Correspondence

Research Ethics Boards: Size, Not Money

Joal Hill

I read with interest the debate about for-profit versus non-profit institutional review boards (IRBs) [1], but was disappointed that no one addressed the ability (or inability) of for-profit IRBs to review studies with the local context of research subjects in mind and then monitor what actually occurs during the consent process throughout the research trial.

To my mind the "bigness" of for-profit IRBs may be more of an impediment in protecting research subjects than their inherent conflict of interest. Our IRB has reviewed consent forms approved by central/for-profit IRBs that contained obvious errors such as schemas that did not match protocol narrative and use of eight point font in a study of geriatric subjects. Even when the initial review is outstanding, it seems a practical impossibility for a single IRB to provide meaningful monitoring of the actual consent process and implementation of the protocol at sites throughout the country. The greater "efficiency" of for-profit IRBs is only a meaningful benefit if increased speed can be shown not to occur at the expense of careful review of consent forms, real understanding of the local research context, and a commitment to audit the informed consent process throughout the study for the protection of research subjects, including ongoing education and advice for researchers and their teams.

This is not to say that all local IRBs perform this function as they should, but it does seem almost impossible for one IRB to perform local review and oversight for research sites around the nation in a way that really makes a difference for the men, women, and children who give of their time and their bodies so that society can benefit. ■

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Research Ethics Boards: Error and Misconception

Angela Bowen

We are compelled to respond to the concerns expressed by Lemmens and Elliott [1] about the Western Institutional Review Board (WIRB) and address the errors and misconceptions contained therein. We have worked diligently to protect the IRB decision-making process from the "for-profit" conflict and many believe that WIRB has set the standard for separation of board and business in the IRB community.

More than 200 people visit WIRB each year to observe our processes, systems, and board meetings. These visitors find that:

- The ethics review process is totally separate from the business of WIRB.
- The regulations are carefully and completely respected on a daily basis.
- Freedom of decision-making is expected by and of each board member.
- Board members and alternates are fully trained and regularly updated.
- Appropriate expertise is available.
- Meetings are convened.
- Disapprovals are as respected as approvals.
- There is never pressure to change a decision.
- WIRB's work comes from the 148 academic and other institutions where WIRB is listed on the Federalwide Assurance form and includes both federally funded and privately funded research from non-institutionally based investigators; about one-third comes from the 400+ public companies, contract research organizations, and foundations that fund medical research.

The following inaccuracies reflect the credibility of the referenced Bloomberg Market article:

- WIRB's annual revenues were not accurately stated.
- The number of Food and Drug Administration (FDA) submission reviews attributed to WIRB was not accurate.
- The Georgia investigators, whom WIRB last reviewed in 1994, were not jailed for endangering research subjects but for diverting funds from the state of Georgia.
- WIRB was not the primary target of the lawsuit cited, which was settled by the insurer as a nuisance settlement on behalf of the group.
- FDA's audits are not done haphazardly; they occur every three years or as indicated.

Auditors, the FDA, the Office for Human Research Protections, and accreditors see our work around the world. Any flaws surely would be noticed and corrected. WIRB will continue to rely on our longstanding reputation for transparency and reliability in the research community. ■

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Research Ethics Boards: The Protection of Human Subjects

Valia S. Lestou, Nancy Ondrusek, Morris A. Blajchman

Compelling arguments, documentation, and published data have always been the basis of scholarly examination, discussion, and reasoning. Rhetorical catch phrases, biased ideologies, and anecdotal reports, when used to prove erroneous and often unrelated points, are creating condemnation and polarization instead of awareness on the important issues of research ethics boards.

The statement that "they are in a client–provider business relationship" as expressed in the article by Lemmens and Elliott [1] implies a direct financial relationship between sponsors and those reviewing their research protocols. This is incorrect. Since we cannot speak on behalf of other for-profit Institutional Review Boards (IRBs), we will describe how our Canadian for-profit IRB functions. The owners of the company and those involved in the running of the business are not IRB members and have no voting privileges. IRB members are external consultants who are paid by the company providing the review services for the time spent in reviewing a protocol and providing an expert ruling regarding the ethics and science of a particular study. IRB members have no business interests in the company (e.g., partnership or profit-sharing) and no vested interest in the approval or non-approval of a specific study. It is worth noting that members of academic or governmental not-for-profit IRBs are often paid for the ethical review services they provide, in recognition of the time and skill required to carry out their duties.

