

Invited State-Of-The-Art Review

Non-financial conflicts of interest in medicine – a narrative review

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ABSTRACT

Conflicts of interest have the potential to unduly influence medical research and clinical practice. While financial interests, such as funding and researchers' financial relationships, have received most attention, non-financial interests are also considered important. Non-financial interests are, however, more difficult to define and identify, the evidence of their impact is limited, and there is little consensus on how to disclose and manage them. Further research is needed to clarify how non-financial interests operate, and journals should improve guidance for how they should be addressed.

KEY POINTS

- Conflicts of interest can unduly influence medical research and clinical practice.
- Financial interests receive the most attention, but non-financial interests are also considered important despite the limited evidence on their impact.
- Medical journals should improve guidance for how to address non-financial interests, as there is little consensus on how to define, disclose and manage them.

In the EXCEL trial, interventional cardiologists, in collaboration with cardiothoracic surgeons, compared percutaneous coronary intervention (PCI) with drug-eluting stents to coronary artery bypass grafting in patients with left main coronary artery disease [1]. At five years, the composite primary outcome (death, stroke or myocardial infarction) showed no difference, but all-cause mortality (a secondary outcome) was higher with PCI. In the manuscript, the excess mortality was downplayed, prompting the chair of the surgical committee to resign during the journal submission process. Subsequently, the European Association for Cardio-Thoracic Surgery withdrew from a joint guideline with the European Society of Cardiology [2].

The case illustrates how specialty interests can influence the interpretation and presentation of trial evidence. Conflicts of interest in medicine can be defined as a set of circumstances that create a risk that professional judgement or actions regarding a primary interest (e.g. objectively answering a research question) will be unduly influenced by a secondary interest (e.g. the financial interests of the professional) [3]. Conflicts of interest are context-specific, and the same interest may or may not lead to conflicts of interest depending on the situation. For example, an orthopaedic surgeon who owns stock in a hip prosthesis company has a conflict of interest when authoring a guideline on hip osteoarthritis, but not when peer reviewing a manuscript on diabetic foot

ulcers.

The importance of conflicts of interest is recognised by various scholarly organisations, including journals, funders, guideline organisations and also by society through organisational policies and legislation aimed at identifying, preventing or mitigating undue influence on professional conduct [4-6]. Importantly, having a conflict of interest does not necessarily imply any wrongdoing and should merely be viewed as a risk factor that warrants scrutiny. Nevertheless, many researchers dislike being labelled as conflicted, and the topic often causes controversy [7].

This narrative review examines research on conflicts of interest, focusing on non-financial conflicts of interest and describing how they are addressed through disclosure and management strategies ([see the Supplementary material for our literature search](#)).

Conceptualisation of conflicts of interest

We use the term conflicts of interest and consider it synonymous with the terms vested interests and competing interests used in other papers, as all terms refer to situations in which a professional's financial or non-financial interests may unduly influence professional conduct (i.e., the primary interest). Our focus is on the professional's individual interests, though professionals may also have conflicts of interest arising indirectly through their affiliation with institutions (i.e. institutional conflicts of interest) [3] or due to the societal or political climate [8]. Traditional theory divides interests into financial interests arising from financial relationships with third parties and other (non-financial) interests [9].

Financial interests

Financial interests have received more attention than non-financial interests and are easier to conceptualise, as they require some financial involvement, either directly (i.e., payment) or indirectly (i.e., the provision of a free good, such as a meal or a sponsored conference trip). Typical financial interests are research funding or fees for consulting or educational activities (see **Table 1** for examples).

TABLE 1 Framework for categorising different types of financial and non-financial interests.

