Cell Stem Cell
Forum

Hopes and Fears for Professional Movement in the Stem Cell Community

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http://dx.doi.org/10.1016/j.stem.2013.04.016

We examine here how the issue of professional migration in stem cell research has been explored in news media, government documents, and the peer-reviewed literature. The results shed light on how patterns of and forces that motivate these movements are depicted and highlight issues of significance to the stem cell community.

Introduction

The professional movement of researchers within and across geographic borders has become a significant ethical, legal, and social issue (ELSI) in the domain of stem cell research and an issue of great importance to nations belonging to the Organization for Economic Co-operation and Development (OECD), a group devoted to promoting the economic and social well-being of people around the world (Mahroum, 2005). However, it is widely recognized that the policy guidance intended to address these trends—alongside the challenges of stem cell research itself—is inconsistent and for the most part, has not been harmonized. Among the noteworthy consequences of researcher movement is the steep learning curve for new arrivals and a dearth of resources around norms, procedures, and policies of the home country that can impede the practice of ethical research. Research conducted with members of the Canadian Stem Cell Network, for example, revealed that most ethics training, outside of their required online certification, is inconsistent and informal for its members and is largely left to the responsibility of individual principal investigators (Longstaff et al., 2009).

Scholars, policy-makers, and others have speculated that the professional migration of stem cell researchers is primarily motivated by the promise of new funding opportunities (Russo, 2005) and the increased scientific freedoms associated with permissive regulatory environments. For this reason, countries such as China, Singapore, and South Korea have attempted to attract high-caliber international researchers through massive investments in science and technology and new clinical treatment possibilities (Salter et al., 2006). Nevertheless, regulatory environments and available funding are only two of the critical factors that likely influence the international mobility of stem cell researchers; others include political interference, family linkages, and cultural, religious, and language issues.

Little empirical evidence has been collected, however, about the actual causes and consequences of these movements to date. Notable exceptions include the work conducted by Levine (2012) on the factors influencing the geographic preferences of American stem cell researchers. In this paper, we examine how the issue of what is often called "brain drain" has been explored in three literatures—news media, government reports, and published academic articles. The results of the analysis shed light on how patterns of and forces that motivate professional movement are depicted and highlight issues of significance to the stem cell community.

Methods

Sample Selection

We conducted a review of articles in three domains of literature: peer-reviewed and published academic articles, government reports, and online news media. Following the method of Racine (2010), we applied the key search terms {brain drain} and {stem cell} to LexisNexis, PubMed, Canada.gov, the UK Hansard Archive, and Google Scholar databases. The window of interest was set at January 2001 to March 2012, time locked to the year of the 2001 ban on funding of human embryonic stem cell research imposed by President George Bush in the USA and 10 years hence. We conducted content analysis of all documents after manually screening and eliminating duplications and irrelevant returns and identified the subsample of papers from each domain that fulfilled all of the following criteria: (1) addresses specifically the theme of brain drain; (2) explains the causes of brain drain relevant to stem cell research; (3) explains the consequences of brain drain relevant to stem cell research; and (4) provides a clear context in which brain drain is discussed. We used the resulting sample of approximately 33% of the larger set for in-depth analysis.

Coding and Analysis

We applied the method of gap analysis (Van Hecke et al. 2008) to each document to determine the presence and absence of thematic content. This method has been employed widely in a range of disciplinary fields and is especially useful when applied to heterogeneous documents. The first step in the method is the organizational compilation of emergent themes across all documents. The themes, identified independently by two trained coders and then combined into one master consensus list, are then coded for whether they appear in individual documents in substantial way (coded as an "S"), are mentioned only briefly (coded as a "B"), or not mentioned at all (coded as an "X"). The resulting data are reported in the form of descriptive statistics as percentages across each document domain. Quantitative comparisons are not suitable since the independence of the data cannot be established.

Table 1. Gap Analysis Combined Results of Representative Articles from Each Document Domain

Themes	Media (n = 65)			Gov't (n = 10)			Academic (n = 10)		
Causes	S	B	X	S	B	X	S	B	X
Regulatory and policy factors that influence brain drain of stem cell researchers (e.g., restrictive policy, access to visas, and immigration issues; also includes references to California Prop. 71).	72	9	18	90	10	0	80	20	0
Influence of funding opportunities on brain drain (e.g., restrictive funding for embryonic and cloning research), priority setting through funding, need for continuity in funding so scientists can develop research roots, funding from industry, and competitive salaries.	78	8	14	100	0	0	100	0	0
Translational pressures and commercialization.	11	11	78	20	0	80	20	10	70
Impact of infrastructure on the quality and efficiency of research and on collaboration.	8	12	80	30	10	60	40	30	30
Cultural and social factors that influence brain drain (e.g., limits to scientific freedom, family ties, language barriers, and social supports such as child care or maternity leave).	3	3	94	40	10	50	40	10	50
Ethical dimensions of brain drain (e.g., scientific integrity, exaggerated claims, misunderstanding of ethical norms, and undesirable ethical norms in human and/or animal research).	2	2	97	0	10	90	30	0	70
Responses									
Legal and regulatory diversity across nations regarding professional movement; stated need for a political strategy to address brain drain.	7	9	83	60	10	30	30	20	50
Attraction, retention, and promotion of scientists to achieve world class status.	15	15	69	50	10	40	30	30	40
Public involvement and views on brain drain.	0	0	100	0	20	80	0	0	100
Research on brain drain (e.g., patterns of migration, nature and contextualization of debates, and evaluation of the success of policies intended to address brain drain).	2	0	98	10	20	70	0	10	90
Educational efforts to address brain drain (e.g., train more high quality scientists in home country), cost of educating students, and cross-sector (academic-industry) movement of trainees.	0	6	94	80	10	10	40	0	60
Importance of international collaboration and multidisciplinary collaboration.	8	9	83	80	0	20	50	0	50
Brain drain as a positive phenomenon and benefits of knowledge diffusion and professional linkages.	9	0	91	40	10	50	10	10	80