Respected, well-organized, and accredited IRBs (for-profit and not-for-profit) are not an enterprise of "five people". This is merely the minimal regulatory requirement, which we consistently exceed in our meetings. IRBs are complex bodies of highly qualified professional experts from various disciplines, such as physicians, pharmacists, scientists, lawyers, philosophers, ethicists, and lay persons. They are multicultural, balanced in gender, diverse in social background, and dedicated to the protection of research subjects (which remains the main mandate for all IRBs). Often, for-profit IRB members are serving or have served as IRB members on academic or governmental not-for-profit IRBs. Is it expected that the work of these individuals is ethical when they are volunteers, and unethical when they are remunerated for their expertise?

Rather than fixate on the concept that members of IRBs are paid, we should concentrate on the real challenges regarding IRBs (for-profit and not-for-profit) and try to propose some meaningful insight. Ethics in biomedical research is a serious and complex affair with huge societal implications. Expert advisors that are paid or not paid are not the problem that IRBs face today. It is rather the rapidly growing complexity of biomedical research that confronts IRBs, together with the lack of a timely transfer of knowledge, often due to insufficient resources, the lack of continuing education, and the lack of sufficient and appropriate member expertise. IRBs are expected to function as multifaceted oversight bodies and assume many duties, including ethics consultation, education, peer reviewing, adverse events reporting, publication policies, and the review of financial conflicts of interest.

The attention should be focused on whether IRBs are performing to the highest ethical standards and conforming to existing regulations rather than if their members are remunerated or not. Singling out the issue of payment distracts from sincere discussion on how to improve and ensure high-quality reviews of biomedical research and maintain the protection of the human subjects involved. ■

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Research Ethics Boards: No Data on Quality of For-Profit or Non-Profit IRBs

Adil E. Shamoo, Elizabeth Woeckner

We are concerned by two inaccurate statements offered by Emanuel [1]. First, he claims: "And in recent years, the OHRP [Office for Human Research Protections] has called upon WIRB [Western Institutional Review Board] to re-review protocols and revamp the IRB processes and procedures at not-for-profit academic institutions where the OHRP had temporarily suspended research." We were sufficiently surprised by this that we sought clarification from OHRP Director Bernard Schwetz, who was kind enough to explain that Emanuel's statement was incorrect, and further, that "The Office for Human Research Protections has never asked WIRB to re-review protocols for any institution, nor would OHRP endorse any IRB in such a manner. OHRP will provide information about the several such IRBs. However OHRP does not suggest that we endorse any of these commercial or independent IRB services" [B Schwetz, personal communication].

Accordingly it is incorrect to conclude, as Emanuel does, that "Calling upon WIRB constitutes a vote of confidence by federal regulators that at least this one for-profit entity provides high-quality IRB review."

Second, Emanuel writes: "OHRP has never suspended a for-profit IRB." This is misleading and incorrect in that OHRP regulates institutions, not IRBs. OHRP Director Bernard Schwetz was kind enough to clarify that "While this statement is true, it is also true that OHRP has never suspended a not-for-profit IRB."

It is useful to reflect upon the fact that WIRB has been the IRB of record in a number of egregious cases. For example: Faruk S. Abuzzahab, MD (medical license suspended following the death of research subject inter alia); Robert A. Fiddes, MD (indicted and convicted for research fraud); and Richard L. Borison, MD and Bruce I. Diamond, PhD (indicted and convicted for research fraud) [2]. Moreover WIRB was copied on the OHRP determination letters to Oregon Health and Science University regarding the Student Athlete Drug Surveillance Trial trial, the reasonable conclusion from which is that WIRB was involved in its review and approval [3,4].

There is no data, scientific or otherwise, because the lack of universal, legally codified human research protections discourages, if not prevents, collection of such information. We agree that commercial IRBs are not unacceptable simply because they review proposed research for a fee, but commercial IRBs may provide unacceptable review and oversight when they exist primarily to provide rapid approvals.