Type of interests	Sub-types of interests	Examples
<i>Financial interests</i>		
Research-related	Monetary support:	
	Direct	Grant or contractual agreement
	Indirect	Payment of article processing fee or laboratory analyses
	Non-monetary support:	
	Provision of study materials	Drugs or diagnostic equipment
Technical support	Medical writing or statistical analyses	
	Fees for research participation	Investigator or member of trial steering committee or Data and Safety Monitoring Board
Personal payments	Direct payment via:	
	Employment	Statistician at drug company
	Consultancy	Surgeon consulting for medical device company
	Lectures and other educational activities	Hired by drug company to give a talk for a patient organisation
	Expert testimony or involvement in litigation	Hired by drug company as an expert in court case on drug harms
	Board membership or leadership role	Drug company advisory board or advocacy group
	Indirect payment via:	
Support for attending meetings/conferences	Paid conference fee, or expenses for travel and accommodation	
	Industry-sponsored continuing medical education	Free attendance to seminar and dinner
Private	Stock ownership	Drug or medical device company stocks
	Ownership of company	Co-ownership of medical device company
	Patents, licences or royalties ^a	Potential sale of patent on medical device to a device company
<i>Non-financial interests</i>		
Professional	Member of a profession, specialty or professional organisation	View on antidepressants might differ between psychiatrists and psychologists
	Unpaid board membership or leadership role	Professional society or scientific journal
	Unpaid expert testimony or involvement in litigation	Medical specialist in malpractice case involving specific surgical procedure
Intellectual	Attachment to a certain scientific theory/school of thought	View on balance between benefits and harms of mammography screening
	Self-criticism	Risk of bias assessment of a study co-authored by the individual
	Unpaid board membership or leadership role	Board member of scientific society
Ideological	Strong beliefs	Religious, cultural or political beliefs
	Advocatory activities including membership or leadership of advocacy group	Reproductive health advocacy group supporting access to abortion services
Personal	Private relationship	Peer reviewing manuscript authored by the individual's spouse
	Professional relationships	Assessing grant application by the individual's former PhD student
	Institutional or organisational affiliation	Editor on manuscript submitted by researcher from same institution
	Personal experience	Having a certain health condition
	Personal aspirations	Desire for fame, status or career advancement

a) We use the terms patents and licences to refer to intellectual property rights, whereas royalties are payments for the usage of these rights.

Financial interests were also present in the previously described EXCEL trial [1]. The trial was sponsored by Abbott Vascular, the manufacturer of the stents used in the trial, and included both company-employed authors and academically employed authors with financial relationships with the company.

Financial interests are common. Between 2013 and 2022, 57% of US physicians received at least one payment from industry, with large variation between specialities, from 36% among general practitioners to 74% among haematologists and oncologists [10]. Similarly, a study of drug trials from 2011 to 2013 found that 48% of Danish physician authors had financial relationships with a drug manufacturer [11]. The high prevalence of financial interests among healthcare professionals is noteworthy, as numerous studies have found an association between professionals' financial conflicts of interest and favourable study results and conclusions, treatment recommendations and drug prescription patterns [12-14].

Non-financial interests

The term non-financial interests is used across the literature as the antonym of financial interests to refer to interests that are mainly not of a financial nature, such as attachment to particular schools of thought or private and professional relationships [15]. However, some interests, such as intellectual interests may also have financial aspects. For example, a researcher who identifies a receptor involved in cancer cell regulation may develop a strong belief in the importance of the receptor, alongside potential career advancement, funding and future income through patenting. Financial and non-financial interest should therefore not be viewed as a binary distinction but more as a spectrum where some interest may contain both aspects and others – such as religious interests – may lie entirely at one end.

There is no consensus on how to define or conceptualise non-financial interests. To better characterise the different types of non-financial interest, we have drawn on Grundy, Resnik and co-authors [16, 17] to organise them into a simple framework of four types: professional, intellectual, ideological, and personal interests (see Table 1 for examples). The categories overlap to some degree, and some interests may fall into multiple types.

Professional interests

Professional (or specialist) interests are interests of the profession the individual belongs to, for example, in the form of protecting and promoting the strategic role, or dominance of a profession or specialist group (i.e. guild interests). Professional interests are closely linked to the opinions formed during members' education, training or experience with a specific area or method. An example in which different interpretations of evidence appear closely linked to professional interests is the debate between physiotherapists and orthopaedic surgeons over the relative effectiveness of physiotherapy versus surgery for knee osteoarthritis [18].

Intellectual interests

Intellectual (or scholarly or academic) interests can be understood as predetermined theoretical views or intellectual investments in a field or topic. They may occur when a researcher becomes so invested in their own theory that it distorts their interpretation of evidence. This can reflect a form of confirmation bias where the same evidence can lead to different conclusions by different individuals, as observed in the debate on the effect of masking during the COVID-19 pandemic [19, 20].

