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Conflicts of Interest Between Systemic and Corruptive: A Conceptual Compass for Watchdog Science Journalists

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Abstract

Watchdog science journalism is essential to scrutinise the structural and financial conditions of scientific research. As a crucial part of this system, experts play a pivotal role in shaping knowledge, guiding policy, and influencing societal decisions. Their credibility is embedded in a complex web of relationships that brings about different conflicts of interest (COIs). Yet, journalists' ability to uncover entanglements and ensure accountability is limited by often incomplete disclosure and conceptual vagueness of what exactly constitutes a COI. Using (bio-)medical research as an example, we develop a multidimensional typology of COIs, based on an extensive review of academic literature and disclosure frameworks in science, practice, and policy-making. To our knowledge, this is the most comprehensive mapping of structural, social, and material factors in a single overview to date. While not all these interdependencies are inherently problematic for a functioning research system, they still require journalists to navigate them and carefully evaluate their significance. To facilitate this, the framework also serves as both a matrix and a corrective for potential AI-based systems detecting COIs. Even though transparency and critique are central to watchdog science journalism, journalists should also be careful not to undermine public trust in science generally. Conflicts have to be evaluated carefully but without portraying science funding as inherently corrupt—thus feeding narratives of science-related populism. By foregrounding the systemic nature of COIs, this perspective supports reflection on professional norms, strategies, and principled decision-making in investigative reporting—also regarding journalism's own entanglements with individual and third-party interests.

Keywords

conflicts of interest; expert credibility; funding transparency; science journalism; watchdog journalism

1. Introduction

Watchdog science journalism, which monitors, investigates, and reports on research infractions, their impacts, and causes (Franks et al., 2023), plays a crucial role in scrutinising scientific research for the public, the scientific community, and regulatory bodies. Its scope ranges from the exposure of questionable scientific methods, uncovering funding-related conflicts and research fraud, to exposing ethics breaches and predatory publishing that compromise research integrity and public trust in the scientific system (Fleerackers et al., 2026; Franks et al., 2023; Nature, 2009). In this respect, science journalism follows the theoretical framework of journalism in general as a critical mechanism for ascertaining truth (Barnhurst & Owens, 2012). Its accountability function is particularly vital in (bio-)medical research, where scientific knowledge directly affects clinical practice, health policy, and public understanding of diseases. Additionally, researchers and physicians play a central role in reporting on health topics. Their statements carry weight; they can not only influence individual treatment decisions but also shape the public perception of science and steer political debates (Entwistle & Hancock-Beaulieu, 1992; Serong et al., 2019). This function of journalism becomes even more important in the face of increasing digital disinformation. Critical reporting without legitimising narratives of "science-related populism" (Mede & Schäfer, 2020) that portrays organised scientific "elites" as corrupt and untrustworthy becomes a key challenge.

However, (bio-)medical practice and research operate within a network of science, industry, healthcare, and policy, with individuals and institutions regularly collaborating with pharmaceutical, medical device, and biotechnology product manufacturers (Chimonas et al., 2021). Between 2013 and 2022 alone, the medical device and pharmaceutical industry paid $12.13 billion to over 826,000 physicians in the US (Sayed et al., 2024). Substantial and often undisclosed industry payments to institutions and researchers who author guidelines, advise on drug policy, and shape treatment standards have been frequently reported across multiple health industry areas (e.g., Boytchev, 2023).

These connections are not necessarily problematic in every case. In fact, they often drive research and innovation. The pharmaceutical industry, e.g., funds a majority of drug development, with estimated total costs ranging from $43.4 million to $4.2 billion per drug (Moon et al., 2022). Around half of these costs accrue during clinical development, borne largely by the pharmaceutical industry (Simoens & Huys, 2021; Zhou et al., 2023).

However, these connections increase the risk of influence on professional judgment, research outcomes, and policy recommendations—whether conscious or unconscious—and therefore pose a conflict of interest (COI; Chimonas et al., 2021; Thompson, 1993). A variety of studies show that even modest incentives, such as sponsored meals or small gifts, can shift physicians' prescribing patterns (e.g., Mitchell et al., 2021; Newham & Valente, 2024). Similarly, industry-funded clinical research tends to yield favourably interpreted results for the sponsor (Lundh et al., 2017; Siena et al., 2023).

To fulfil their watchdog role, science journalists must therefore monitor, investigate, and report on such connections. Most journalists working for quality media are used to keeping the possible financial or political COIs of their sources in mind. For example, the Science Media Center Germany (www.sciencemediacenter.de/en) requires COI disclaimers from experts cited. The need for "asking about, weighing and disclosing relevant financial, advocacy, personal or other interests of those [they] interview as

a routine part of story research and interviews" is also mentioned in a checklist for good medical journalistic practice (Schwitzer, 2008, p. 701). Such standards are often applied in journalism education as well. However, a detailed explanation of the broader spectrum of possible COIs as developed here seems to be missing in current journalism training manuals.

Journalistic responsibility begins with the selection of the sources that media features since "the people who are given the right to speak, are afforded the power and privilege to frame the narrative" (Scherling & Foltz, 2024, p. 164). As they are essential context for evaluating experts' positions in public discourse, journalists who fail to scrutinise COIs may "wittingly or unwittingly" become "megaphones for biased experts, industry and lobby groups" (Levi, 2001, xiii).

However, their means to uncover these entanglements are limited. While in the US the "Sunshine Act" provides legal requirements to disclose at least some financial connections between prescribing clinicians and industry, many European countries lack regulation. Disclosure to the general public often remains voluntary—and tends to be incomplete, inconsistent, or difficult to find (Ozieranski et al., 2021). Moreover, even where standardised databases exist, they typically capture only a subset of connections based on their specific regulatory framework. This complicates the search further, as definitions of COIs vary vastly across contexts—even within medicine itself (Morciano et al., 2016). Journalists must therefore navigate scattered sources: publications, corporate registers, transparency lists, institutional disclosures, and information provided by experts themselves.

