Special Section

Technology and medicine: Academic dishonesty and risks to global health

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Bryan A. Liang
is in the Department of Anesthesiology, University of California, San Diego School of Medicine; San Diego Center for Patient Safety, University of California, San Diego School of Medicine; and, the Program on Health Policy & Law, University of California, San Diego.

Timothy K. Mackey
is in the Department of Anesthesiology, University of California, San Diego School of Medicine; Program on Health Policy & Law, University of California, San Diego; and California Western School of Law.

Kimberly M. Lovett
is in the San Diego Center for Patient Safety, University of California, San Diego School of Medicine, and Stanford Law School.

ABSTRACT

Technology has promoted global health. Yet advancing technology has also allowed physicians and trainees to cheat, and inappropriate experimentation with medical technology has resulted in study patient deaths. Further, journal editors have not made significant inroads in employing technology to identify dishonesty. Unfortunately, this continues to be strongly within the culture of the profession. Due to corruption of medicine, global health promotion will be severely retarded by falsified and suspect data that lower-and-middle income countries cannot afford to reproduce themselves and must rely upon for clinical decisionmaking. Further, clinical environments that facilitate dishonesty will result in poorer patient care. In addition, emerging markets rely on research to produce advanced therapeutics such as biosimilars that will be used by developed and developing economies, compounding the potential risks of dishonesty globally. By employing relevant antiplagiarism technology and accessing funding sources for all parties including authors, reviewers, and journal editors; "honesty" accreditation that includes mandated participation by journals; and external audits and whistleblowing of dishonesty, medical culture globally can move toward honesty and take advantage of technological evolution to promote global health.

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INTRODUCTION

Research in healthcare should focus upon acquisition of reliable and validated knowledge that translates into clinical use to benefit patients. Theoretically, by publishing research through a rigorous process of scientific review, clinical truth may emerge about the effectiveness of treatment. This will allow medical care providers to rely on these approaches and publications in environments that have limited resources and cannot reproduce this work, such as those treating vulnerable populations globally. As well, emerging economies, which are increasingly seen as the source of production for cutting edge drugs such as biologics and biosimilars,[1] rely on the literature for production of complex pharmaceuticals. Hence, if the literature is robust, global health can be promoted efficiently, without having to reproduce any study or outcome reports. However, the culture of US medicine may undermine this critical assumption, leading to reliance on faulty and dishonest data, which may adversely impact global health.

Correspondence: Bryan A. Liang, San Diego Center for Patient Safety, University of California, San Diego School of Medicine, US. Email: baliang@alum.mit.edu

ACADEMIC INCENTIVES

For example, our research group was considering submitting a paper for potential publication in a high impact factor journal, recognized globally. The research topic

was in an area not well recognized in medicine as of yet, and we believed there was significant potential for it to be a leading work in the field.

But on discussion with colleagues, we were actually advised by our most senior colleagues to not submit to any high impact factor journal. Instead, we were advised to submit to a lower impact journal that would be much more likely to accept it. Upon further discussion, we learned that journal editors and reviewers in the past have been unethical in their assessments, particularly as top tier journals have moved toward only one-sided blinded peer review, where the authors are known to reviewers but reviewers are not disclosed to the author. Indeed, new ideas have been pilfered by journal reviewers in the past; the clear message was better to go with a journal that will publish on the first round and secure the idea as ours (for ourselves, our career, and for academic review purposes) than risk these other results.

Hence, we investigated the challenges with the system of academic medicine in the USA to determine if dishonesty is as rampant as implied, particularly in medical research and review, and if the use (or not) of technology has assisted in ferreting out a culture of dishonesty. We were particularly interested in whether technology plays positive or negative roles in the development of a culture of dishonesty in medicine.

CONTEXT AND CULTURE: EXAMPLES

Unfortunately, the more dishonesty we looked for, the more we found. For example, by simply glancing at a recent high impact factor journal arriving in our offices, we immediately saw a paper on undisclosed conflicts of interests in meta-analyses of pharmacological treatments.[2] This paper reported that meta-analyses of studies involving pharmaceutical randomized controlled trials generally do not disclose that original study authors had conflicts of interest that were either undisclosed or not assessed by meta-analysis reviewers. This (and the rare public retraction) demonstrates that the world's top impact factor journals are certainly filled with at least some discovered and, likely, many undiscovered such works. Yet this also demonstrates that it does not take much technology to detect potential dishonesty in medicine.