Extreme cases in which researchers hold strong beliefs in their own theories or methods have been linked to scientific misconduct. For example, the Australian obstetrician Dr William McBride, who discovered the teratogenic effects of thalidomide, was convinced that the drug Debendox also caused birth defects, leading him to falsify data to prove his theory. As a consequence, he lost his medical license [21].

Intellectual interests are linked to professional ones but usually refer narrowly to an individual's research field and publications. For example, intellectual interests may favour a particular intervention within a field or specialty, while professional interests may favour the interventions of one specialty over those of other specialties. Intellectual interests can also affect self-criticism, such as assessing the risk of bias in the researcher's own studies within a systematic review.

Ideological interests

Individuals may hold ideological beliefs – such as religious, cultural or political beliefs – that may potentially exert an undue influence on research. Strong beliefs may be completely immune to any scientific reasoning and therefore better understood as ideological rather than intellectual interests, especially when they result in individuals taking on strong advocacy positions – for example, related to homeopathy, anti-abortion or harms from vaccines [22-24].

Personal interests

Personal interests, including private relationships with family and friends, and professional relationships with colleagues or rivals, may give rise to conflicts of interest, for example, when peer reviewing a manuscript authored by a close collaborator. Such interests are, in some sense, the most objectively defined non-financial interests. Personal interests may also be deeply intimate, arising from personal experience with a health condition or stemming from aspirations such as seeking fame, status or career advancement, creating another potential motivation for scientific misconduct [15, 16, 25].

Empirical studies on non-financial interests

Generally, empirical research on non-financial interests is limited. However, some studies have examined the

prevalence and impact of non-financial interests in medical research, peer review, clinical guidelines and clinical practice, as well as strategies for identifying and managing them. See Table 2 for findings from key studies on prevalence and impact, and the [Supplementary material](#) for additional studies.

TABLE 2 Empirical studies investigating the prevalence and impact of non-financial conflicts of interests in medicine.

Type of interests	Context	Main findings
<i>Prevalence</i>		
Professional	176 WHO clinical guidelines [26]	29 (16%) guidelines disclosed professional interests for ≥ 1 author(s)
Intellectual	200 Cochrane reviews and other systematic reviews [27]	9 (5%) reviews disclosed intellectual interests due to authorship of studies included in the review, 19 (10%) due to authorship of studies not included in the review, and 1 (1%) due to participation in a previous guideline panel on the topic
	155 systematic reviews of surgical interventions and devices [28]	6 (4%) reviews disclosed authors' intellectual beliefs
	176 WHO clinical guidelines [26]	35 (20%) guidelines disclosed intellectual interests due to participation in related research studies or presentations on related topics
Ideological	200 Cochrane reviews and other systematic reviews [27]	7 (4%) reviews disclosed ideological interests due to advocatory positions of authors
Personal	200 systematic reviews within health policy and systems [29]	1 (1%) review disclosed review author's collaboration with one of the trial authors
	155 systematic reviews of surgical interventions and devices [28]	3 (2%) reviews disclosed one or more authors' personal experience with the review topic
<i>Impact</i>		
Professional	12 clinical guidelines on mammography screening [30]	It was uncertain whether guidelines co-authored by radiologists were more likely to recommend routine screening (RR = 6.05, 95% CI: 0.57-∞) Guidelines co-authored by primary care physicians were more likely to recommend against routine screening (OR = 1.64, 95% CI: 1.03-5.18 for every 10% increase in the proportion of primary care physicians in guideline author group)
	4,460 publications in 20 journals from 5 medical subspecialties [31]	There was an excess of publications from the journal's own editorial board in 14 of the 20 journals (p < 0.05)
	143 research publications on mammography screening [32]	Overdiagnosis was more often downplayed or rejected in publications by authors professionally involved in mammography screening (40%), compared with authors unrelated with screening (7%) (p = 0.03)
Intellectual	12 clinical guidelines on mammography screening [30]	Number of publications on breast disease by the guideline lead author was associated with recommending routine screening (OR = 2.32, 95% CI: 1.05-∞ for each additional publication on breast disease)
	Questionnaire of 16 primary study authors and 20 methodologists on the interpretation of a meta-analysis on IGF-1 and prostate cancer [33] 67 peer review reports on fictive abstracts in psychology [34]	Authors who had published more IGF-1-related studies or studies with statistically significant results interpreted the meta-analysis more favourably than methodologists Peer reviewers were strongly biased towards manuscripts with results contrary to their theoretical perspective
	95 systematic reviews of psychological therapies [35]	It was uncertain whether spin in conclusions was associated with inclusion of review authors' own primary studies in the review (OR = 2.08, 95% CI: 0.83-5.18) and researcher allegiance ^a (OR = 2.63, 95% CI: 0.84-8.16)
Ideological	20 meta-analyses of homeopathy [36]	More favourable effects of homeopathy in 13 meta-analyses with conflicts of interest due to homeopathy (OR = 0.60, 95% CI: 0.50-0.70) compared with 7 meta-analyses without conflicts of interest (OR = 0.96, 95% CI: 0.75-1.23) (p = 0.002 for subgroup differences)
Personal	Peer review reports of 7,981 neuroscience manuscripts [37]	Peer reviewers who were close in the manuscript authors' co-authorship network provided more favourable review scores compared with reviewers with more distant relationships