Consequently, they often remain dependent on what their sources define as a COI at any given moment. While efforts exist to provide overviews of different COIs in medicine and (bio-)medical research, they often cover only specific subsets (Wiersma et al., 2024) or remain broadly defined (Akl et al., 2022; Chimonas et al., 2021).

This article addresses this gap by developing a conceptual compass for navigating COIs in (bio-)medical contexts and asking: What types of COIs exist in (bio-)medical research and practice, and how can they be systematically mapped to support investigative work?

Through analysis of academic literature, guidelines, and disclosure frameworks across research, clinical practice, and policy-making contexts, we map possible structural, social, and material connections in (bio-) medical practice and research. Complementary expert interviews, conducted in parallel, capture how COIs are currently dealt with in practice and explore whether structured approaches could support investigative efforts. The data also provides a first assessment of whether this systematisation captures the COIs that journalists recognise in practice. Given that journalists operate as important gatekeepers in uncovering undisclosed connections, understanding their investigative practices and what challenges them is essential for developing practice-oriented transparency tools.

The comprehensive overview serves a threefold purpose. First, it functions as a reference tool enabling journalists to systematically navigate common COIs as they investigate researchers, evaluate expert sources, or scrutinise institutional practices. Second, the framework's structure as a matrix should facilitate its application in potential AI-based systems for better detection and analysis of COIs in the future. Third, it encourages further theoretical work on COIs as well as the role of journalism in this context.

2. Theoretical Background

2.1. What Makes a Conflict?

Although understandings of COIs overlap across many professional groups, there is no internationally recognised definition. Even within medicine, various definitions exist (Morciano et al., 2016). However, a concept developed by Thompson (1993) has largely prevailed and underpins, e.g., the influential 2009 Institute of Medicine report. It defines a COI as "a set of circumstances that create a risk that professional judgement or actions regarding a primary interest will be unduly influenced by a secondary interest" (Lo & Field, 2009, p. 46).

According to Thompson (1993, p. 573), primary interests are those "determined by the professional duties of a physician, scholar or teacher"—meaning patient well-being, scientific integrity, and quality education. Secondary interests include financial benefits, relationships, professional recognition, career advancement, and personal affiliations. Thompson emphasises that secondary interests are not inherently illegitimate and may constitute an integral part of professional practice by supporting primary interests. Crucially, a COI is initially a risk arising from the coexistence of primary and secondary interests: "A conflict of interest exists whether or not a particular individual or institution is actually influenced by the secondary interest" (Lo & Field, 2009, p. 47).

This distinguishes Thompson's concept from frameworks that ask authors to declare "potential COI," as e.g., applied by the International Committee of Medical Journal Editors ([ICMJE] 2026). Here, a conflict exists only once inappropriate influence has occurred. Klemperer and Lieb (2018, p. 7) criticise this approach as fundamentally impractical as "the motives that trigger human judgment and action can only be presumed, but not proven." Our article therefore follows Thompson's and the Institute of Medicine's definition.

2.2. Categorisation of COIs: An Inconsistent Guessing Game

Approaches to categorising COIs typically differ with regard to their conceptualisation of secondary interest as involving financial or material gain. This is the case, for example, when researchers or clinicians receive payments for talks, hold shares, or accept gifts. This is referred to as a material or financial COI. Such benefits may originate "from healthcare industry companies…industrial interest groups, commercially oriented contract research organisations, insurance companies/insurance providers, or from public funding bodies (e.g., ministries), self-governing bodies/institutions, foundations, or other funding sources" (Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften [AWMF], 2020) and may be directed at individuals or institutions. The value exchanged can range up to stock ownership worth several million euros. These connections may be unilateral and passive (e.g., receiving a gift) or based on active exchange (e.g., payment for a talk). Non-material, non-financial, or intellectual COIs arise when professional, ideological, or religious interests, family relationships, friendships, or personal rivalries emerge as secondary interests (Garattini & Padula, 2019; Wiersma et al., 2024). These interests are also referred to as intrinsic or academic interests, terms that are used depending on the context (Wiersma et al., 2024).

Furthermore, guidelines and disclosure policies often distinguish between direct and indirect COIs, showing value-centred and recipient-centred understandings. Direct interests are often described as direct financial

interests. The AWMF, e.g., defines "direct financial interests" as "financial, personal, or institutional benefits," while indirect interests, similar to non-material interests, encompass "clinical, academic, and personal interests" (AWMF, 2017, p. 2; see also European Medicines Agency [EMA], 2023; Schünemann et al., 2015).

In contrast, a recipient-centred understanding of direct and indirect conflicts exists. The National Institute for Health and Care Excellence ([NICE] 2022) and the General Medical Council (n.d.), for example, classify direct COIs as situations that provide a direct benefit to an individual. Indirect COIs, however, benefit the individual rather indirectly through third parties, such as employers or family members. In this framework, direct and indirect interests can be both financial and non-financial. The Thieme Group uses the same criteria to distinguish between economic (corresponding to direct) and private (indirect) relationships (Thieme, n.d.). The Cochrane Network (2023) and the WHO (2022) also employ this classification, albeit more narrowly defined, distinguishing financial COIs according to whether a payment is made to an individual (direct) or to an organisation (indirect).

A distinction based on the recipient of monetary benefits is also made by the European Federation of Pharmaceutical Industries and Associations ([EFPIA] 2019) and its national members: In transparency reports, they distinguish between payments from pharmaceutical manufacturers made to healthcare organisations or to healthcare professionals. The former are also referred to as institutional COIs, the latter as individual COIs (Akl et al., 2022).

3. Methodological Approach

3.1. Literature Review

In view of the different interpretations and the lack of a uniform definition of COIs, a hybrid search strategy to comprehensively map and systematise COIs in (bio-)medical research, practice, and policymaking has been applied, combining an integrated exploratory approach with citation-based snowballing and a systematic database search.