However, of main concern is that the system of success in academic medicine is biased. Positive result research published in prestigious journals, extramural funding reliance, and personal gain are all intertwined and drive self-interested actions for perceived success specifically in academic medicine, for example, where most of these meta-analyses study authors work. This of course is harm in and of itself, since the integrity of the field is at stake and the recommendations may need review because of this dishonesty. But even more tragically, the "halo effect" of US medical research results in excessive reliance upon and public harms associated with falsified or questionable data in US-based literature, particularly by lower and middle income countries, where providers guide their use of limited resources in treating vulnerable patient populations using US work.

Indeed, this state of affairs reflects the limited interest or even knowledge of conflicts of interest by key academic opinion leaders and entities. One study from 2008 noted that fewer than 38% of academic centers in the USA have adopted some form of conflict of interest policy for academic researchers and the entities they represent, a quarter indicating they "did not know" about any such policy, and the fact that roughly one-third of medical school deans simply did not respond to requests regarding these policies[3] indicates a majority with limited engagement in systemically blocking dishonesty. Yet, despite this poor showing, it would take little cost and effort to register conflicts online or in an intranet to identify potential conflicts so they may be managed—with penalties for dishonesty and non-disclosure. However, no academic institution has reported use or implementation of such a system.

In addition, unfortunately, on further digging, it was absolutely unsurprising that meta-analyses of drug company-funded randomized controlled trials are filled with even more undisclosed personal conflicts. These, too, could have been identified earlier using simple compare-and-contrast software, grant funding lists, and search engine and social media searches that can be tailored, automated, and recurrent based on specific guidelines.

Indeed, the article's identified issues also provide another expression of conflicts of interest shown in the derivative materials of these meta-analyses, i.e., clinical practice guidelines.[4] In these cases, almost half the authors of these guidelines literally refused to provide investigators with any information, and over the 44 guidelines and 192 authors, only 2 cases of individual personal financial interactions with drug companies were disclosed—*despite the fact that 87% of authors had some relationship with the industry*. This status continues, while medical care costs continue to rise and concomitantly, registration technology already developed to identify who has participated in what guideline, practice parameter or study to determine if any actual or appearance of impropriety results from their participation exists. Yet again, the technology that is available to register participants and their past and present connections to the work that may reflect dishonesty but are not being used broadly.

ACCULTURATION

Let us make no mistake about it: the acts of omission by nondisclosure are instances of plain dishonesty. Unfortunately, this dishonesty has a long history including "elite" academic medical institutions globally.[5,6]

Acculturation starts early. It is reflected as early as medical school through disturbing reports that medical students often cheat,[7] and with technological components such as wifi, in-ear communication devices, disguised microphone writing instruments, and disguised cameras for active use in cheating and to take pictures of questions (including board exams). In fact, this cheating increases as medical students go through their training.[8,9] Disturbingly, there is a perception that residency applications seem to actively reward such illicit activities. As one resident applicant put it:

> *It is disconcerting that medical students openly resort to the use of deception, dishonesty, and outright lies in the resident-application process.… in which inherent dishonesty is needed in order to succeed.… Everyone involved in resident selection must begin to acknowledge and realize the potential implications of the institutionalized dishonesty that has become an integral part of the selection process.*[10]

Yet the ability to verify and indeed, assess whether the submitted recommender statements are legitimate takes little or no time (a simple verification email can perform this function for recommenders, journals, etc.). Indeed, claimed publications can also be easily verified by a PubMed search (particularly now there is e-pub ahead of press announcements), search engine searches, or, if "in press," an email or text from the journal editor that the paper is indeed in press.

Further, with the advent of mobile devices and other "Web 3.0" technologies, cheating has grown to new levels.[11] Because of the correlation between cheating in school and cheating in clinical care,[7] it is regretfully likely that those who perform peer review, act as journal editors, treat patients, and perform clinical trials data assessment, may have some representation in this group. As studies show and early work teaches us,[4] the dishonest nature of those who are obligated to disclose their conflicts simply results in them often not doing so, and journal editors appear not to check or review citations nor text for suspect wording, plagiarism, or other malfeasance. This dishonesty may therefore be reflected in future clinical care, and, potentially, academic careers, which may place patient safety at risk—particularly for vulnerable populations here and globally. All this while there are technologies available to detect cheating and dishonesty, from simple to complex. Yet once again, employment of such technologies have not been widely adopted.

