Within and beyond the communal turn to informed consent in industry-sponsored pharmacogenetics research: merits and challenges of community advisory boards

Hojjat Soofi¹ · Evert van Leeuwen²

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Abstract The one-size-fits-all paradigm of drug development fails to address inter-individual variability in drug response. Pharmacogenetics research aims at studying the role of genotypic differences in drug response. Recently, the pharmaceutical industry has shown interest to embed pharmacogenetics studies in the process of drug development. Nevertheless, population-based and commercial aspects of such future-oriented studies pose challenges for individually based informed consent (IC). As an exemplar of the communal turn to IC procedures, community advisory boards (CABs) have been integrated into different types of medical research. CABs hold the promise of organizing the relationship between participants and researchers in a more reciprocal and participatory way, offering possible means of overcoming the lapses of individualistic IC. However, the involvement of CABs with pharmacogenetics research might be rife with difficulties, uncertainties, and challenges. The current study first reviews the existing literature to discuss added values and challenges of relying on CABs as a supplement to individually based IC. Then, the particular moral and regulatory landscape of pharmacogenetics research will be delineated to argue that community engagement is both necessary and promising beyond the communal turn to IC processes. Three main features of the landscape include (1) new supportive stances that some

regulatory bodies have adopted toward pharmacogenetics research, (2) the motivation of the industry to draw reception and trust from the subpopulations, and (3) the important role of the society in generating and embedding pharmacogenetics knowledge. Finally, some points to consider will be discussed to contextualize relying on CABs within this landscape.

Keywords Pharmacogenetics · Informed consent · Community advisory boards · Pharmaceutical industry

Introduction

The old one-size-fits-all approach to drug development seems a hindrance to optimized patient care (Giacomini et al. 2012). There is a broad inter-individual variability in response to a particular drug, and some patients might be at a higher risk of developing the adverse effects than others (Ingelman-Sundberg 2001; Meyer 2000). As an emerging application of genetic knowledge, pharmacogenetics research aims at studying inter-individual genetic polymorphisms associated with drug response (Buchanan et al. 2002). One of the characteristics of pharmacogenetics studies is to find genetically defined subpopulations that are distinguished regarding their response to a particular drug (Ingelman-Sundberg 2001).

Some of the genetic variations that can influence individuals' response to specific drugs can be attributed to genetic ancestry (Ortega and Meyers 2014). In 2005, the first race-based medicine, BiDil, was approved by FDA for the treatment of heart failure in "self-identified black patients," and the patent was granted to a private company named NitroMed (Kahn 2008). There was so-called grassroots cooperation between the community members and the pharmaceutical company. The active community considered BiDil as a right response to long-standing race-based health inequalities in the

✉ Hojjat Soofi
hojjat.soofi@gmail.com; hojjat.soofi@members.em-a.eu

Evert van Leeuwen
Evert.vanLeeuwen@radboudumc.nl

¹ Student of Erasmus Mundus Master of Bioethics (KU Leuven et al), Nijmegen, The Netherlands

² Radboud Institute for Health Sciences, Radboud University Medical Center, Nijmegen, The Netherlands

USA (Rusert and Royal 2011). However, the marketing of the drug was not very successful, and many African American patients were doubtful about the drug that is developed only for them (Parker and Satkoske 2012). Many scholars later considered BiDil as an example of using race to acquire commercial and regulatory benefits (Sankar and Kahn 2005) and even criticized the use of race as a proxy for gaining pharmacogenetic knowledge (Holm 2008).

On the other hand, in January 2012, the first disease-modifying drug, Ivacaftor, was approved by FDA for a small subgroup (approximately 4 %) of cystic fibrosis patients with a unique genetic mutation (Aditya 2012; Clancy and Jain 2012). The development of the drug was driven by active collaboration between the industry and the Cystic Fibrosis Foundation (Clancy and Jain 2012). Other subgroups of CF patients with other genetic characteristics who could not benefit from Ivacaftor intensified their activities to raise funds and awareness (Kramer-Golinkoff 2014). Moreover, they called for more influence over research agenda (Kramer-Golinkoff 2014). This example shows how new communities comprised of biomarker-defined subpopulations, in the context of pharmacogenetics research, can develop and expand.

