



A comparative analysis of the participation and knowledge gained by clinicians and researchers in a web based learning program on regenerative medicine

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ABSTRACT

Objective: The Training Programme in Regenerative Medicine (TPRM) is a web-based learning program on Regenerative Medicine (RM) live telecasted from the University of Toronto, Canada to Nichi-In Centre for Regenerative Medicine (NCRM), India through a partnership agreement. This manuscript analyses the participation of clinicians and basic researchers in this programme and their knowledge gained. **Methods:** Scholars' participation and scores gained in the three assignments during the course for three consecutive batches from 2008-09, 2009-10 and 2010-11 were analyzed. **Results:** The results showed that the participation of clinicians was high compared to basic science researchers. When the average scores obtained by each individual scholar was calculated and then analysed over three years, it was observed that clinicians scored statistically significant higher marks than the basic science researchers (p value = 0.0029). There was no significant difference in the scores between graduates and doctorates. **Conclusion:** Thus this analysis based on the scores suggests that clinicians have relatively higher exposure and interest in the field of RM compared to basic science researchers in India. Designing courses so as to provide equal exposure to clinicians and scientists will help to bridge the gap which will in turn lead to better bench to bedside translation of RM technologies.

KEY WORDS: Regenerative Medicine, Online education, Clinicians Vs Basic science researchers

INTRODUCTION

A two way informed interaction between basic scientists and clinicians is critical for successful bench to bedside translation of technologies [1]. Several studies have highlighted the existing barriers between the basic science researchers and clinicians [2]. This holds good especially in regenerative medicine (RM) which is an interdependent science where various techniques are combined to regenerate organs or tissues by repairing and replacing diseased organs or tissues and cross-disciplinary collaborative efforts have been suggested to be advantageous in this field [3]. In this background, a training programme on regenerative medicine (TPRM) is conducted

by a network of Universities in Canada funded through a national grant from the Canadian Institute of Health Research (CIHR). The main objective of this course is to educate researchers and clinicians on the various aspects of RM including organ failure, transplantation, stem cell therapy, tissue engineering, and gene therapy and to create a platform to encourage trainees to work together to find novel solutions to treat organ failure and to initiate RM as a hope for the future.

Transnational education is viewed as an integral part of higher education especially in medicine to equip the professionals with the competence to practice in a globalized world [4]. In this context the TPRM as a

trans-national initiative is web-casted every year to an institute in India carrying out research, training and clinical applications-protocol development in RM. The program has been webcasted since 2008 and in this article, we have presented the analysis on the participation of clinicians and researchers in this course from India from 2008-2011, their grades and implications of an online course in bridging the gap between the clinicians and the researchers from two independent nations.

MATERIALS AND METHODS:

The TPRM programme was conducted from the month of September to May every year while the course announcements were given in July. The course in India was open to basic science researchers and clinicians who have completed at least an undergraduate degree in biological sciences, medicine, dentistry, veterinary and their allied fields. The lectures were telecasted once in a week in the evenings for a minimum of two hours and classes were mostly scheduled on Thursdays. The lectures were webcasted live from Toronto to the institute in India. The scholars who enroll must attend the webcast lectures at the Institute where they were telecasted. The webcasting mandated the availability of only the following basic technologies at the institute in India for the scholars to take the course: Adobe Flash Player, high-speed broadband internet connection, a modern web browser such as IE7/8, Firefox 2+, Chrome 1+, or Safari 3+, Microsoft PowerPoint 2003+ and a daily access to email. In order to validate the program outcome, there were tests and assignments which were given online and a time of two weeks was given for the scholars to submit their essays and answers. Nearly 26 lectures were conducted each year and the lectures were presented by individuals who had an expertise in the field of RM using power point presentation.

The course structure was divided into four parts

1. Organ Failure
2. Innovative technologies
3. Clinical Applications
4. Ethics and society

There were two assignments and one take-home midterm examination during the course every year. The take-home mid-term exam was considered as the second assignment for analytical purposes in this article. The answers were analyzed using the 'Turnitin' plagiarism program to ensure the academic integrity of the scholars followed by evaluation of the answers by experts.

RESULTS

The data on participation of clinicians and basic science researchers in the three batches of TPRM is given in Table 1.