ACADEMIC FACILITATION

The culture of particularly academic medicine provides for opportunities and incentives to be dishonest. The steep medical hierarchy lends itself to dictatorial perspectives and, indeed, has resulted in threats against students by academic physicians to unjustifiably give students bad grades and to ruin their careers.[12] Is it no wonder that this cultural norm of dishonesty continues? Even colleague-colleague cheating occurs, now using technology. For example, we have seen iPhones stolen or wiped clean remotely with patient notes and other important information.

But students and trainees do not push back against this system because of the reasonable fear of recrimination within the culture, and then over time and long hours simply become acculturated to it as a matter of survival. Yet a culture where senior academic physicians are unchallenged, unethical, and reward dishonest medical trainee applications supports a never-ending cycle of inculcation of corrupting influences in each generation of academic medicine. This becomes more facile as technology grows in power—and a growing potential for patient safety risks if dishonesty amongst physicians or trainees remains or grows as part of the educational system.

Other factors contribute to this phenomenon globally. In addition to limited intramural funding, the need to publish in high-impact factor journals and first or primary author on major works creates a system that, like in medical school, "requires" that one should do "anything … to get ahead"[5], including cheating by any means. Further, in combination with a hierarchical ends-justify-the-means culture, limited funding and the reliance of academic medicine on pharmaceutical company grants drives self-interest by academic physicians, consciously or unconsciously, to rationalize participating in this "system" and use all its "advantages" to get ahead. The predictable result is the scandals of ghost writing[13] (where another person writes the piece and a second nonparticipating author puts his/her name on it) and other inappropriate attributions of authorship (including adding high performance, well-known researchers to add a positive imprimatur to the manuscript).[19] Yet ghost writing is not a new phenomena; hence little has changed from the days of limited technology to today—despite the increasing ease by which text can be translated, reworked, and retitled from another language, and all represented as one's own work. This creates challenges

to understanding and using this information clinically worldwide. Indeed, with falsified data, its use may lead to iatrogenic injury, which will have its greatest burdens on low and middle income countries. It also will require remedial work to correct the profession's impression of the particular dishonest findings and puts patient safety and public health at risk anywhere in the globe where the falsified work is being relied upon.

TECHNOLOGY CONTROL AND EDITORSHIP

Contributing to this concern is that academic medical editors may not effectively police themselves, and hence even the greatest levels of dishonesty and detection technology can be undermined by those who control access but do not use it (or, say, plagiarism technology only used in "high risk" cases decided by the editor). Indeed, the case of Sir Cyril Burt, a knighted investigator from the UK, is instructive.[14]

Burt's "leading" research was on educational systems. He was the founding editor of the *British Journal of Statistical Psychology*. During his time as editor, he published more than 60 papers in the journal. However, of importance here, he was highly dishonest. During his tenure, he altered submitted manuscripts without any permission, including adding positive references to his own work. Other "creative" dishonesty schemes included publishing a letter he wrote himself under a pseudonym along with a response under another pseudonym to undermine another investigator's work.[14] Yet even during this period of fraud, all of these transgressions could have been identified by simple manuscript compare-and-contrast as well as sourcing of the materials themselves if done by a third party reviewer or responsible (associate) editor.

Although Burt's dishonestly transgressions were in earlier days with limited technology (though as noted above, these dishonest activities could still have be caught), the situation has become common enough in top medical journals and academic medical programs to have resulted in Congressional attention. Sen. Charles Grassley (R-IA) has requested information from the eight top impact factor medical journals and the top 10 US medical schools as to specific steps they have implemented to address such dishonesty, including technology.[15] That was in 2008; little has changed since then.[19] Indeed, related concerns continue to be unaddressed for decades while technology continues to progress, including some of the very things our medical colleagues warned us of: journal reviewers basing accept/reject decision on the manuscript author(s),[16] whether it goes with or against their interest or perspective,[17,18] or through stealing concepts from submitted manuscripts and then rejecting the piece.[16] However, now this goes on with technology that could detect it, particularly on audit of a reviewer's work. Yet this is not standard in academic manuscript review.