Publications and practice-relevant documents previously known to the authors served as starting points for an iterative search. Reference lists and citation networks of these sources were screened to identify relevant literature and documents. Additionally, keyword searches ("conflict of interest" AND "guidelines" OR "policy" OR "disclosure form" AND "medicine" OR "research," both in German and English) on Google Scholar, PubMed, and Google were conducted to identify academic research, as well as guidelines, policy statements, and COI disclosure forms issued by societies, journals, research institutions, and regulatory bodies. The retrieved articles served as seed materials for citation-based forward and backward snowballing. The academic discovery tool Connected Papers was employed to facilitate the identification of further relevant literature through citation networks and related articles.

This exploratory approach allowed for the identification of a wide range of connections and situations discussed as COI across different contexts. Provisional saturation was assumed once additional snowballing rounds no longer yielded substantively new categories or dimensions of COIs relevant to the framework.

The exploratory and snowballing phases were conducted until late 2024. Informed by the concepts and categories identified during these phases, a systematic, keyword-based literature search was subsequently conducted on PubMed in December 2025 to ensure comprehensive coverage of the latest (bio-)medical literature for the present article. The search combined medical subject headings as well as free-text terms (see Supplementary Material A for PRISMA-Chart and search string).

The search included German and English-language publications published since January 1, 2020. In total, 303 publications were retrieved. After screening, six records were excluded as they had been covered by the snowball search. Three articles could not be retrieved as the full article was not available, leaving 294 reports assessed for eligibility. Of these, 196 reports were excluded as they didn't discuss different types of COIs or offered no differentiation (other than "financial" and "non-financial"). A further 83 were excluded for only retrieving from the Open Payments database—the 17 subcategories had been covered previously. One report was excluded due to language barriers, leaving 14 studies to be included.

3.2. Expert Interviews

To complement the exploratory phase, six expert interviews with German-speaking professionals in medical and science journalism were concurrently conducted in June and July 2024. The goal was to capture practical and contextual knowledge on how journalists currently identify, evaluate, and handle COIs in their work and to explore expectations towards potential assistance tools for COI research. The interviews also reflect which COI situations experts consider and encounter in their work, thereby providing material for a subsequent plausibility check of the proposed framework through deductive coding.

We explicitly chose experts with a high level of experience regarding COIs and the research system. Although many practical challenges may more commonly affect less specialised journalists, this approach allowed for the generation of in-depth insights and reflective engagement of the experts. Participants were selected to ensure diversity across roles, gender, and editorial contexts (Table 1).

Table 1. Overview of the participants in the expert interviews (anonymised).

Expert	Employment	Role	Specialisation
E1	Science editorial office	Editor	Medicine
E2	Public service broadcasting	Managing editor	Medicine, investigative
E3	Scientific institution	Managing editor	Public health information, journalist training
E4	Freelance (print/online)	Science journalist	Science (biotech, medicine; partly investigative)
E5	Public service broadcasting	Managing editor	Medicine, health
E6	Science YouTube channel	Editor	Science

Experts E2, E3, and E5 hold decision-making positions within their organisations. E4 can also be considered a decision-maker due to editorial autonomy. Decision-makers are defined as "experts for their respective organisation and close observers of decision-making processes, structures and changes" (Scheu et al., 2014, p. 76). Therefore, they should also play vital roles in dealing with COIs in editorial reporting. As we focused on COIs in (bio-)medical research, participants were not asked about their own COIs, in order to avoid any misleading framing of COIs in their responses. E1 was selected for their long experience in local journalism, a relevant perspective given the increasing diffusion of (bio-)medical reporting beyond dedicated desks.

Recruitment drew on professional visibility mainly among professionals affiliated with familiar editorial organisations, and was complemented by referral-based recommendations.

All interviews were conducted as semi-structured interviews (average duration: 40 minutes) via Zoom. Interviews were audio-recorded, transcribed (using NoScribe), and analysed using qualitative content analysis (Kuckartz & Rädiker, 2022). MAXQDA was employed for the coding process using a comprehensive codebook (see Supplementary Material B) that covered both journalistic practices (e.g., investigating COIs, disclosure decisions, perceived barriers, and expectations toward support tools) and types of COI. To ensure coding consistency, intracoder reliability was assessed through time-delayed recoding of interview E1 using MAXQDA, yielding an overall agreement of 92.52% at an 80% segment overlap and 89.8% at a 90% overlap threshold. Coding combined inductively developed categories with a deductive component: For COI types, the systematisation from the literature-based typology served as an a priori category system. This approach allowed a systematic post-hoc assessment of whether COI situations described in the interviews could be mapped onto the proposed framework.

All participants' comments were anonymised throughout the research process; quotations presented were translated from German into English by the authors and will display the initial of the interviewee.

4. Findings: Mapping COIs

The review of guidelines, academic research, and disclosure forms allowed us to identify a variety of connections and scenarios that, depending on the individual context, constitute a COI. Identified connections were collected and clustered according to shared structural characteristics. Recurring groupings from declaration forms and literature served as initial points of orientation, but were critically reassessed and adapted, ultimately leading to a framework of four material and four non-material dimensions (Table 2).

Table 2. Overview of the eight dimensions.

Material	Non-material
Proprietary rights and dividend payout	Beliefs & stances
Industry marketing	Interests regarding career or research
Non-research partnerships	Interpersonal relationships
Research partnerships	Wish for status and respect

The framework is designed for conceptual comprehensiveness—it maps the range of COIs discussed in the literature rather than reflecting the relative weight of empirical evidence or assessing their relevance.

The following sections provide a detailed account of the specific COI constellations within each of the identified dimensions. Figure 1 maps the framework schematically (see Supplementary Material A for the underlying sources).

COIs are understood as potentially manifesting across both material and non-material dimensions, which may co-occur and take different forms within a single case. Importantly, these dimensions are not mutually exclusive. For instance, regular contact with a medical device representative may constitute a material COI within the "industry marketing" dimension if a clinician receives gifts, samples, or complimentary meals.

The same interaction may also represent a non-material COI within the "interpersonal relationships" dimension if the representative maintains a longstanding relationship with the clinician.