Finally, we would like to offer bibliographical addenda. Emanuel writes: "With Wood and Grady, I have proposed a system of regional ethics organizations that would review and monitor research protocols." A recent paper reviewed the history of the proposals for regional IRBs [5]. The earliest suggestion for regional ethics organizations identified was Alberti (1995) [6]. ■

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Research Ethics Boards: Reply from Ezekiel Emanuel

I have misstated. Obviously, as a governmental agency, the Office for Human Research Protections (OHRP) could not "endorse" the Western Institutional Review Board (WIRB) to re-review protocols at institutions whose federal assurance was suspended, or advise such institutions to consult WIRB. As Dr. Schwetz reminded me [1], OHRP could provide information about independent or other IRBs that could help suspended institutions re-review protocols, but could not suggest which one they should employ or endorse a particular IRB. I presume OHRP would not provide information to institutions on IRBs that it deemed to have questionable practices or performance in reviewing protocols. So while as a government agency it could not provide a formal endorsement, there is an implied claim that the IRBs mentioned by OHRP conduct satisfactory reviews. Furthermore, as a matter of fact it is worthy of note that the University of Rochester, the University of Colorado, Johns Hopkins University, and other academic institutions whose federal assurance was suspended by OHRP ended up consulting WIRB. I stand corrected. ■

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Reference:

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Competing Interests: EJE has spoken at and received an honorarium from many different not-for-profit academic medical centers, some that review their own protocols and others, including the University of Iowa and Johns Hopkins University, that have outsourced their protocols to a for-profit institutional review board (IRB). He has served on a subcommittee of the Dana-Farber IRB and on both commercial and noncommercial data safety monitoring boards. He was a member of the Consortium to Examine Clinical Research Ethics, which is financed by the Doris Duke Charitable Foundation to collect primary data on and critically examine human subject protection (members of the consortium are listed at http://www.ddcf.org/page.asp?pageId=302).

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Research Ethics Boards: Reply from Trudo Lemmens and Carl Elliott

Our basic argument is this: for-profit research ethics boards are in a client–provider relationship with study sponsors; this relationship creates a conflict of interest; and this conflict of interest is particularly dangerous under a weak regulatory system which does not prevent forum shopping and allows market criteria to influence committee selection. We use various examples of serious controversies to support our claim that there are flaws in the system. This seems more appropriate than using one or two "good examples" to argue that the system works just fine. The claim by two for-profit research ethics boards that they manage to

perform admirably despite this conflict of interest would not undermine our argument, even if independent evidence were given for the claim. (None is given here, of course.) Academic committees are certainly also affected by conflicts of interest. But that doesn't remove the conflict in for-profit review. The widely lauded system of accreditation is in our opinion a soft self-regulatory mechanism which does not fill the regulatory loopholes.

Lestou, Ondrusek, and Blajchman [1] are members of IRB Services, the for-profit research ethics committee that approved the controversial immunosuppressant study conducted at an Anapharm research unit in Montreal. As we noted in our article, which referred to a Bloomberg report [2], a number of subjects in that trial were infected with tuberculosis. Commentators (Steven Miles, and one of us—Lemmens) interviewed by Bloomberg criticized IRB Services for some aspects of its review, including for not imposing basic tuberculosis screening of participants and for approving a backloaded payment structure intended to keep people in the trial [2]. It is worth noting that Anapharm used at least one other prominent Canadian for-profit committee in the past [3], raising concerns about forum shopping.

We referred to WIRB in our article because WIRB is frequently lauded as setting the highest research ethics standards. Thus it seems particularly relevant that even WIRB has had its share of problems. Our reference to the sheer number of reviews conducted by WIRB reflects our concern about the power of one commercial entity in the exercise of what we consider a fundamental public function. WIRB has become a state within the state when it comes to the protection of human subjects. Particularly in the absence of strict regulatory control, it is worth asking whether it is healthy to concentrate so much power over the protection of human subjects in the hands of one commercial enterprise.

Shamoo and Woeckner [4] rightly point to the difficulty of gaining empirical evidence on research ethics boards. One of us conducted a survey of for-profit research ethics boards in 1997 [5]. While several committees collaborated well with this survey (including WIRB and IRB Services), much information remained hidden behind a veil of corporate secrecy. Regulatory agencies in Canada and the United States simply accept this secrecy. Some regulators even rely on the goodwill of research ethics boards to determine regulatory initiatives. When the US Food and Drug Administration looked into the issue of "IRB shopping," for example, it invited comments, received them primarily from those in the industry, and simply accepted the claim that shopping for research ethics boards was not a serious concern [6].