JESSE GELSINGER

The academic push for publication and inappropriate employment of technology also shows how academic incentives can result in dishonesty—and poor patient safety outcomes including death. The case of Jesse Gelsinger is important to remember in this regard.[19]

Gelsinger was a teenage study participant at an "elite" medical program, the University of Pennsylvania, who died after being lied to by the key study investigator, the medical department, and Dean of the medical school regarding all of these parties' financial interest in the therapeutic approach. Indeed, the biotechnology intervention did not have the success record claimed, and, importantly, there were significant financial conflicts of interest rampant throughout the system, and the investigators themselves as well as the school would profit substantially if the therapy succeeded. The "system" at the university actually recognized these issues, but, as typical in current medical culture, did nothing about them, despite Gelsinger's proposed genetic technology and experimental treatment were highly novel and risky.[19] Further, these investigators and university representatives also lied to NIH and FDA regarding the actual clinical findings in the case, and informed consent was not appropriately obtained.[20] Hours after he was injected with the new biotechnology formulation, Jesse Gelsinger went into coma; four days later he was dead.

POTENTIAL REFORM

Although many students and professionals are honest, good faith actors, systemic weaknesses indicate clearly that academic medical work is being corrupted by an ethic of dishonestly, self-interest, and self-justified actions through unchallenged, collective acceptance supported by personal and medical technology. Yet technology is not being used to challenge this ethic. Global health is thwarted and put at risk when such systems are not created and used to detect unreliable and falsified research.

The academics who do not disclose their conflicts appear to be the rule, at least on drug company-funded studies and clinical practice guidelines promulgation in the USA, rather than the exception. The academics who

run the top impact factor journals are part of this process, for they, themselves, may act inappropriately and not employ extant technological tools to determine illicit authorship behavior, but there is little oversight of their activities. The top fellows, residents, and students entering into highly prestigious programs with these academics cater to and mimic the norms created by these corrupting influences in order to succeed under outcomes rules, not process rules (i.e., how many publications with positive results were published in top impact factor journals, not how the physician did the work, engaged patients and mentored trainees, maintained ethical standards, and published the work, positive or negative). If technology can get these high energy academics ahead (i.e., top-tier publications), they will do so, for their careers are at stake.

To break this cycle of dishonesty, a risk-based approach may be best. A three part technology, accreditation, and audit/whistleblowing combination may act as a barrier to dishonesty.

At the outset, using simple tests and applying them across manuscript editors, reviewers, and authors should be a priority. Three questions should be the focus and the relevant setting checked for information:

1. Was this work copied? Use of antiplagiarism software such as Turnitin should be standard in this regard. Results show those with knowledge of Turnitin use by universities have reduced instances of potential plagiarism.[26,27]
2. Who was the funding source? Reference to clinicaltrials.gov should be standard to assess for the current project as well as others of the investigators. Clinicaltrials.gov is a website that provides regularly updated information about both federal and private clinical trials for a spectrum range of diseases and conditions, and hence can provide information on corporate sponsors of all investigator works.
3. Did the authors receive money from the private sector? Here, review of propublica.org should be performed. Propublica.org is an independent, non-profit newsroom producing investigative journalism and listing information on payments to healthcare providers by pharmaceutical manufacturers.[28]

In addition, peer review should be unblinded. Because of the need for transparency as to conflicts of interest and the potential for biased review, authors, reviewers, and editors should be clearly identified to ensure open, honest, and accountable activities related to medical research.

Second, an "honesty" accreditation system should be implemented based on the Transparency International Corruption Perception Index. All audits should be made public, should be part of a faculty/staff review process, and annual reports akin to Transparency International efforts to document global corruption[21] should be released. An independent committee of auditors not drawn from "elite" institutions or journals, including public members, computer scientists, forensic accountants, and lawyers, should be created. All journals and their editors should agree to provide clear notification to all authors, potential authors, and journal editors that random computer and technological audits of activities, disclosures, and support will occur. These audits will require, if necessary, investigation of funding and bias (supported by public filings and, if initial findings support it, investigator and corporate tax records, as well as internal documents) and would be unannounced. Scores would be posted on a website. Further, we believe that any journal claiming non-profit, tax exempt status should be required to participate, as this non-profit status requires limitations on lobbying and electioneering, two areas in which high impact factor journals are on the edge of acceptability.[22] This technological scrutiny should also encompass journal editors and reviewers, to ensure that application of "standards" such as disclosure of relevant interests are performed equitably. Again, this is particularly important for journals that select publication of articles representing a particular social policy point of view.