4.1. Material Dimensions

4.1.1. Proprietary Rights and Dividend Payouts

Regarding patents, utility models, and royalties, scientific advances are frequently accompanied by patent or utility model applications. They may be filed by researchers, affiliated institutions, or commercial partners and cover pharmaceuticals or medical products such as vaccines, medical devices, surgical instruments, or genetic markers (European Patent Office, 2025). Although patents do not necessarily generate immediate income, they may be licensed in exchange for fees or revenue-based royalties. Patent holdings are therefore widely regarded as material COIs and are commonly subject to disclosure even at the stage of planned applications (e.g., The Cochrane Network, 2023; ICMJE, 2026). Income through royalties and licenses is often listed separately (e.g., ICMJE, 2026; NICE, 2022).

In regard to shares, stock options, and investments in sector funds and companies, beyond intellectual property rights, equity holdings are also considered financial COIs. The economic performance of (bio-)medical companies is sensitive to information on drug development and regulatory decisions, with development news as well as decisions made by the US Food and Drug Administration having measurable effects on stock returns and share prices (Cho et al., 2024; Vedd et al., 2019). Some sources therefore differentiate funds based on whether the individual can influence their composition (e.g., EMA, 2023; NICE, 2022). Some guidelines also request disclosure of holdings by the individual's spouse or children (Springer, n.d.).

4.1.2. Industry Marketing

As direct-to-consumer advertising of prescription medicines is restricted in many countries, companies often focus marketing on healthcare professionals, particularly those in influential decision-making roles. In the US alone, industry spending on marketing directed at healthcare professionals amounted to $20.3 billion in 2016, including $5.6 billion for the deployment of pharmaceutical representatives, $13.5 billion for free drug samples, and approximately $260 million for meals, travel, and accommodation costs (Schwartz & Woloshin, 2019).

Concerning donations and sponsorship, industry support may take the form of sponsorship or donations, typically defined as voluntary funds, assets, or services provided without contractual obligations of reciprocity (EFPIA, 2019). Besides money, they often include funding for teaching materials, equipment, infrastructure, scholarships, or educational programs (Hensley, 2019). Sponsorship differs in that it involves financial, material, or service-based support in exchange for a defined counter performance (EFPIA, 2019).

As for continuing medical education and conferences, in many countries, physicians are required to complete continuing medical education, a substantial share of which is at least partially financed by healthcare companies (Wienke & Hübner, 2022). These include company-funded symposia, including reimbursement or discounts of conference fees, travel, or accommodation. Such arrangements may increase the attractiveness of specific events and shape educational agendas, speaker selection, or thematic focus (e.g., Lempert et al., 2019).

In regard to promotional gifts, sample packs, and sponsored meals, regular interactions with industrial representatives often involve free drug samples, promotional materials, invitations to meals, or educational resources (Fickweiler et al., 2017). According to Chen (2022), physicians perceive these interactions as an efficient way to obtain information on new drugs, devices, and procedures through direct exchange, while representatives gain the opportunity to disseminate targeted information. While often low in monetary value, such benefits may influence professional judgment through reciprocity effects.

4.1.3. Non-Research Partnerships

Physicians and researchers may engage in active collaboration with pharmaceutical companies and interest groups; typical forms identified in disclosure guidelines and literature include paid consulting, advisory board participation, expert assessments, teaching activities, and authorship roles. Unlike industry marketing, these interactions are formally defined by a reciprocal exchange of compensated professional services.

In regard to paid consulting activities, pharmaceutical and medical device companies frequently engage clinicians and researchers as paid consultants, with fees accounting for a substantial share of industry compensation to physicians (Cuomo et al., 2021). Such collaborations are typically formalised through consulting contracts and may be project-based or ongoing, including roles on advisory boards, steering, or data monitoring committees (Koch & Lieb, 2018).

Clinicians and researchers may receive honoraria for expert testimony or expert assessments for courts, regulatory authorities, insurers, law firms, or professional bodies. The receipt of remuneration from interested parties may itself constitute a COI. In addition, paid (co-)authorship arrangements may involve the production of journalistic contributions, informational materials, or educational content on behalf of companies or interest groups (Chimonas et al., 2021)

There is also peer-to-peer marketing, which comprises, e.g., paid lectures, speaker bureaus, and social media. Peer-to-peer marketing refers to promotional activities conducted by clinicians and scientists toward other healthcare professionals. Commonly discussed forms include paid lecturing or teaching at industry-sponsored events, sometimes organised by speaker bureaus (Reid & Herder, 2013), where companies influence content by defining topics or even providing slides (Koch & Lieb, 2018). Such activities also extend to digital platforms, disseminating paid endorsements or promotional content to professional audiences (Persaud et al., 2024).

4.1.4. Research Partnerships

Here, we first have industry-funded drug trials. Research partnerships commonly involve roles such as principal or sub-investigator in industry-funded clinical trials, patient recruitment, or contract research arrangements (EMA, 2023; Murayama & Marshall, 2024). Participation in such research may entail sponsor influence on study design, data access, interpretation, or publication rights (Schott et al., 2018).

Second, there are post-marketing surveillance studies and “seeding trials”. Physicians in outpatient care may receive honoraria for participation in post-marketing studies, which collect data on already approved pharmaceuticals during routine clinical use. Although prescribing solely for study enrolment is prohibited, they may create financial incentives to preferentially prescribe the observed product (Koch et al., 2020).

Closely related are so-called seeding trials, which are formally structured as clinical research but primarily serve to familiarise physicians with new drugs and stimulate prescribing behaviour (Schott et al., 2018).

Third is the guest and honorary authorship. In Western research systems, physicians and researchers are often not financially compensated for publishing their research. However, companies may commission publications written wholly or in part by ghost authors (Schott et al., 2018). Closely related is the practice of guest, gifted, or honorary authorship, including reciprocal authorship arrangements or paid use of reputable experts' names.