Nonetheless, the population-based and future-oriented aspects of pharmacogenetics studies can pose some ethical challenges concerning both the individuals and the related subpopulations. The challenges of privacy, confidentiality, and sample collections in medical genetic research have been extensively studied (Elger 2013; Wolf et al. 2015). Some of these difficulties have been specifically discussed in pharmacogenetics context, for example, revealing secondary information (Buchanan et al. 2002) and the responsibilities of researchers to return the results to participants (Prucka et al. 2014). It is also problematic how to configure the withdrawal options when there is unspecified research in the future (Anderson et al. 2002). There are also concerns about the conduct of pharmacogenetics research because of genetic stratification of the patients (Smart et al. 2004). It has been hypothesized that pharmaceutical companies might prioritize developing drugs for some specific populations partially or solely on the basis of expected economic benefits (Lee 2005). As informed consent procedures are one of the essential aspects of clinical trials, discussing and disclosing aforementioned concerns to individuals seem crucial (Howard et al. 2011). However, many scholars claim that these wide-ranging concerns cannot be simply integrated into individualistic informed consent in post-genomic era (Chadwick and Berg 2001; Manson and O'Neill 2007; O'Neill 2001). By the same token, but specifically in pharmacogenetics context, Corrigan and Williams-Jones (2006) maintain that the rights of patients could not be addressed sufficiently by individually based informed consent. They call for more reciprocity between

the researchers and the participants in pharmacogenetics research and broader ethical review (Corrigan and Williams-Jones 2006).

As a possible solution to embrace more “communal models” (Widdows 2009), community advisory boards (CABs) have been involved with biobanking and other medical genetic research in order to counter the lapses of individualistic informed consent in such population-based studies (Frye et al. 2015; Lemke et al. 2010; McCarty et al. 2008). CABs invite people from a shared ethnicity, culture, disease, or any other sources of the alliance to come together, attend regular meetings, and discuss the options for empowering individuals’ informed consent to the research, for instance, gay HIV-positive individuals in AIDS clinical trials (Strauss et al. 2001). CABs are seen, in this study, as the paradigm for the communal turn to informed consent processes.

However, the moral and regulatory landscape of pharmacogenetics research seems to necessitate community input beyond the communal turn. Some of the major regulatory bodies have adopted new supportive stances toward pharmacogenetics research. These new postures are not based on the standard gatekeeping roles because pharmacogenetics research is seen as a solution to old risk-benefit assessment that relies on a public interest model. This fact implies that other complementary ways of regulating and oversight of pharmacogenetics research are needed. Furthermore, the pharmaceutical industry is motivated not to repeat the BiDil case. Also, the role of the public in the process of pharmacogenetics knowledge production, in light of increasing uncertainties, is definitive for embedding and expanding pharmacogenetics knowledge in the society. The existing literature, so far, has not paid enough attention to consider the communal turn to informed consent in pharmacogenetics research within this particular landscape.

The first objective of this study is to discuss, based on the existing literature, the added values and the challenges of incorporating CABs, as exemplar of the communal turn, into individually based informed consent in industry-sponsored pharmacogenetics studies. Individually based informed consent is referred to as written consent asked from and given by a solitary person and is focused primarily on the individuals’ concerns, interests and rights, and not “connected individuals’ rights and interests” (Widdows 2009). The initial keywords include community engagement, CABs, informed consent, pharmacogenetics, and pharmaceutical industry. The literature review has been conducted by using databases such as Google Scholar, PubMed, and Scopus. All the steps of literature review have been iteratively repeated to increase inclusiveness and coherence. The study explores again the literature to delineate the particular moral and regulatory landscape of pharmacogenetics research. Given that, the possibilities and challenges of CABs as the paradigm for the communal turn

will be revisited. Finally, some points to consider will be discussed to extend the scope of the communal turn to pharmacogenetics research and embrace its particular necessities and realities.

