how they become aligned with public and democratic spheres by conceptualizing evidence (Ehlers & Esselborn, 2022). Although

those can be solved, PRISMA focuses on the practices of reviewing and how those can be improved procedurally. Conceived as a regulatory tool, PRISMA represents an intervention aimed at improving reports of systematic reviews so that they can be considered as biomedical evidence. This pattern relates to or even originates from what is often understood as the core of evidence-based medicine, in which doctors are provided checklists and standards to increase treatment uniformity and reduce treatment errors (Tanenbaum, 1994; Timmermans & Mauck, 2005). Likewise, PRISMA tries to guide authors through the writing of systematic reviews to ensure that all reviews contain the necessary information and nothing is left out. So, the basic principles behind the improvements of medical practices were used to improve evidence practices such as systematic reviewing.

In becoming a new standard, PRISMA interferes with already established practices and local authorities that have defined the characteristics of systematic reviews. In our analysis, we found that some efforts were taken to make PRISMA applicable as well as acceptable. Besides keeping the guidelines rather simple for easy application, it was designed with respect to the regulatory capabilities of academic journals. Since PRISMA focuses only on reporting, compliance can be enforced or supervised by editorial offices. This turned the guideline not only into a regulatory tool for journal editors but also fostered a wider dissemination and application. In addition, its developers formed a professional community that evaluates endorsements and compliance with PRISMA. This community also developed updates and extensions to keep PRISMA relevant to contemporary trends in biomedical research.

Our analysis has shed some light on the configurations and decisions that enabled the wide dissemination and application of the PRISMA guideline in a diverse and global endeavor that lacks central authorities. As such, this study provides insights into standardizations and the very mechanisms that shape evidence practices in science. Since disciplines such as the social sciences, psychology, or climate science also proclaimed crises, our results can be used to inform similar efforts in those fields or, at least, explain if and when such forms of overarching standardizations are inapplicable. However, more research is needed to better understand some factors affecting the dissemination and application of PRISMA, as well as the reflexive discourse that follows its implementation.

all these tensions play a role in this and the other chapters, they are not addressed explicitly.