Finally, there are employment relationships and third-party research funding. Physicians and researchers are often employed by hospitals or research institutions and thus operate within structural dependencies that may influence professional decision-making. As Klemperer (2011) notes, any remuneration system generates financial incentives—for example through performance-based compensation or minimum case volume requirements. This includes holding positions in or ownership of pharmaceutical, medical device, or biotechnology companies, or running a private medical practice with direct financial exposure to treatment decisions. A further structural source of material dependency is third-party funding. It can be made available to the university, one institution, or individual researchers. Such funding includes endowed chairs, industry-funded research projects (including salaries), and donations—allocated to institutions, departments, or individual researchers (Murayama & Marshall, 2024; Springer Nature, 2018).

Figure 1 provides an overview of the different dimensions of COIs in medical practice and research discussed above.

4.2. Immaterial COIs

Compared to material COIs, immaterial COIs receive considerably less attention in the literature and have been characterised as being of "lower ethical priority" (Goldberg, 2020, p. 1). In disclosure forms, they are often only briefly addressed. Some authors have questioned whether immaterial interests should qualify as COIs at all, arguing that they have been constructed as an ethical issue by leading figures in evidence-based medicine and COI policy development (Bero & Grundy, 2016; Grundy, 2021).

Nonetheless, concerns about their potential influence have increased (Resnik, 2023; Wiersma et al., 2024), and immaterial interests are now addressed in journal policies (Resnik et al., 2017), guideline-development frameworks (AWMF, 2017; Schünemann et al., 2015), and institutional disclosure requirements (General Medical Council, n.d.; NICE, 2022; The Cochrane Network, 2023; Thieme, n.d.). To systematise immaterial COIs in health research, Wiersma et al. (2024) identify five recurring types: Belief- or position-based, career-related, interpersonal, research-related, and status-related conflicts. These categories form the basis for the following dimensions.

4.2.1. Beliefs and Stances

Immaterial COIs may arise from strong moral, political, philosophical, ideological, or religious beliefs (American Association for the Advancement of Science, n.d.; Wiersma et al., 2024). Firmly held positions on morally or ethically contested issues may constitute COIs when they create a risk that professional judgment is shaped by prior commitments rather than by available evidence. Akl et al. (2022) suggest that even

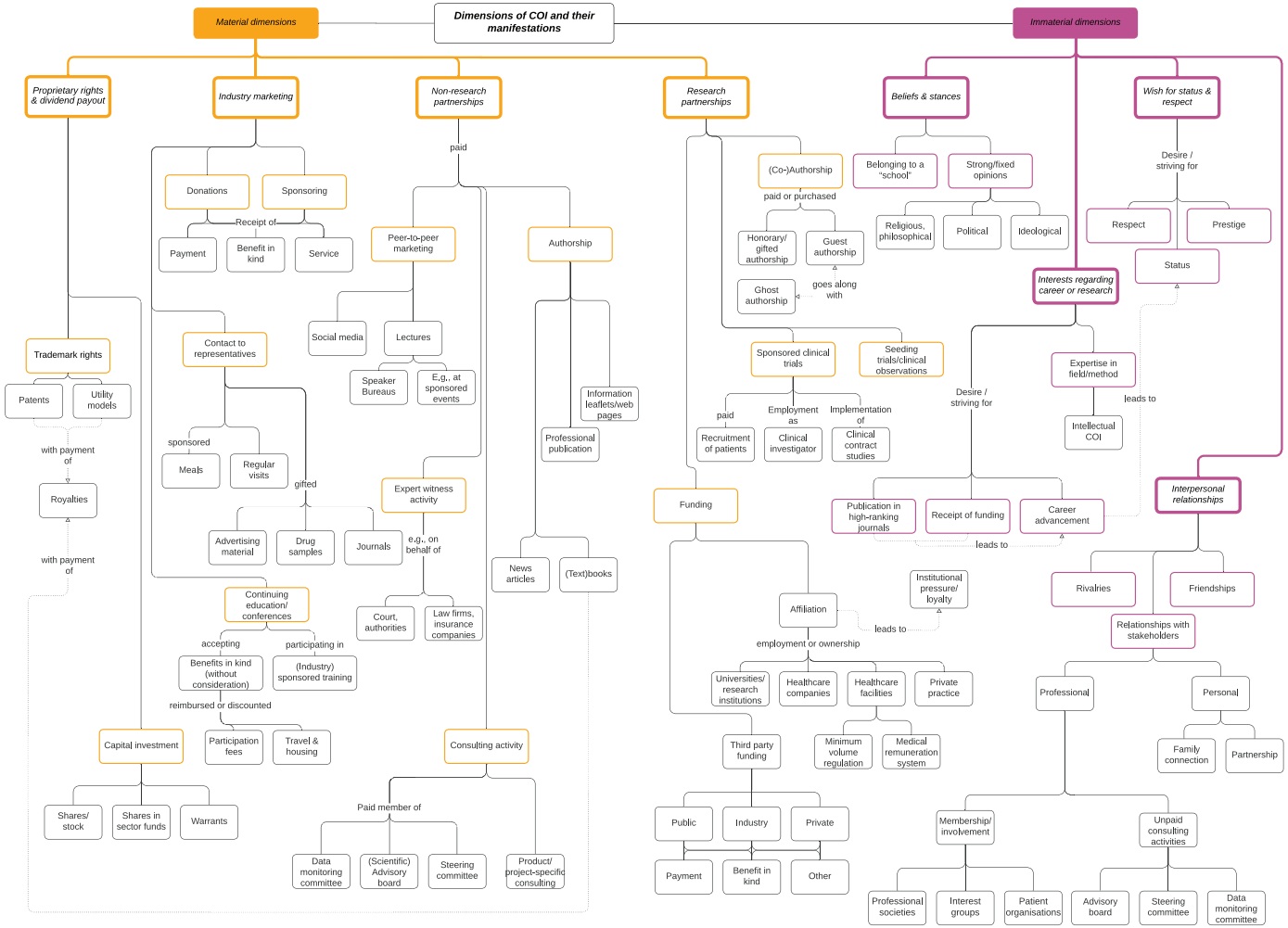

Figure 1. Dimensions of COIs in medical practice and research. Notes: Four material (purple) and four immaterial (orange) dimensions are distinguished (thick, coloured outlines); each dimension comprises groups of relationship constellations that constitute COIs (thin, coloured outlines), which can be further specified into different manifestations (black); the categories are not exhaustive and are intended to provide an overview, not to suggest an equivalent weighting in empirical evidence or relevance; some categories under the dimension "non-research partnerships" can also be considered a form of industry marketing.

personal characteristics such as gender, age, race, physical or psychiatric conditions, and sexual orientation make up a secondary interest and therefore a COI. While personal characteristics may be an implicit factor in decision-making, they are usually not considered a secondary interest. They may, however, influence the development of moral commitments or firmly held views, which are considered a factor in a COI.