CABs: historical context, common practices, and different modalities

CABs as the manifestation of community-based participatory research (CBPR) aim at formalizing community-researchers partnership by soliciting input from targeted populations into various steps of research procedures (Newman et al. 2011). Strauss et al. (2001) tried to demonstrate the lapses of individualistic informed consent processes and argued that incorporating CABs into the research activities result in more effective individual informed consent. As some of the first well-documented examples of establishing CABs come from AIDS studies in the 90s, they listed some practical examples of how CABs halted the progress of clinical trials and advocated for the compensation and full disclosure of risks and benefits in HIV research (Strauss et al. 2001). One of the most significant legal supports of CABs emerged when the National Institutes of Health (NIH) mandated incorporating CABs into AIDS clinical research in order to enhance the inclusion of underserved populations of the USA in the research (Delaney et al. 2012).

Current practices of establishing CABs, as referred to earlier, are expanded to other themes of medical research including biobanking and medical genetics. For example, Frye et al. (2015) describe the creation of a CAB, comprised of members with personal or family experience with the bipolar disorders, during the initial phase of establishing a bipolar disorder biobank. Also, researchers may set up partnership with existing communities such as tribal populations. For instance, Fohner et al. (2013) document partnership with American Indians populations through a tribal advisory board to integrate their priorities into a pharmacogenetics study on anticancer drugs.

Apart from different models of member composition, there is also a wide array of perceived roles for CABs. Some of the roles include embedding community needs in research protocols, empowering communities, identifying further paths of research, and involvement in the Institutional Review Board (IRB) processes (Delaney et al. 2012). These different modalities of engagement imply different dynamics of cooperation, expectations, and activities. Discussing all these different configurations falls outside the scope of the current research. Nonetheless, a common feature of all the aforementioned modalities is the presumption that lapses of individual informed consent might be better addressed by CABs. Particularly, it has been argued that genetic ethics needs to rely on new ethical

models, which has been called the communal turn in bioethical debates, to address the rights and concerns of both individuals and communities (Widdows 2009). In what follows, this presumption will be discussed with a specific focus on the added values and the challenges of relying on CABs as a supplement to individually based informed consent in industry-sponsored pharmacogenetics research.

The communal turn to informed consent in pharmacogenetics research: added values of CABs

This section aims at reviewing the most relevant advantages of CABs to adequately contextualize individually based informed consent in the pharmacogenetics context. The advantages will be broadly referred to, including both the supplementary (how CABs can promote individual informed consent) and essential (the specific advantages of CABs that cannot be addressed straightforwardly by individual informed consent) aspects.

Extending the scope of protection and oversight

Protection in pharmacogenetics context needs to extend to both individual and collective possible harms. The main advantage of CABs regarding individuals' privacy and confidentiality emerges from facilitating a continuous and future-oriented relationship with individuals that is very necessary for pharmacogenetics research. This necessity relates to the fact that many research objectives in the initial contact with participants may not be explicitly defined. Concerning collective or social harms, CABs can identify and discuss possible social harms that might emerge from the research. These harms might be unknown initially to researchers, IRBs, and sponsors (Dickert and Sugarman 2005). Also, it is important in tribal and underserved communities to establish an advisory panel to discuss the protection options and maintain this relationship throughout and even beyond the study. Woodahl et al. (2014) document a recent involvement of American Indian and Alaska Native communities to pharmacogenetics research through the formation of some community advisory groups. They hold the view that despite historical mistrust of research, the communities support the studies that allow proper tribal oversight (Woodahl et al. 2014).

Furthermore, the involvement of racial and ethnic communities in pharmacogenetics research poses specific challenges stemming from general controversies of "the science and politics of studying racial and ethnic difference" (Weijer and Miller 2004). By highlighting the need for different policies for diverse communities, Weijer and Miller (2004) call for wide-ranging discussion and reflection about defining the appropriate level of protection in pharmacogenetics context.