IGF-1 = insulin-like growth factor 1.

a) Allegiance covers the belief of a researcher in the superiority of a treatment, i.e. a school of thought.

Available evidence shows that non-financial interests are not uncommon in medicine. For example, they were disclosed in 35 (20%) of 176 WHO guidelines [26]. They nevertheless tend to be disclosed less frequently than financial interests; for example, a study of 200 clinical trials found that 57% disclosed financial interests and only 4% disclosed non-financial interests [38]. This discrepancy could reflect that financial interests are more common or that non-financial interests are underreported due to a lack of awareness and tradition.

Studies have described several ways in which non-financial interests may affect professional integrity and drive interest-aligned behaviour, including preferential publication of articles by editorial board members, nepotism between authors and peer reviewers leading to more positive peer reviews, bias against study results conflicting with peer reviewers' perspectives, and favouring interventions within one's own specialty [30, 31, 34, 37]. However, evidence on the impact of non-financial interest is generally limited, mainly due to a small number of observational studies of varying methodological quality, which are susceptible to bias, reverse causality and spurious findings, and whose results have rarely been replicated.

Conceptual ambiguity regarding non-financial conflicts of interest

There is an ongoing academic discussion about whether non-financial interests are fundamentally the same as financial interests, as they often reflect internal inherent characteristics of the individual. Unlike financial

interests, which are external, measurable and avoidable, non-financial interests may be impossible to detect, avoid or separate from the individual concerned [39]. That leads to the question whether non-financial interests can result in conflicts of interest at all [39, 40] and whether such interests require a different approach to identify and manage [41, 42] – if they should be managed in the first place, given how difficult they are to define and fully capture [15]. On one hand, all professionals have intellectual, professional and personal interests and labelling such researchers as having conflicts seems unreasonable. On the other hand, it is widely recognised that non-financial interests in certain situations may serve as powerful incentives, similar to financial interests, thereby resulting in conflicts of interest. The key issue with non-financial interests is therefore determining when they should be considered conflicts of interest.

Disclosure of non-financial interests

The core mechanism for identifying conflict of interest is a disclosure submitted to the organisation by the professional; however, the practice has been uneven, with a focus on disclosure of financial interests. According to studies from 2016 to 2021, only around half of medical journals had a policy requiring disclosure of authors' non-financial interests [43, 44]. The widely used disclosure form developed by the International Committee of Medical Journal Editors (ICMJE) does not emphasise non-financial interests either, as it includes 12 items related to financial interests and only a single item on “Other financial or non-financial interests”, without specifying which non-financial interests should be disclosed [45].