Table 1. Number of clinicians and basic science researchers who participated in the TPRM from 2008-11

Year	Clinicians		Basic Science Researchers	
	Doctorates	Graduates	Doctorates	Graduates
2008 - 09	2	3	1	4
2009 - 10		4	1	4
2010 - 11	1	6		3

During the first year, the number of clinicians and scientists who participated was equal. In the second year, there were more basic science researchers compared to clinicians while in the third year the number of clinicians significantly increased compared to the basic science researchers. The Figure 1 depicts the comparison of the average scores between clinicians and basic science researchers in the three assignments during the TPRM for the batches 2008-09, 2009-10, 2010-11. When analysed year wise, the difference in the scores between the clinicians and basic science researchers was not evident, as the sample size was small for each year. Nevertheless, the difference was statistically significant for one assignment in each year (III assignment in the 2008-09 batch, II assignment in the 2009-10 batch and the I assignment in the 2010-11 respectively) with clinicians scoring higher marks than basic science researchers in these assignments. When the average (of the three assignments) for each scholar was calculated and the difference between the clinicians and the basic scientists was analysed over the three years by Unpaired t test, it was observed that clinicians scored statistically significant higher marks than the basic science researchers (p value = 0.0029; Difference in the mean = 7.5).

However there was not any statistically significant difference between graduates and doctorates in the scores (Figure 2) (Mean = 77.42 (SD=6.94) of the scores of the graduates Vs Mean = 78.72 (SD= 8.45) of the scores of the doctorates).

DISCUSSION

Delivering knowledge by a direct learning environment was the norm in the earlier decades. However a web based learning environment is presently very popular and its use as a learning tool is growing quickly. Benefits include improving students' independence during data collection, supporting self-directed learning and helping to stimulate higher order thinking [5, 6]. Though in TPRM, the web based classes lacked direct contact of the scholars with the lecturers, there was an interacting section through online chat, where the scholars can ask questions. Basic Information technology (IT) tools such as a computer and the availability of an internet connection has helped in the dissemination of critical and current knowledge on Regenerative Medicine via TPRM from the leaders in the field of RM from a nation where stem cells were first discovered, Canada [7, 8] to a developing nation like India where healthcare delivery is most needed owing to the large population and increased prevalence of diseases.