The master list of 13 emergent themes is shown in the first column. Numbers are percentages (%) of articles within each document domain that correspond with each code. If the theme was not mentioned either briefly or substantially in at least 60% of the articles, then it was coded as a gap ("X").

Results

Our searches returned a total of 198 relevant news media articles, 30 government reports, and 24 academic articles from the period of interest, of which 65 media articles, 10 government reports, and 10 academic articles met our criteria for inclusion and analysis.

Table 1 presents the results of the gap analysis. We find that media focuses substantially on the ways in which regulatory (S = 72%) and funding opportunities (S = 78%) influence professional movement. In the media documents, 15% further focused in a substantial way on the desire of the nation, state, or province in question to retain or gain a world class status in stem cell research, while 11% focused on issues related to translational pressures and commercialization. The news media articles also tended to portray brain drain negatively, with only 9% describing it as a positive phenomenon.

Government articles also placed a significant emphasis on the ways on which funding (S = 100%) and regulatory factors (S = 90%) shape professional migration, including the patchwork nature of these policies at the national or international scale (S = 60%). However, 80% of these documents also substantially discussed educational efforts to address brain-drain-related issues such as the movement of trainees and the need to train more high-quality scientists in their home country. In addition, government reports tended to view brain gain as a positive phenomenon (S = 40%) that should be actively encouraged through efforts that foster collaborations across countries, industry, and international researchers (S = 80%). Perhaps because government articles tend to present brain drain as a positive activity that can benefit the home country, more government articles also suggested that there is a need for public involvement (B = 20%) and more research into the topic of brain drain (S = 10% and B = 20%) when compared to the sample of news media and academic articles. Government reports were the most comprehensive overall, with the fewest gaps overall.

Although the academic peer-reviewed articles also focus on issues related to regulatory (S = 80%) and funding opportunities (S = 100%), many also discuss the ways in which quality research infrastructure can influence brain drain either substantially (40%) or briefly (30%) and about 20% represent brain drain as a positive phenomenon (S = 10% and B = 10%). Approximately 30% of the academic papers also discussed the ethical dimensions of brain drain either substantially or briefly compared to 4% of the media articles and 10% of the government articles. Academic and government articles

discussed the cultural and social factors that influence brain drain equally.

Discussion and Conclusions

In this analysis of the representation of brain drain in media, government, and academic literatures and gap analysis for thematic content, we find significant perspectives and strategies for the stem cell community to consider. Taking the 10 year analysis window into consideration, we observe that government articles tend to view the issue of brain drain as a natural and even desirable professional pattern that has the potential to benefit individual countries as well as the international stem cell community as a whole. The data for the peer reviewed literature are similar. Media articles by contrast—the material most likely to be viewed by citizens—present the issue of brain drain as a negative phenomenon that should be curtailed. In addition, our analysis reveals an array of minor themes that likely influence the migration of stem cell researchers. These include educational efforts to address the migration of professional researchers and the importance of international collaborations. We also note that the ethical dimensions of brain drain theme were largely, if not entirely, absent from the literatures reviewed for this study.

The data sets here are limited both by the time period that they cover and their number. They may also be limited by the relatively pejorative search term "brain drain" but, as the more positive term brain gain (for example) is collected under the familiar brain drain term, we captured the majority of both connotations in this review. Nonetheless, additional empirical evidence is clearly needed to determine the actual significance of any of these issues to individual researchers in different nations and to compare in detail the ways in which governments that differentially experience outflow and inflow of researchers view the issues.

We conclude by highlighting that all three literatures underscore the importance of public policy and funding influences on the migration patterns of professional researchers. If any regulatory, educational, or other efforts are to be successful in supporting healthy professional movement of stem cell scientists, public support is essential. Evidence-based and balanced press reporting on this topic—whether through traditional print media or new social media formats—is one response to achieve this goal. The deliberate engagement of researchers with citizens and policy-makers (Dresser, 2010) is another, and will produce consensus that is derived democratically, reflects the diversity of citizen values, and further promotes realistic understandings of stem cell science (Trounson and Harvey, 2008).

ACKNOWLEDGMENTS

This work was supported by grants from the Stem Cell Network and further enabled by funding from the Canadian Institutes of Health Research, the Canadian Foundation for Innovation, and the British Columbia Knowledge Development Fund. We thank Sunita Barker and the members of the National Core for Neuroethics for their interest and contributions throughout the evolution of this project. J.I. is the Canada Research Chair in Neuroethics.

WEB RESOURCES

The URL for data presented herein is as follows:

OECD (2008). The Global Competition for Talent: Mobility of the Highly Skilled. Retrieved on March 17, 2013: http://www.oecd.org/innovation/inno/theglobalcompetitionfortalentmobilityofthehighlyskilled.htm

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