Due to the nature of certain non-financial interests, disclosing them may be considered inappropriate and disproportionate, as the information might be regarded as sensitive. Thus, some organisations do not require disclosure of religious beliefs or personal experience with a health condition [46]. Nevertheless, under certain circumstances, transparency may outweigh privacy. In a debate on male circumcision in the Danish journal, *Ugeskrift for Læger*, the tension between privacy and transparency was addressed, arguing that authors can state their position – such as supporting circumcision as a parental right for cultural, religious or non-medical reasons – rather than disclosing their religion [47]. Conversely, forced disclosure of sensitive information may backfire, causing non-compliance, discouraging participation, resulting in self-censorship or reputational stigma.

Management of non-financial interests

For medical researchers, guideline authors and healthcare providers alike, professional passions, intellectual commitments and personal beliefs are to some extent inevitable parts of their work. The challenge lies in recognising when non-financial interests have the potential to unduly influence professional conduct, resulting in conflicts of interest needing appropriate management.

While disclosing non-financial interests is essential for identifying conflicts of interest, disclosure alone may not be sufficient, as it does not eliminate the risk of undue influence [48]. Strategies may thus be needed to prevent conflicts or minimise their influence. In contrast to financial interests, which can in general be avoided, most non-financial interests cannot be removed without excluding the individual, a practice that has been criticised as unfair and potentially damaging diversity [39].

Rather than excluding professionals with conflicts, non-conflicted contributors could be involved to mitigate potential bias and provide balanced viewpoints, such as inviting another peer reviewer from a different theoretical perspective [39, 49]. Nevertheless, most journals and funders require peer reviewers to recuse themselves if they have any conflicts. More subtly, in Cochrane reviews, authors who have co-authored eligible studies must be excluded from decisions on study inclusion, data extraction, risk of bias assessment and grading

the certainty of evidence for those studies, but may contribute to other review tasks, thereby minimising undue influence without exclusion [50]. Similarly, while some medical journals do not allow editors to submit manuscripts to their own journal, others delegate the oversight of peer review and editorial decisions to another editor [51]. See **Table 3** for further examples.

TABLE 3 Examples of management strategies for non-financial conflicts of interest.

Management strategy	Examples
Balancing	A Danish guideline on knee osteoarthritis included authors from different professions and medical specialties creating diversity of opinions, which may have balanced the influence from professional interests [52] In Cochrane reviews, it is recommended that study inclusion is done by both a content expert and an author who is not a content expert to reduce the influence from pre-formed opinions [53]
Minimisation	In the 9th edition of the antithrombotic guidelines of the American College of Chest Physicians, the primary responsibility of each guideline chapter was given to a methodologist to minimise the influence from professional, intellectual, and financial interests [54] In Cochrane reviews, authors who have co-authored eligible studies must be excluded from decisions on study inclusion, data extraction, risk of bias assessment, and grading the certainty of evidence for those studies [50]
Disqualification	At the University of Southern Denmark, members of the assessment committee may never have published with the PhD student nor may they have or published with any of the supervisors within the last 5 years [55] The ICMJE recommends that editors who make final decisions about manuscripts should recuse themselves from editorial decisions if they have relationships or activities that pose potential conflicts related to articles under consideration [4]

ICMJE = International Committee of Medical Journal Editors.

Perspectives

There is a general need for a broader consensus on how to define, disclose and manage non-financial interests. Empirical studies quantifying the impact of non-financial conflicts on medical research and clinical practice are crucial to guide future strategies. Investigating which subtypes of non-financial interest are influential and which may be considered trivial may inform journal policies on disclosure and management of non-financial interest. A good starting point might be to revise the ICMJE disclosure form to more clearly specify the types of non-financial interests that need to be disclosed. Furthermore, journals and publishers should also provide clearer guidance on which specific interests require disclosure, which do not, and which require recusal or other management strategies.

Conclusions

Conflicts of interest in medicine are considered important and thus addressed through policies and legislation, with most attention focused on financial interests. However, non-financial interests – such as professional, intellectual, ideological or personal interests – might also unduly influence research studies and clinical practice, even though the evidence of their impact is limited. Non-financial interests are more difficult to define and identify, and there is little consensus on which interests require disclosure and how they should be

managed. Further research is needed to clarify how these interests operate across medicine and how they can be effectively approached. Strengthening transparency and ensuring meaningful management of non-financial interests through polices by medical journals is essential to safeguard trust and credibility in medicine.

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