

Punishing Misconduct: Sanctions for Fraudulent Research in Anesthesia and Beyond

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Research misconduct compromises the integrity of the scientific record, undermines public trust, and, in the clinical setting, can directly jeopardize patient safety. Although fabrication, falsification, and plagiarism are widely recognized as serious misconduct, the sanctions imposed on those responsible vary markedly across publishers, institutions, and regulatory bodies. Retraction remains the most visible sanction, yet it represents only one component of a broader, often heterogeneous response to misconduct that can include far more dramatic consequences for authors. In this paper, we first review several landmark cases relevant to anesthesiology before examining the full spectrum of sanctions for research misconduct.

SELECTED CASE STUDIES

Scott Reuben: Analgesia That Hurt

The April 2009 issue of *Anesthesia & Analgesia* was, in many respects, a watershed moment for the specialty. In an editorial notice, Steven Shafer (editor-in-chief) announced the retraction of 10 papers by Scott Reuben, a Professor of Anesthesiology and chief of the acute pain service at Baystate Medical Center (Tufts University) in Springfield, MA. As Shafer later detailed,¹ Reuben was suspected of having fabricated data in several clinical trials on multimodal analgesia—in some instances, publishing

wholly illusory results. Journals would ultimately retract 21 of his articles—a remarkable count at the time—but one, as this article will explore, that was soon eclipsed in spectacular fashion by two other anesthesiologists.

For Reuben, the fallout was catastrophic.² He lost his position at Tufts and eventually, his medical license, and has not practiced since. The US Food and Drug Administration (FDA) permanently debarred him “from providing services in any capacity to a person that has an approved or pending drug product applications,” effectively precluding any future participation in regulated clinical research. Having defrauded multiple pharmaceutical companies (Pfizer, Wyeth, and Merck) through his work on COX-2 inhibitors, he was ordered to pay restitution exceeding \$360,000 in addition to federal penalties. Finally, in what is believed to be a first in the United States, Reuben was convicted of healthcare fraud and sentenced to six months in federal prison.

Joachim Boldt: The Record-Holder

Unbeknownst to Shafer when he published the Reuben retraction notice, the journal was already heading toward an even larger case of misconduct. In June 2009, *Anesthesia & Analgesia* had accepted a manuscript from Joachim Boldt (Klinikum Ludwigshafen, Germany), a leading figure in critical care medicine and a frequent contributor to the journal. The paper, however, soon attracted scrutiny from three meticulous readers, who in turn contacted Shafer with concerns about error bars in one of the figures. Shafer brought the question to Boldt, whose responses became increasingly opaque, prompting the editor to contact his institution (Supplementary Material S1, <https://links.lww.com/AA/F814>). The response was shocking: Boldt had not received ethical approval to conduct the study in question, nor had he received approval for 68 other trials.

In May 2011, *Anesthesia & Analgesia* announced the retraction of 22 papers authored by Boldt. As Shafer wrote in the retraction notice, “research without IRB

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approval is a violation of human rights,” and an absolute violation of the journal’s editorial policies: “there are no exceptions.” Unfortunately, this batch proved to be the first of many,³ in what has now amounted to a record-breaking 236 retractions (as of March 2026).⁴

In Boldt’s case, much of his work concerned intravenous fluid management and advocated the use of colloids, particularly hydroxyethyl starch (HES), during surgery. However, unlike Reuben’s fraudulent data, whose downstream effects are believed to have been negligible,¹ Boldt’s were a different matter. As a prominent researcher with over 300 papers, his “findings” had shaped clinical guidelines on volume expansion worldwide.³ Yet when Boldt’s studies were excluded from meta-analyses, HES was associated with significantly increased mortality and severe kidney injury.⁵ In fact, the inappropriate use of colloids is estimated to have caused 200 to 300 deaths per year in the UK alone.³

Nonetheless, Boldt has not experienced the full array of sanctions imposed on his American counterpart. Although “the great pretender” lost more papers to retraction than Reuben (and more than any other scientist to date), was stripped of his title “professor extraordinary,” and is no longer able to practice medicine in Germany, to our knowledge, he has faced neither criminal charges nor monetary restitution.