A related constellation concerns affiliation with specific therapeutic or professional schools, such as surgical traditions or schools of psychotherapy, or alternative medical approaches, as addressed by e.g., Klemperer (2011), AWMF (2017), and Thieme (n.d.).

4.2.2. Interests Regarding Career or Research

Career-related conflicts include the pursuit of professional advancement, institutional pressures, loyalty to organisations, identification with a specific discipline or set of practices, or protection of intellectual legacy (Wiersma et al., 2024). Someone who built their reputation and life's work on a specific approach may face difficulty objectively evaluating contradictory evidence. Schünemann et al. (2015, p. 549) therefore consider "being an acknowledged expert in the intervention" a COI.

In research contexts, recurring drivers include acquisition of funding, publication in high-impact journals, confirmation biases, awards or recognition, and validation of one's intellectual capabilities (Wiersma et al., 2024). These pressures are intensified by evaluation systems emphasising metrics such as publication counts, citation indices, and grant success rates, rather than greater scientific or clinical importance (Plevris, 2025). Notably, several of these drivers also carry material implications (e.g., "career advancement"). However, the underlying non-financial pressures represent a distinct risk for bias in their own right—as noted, dimensions are not mutually exclusive.

4.2.3. Interpersonal Relationships

Personal relationships are considered relevant when connections exist with individuals whose economic or ideological interests may affect a professional decision. These may include family ties, friendships, intimate or mentoring relationships, and personal rivalries (e.g., American Association for the Advancement of Science, n.d.; Thieme, n.d.).

Professional relationships include activities in scientific societies, professional associations, self-governing institutions (e.g., health insurance companies), patient and consumer advocacy groups, or other associations (AWMF, 2020). Unpaid activities in an advisory board, steering or data monitoring committee also fall into this category (EMA, 2023; ICMJE, 2026; Resnik, 2023; Springer Nature, 2018).

4.2.4. Wish for Status and Respect

Among the least discussed immaterial COIs are those related to the pursuit of status (meaning the position within a hierarchy), respect (meaning a positive moral assessment), and the desire to achieve priority in discovery or to avoid stigma. According to Wiersma et al. (2020), they are commonly discussed with other immaterial conflicts, e.g., holding academic titles or engaging with industry as a way of gaining status. Interestingly, it may also work the other way around: The authors found that engagement with industry may also be met with loss of respect.

4.3. Journalistic reporting on COI: An Insight Into Practice

Across the interviews, journalists reported awareness of a broad range of COIs (Figure 2). Material COIs related to non-research partnerships were mentioned by most interviewees, particularly paid lectures, consultancy activities, reviewing work, and positions on supervisory boards. Research-related COIs—such as clinical trials, third-party funding, and employment relationships—were also regularly discussed.

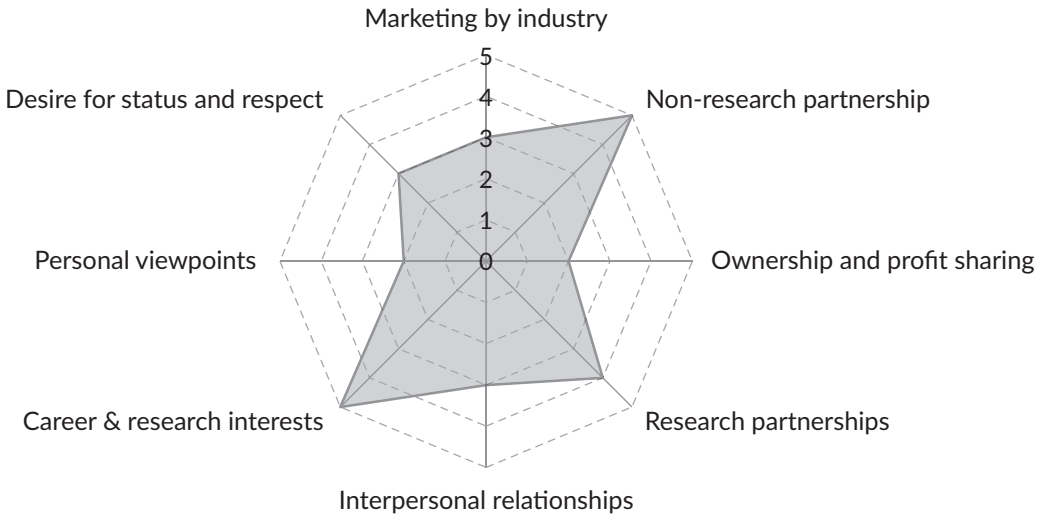

Figure 2. Dimensions of COI referred to in the expert interviews. Notes: Based on qualitative coding ($N = 6$); interview statements were assigned to predefined COI dimensions derived from the concept introduced in Figure 1; this figure provides an illustrative overview instead of a lengthy list within the text and indicates the presence of a dimension in the interviews but does not quantify frequencies or intensities of mentions.

Several interviewees addressed industry marketing strategies, including sponsored continuing education, participation in specialist conferences, reimbursement of travel expenses, and the acceptance of small gifts. Ownership and profit interests played only a marginal role in the interviews.