CABs can tailor such discussions to particular setting of a community.

Agenda setting

While discussing the merits of CABs for contextualizing informed consent procedures, Quinn (2004) challenges the predominant principalist interpretation of ethical guidelines such as the Belmont Report that tend to limit a specific study to synchronic and slice-of-time objectives. She highlights the need for integration of principalist approach with relationships paradigm so as to address both the relations between the participants and the communities and participants/communities with researchers (Quinn 2004). CABs can situate a particular study within the broad perspective of community needs and priorities. The participants can communicate their concerns and ask researchers how a particular study contributes to their priorities. This approach implicates “a broader understanding of time beyond that of a specific research study” that focuses on both before and after the research (Quinn 2004).

Moreover, one of the perceived potentials of pharmacogenetics research is that clinical drug trials could be smaller and more directed since only individuals with a specific biomarker will be enrolled, which in turn may expedite the introduction of the drugs to the market (Peterson-Iyer 2008). Though promising, it seems more necessary to conduct regular and thorough post-marketing surveillance because pharmaceutical companies would have limited available data about possible adverse effects, considering the fact that the companies cannot rely on the general population to detect the adverse effects (Peterson-Iyer 2008). Therefore, the scope of agenda setting by CABs includes both the general priorities of communities and how a particular study can commit itself to post-marketing monitoring, which apparently needs a sustained and prospective communication with research participants. In contrast, individually based informed consent cannot go beyond slice-of-time objectives and address future-oriented aims of pharmacogenetics research.

Enhancing trust and trust-enhancing procedures

Trust between researchers and participants is of great importance to ensure the right conduct of the research. It has been noted that trust, unlike informed consent, is not easily adaptable to legal procedures (Skolbekken et al. 2005). It indicates that formal informed consent procedures might not be sufficient for providing a trust-based relationship between researchers and participants. CABs can provide a workable ground for participants to examine the trustworthiness of the researchers. CABs also can provide the researchers with some practical options to create, maintain, and enhance the trust. This is of great importance when there is already a high level of communal mistrust of research (Woodahl et al. 2014).

Constructing more just schemes for benefit sharing

Genetic stratification of individuals and diseases may breed injustice through “inappropriate use of difference or through the inappropriate failure to use difference” (Smart et al. 2004). Such misuses and failures may lead to deprivation of some patients or research participants from future drug developments. Thus, there is a pressing need for including underserved or marginal communities and benefiting, either directly or indirectly, such communities when the research is conducted (Dickert and Sugarman 2005; Woodahl et al. 2014). At the policy level, it has been argued that community-based dialogue can facilitate the application of genomic knowledge to improve “the health of all” (Bonham et al. 2009). Conversely, addressing these wide-ranging concerns in individual informed consent seems very difficult and demanding since the scope of benefit sharing may not be well-defined at the time of soliciting informed consent.

Challenges of incorporating CABs into informed consent procedures

There are, however, some crucial challenges and setbacks with regard to establishing and maintaining a cooperative relationship with the communities through CABs. These challenges include both essential aspects such as the risk of undermining the importance of individual informed consent, and practical dimensions like the difficulties of establishing, incorporating, and maintaining CABs.

Overshadowing the principle of autonomy

Informed consent is the hallmark of well-debated practices of respecting the autonomy of research participants. It has been argued that the language of communities in clinical trials poses serious challenges because it might overshadow the historically powerful principle of autonomy (Holloway 2006). According to Holloway (2006), it does not mean that inclusion of underserved minorities in medical research is incorrect or unsound. Rather, she points out that any attempt to include historically underserved populations in the research should take into consideration the persistence of cultural memory of “an outside-of-group response to phenotype” (Holloway 2006). It implies that involving communities in clinical trials should not essentialize the communities as a *crowd* of people but to consider the communities as *individuals* that come together and deliberate.