Yoshitaka Fujii: A House of Cards

Boldt may currently stand as the record-holder for retractions, but for many years he remained in second place behind another anesthesiologist: Yoshitaka Fujii. Like Boldt, his undoing also began with letters of concern, in this instance from Kranke and colleagues writing in 2000 to *Anesthesia & Analgesia*,⁶ and subsequently to *Acta Anaesthesiologica Scandinavica*.⁷ Yet Fujii was quick to defend his work and attempts by these authors to notify regulatory organizations went in vain. Not until a decade later did the editors of several anesthesia journals begin a coordinated investigation into Fujii’s work.

Meanwhile, Toho University (where Fujii had worked) began its own inquiry after receiving allegations of data fabrication, initially discovering that eight of his manuscripts lacked proper ethics approval; these were later retracted. Fujii was ultimately dismissed from his position (Supplementary Material S2, <https://links.lww.com/AA/F814>), but there was still no suspicion of fraud.

However, John Carlisle (an anesthetist in the UK) had noticed that Fujii’s data appeared too good to be true. After analyzing 168 randomized trials, he published a landmark report in *Anaesthesia*⁸ concluding that the likelihood Fujii’s data had arisen by chance was infinitesimally small.⁹ Carlisle’s method has been developed as a screening tool to check for

fraudulent data submissions to journals.^{10,11} At the request of 23 scientific journals, the Japanese Society of Anesthesiologists then convened a special committee to probe Fujii’s entire research output, finding 172 of 212 examined papers to contain fabricated data; of these, 126 were deemed totally fabricated, and only 3 were genuine. The investigation report remarked: “It is as if someone sat at a desk and wrote a novel about a research idea.”¹²

Fujii lost his membership of the Japanese Society of Anesthesiologists, which also permanently barred one of his frequent coauthors, Yuhji Saitoh, after an investigation into his published works.¹³ Yet Fujii, too, appears not to have been subject to criminal charges or restitution in his home country.

Paolo Macchiarini: When Fraud Reached Patients

Among the most dramatic cases of misconduct outside anesthesiology is that of the Italian “super-surgeon” Paolo Macchiarini, whose claims to have developed a method of tracheal transplant collapsed amid allegations of fraud. Beginning in 2014, the Karolinska Institutet (KI) began receiving allegations that Macchiarini had substantially misrepresented the risks and benefits of these procedures. Although an initial inquiry found no evidence of wrongdoing, the KI subsequently commissioned an independent expert to formally investigate these concerns. In May 2015, this expert (Bengt Gerdin) reached a different conclusion, finding that Macchiarini had committed misconduct in at least six published articles.¹⁴ Macchiarini—by then a high-profile public figure—denied wrongdoing and was subsequently cleared of misconduct and restored to his appointment at KI.

The folly of that decision soon became apparent. In early 2016, *Vanity Fair* magazine¹⁵ detailed how Macchiarini had misled a news producer, when it also became clear that he had lied on his curriculum vitae. A three-part documentary broadcast on Swedish national television followed, depicting patients dying in connection with failed tracheal transplant surgeries. After two months of internal turmoil at KI, Macchiarini was ultimately fired, and his legal troubles escalated. Macchiarini later faced criminal charges of assault and, in June 2022, was convicted on a felony count with a suspended sentence. Prosecutors appealed the verdict and the leniency of the sentence. In 2023, he was found guilty on three counts of aggravated assault for the surgeries he had conducted and sentenced to 2.5 years in prison.¹⁶

Beyond Retraction: The Full Spectrum of Sanctions for Research Misconduct

What emerges through discussion of these cases is both the breadth of sanctions that may confront perpetrators of research misconduct—from retraction to

loss of medical licensure and even incarceration—but also the profound inconsistency with which they are applied.