Through this process, this accreditation system can create medical research equivalents of Corruption Perceptions Index, the Bribe Payers Index and the Global Corruption Barometer for public entities and private persons involved in medical research. But further, it should allow open assessment for patients and policymakers of the academic medical research culture, findings, and any levied penalties. By employing online technology, this information can be readily available anywhere the patient or provider has an Internet connection. Automated search functions for public actions against researchers (e.g., by the FDA) can allow for lower costs associated with this information gathering and a "one stop" information source for dishonesty determinations.

The final category is audit. Published work should be subject to audits, including reproduction of work and whistleblowing for potential dishonesty. These audits can be modeled by programs such as the Reproducibility Initiative, which allows for voluntary submission of research results for verification.[23] Indeed, these latter efforts are sensitive to academic scholarship needs: if the work is indeed verified, it can be published as another research article in the prestigious, high impact journal *PLoS ONE*, hence addressing some of the cultural

challenges in US academic medicine. Using such a program consequently benefits both the honest researcher and the original journal that published the work. Initial efforts may focus upon high potential clinical trials; other work may be included.

We also believe that whistleblowing is critical as part of the scientific integrity process. First, medical research misconduct should be expressly included as part of the Sunshine Act (which, as part of healthcare reform, mandates disclosure of industry funding) and the False Claims Act (which precludes reimbursement for false claims in a federal healthcare program).[24] The following text should be added to the Sunshine Act:

> *Any person shall be empowered to report dishonesty, impropriety, or the appearance of impropriety by academic authors, editors, reviewers, and others, or a reasonable suspicion thereof, and shall not suffer retaliation or penalty, tangible or intangible, if the report is given in good faith. Substantiated reports, and the information on providers, sanctions (if any), and other penalties shall be as provided for and publicized as under the Physician Payments Sunshine Act, the False Claims Act, and other federal statutes. Sanctions shall also include consideration of revocation of federal nonprofit tax status, if warranted.*

In this manner, whistleblowers are expressly covered in reporting dishonestly of a wide range of academic actors. Further, the reporter would be expressly protected if the report is done in good faith. Penalties are focused upon financial and disclosure processes as well as potential prosecution under federal fraud and abuse laws. These can act as powerful disincentives for dishonesty.

In addition, because of the significant harm associated with medical dishonesty, we believe both civil and criminal penalties are warranted. This includes civil penalties including monetary penalties and the "administrative death penalty" where these providers are financially fined and unable to participate in public healthcare programs. In addition, we believe strong criminal penalties should also be engaged, both under fraud provisions as well as potential battery and other criminal causes of action. This will both incentivize researchers from being dishonest as well as provide important tools for law enforcement protection of the public fisc. Finally, we believe that strong reaffirmation of the National Academy of Sciences mantra should be encouraged annually in medical research ethics training: Someone who has witnessed misconduct has an unmistakable obligation to act.[25]

CONCLUSION

The corrupting influences in academic medicine—the people and places that society looks to for the development and dissemination of future medical advances—are extensive and expensive for society, particularly in global settings with little internal research capacity. In exchange for its trust, the public expects and demands that physicians and the medical profession be honest, use the right treatments and technologies for the right diseases, and put the patient's interest first. It is abundantly clear that our academic and leading physicians and research outlets may not be living up to that trust, potentially placing global lives at stake. We must reaffirm that as medical researchers, we are privileged to be trusted with the acquisition, exploration, and application of knowledge for the benefit of all humankind. We must each and every day earn the hope and trust the global community places in us. And we should always remember that this stewardship is important so that the next generation of providers and patients can face new global healthcare challenges unencumbered by an earlier culture of dishonesty and research that puts our medical science into doubt.

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