Dual functions and aims of CABs

By drawing an analogy with how the researchers left out from ethical review of the research, Reddy et al. (2011) challenge

the expectation that CABs can play both roles of facilitating the research and providing oversight. Since there is always a level of risk involved in taking part in the research, CABs' role in facilitating the research might result in tension with their protective stances. Drawing on their empirical findings on integrating CABs into HIV/AIDS vaccine trials in South Africa, they argue that mixing the roles seems no longer sustainable and promising (Reddy et al. 2011). While the scope and severity of risks in AIDS research might seem more complicated, it should be noted that pharmacogenetics studies are also usually an add-on to a clinical trial, escalating the overall risks of enrolling in the research. Thus, it still seems a potential source of conflict when CABs are integrated into pharmacogenetics research.

Another source of ambiguity is as to whether the overarching aim of CABs should be community consent or community consultation. Community consent implies asking for endorsement or permission from targeted communities. By contrast, community consultation only solicits advice, suggestion, and recommendation (Dickert and Sugarman 2005). While the ultimate decision might be based on concrete realities of communities, defining the proper aim of CABs remains challenging. Particularly, choosing community consent as the aim of incorporating CABs into the research might result in tension with the participants' autonomy.

Legitimacy of CABs

Another important question concerning the function of CABs relates to defining sufficient degree of legitimacy of such advisory boards (Dickert and Sugarman 2005). As pharmacogenetics research gives rise to formation of new communities or fragmentation within existing communities, it might be very difficult for CABs to reach out to all viewpoints within the targeted population. The unlikelihood of including all the research participants in pharmacogenetics research might lead to a situation in which CABs represent perspectives of a limited number of individuals.

The danger of tokenism and window dressing

Some scholars have already noted the perils of considering community involvement with the research only with a tokenistic (Dove and Özdemir 2013) or window dressing approach (Quinn 2004). Dove and Özdemir (2013) challenge the view that by inviting the public to the research agenda, automatically more just and ethically sound pharmacogenetics research will emerge. They implicitly call for more socially organized public engagement to pharmacogenetics research. Similarly, Quinn (2004) also highlights the need for an effective will to cooperate with CABs and the importance of materializing a genuine partnership with the communities.

Challenges of membership: affiliation through genetic identification

Dynamics of establishing CABs for pharmacogenetics research is based on affiliation through genetic identification. This situation might downgrade the need for “shared social experiences” to be a legitimate member of a CAB, that is, for example, comprised of a biomarker-defined subpopulation (Bliss 2015). The lack of underlying social bonding can negatively affect the advocacy and deliberation of CABs.

Independence and conflict of interest

Establishing CABs needs sufficient financial resources for training members and organizing activities. The reliance of CABs on external funding resources might challenge the independence and transparency. The reliance of CABs on the researchers' financial support has been shown to result in frustration among CABs members (Reddy et al. 2011). It might be even more problematic in industry-sponsored research concerning conflict of interest in decisions CABs make on behalf of the communities.

Challenges of collaboration with IRBs

Involving communities in the oversight process of research can pose some challenges for standard oversight bodies such as IRBs. A focal concern is as to whether all the proposals reviewed by IRBs should also be revised by CABs (Shore et al. 2011). Furthermore, a study on public perspectives on CABs shows that the public is concerned about creating redundant and unnecessary layers of oversight that might hinder further medical research (Simon et al. 2011).

Training and education

The members of CABs should be sufficiently able to understand the scientific objectives of the study and discuss them productively. An empirical study on quality of disclosure during informed consent procedures in a pharmacogenetics study indicated a poor level of understanding (Rose et al. 2013). Developing a practical level of understanding of scientific objectives of the research is a continuous and time-consuming task. An insufficient level of understanding might negatively affect also other aspects of establishing CABs such as cooperating with IRBs and the researchers.

Scientific legitimacy of pharmacogenetics research: a different moral and regulatory landscape

Nonetheless, the development and regulation of pharmacogenetics research differ significantly from standard clinical trials.