Although retractions attract significant attention, they represent only one element within a broader, multi-stakeholder response that may include editorial, institutional, regulatory, and legal consequences. This expanded view is particularly relevant to anesthesiology, a specialty that has witnessed several high-profile cases of fraud, with downstream effects on evidence syntheses, patient safety, and the reputation of the field.¹⁷ A summary of sanctions is provided in the Table.

Editorial Sanctions

Editorial sanctions are typically the earliest formal response by journals and publishers (often following detection of misconduct through various tools, as discussed in accompanying articles^{10,18–20}) and encompass expressions of concern (EoC) and retractions. Collectively, these measures—which publishers are quick to say are designed to correct the scientific record rather than punish—represent the most common formal “sanction”: published data indicate a retraction rate of 0.2% in the scholarly literature.²¹

EoCs occupy a middle ground between corrections and retractions, often issued when misconduct is suspected without concrete evidence, or while formal investigations are ongoing. However, they remain comparatively uncommon, inconsistently

indexed, and often unresolved; in one large study, most did not lead to subsequent correction or retraction.²²

Retractions are intended to alert the readership to unreliable findings, prevent continued citation, and thereby correct the scientific record. Although historically rare, their incidence has risen substantially; the Retraction Watch database now includes between 5000 and 6000 retractions per year, up from fewer than 100 a quarter century ago. Notably, some retractions are instigated by authors themselves, but in almost two-thirds of cases they are linked to misconduct.²³ In practice, their effectiveness is dependent on clarity and visibility: guidelines from the Committee on Publication Ethics (commonly known as COPE) emphasize prompt action, linking between the original article and retraction notice, and a clearly stated purpose for retraction. Yet notices are often vague about the nature of the misconduct and investigation details, and many fraudulent articles continue to be cited long after their retraction.¹⁷ Scholars have observed that retraction takes significantly longer than publication, and eligible papers are often not retracted.²⁴ Encouragingly, however, the quality of retraction notices appears to be improving somewhat.²⁵

Very rarely, journals and publishers may impose bans on fraudulent authors. Such penalties are typically journal-specific, since publishers generally are not known to maintain centralized author blacklists, and as such, authors who engage in misconduct

Table. Spectrum of Sanctions for Research Misconduct, Approximately Ordered From Mildest to Most Severe

Sanction	Advantages	Weaknesses	Example/s
Mandatory training or enhanced monitoring	Proportionate for first-time offenders or less serious cases of misconduct	May be perceived as too lenient; limited deterrent value	Mandatory training in the RCR or periodic data audits
Retraction	Corrects the scientific record and indicates that findings are unreliable	Often delayed; notices may be vague; retracted articles may continue to be cited	Boldt record-breaking case
Submission ban or moratorium	Imposes a direct publishing consequence	Usually limited to one journal or publisher; does not preclude publication elsewhere	American Society of Microbiology imposed a 10-year moratorium on Naoki Mori
Loss of future research privileges	Reduces risk; can be tailored to the seriousness of the misconduct	Enforcement may be inconsistent and does not itself correct the literature	Prohibition on initiating new studies in Fujii case
Funding suspension/debarment or regulatory disqualification	Protects public funds and regulated research	Highly jurisdiction-specific	ORI or FDA debarment (eg, Reuben case)
Termination of employment or loss of licensure	Removes access to research infrastructure and patients	Institutions may have a conflict of interest; investigation process may be lengthy	Reuben and Boldt lost medical license; Fujii lost society membership
Civil restitution or grant repayment	Recovers misused funds and creates a strong financial deterrent	Resource-intensive; depends on specific legal mechanisms and may not apply in all jurisdictions	Reuben ordered to pay restitution; Birbaumer ordered to repay grant funds; Duke University settlement.
Criminal prosecution	Strongest deterrent; appropriate for major cases of fraud (eg, involving direct patient harm)	Rare; high evidentiary threshold	Reuben, Macchiarini cases.