The idea of regional committees is indeed not new, as Shamoo and Woeckner indicate. They cite as first source an article of 1995. However, research ethics committees with exclusive territorial jurisdiction have existed in several European countries since the late 1980s to early 1990s (e.g., France, Switzerland, and Denmark). They have since been introduced in many more countries. Emanuel suggests that we have failed to make positive contributions to the debate on the organization of research ethics boards and contrasts that with his 2004 proposal for regional review boards. In fact, one of us (Lemmens) has argued since 1996 for improvements to the regulatory structure of research ethics boards, including the introduction of regional committees, in scholarly journals [5,7–11], at international conferences, and in a report for the Council of Europe [9]. Excerpts of one of these articles [7] were reprinted in a text book on research ethics edited by Emanuel and others [12]. We are pleased to know that Emanuel has come to agree. ■

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Industry-Sponsored Research: A More Comprehensive Alternative

Peter Mansfield

Julio Sotelo's proposal for pharmaceutical research to be organised by a Collegiate Research Council (CRC) funded by

drug companies [1] is one of several alternatives that deserve debate [2].

The Sotelo proposal has advantages, but if the CRC is a single international monopoly how could the risk of corruption and inefficiency be managed? Alternatively, if there were competing CRCs, they would be under pressure to compromise to win more contracts, as happens already with contract research organisations.

Fiona Godlee has proposed that pharmaceutical manufacturers be banned from researching their products [3]. She suggests that "to get their products licensed [drug companies] would contribute to a central pot for independent, publicly funded clinical trials." She did not specify what percentage of the "central pot" would be funded by taxpayers versus pharmaceutical companies. If the funding was mostly from pharmaceutical companies then her proposal is similar to Sotelo's. If not, how will governments to be persuaded to allocate adequate funds?

My organisation, Healthy Skepticism Inc., advocates a more comprehensive alternative that will also reduce the harms currently caused by misleading promotion, biased industry funding of education, and high drug prices. Our alternative is politically achievable because implementation can be achieved without increasing costs for pharmaceuticals currently paid by individuals and/or third party payers (governments or insurance companies) whilst securing long-term competitive return on investment for the pharmaceutical industry.

Pharmaceutical companies currently have four main functions: manufacturing, research, promotion, and education. Performance of those functions is currently distorted by incentive systems that reward only activities that increase sales of more expensive drugs regardless of the impact on health care. We recommend that these four functions be paid for separately by government agencies via iterative open competitive public tender. This would allow the relevant divisions and subcontractors of pharmaceutical companies to compete with universities and other non-profit organisations for funding to provide each function separately. Incentives can then to be aligned to reward quality performance at each function separately. If a company performed poorly, e.g., committed research fraud or provided misleading promotion, then it would not get funding for that function in the next tender round. Drug prices would no longer include a premium for research, promotion, and education. Consequently, drug companies would no longer fund those functions from drug sales. Lower prices would make drugs more cost-effective for larger numbers of people.

Our recommendations can be implemented quickly or slowly by gradually reducing prices and transferring the savings to organisations that fund research (e.g., the United Kingdom Medical Research Council); education (e.g., medical schools and specialist colleges); and promotion (e.g., Best Practice Advocacy Centre, New Zealand). We also recommend improving regulation of pharmaceutical companies and improving education, incentive systems, and regulation for health professionals[4–7]. ■

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Industry-Sponsored Research: Author's Reply

In his letter [1] Dr. Mansfield has raised a debatable issue: "If the CRC [Collegiate Research Council] is a single international monopoly how could the risk of corruption and inefficiency be managed?" By no means would the CRC be an international monopoly; in the proposal it was stated that the CRC would be certified by the appropriate health authorities of any country. Moreover, several CRCs could be established, as long as the participants were nominated by prestigious academic institutions and the CRC was certified by the federal regulatory agencies.

The risk of corruption and inefficiency would be remote for the following reasons. The constituents of the CRC would be distinguished scholars, appointed independently by leading medical institutions and universities. Contrary to Dr. Mansfield's and Dr. Prabhakar's fears [1,2], this council would not require a substantial infrastructure, since its main goal would be to meet periodically, to select the investigators and institutions that would conduct the clinical protocol submitted during that period, and to review the results generated by previous trials. This task could be expedited through the peer review method. The administrative implementation necessary to carry out the decisions of the CRC might be done by existing institutions (e.g., the US Food and Drug Administration), without the formation of an additional bureaucratic body. In this way, the CRC would be strictly maintained as an academic and scientific core whose opinions and sanctions were respected by the individuals and institutions involved in the execution of any given protocol of drug testing.