The moral and regulatory landscape of pharmacogenetics research necessitates society's input not only on the basis of the communal turn to informed consent procedures but also based on the particularities of formulating, communicating, and discussing the scientific legitimacy of pharmacogenetics research by different stakeholders.

First, pharmacogenetics research challenges the traditional regulation of drug development by regulatory bodies. The old regulation scheme has been grounded on a public interest model in which the occurrence of adverse effects in a minority of patients could be overlooked in favor of a greater good calculation (Hogarth 2015). Pharmacogenetics changes the ethical landscape of traditional regulations, which is based on public risk-benefit assessment, by reducing the problem of relying on the general population to a technical challenge of finding subpopulations with a higher chance of efficacy or adverse effects (Hogarth 2015). These realities have changed the role of regulatory bodies such as FDA and European Medicines Agency from *guardian* or *gatekeeper* to *promoter* and *enablers* of the pharmacogenetics research (Ehmann et al. 2014; Hogarth 2015). Therefore, regulation of pharmacogenetics studies by regulatory bodies cannot be based only on standard gatekeeping approach, requiring pursuit of other complementary ways of regulation and oversight. Encouraging community input into the research seems a very promising alternative option for regulatory bodies to perform their new roles and responsibilities. Involving communities also helps regulatory systems to have better resources to address adverse effects of the drugs in the post-marketing phase.

There are also new motivations for pharmaceutical industries to solicit community input into pharmacogenetics research. The BiDil case showed that the industry needs reception from the subpopulation that might benefit from the drug. Furthermore, a considerable lack of trust in the industry may have adverse consequences for further research since many clinical trials are dependent on the sponsorship of the pharmaceutical industry (Bauchner and Fontanarosa 2013). Thus, pharmaceutical industries need trust and reception, and it affects how the scientific legitimacy of pharmacogenetics research will be configured and communicated. Establishing trust, however, unlike standard informed consent procedures cannot be translated straightforwardly into legal terms (Skolbekken et al. 2005). Further, O'Neill (2001) points out that trust cannot be achieved through constant examinations and inspection but through the secure knowledge that individuals can monitor the trajectory of the research. Involving communities, timely and efficiently, can be very promising to enhance or revive the trust in the pharmaceutical industry and guarantee the reception of the future drugs.

Thirdly, the process of pharmacogenetics knowledge production is rife with uncertainties. Hence, at present, formulating scientific legitimacy of pharmacogenetics research cannot be based on completely clear and defined grounds. Some

scholars claim that in a broad sense more and more “unknown” components find the way to the research table, calling it “mode 2” knowledge production that denotes a co-production of the knowledge by both experts and non-experts (Dove et al. 2012). Specifically, Dove and Özdemir (2013) show the relevance of such reconsideration of the role of society in knowledge production in the intersection between public health and pharmacogenomics. Moreover, some scholars also note the importance of considering pharmacogenetics as a scientific enterprise that is “deeply embedded in the values and history of the society where it is produced” (Santos et al. 2015). Therefore, the role of society in the pharmacogenetics knowledge production seems both definitive and necessary.

Revisiting the merits and challenges of CABs: more than the communal turn?

The previous section points to the particular framework in which pharmacogenetics research is carried out, funded, regulated, and embedded in the society. Different stakeholders can benefit from a timely and efficient involvement with the society in general and the patient communities in particular. Moreover, specific aspects of pharmacogenetics research necessitate a sustained and future-oriented relationship with the participants through the research and even in the post-marketing phase of developing the drugs. Involving communities with pharmacogenetics research seems, as such, more than the communal turn and can be framed within implications of new roles and postures of regulatory bodies, the industry, and society.

Considering CABs as the extension of such new stances offers new ways of resolving the challenges and expanding the possibilities. The purpose of CABs, for example, could be seen as the extension of new roles of regulatory bodies as enablers of the research. It also can solve the problem of impartiality and conflict of interest as CABs can rely on independent sources of funding. Regulatory bodies can also contribute to training and education of participants.