Abbreviation: FDA, US Food and Drug Administration; ORI, Office of Research Integrity; RCR, responsible conduct of research.

may not be barred from publishing outright. Nonetheless, blanket bans are not unprecedented: in 2010, the American Society of Microbiology issued a 10-year moratorium on submissions from Naoki Mori, a cancer researcher in Japan, after retracting several of his papers for image manipulation.²⁶ We are not aware of any comparable cases in anesthesiology to date.

Institutional Sanctions

Universities and medical schools are uniquely positioned in this context as they have access to primary data, can enforce supervisory practices, and control employment. Consequently, responsibility for investigating allegations of misconduct typically falls on institutions. This burden creates a range of conflicts of interest for such institutions that can delay or disrupt any public accounting of inquiries into misconduct by their charges. Institutions often are the beneficiaries of funding and prestige won by their researchers, neither of which they are inclined to cede readily.

They also avidly protect their own image and often are loath to publicize episodes that might tarnish the academy's reputation. Universities, in particular, also may be governed by local personnel laws that, under some interpretations, may prevent them from disclosing information about misconduct cases—interpretations they frequently choose to adopt.²⁷

At one end of the spectrum are remedial sanctions, such as compulsory formal training in the responsible conduct of research or ongoing monitoring to ensure compliance (eg, through periodic audits of data). These approaches may be more frequent in cases involving questionable research practices, poor oversight, or first-time offences without clear evidence of malicious intent. More restrictive outcomes include loss of research privileges, which may include mandatory supervision of future work, or even outright prohibition from initiating new studies (as in the Fujii case).

The most severe institutional sanctions involve termination of employment or dismissal from academic appointments, typically reserved for cases where multiple publications or clinical studies were affected. Reuben lost his position at Baystate Medical Center, whereas Boldt was dismissed from Klinikum Ludwigshafen after several ethical and scientific irregularities were identified. In the Fujii case, both he and Yuhij Saitoh received permanent bans from the Japanese Society of Anesthesiology. In a 2017 statement about Saitoh, the group said it took the action because the misconduct led to “a major loss of credibility among anesthesiologists and researchers in Japan.”¹³

Funding and Regulatory Sanctions

Funder and regulatory sanctions apply when misconduct represents fraudulent use of public funds or intersects with regulated clinical research.

The United States was the first country to establish formal oversight of misconduct with the Office of Research Integrity (ORI) to ensure the integrity of federally funded research. The ORI oversees investigations of misconduct in research funded by the Public Health Service (which includes the National Institutes of Health) using a definition centered on fabrication, falsification, and plagiarism.

Potential sanctions include mandated retraction, suspension of funding, and oversight of future research activity. An analysis of 343 ORI case summaries between 1993 and 2023 found the most common type of sanction (65% of cases) was a 3-year funding debarment or research supervision period, and that being required to retract or correct publications was associated with more severe administrative outcomes.²⁸ Lifetime funding debarments are reserved for researchers who have engaged in severe misconduct such as Eric Poehlman, who admitted to fabricating or falsifying data in 15 grants and 17 publications over a 10-year period.

In rare instances, researchers who have committed misconduct—or the institutions where they worked—using government funds have been forced to pay back some or all of those monies.²⁹

When misconduct intersects with clinical trials, the FDA may impose disqualification or even permanent debarment, preventing individuals (as in Reuben's case) from “providing services in any capacity to a person with an approved or pending drug product application.”

Europe lacks an overarching federal authority analogous to the ORI, and the regulatory landscape remains heterogeneous across definitions of misconduct, investigative protocols, and available sanctions. Germany, for instance, has opted for a decentralized approach. Institutions seeking German Research Foundation (DFG) funding are required to maintain internal structures capable of investigating and handling misconduct. The DFG also maintains a committee to investigate allegations related to funded research and to review institutional investigations. In one high-profile case, Niels Birbaumer—a prominent neuroscientist who claimed to have developed an effective brain-computer interface—was ordered to retract two fraudulent publications and repay all grant funds related to these papers. He also received a 5-year ban on submission of future research proposals.³⁰