Beyond material aspects, immaterial COIs featured prominently in the interviews. Almost all journalists pointed to ambitions regarding research and career as well as interpersonal relationships, including memberships in commissions or supervisory boards, but also personal and professional connections between researchers, friendships and rivalries alike:

> If you have a very small field, then people review each other's papers and then, of course, try not to be too critical….It can also be that there is someone who is exactly the opposite, who is very vehemently of the opposite opinion. (E6)

Status and reputation were also discussed, with interviewees noting that academics may seek to preserve their standing. Several statements indicated that material and immaterial COIs cannot always be clearly separated.

Looking for COIs, interviewees reported consulting a variety of sources including clinical studies, peer-reviewed publications, conference papers, CVs, project lists, institutional websites, medical associations, professional guidelines, prior media coverage, and publicly accessible transparency databases

such as the German registry of the Freiwillige Selbstkontrolle für die Arzneimittelindustrie. Some also consult external actors, such as watchdog organisations or peers in the field.

Interviewees emphasised several limitations for investigating COIs. These include limited access to information, for example due to journal access restrictions, deliberate non-disclosure or incomplete disclosure by experts, and time constraints. While E2 estimated that a basic COI investigation could be completed within an hour, others estimated around two hours for a comprehensive check, making time a limiting factor.

The interviewees unanimously reported that they do not follow a generalised procedure for dealing with an identified COI. Instead, decisions are described as situational, dependent on first impressions and made on a case-by-case basis, often in consultation with editorial teams. Context was described as decisive:

> That is also always context-dependent. You know, it's a transfer of € 10,000 to a doctor. That's not problematic or not problematic per se. You have to look at what he is getting the money for. Is there an appropriate service or not? (E2)

One interviewee referred to such questions also as a "gut feeling" that prompts further investigation when expert statements appear unusual or problematic. Another reported intensifying investigation when new methods or therapies have been presented as exceptionally positive or, conversely, strongly criticised.

Several factors influence how the experts assess the relevance of a COI (Figure 3). These include the possible financial benefit, its temporal distribution, and the extent to which it supports the expert's ongoing work. For example, E1 noted that a COI becomes more relevant when it "contributes significantly to maintaining his work and his research in some way" (E1).

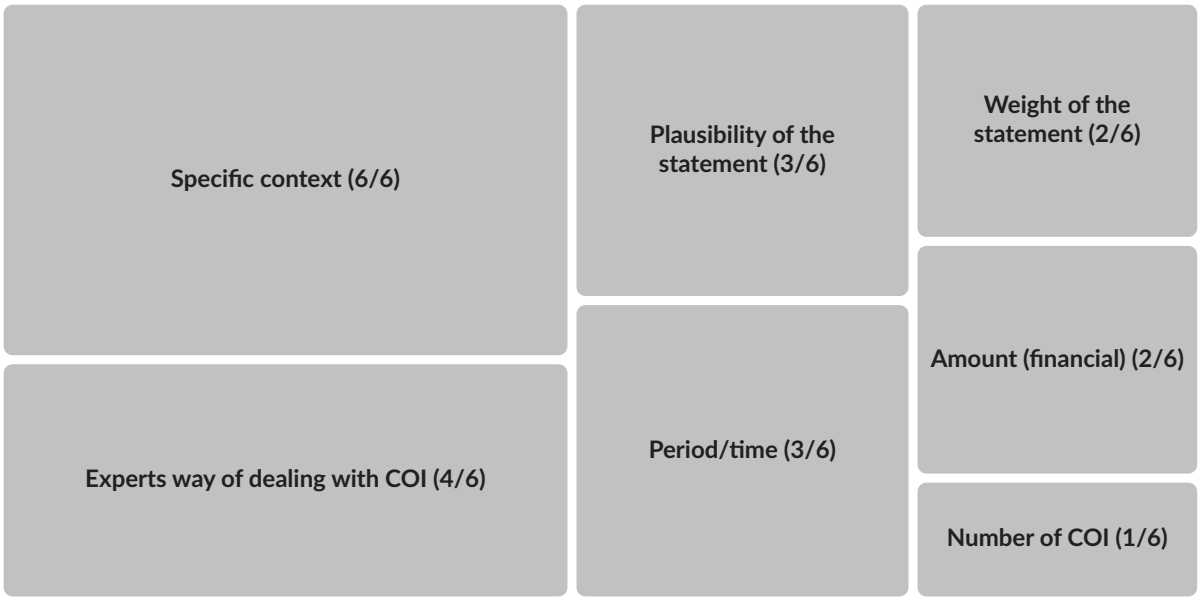

Figure 3. Illustrative overview of factors that determine how COIs are handled, as mentioned in the interviews. Notes: The figure indicates whether a factor was referred to at least once in the interviews ($N = 6$) and does not represent frequencies or intensities of mentions.

Importantly, interviewees emphasised that the number of COIs is less decisive than how experts disclose and reflect on them. COI assessment is thus framed as a qualitative judgment that weights credibility, plausibility, and transparency rather than as a mechanical filtering process.

Journalistic responses to COIs range from exclusion to contextualised inclusion of a source. Several interviewees—particularly those working in investigative journalism—reported avoiding experts with extensive COIs altogether. Others noted that experts with COIs may still be used as background sources but should not be presented as neutral authorities. When experts with COIs are included in reporting, transparency regarding their position and interests is widely regarded as essential. As one interviewee stated: "I think you can write anything in journalism as long as you clearly state where it comes from" (E6).

At the same time, interviewees differed in their views on the appropriate extent of disclosure, ranging from contextual, threshold-based approaches to calls for more systematic transparency in journalistic reporting.

COIs were widely perceived as a structural feature of science and medicine rather than exceptional cases. Close relationships between academia and industry were not framed as inherently problematic; instead, interviewees consistently emphasised transparency as key.

Against this background, five of the six interviewees criticised the current disclosure situation in Germany, particularly its voluntary nature. Several expressed negative views of the Freiwillige Selbstkontrolle für die Arzneimittelindustrie transparency initiative and emphasised that the possibility for recipients to withhold consent makes it unclear whether missing entries indicate the absence of payments or non-disclosure.