The CRC would not have "bureaucratic bodies," as it would function only as a collegiate board to select who would do the testing and where a given protocol of drug testing would be

conducted. The research funds provided by the pharmaceutical company would not be administered by the CRC, but by the corresponding institution in charge of the specific research or by the administrators appointed by the CRC.

To the question of who would fund the CRC the answer is simple: a very small percentage of the total cost of the protocol would be used to create a fund to cover travel expenses and stipends for the scholars participating in the CRC.

In response to the statement that the CRC "will consume significant amounts of time and human resources" [2], I do not see why this should be the case. I believe that the members of the CRC could meet once or twice a month and propose, in a single day, one or various candidates for a given protocol. The operation of the CRC would be somewhat similar to that of the editorial board of scientific journals who meet periodically to select reviewers for scientific papers and to evaluate the results of reviews. Once the scholars of the CRC had selected the potential investigators or institutions they would be invited to conduct the research; this task could be accomplished by commissioned personnel independent from the regulatory agency.

With regard to the prices of drugs, I think that Dr. Prabhakar has not chosen a comparable example. In fact, hospital charges and physicians' consultations are not controlled in most countries; that is because these prices are usually set—very much as for many other services and goods—by production costs and competition. As mentioned in my proposal, this is not the case for pharmaceutical substances. ■

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Profiling of CSF: Reliability of Diagnosis

Robert Matthews

Research that points towards more reliable diagnosis of schizophrenia is always to be welcomed. However, the impact of the relatively low prevalence of this disorder on the reliability of any test should be borne in mind when assessing any proposed diagnostic.

Holmes et al. [1] find a sensitivity for their cerebrospinal fluid (CSF) test of 82% and a specificity of 85%. Thus their test increases the weight of evidence in favour of a diagnosis of schizophrenia by a factor of $0.82/(1 - 0.85) = 5.5$. While impressive, this figure must be balanced against the population prevalence of schizophrenia of around 1%. A simple calculation then shows that the CSF test increases the probability for the presence of schizophrenia to around 5%. Or, put somewhat more bleakly, in the absence of any other diagnostic evidence, it is still 95% probable that a diagnosis of schizophrenia is not merited.

While the work of Holmes et al. may well be a step towards reliable diagnosis, it is perhaps a much smaller step than one might expect. ■

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Profiling of CSF: Small Subgroups

Dave Hambridge

This very encouraging article [1] is based on relatively small subgroups of patients. That in itself does not invalidate the conclusions, providing that the subjects in each group have the same illness.

I recently reported that many detained psychiatric inpatients had not been fully investigated to exclude organic causes of their seeming first episode of schizophrenic-like psychosis [2].

These authors state that their patients had DSM-IV–diagnosed schizophrenia, which excludes organic causation. What investigations did they do to ensure that their clinical sample had no organic precipitants? ■

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Profiling of CSF: Authors' Reply

We are grateful to Dr. Matthews for his comments [1]. With a sensitivity of 82% and a specificity of 85%, the metabolic markers for schizophrenia identified in our study are certainly not perfect. However, we have already identified further biomarkers and envisage that a panel of biomarkers can be used for diagnostic purposes. The utility of these biomarkers will be established in our future clinical studies.

We take the point of Dr. Hambridge [2], and agree that patients who present with schizophrenia-like symptoms need to be fully investigated with respect to possible (treatable) underlying pathologies. However, we strongly disagree with the concept of schizophrenia not being an "organic disorder". Unfortunately, as Dr. Hambridge points out, this atavistic view is still portrayed in the current classification systems, but we hope that by now most psychiatrists would agree that schizophrenia has a biological/organic aetiology. The concept of schizophrenia as a "functional psychosis" is a misnomer, as every function has a biological/organic basis.

As stated in our article, all patients included in our study underwent a thorough neurological and psychiatric examination. The majority of patients had cMRI scans or cCT scans (when MRI was not available at the time of admission), and a battery of blood tests including syphilis and endocrinological screening. Serum and CSF testing for neurotropic viruses and borreliosis as well as routine parameters were undertaken in accordance with European guidelines for cerebrospinal fluid (CSF) diagnostics.