The implications of the unique landscape: some points to consider when relying on CABs

The unique moral and regulatory landscape of pharmacogenetics research, as such, also needs new elements of cooperation between different stakeholders to address aforesaid necessities of community input into the research. Although some challenges of establishing and incorporating CABs may remain, contextualizing the role of CABs within this broader framework of expanding pharmacogenetics knowledge might render practical ways

of overcoming the challenges. In what follows, a list of suggested points to consider will be discussed to situate community input within the unique moral and regulatory landscape of pharmacogenetics research.

Democratization of research governance

The recession of standard roles of regulatory bodies does not require the narrowing of regulations. In contrast, it mandates the spread of oversight and regulation across a wide range of stakeholders especially research participants' communities. Dove et al. (2012) formulate the concept of “wiki-governance” in order to tailor citizens input to pharmacogenetics context. One of the key features of wiki-governance is a distinct role differentiation in which each individual can choose what best suits their abilities and interests, enhancing collective competency of CABs incorporated into pharmacogenetics research (Dove et al. 2012).

Reassessing exclusivity of membership of CABs

Considering the role of CABs within the broad context of social deliberation on pharmacogenetics research, membership of CABs could be extended, at least in some cases, to outsiders who are concerned about social justice as a principle (Dove and Özdemir 2013). In doing so, the communities can welcome not only possible consumers but also citizens. It may enhance the negotiating power of, for example, disease-based CABs since they will not include only the potential end-users.

“Regulation-plus” approach: in pursuit of new schemes for benefit sharing

In a study aimed at exploring the challenges of commercialization of biobanks in Scotland, Haddow et al. (2007) put forward the idea of “regulation-plus,” arguing that additional scrutiny and oversight can be added to standard oversight procedures. They refer to the formation of The Generation Scotland Advisory Board alongside Ethics and Governance Council that officially governs UK Biobank. It implicates that in case of commercialization of the genetic research, the communities can have a say about benefit-sharing schemes (Haddow et al. 2007). They suggest that such innovative benefit sharing arrangements can address the shifting social landscape of genetic research (Haddow et al. 2007).

Expanding network of communities

The case of ivacaftor points toward the possible fragmentation of existing communities in light of pharmacogenetics research. CABs, once initially constructed on the basis of a general ground, should be ready to accommodate further fragmentations. There are also possible overlaps between different

communities. An expanded network of, overlapped and fragmented, communities can facilitate the deliberation on different layers and loci.

Membership of CABs as a type of social activism

It has been noted that the ethics in CBPR is different from that of standard oversight procedures. CBPR implicates a more dynamic, fluid, and iterative ethical discussion that opens the debate to more diverse viewpoints (Mikesell et al. 2013). This space provides a workable ground to influence the trajectory of research in line with background social movements, for example, advocacy for rare diseases or underserved communities. As mentioned above, so-called mode 2 knowledge production and the importance of societal embeddedness of pharmacogenetics research need the active input from lay citizens and non-experts to extend the scope of public deliberation and dialogue (Dove et al. 2012). Grounding CABs on existing social forces might be a source of social bonding that, as mentioned earlier, is a possible drawback of such advisory bodies in pharmacogenetics context.

Working on the basis of existing initiatives or organizations

CABs can be defined, activated, or developed as the extension of existing schemes to systemically invite patients and research participants into the pharmacogenetics research agenda. For example, new precision medicine initiative in the USA aims to invite one million Americans to volunteer for a ground-breaking genetics project. The initiative allows participants to be involved in the design and oversight of the research (Terry 2015). Though pharmaceutical industries do not directly fund the research, the results can be used for further industry-sponsored studies in future. Thus, CABs can be (re)constructed in extension of the initiative and sustain their deliberation prospectively. Also, Genetics Alliance, a coalition of more than 600 patient advocacy groups (Terry et al. 2007) can be another example of how CABs can be created in extension of existing advocacy organizations. Again, the initial CAB can also monitor and deliberate prospectively while a commercial incentive for using the research results is operationalized.