Following a prompt on possible supporting tools, interviewees expressed strong support for the development of an assistance system to facilitate the identification and documentation of COIs. Such a system was believed to increase transparency and reduce the likelihood of missing something. Interviewees emphasised the importance of comprehensive documentation, including information on individuals and companies, financial sums, timeframes, employment relationships, co-authorships, and media appearances. Voluntary registration by journalists themselves was also mentioned.

Participants agreed that informational depth is desirable, expressed in statements such as "the more detailed, the better" (E1) and "the more transparent, the better" (E2). At the same time, most rejected purely algorithmic assessments of COIs. Such evaluations were seen as neglecting context and risking misinterpretation.

Despite general support for increased transparency, interviewees also raised concerns about unintended consequences. As argued by E2, even negligible payments can be misread as proof of bias by lay audiences. Several noted that individuals who disclose COIs openly may face scrutiny, while less transparent actors remain less visible. This asymmetry was viewed as a structural problem, underscoring the need for careful contextualisation. Interviewees also stressed the importance of transparency regarding the system's own funding, data sources, and limitations, as well as explanatory communication clarifying that absence from a database does not imply absence of conflicts.

5. Conclusion

Watchdog science journalism plays a central role in scrutinising the black box of scientific knowledge production. In an expert-centred public sphere, where scientific authority strongly shapes public understanding, clinical practice, and policy decisions, journalists act as key accountability actors. Their ability to identify, contextualise, and communicate COIs is essential, yet constrained by fragmented disclosure regimes, inconsistent definitions, and the systemic nature of many dependencies.

Using (bio-)medical research as an exemplary field, this article developed a conceptual compass for navigating COIs by triangulating expert interviews with exploratory and systematic reviews of academic literature, guidelines, and disclosure forms. While existing definitions have remained fragmented across research, clinical, and policymaking contexts (Morciano et al., 2016), using diverging definitions and often only addressing subsets of COIs (e.g., Wiersma et al., 2024), our methodological approach integrates them into a single typology. The resulting eight-dimensional framework maps a broad range of material and immaterial connections that constitute COIs and illustrates that they are rarely isolated or exceptional. Rather, they are embedded in overlapping structural, social, and economic relationships that characterise modern health research systems.

By conceptualising COIs as risk situations (Thompson, 1993) rather than evidence of misconduct, the framework enables investigative scrutiny without presuming intent or corruption. This perspective reflects both established theoretical approaches and journalistic practice. The expert interviews suggest that specialised science or even investigative journalists regularly dealing with COIs largely perceive them as a structural feature of science rather than as a deviation. Correspondingly, they emphasise transparency as a key criterion for appropriate reporting. However, findings on general news coverage suggest that this standard substantially deviates from broader journalistic practice. Empirical studies indicate that experts' COIs are regularly disclosed and contextualised in only a minority of media reports (e.g., Wilson et al., 2009).

Across the interview material, all COI situations described by the experts could subsequently be assigned to the proposed framework through deductive coding. While this post-hoc alignment does not constitute a formal validation or demonstrate exhaustiveness of the typology, it provides a first empirical indication that the framework captures COI constellations that journalists recognise in practice. The interviews further show that COI research and reporting remain situational and context-dependent, relying on professional judgment rather than standardised procedures. Journalists weigh relevance, proportionality, disclosure behaviour, and credibility under conditions of limited time and incomplete information, underlining the need for more structured approaches. The framework proposed in this paper also represents a first step toward addressing this need in the future, while the interview findings offer initial insights into what journalists would expect from dedicated assistance tools for COI detection.

Besides its contribution to COI scholarship, our conceptual compass may strengthen watchdog science journalism as well as its teaching in several respects. First, it provides a structured reference that supports more systematic investigations of expert sources, institutional affiliations, and funding relationships. Second, it fosters reflexivity by helping journalists reflect on their own potential COIs. Third, by foregrounding the systemic and sometimes legitimate origins of many dependencies, it helps journalists distinguish between structural conditions of knowledge production and conflicts that warrant critical reporting. This distinction is

crucial also from a societal meta-perspective: On the one hand, overly critical reporting that portrays all industry connections as inherently corrupt risks undermining public trust in science itself, triggering "science-related populism" (Mede & Schäfer, 2020). On the other hand, insufficient scrutiny allows problematic influence to go unchecked. Proportionate, context-sensitive reporting is therefore central to the watchdog function.

Beyond its analytical value, the framework offers a first foundation but also a corrective for data-driven and AI-assisted systems aimed at improving the detection and documentation of COIs by aggregating dispersed information. Keeping in mind the limitations imposed by the poor quality of COI data, the framework could help formulate better key questions for both traditional journalistic investigation and effective prompting (see Supplementary Material C).

Several limitations of this study should be acknowledged. The conceptual mapping is necessarily shaped by the scope of the reviewed material and cannot claim exhaustive coverage of all possible COI configurations. The framework is intentionally descriptive rather than evaluative and does not provide criteria for ranking or algorithmically assessing COIs. In addition, the empirical insights are based on a limited number of interviews with German-speaking, highly specialised expert journalists, and should be regarded as examples of best practice, which cannot be generalised across media systems. Moreover, as the focus was on COIs in (bio-)medical research, we have neither assessed the COIs of the interviewees nor of journalism in general. However, further research could examine how dependencies within the media system itself shape science reporting practices.

Despite these limitations, the proposed conceptual compass provides a comprehensive and flexible starting point for scholarly analysis, teaching, and journalistic practice. By making the breadth and systemic embeddedness of COIs visible, it supports a more reflective, consistent, and proportionate form of watchdog science journalism—one that may strengthen accountability while preserving the credibility of science and journalism alike.

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Data Availability

Additional data and transcript excerpts are available from the authors upon reasonable request.

LLMs Disclosure

Some translations of words or singular sentences into English were assisted by DeepL. The expert interviews were transcribed using the AI-powered transcription tool noScribe.

Supplementary Material

Supplementary material for this article is available online in the format provided by the author (unedited).

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