Furthermore, patients had urine drug screens, an electroencephalogram, and were examined using a neuropsychological test-battery as well as having an optional HIV test as first-line investigation. For our study as well as for our daily clinical routine, the diagnosis of schizophrenia or schizophreniform disorder (with regard to time criteria only) is only given if no findings indicative of other neuropsychiatric/neurological disorders, other than schizophrenia, were obtained. We would like to emphasise that it is not our opinion that the possible use of biomarker profiles, such as those identified in our study, would eliminate the need for extensive neurological/biochemical screening of any patient with psychosis. Instead, our study strongly justifies the need to perform an extensive battery of clinical tests. Unfortunately, this is not clinical practice in many countries, not least for reasons of cost and the low profile that psychiatric patients have within our health systems. ■

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Preterm Birth: Effect of Corticosteroids or Immediate Cord Clamping?

David Hutchon, Ben Ononeze

The authors report that conventional antenatal corticosteroid therapy was received by all mothers [1]. While antenatal steroids reduce morbidity from respiratory distress syndrome and probably reduce neonatal mortality [2], there is also evidence that the steroid has an effect on brain development [3]. Multiple courses of steroids have been shown to reduce head size [4]. Multiple doses of steroids are not now recommended but may have been used before 2000. How many of these mothers received multiple courses? Furthermore, if multiple courses have a demonstrable effect, it is quite feasible that there is a minor effect on the brain by a single course.

The findings of this paper are consistent with capillary vascular damage occurring at delivery. 73% of these babies were delivered by caesarean section. We are not suggesting that the caesarean delivery in itself would have an adverse effect, but almost certainly all these babies would have had the cord clamped immediately at delivery. Clamping the cord immediately at birth, especially before the first breath is taken, interferes with the transformation from fetal to adult circulation. It is justified by the need to resuscitate the baby and maintain its temperature. The intervention of immediate cord clamping needs to be justified by evidence, which has never been sought. Indeed there is considerable evidence emerging that it is harmful to term [5], preterm [6], and very preterm infants [7]. Immediate umbilical cord clamping is the result of tradition and is carried out without thought by the vast majority of obstetricians and paediatricians. In the 1980s Peter Dunn, working in Bristol, demonstrated a technique of delivery at caesarean section for the preterm baby which avoided the hazards of immediate cord clamping [8]. This was before the use of antenatal corticosteroids or surfactant, yet the survival rates were excellent.

We would like to alert the clinical community to two issues. Firstly, antenatal corticosteroids are currently given much too readily, often when there is very little risk of preterm birth. Secondly, the cord must not be clamped immediately at delivery, especially for caesarean sections, and ways to allow resuscitation of the neonate with the cord intact must be routine clinical practice. Further research is needed to determine how much of the brain damage demonstrated in this paper could be the result of antenatal corticosteroids and immediate cord clamping. ■

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Novel Therapies for Tuberculosis: Tuberculosis Control and its Discontents

Jose Luis Portero, Maria Rubio

Salomon JA et al. [1] show through mathematical models the hypothetical high impact on tuberculosis (TB) control of a new shorter treatment regimen in South-East Asia. The model assumes all the positive determinants to enhance TB control but none of the negative ones, so the model is a kind of tautology that drives to an inevitable success.

Defaulting, relapsing, and drug resistance do not have to be major problems when a TB control programme based on DOTS [directly observed treatment, short-course] strategy is well established with the current six months treatment [2]. These factors are usually cited as the main obstacles to control TB, the patients being the guilty party, but the reality is more complex: failed health systems, inequity, and poverty hamper the right to use TB services.

It is arguable that shorter regimens and new technology increase case detection by themselves. Their effect is all the greater in an environment of health inequality and scarcity, as in the high TB burden countries. It is not clear if new drugs and technology will be cheaper, fully feasible, and more effective than the current ones on the field.

Strengthening of operative health research could be the fastest way in the short term to find local solutions to use meagre financial resources [3]. Migration of local health workers looking for better living conditions could be critical for the TB programmes in the future [4]. It is likely that new tools and treatments need equal or more qualified human resources than are needed today. Lack of qualified health personnel, fast rotations in their posts, and reductions of personnel due to health sector reform policies shrink the cost effectiveness of training human resources on TB control and paradoxically could increase the necessity of more personnel for the same outcome.

On the other hand, World Health Organization indicators to evaluate TB control may not be the most appropriate to measure the reality [5]. A critical revision of current measuring tools will shed light on the success and pitfalls of TB control [6]. Changes in the fashion of global disease control priorities, rise of expenses as programmes develop, and donor fatigue should be contemplated in the long term [7].

The barriers to access TB services are caused mainly by poverty and its complex socioeconomic determinants, but this key variable is hard to represent into the mathematical models [8]. Could TB be controlled through technology despite a world of increasing poverty? ■

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