Moreover, the necessity of involving patients and research participants directly in the process of drug development has also been the focus of some recent initiatives by regulatory bodies and patient advocacy groups. The US federal government has introduced some new schemes of cooperation with pharmaceutical industries for organizing patient input into the process of decision-making, for instance, the Patient-Centered Outcomes Research Institute (PCORI), the Patient-Focused Drug Development initiative affiliated with the FDA, and Patient Preference Initiative (Anderson and McCleary 2015).

Likewise, European Patients' Academy on Therapeutic Innovation (EUPATI) has developed a series of training for the patients in order to enhance their competency to be actively involved in the research processes (Chakradhar 2015).

Discussion and conclusion

Individually based informed consent procedures in post-genomics era seem to lose their relevance and adequacy. The communal turn to the oversight of genetic research attempts to render a framework for addressing and incorporating concerns and rights of both individuals and communities. CABs as the exemplar of the communal turn are characterized by seeking organized and active involvement of communities with the research.

Incorporating CABs into pharmacogenetics research provides some possibilities for empowering individuals' informed consent. It can extend the scope of protection, allow the communities to contribute to governance procedures, define the communities' needs and priorities, enhance the trust, and facilitate more just schemes of benefit-sharing. On the other hand, there are also some significant challenges that can limit the scope and outcome of cooperation with CABs. They include uncertainties about the purpose of CABs, the challenges of representativeness and legitimate decision-making, the perils of window dressing and tokenism, lack of powerful social bonding, financial dependency, the challenges of cooperating with IRBs, and lack of sufficient training and competency.

However, the unique landscape of pharmacogenetics research needs community input not only as the communal turn but also for addressing particularities of formulating, communicating, and discussing the scientific legitimacy of pharmacogenetics studies. Some of the major regulatory bodies have changed their traditional gatekeeping role to *enablers* of pharmacogenetics research. The BiDil case showed that the pharmaceutical industry needs to draw reception and trust from the drug target subpopulation even before the marketing phase. This requirement impacts how the industry formulates and communicates the scientific legitimacy of the research to communities. Furthermore, with the increasing level of "unknown" components in the objectives of pharmacogenetics research, the environment of knowledge production is shifting toward co-construction of the knowledge with the society. These realities define the specific framework in which pharmacogenetics research is conducted, funded, regulated, and embedded in the society.

Situating CABs within the unique context of pharmacogenetics research can illuminate new ways of resolving the challenges and/or expanding the possibilities. Some points to consider have been listed to suggest how existing or future CABs can be promoted and expanded in order to address the relevant stakeholders more directly: (i) With the new stances

of regulatory bodies toward pharmacogenetics research, alternative and complementary ways of oversight and governance could be sought. CABs can contribute to the process of democratization of the regulations. (ii) CABs can welcome outsiders who are concerned about social justice as a principle. (iii) New approaches to benefit-sharing, such as "regulation-plus," can be sought to accommodate shifting social stances. (iv) CABs should acknowledge possible fragmentations and overlaps with other communities and facilitate the deliberation on different layers and loci. (v) CABs can be seen as a type of social activism to influence the current state of affairs in line with existing or new quests for social justice, and (vi) CABs can be defined, activated, or developed as the extension of existing schemes for inviting the public in general, and patients in particular, into the research and drug development processes.

While the focus of this study was on CABs, it should be emphasized that community input into pharmacogenetics research can be shaped in many other ways too. Nonetheless, the current research tried to show the general moral and regulatory landscape of pharmacogenetics knowledge production and how community input into the research seems definitive and necessary within and beyond the communal turn to informed consent procedures. More empirical research, however, is needed to define the specific possibilities and challenges of incorporating CABs into industry-sponsored pharmacogenetics research in the future.

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Compliance with ethical standards

Competing interests The authors declare that they have no conflict of interest.

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