Finally, sanctions may even extend beyond academia. China has recently attracted attention by introducing a compressive punishment framework, linked

to the country's "social credit system," to deal with misconduct. Reported penalties include being barred from "getting a bank loan, running a company or applying for a public-service job."³¹

Criminal Sanctions

The most severe consequences are legal sanctions, which apply when misconduct constitutes fraud, misappropriation of funds, or causes direct patient harm. Such cases remain exceedingly rare: between 1979 and 2015, we found only 39 scientists from 7 countries had faced criminal sanctions.³² Nonetheless, these cases have fueled debate over whether scientific fraud generally should be treated as a criminal offence. In Reuben's case, he was subjected to a 6-month federal prison sentence, supervised release, and a restitution penalty of \$360,000. Another example is Dong-Pyou Han, a former Iowa State University researcher, who was sentenced to 5 years' imprisonment and ordered to repay over \$7 million after falsifying results in HIV vaccine studies.³³

Civil Sanctions

The US False Claims Act was enacted in 1863 in an effort to combat fraud by defense contractors during the US Civil War. The provision—sometimes referred to as the "Lincoln Law"—now stands as the federal government's main legal tool for recouping taxpayer money lost to fraud, including research misconduct. The law includes civil, but not criminal, penalties for those who "knowingly" obtain monies through falsified records, a standard that can include acting with reckless disregard or deliberate ignorance of the truth. A key provision of the act, designed to deter abuse, is its provision for treble damage plus fines for each instance of a false claim. The act also has a *qui tam* provision, which allows any private citizen (a "relator") to file whistleblower suits on behalf of the government. If successful, relators are entitled to as much as 30% of the amount of the recovery, although this provision is under scrutiny in one federal court district.³⁴

Duke University agreed to pay \$112.5 million to resolve False Claims Act allegations related to falsified research by Erin Potts-Kant in federal grant applications and reports.³⁵ More recently, the Dana-Farber Cancer Institute has agreed to pay \$15 million after admitting that its scientists had duplicated and misrepresented images in papers cited in federal grant applications.³⁶

Publishers may also face accountability. In 2019, a district court in Nevada awarded the US Federal Trade Commission more than \$50 million in a suit against OMICS International after convincing a jury the company had engaged in "deceptive practices." The agency alleged OMICS had "used the names of

prominent researchers to draw conference attendees, even though the researchers had not agreed to participate; misled readers about whether articles had been peer reviewed; failed to provide authors with transparent information about publishing fees before submission; and presented misleading 'impact factors' for journals."³⁷

Economic Sanctions

Misconduct is increasingly sanctioned not only through academic channels but also via market discipline. When integrity compromise occurs at scale and becomes publicly visible, reputational damage can translate into substantial revenue losses for the publisher. Wiley notably attributed an \$18 million loss in one quarter to a reduction in publication volume after thousands of retractions from Hindawi journals.³⁸

As a result, publishers increasingly frame research integrity as a material risk in their earnings reports. Springer Nature's 2024 report,³⁹ for example, explicitly identifies research integrity and reputation as a risk and acknowledges that it will "not detect all problematic papers or attempts by third parties to manipulate the publishing process."

CONCLUSIONS

In many cases of research misconduct, retraction ends up being the only sanction—and even that outcome is frequently delayed, contested, or avoided entirely.⁴⁰ Although this article is able to explore the range of available sanctions, what is lacking is a clear process for directing misconduct cases down any particular path, and who should be responsible for taking the lead. Perhaps it is inevitable that different leads are needed: editors-in-chief to lead the journal response, employers to hold disciplinary hearings, and publishers for taking legal action.¹⁸ There is currently no coordination of these responses, and different jurisdictions mean that this will likely remain the case.

A related question is whether the totality of sanctions is at all a deterrent for bad actors. Deterrence is dependent not only on the severity of a given sanction, but also on the likelihood of being caught. Although there is no formal evidence on this point, the present landscape appears weak: "repeat offenders" are not uncommon, whereas severe sanctions remain exceptionally rare. ■

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