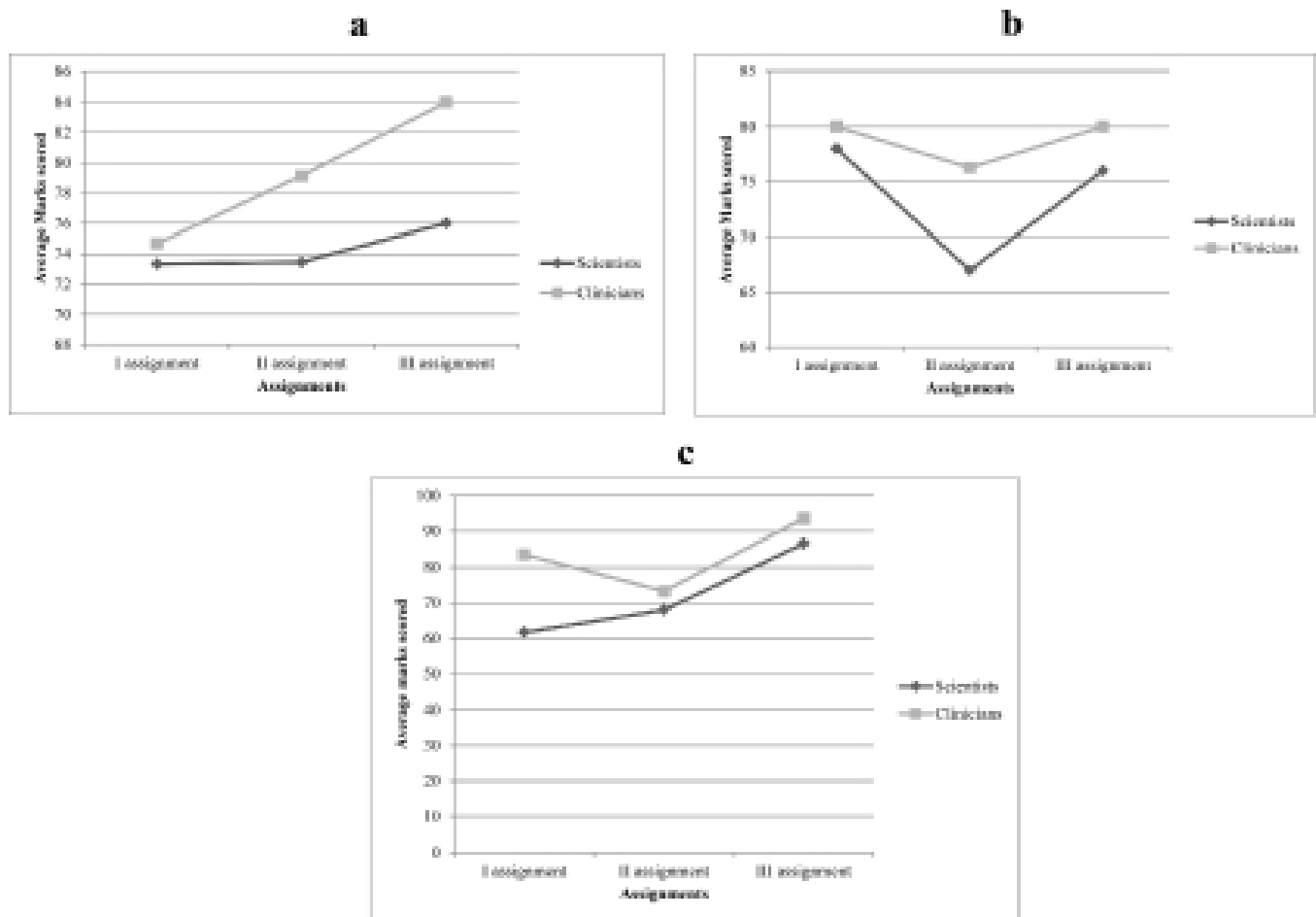


Figure 1: a. Comparison of the average scores between clinicians and basic science researchers of the TPRM batch 2008-09; b. Comparison of the average scores between clinicians and basic science researchers of the TPRM batch 2009-10; c. Comparison of the average scores between clinicians and basic science researchers of the TPRM batch 2010-11.

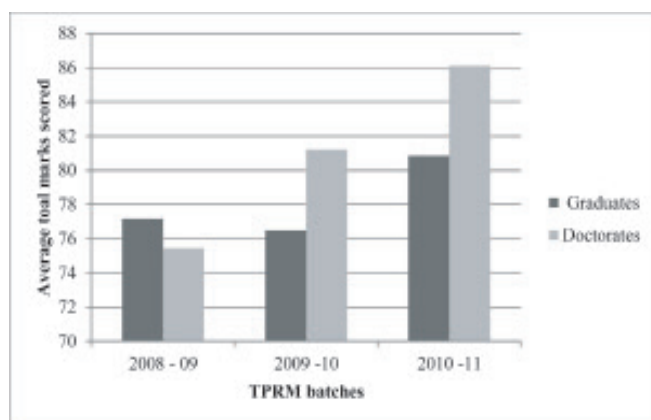


Figure 2: Comparison of the average scores between graduates and doctorates of the three TPRM batches 2008-09, 2009-10 and 2010-11.

A critical need to develop multi-Institutional, multi-disciplinary model to teach translational research was put forth by Estape *et al* [9]. Further Harden emphasizes the need for transnational education programs for exemplifying medical education in a global context as that would be the ideal path to undertake in the present day globalized world

[4]. There are other web based training programs throughout the world [10,11,12] but this program has been unique that it has utilized the potential of internet technology to connect scholars from two independent nations thus helping in trans-border research and knowledge dissemination in the field of RM in which such courses are rare. Also it is one of its kinds which connected clinicians and basic science researchers who got to interact with one another when they attended the webcast lectures at a common place, as for the basic science researchers participating in the programme are benefited by interacting with the physicians while for the clinicians, their research knowledge and publication principles are improved. Moreover this culture of providing training programme for both clinicians and scientist gives an opportunity to build bridges because according to Restifo & Phelan [13] and Rigby [14], there is still a wide and persistent gap between basic science researchers and clinicians. The article by Kong & Segre [15] also suggests that there is a large gap between clinicians and basic science researchers wherein they state that “it is difficult for ‘scientists to identify ways to work with clinicians and for clinicians without a laboratory to find a basic researcher to co investigate a clinical question’. It was further suggested that translational research can only

be enhanced with proper open minded communication and collaboration between basic researchers and clinicians [15]. According to this study, we could learn that the web based training programme was more focused and helpful for clinicians compared to basic science researchers which makes us suggest that the course can include more topics to make it more relevant to the basic science researchers as well. The participation data and the marks scored seem to suggest that clinicians are more attracted towards the field of RM which might be due to their increased exposure to the field compared to basic science researchers and these clinicians might be more interested in the potential for translation of therapies to patients. It should be noted that the course was designed that it had more relevance to clinical medicine rather than to basic sciences. This warrants further analysis to change the course syllabus so as to improve exposure to the basic science researchers. Improving exposure to basic science researchers is essential to make them produce clinically useful knowledge [1].

The non statistically significant differences between graduates and doctorates in terms of average scores implies that although a doctoral degree might enhance knowledge on a particular subject, when considered in terms of a vast field such as RM does so only to a limited extent.

The limitations of the study include the fact that it lacked enough participants to add more significance to the results. The study was done on participants of the course over three consecutive batches from 2008-11 making it a preliminary analysis warranting further elaborate analysis on more participants in the future. Another limitation is the difference in number of participants in each group: Basic science researchers and Clinicians. Though we tried to include equal number of participants from basic science researchers and clinicians in each year, clinicians were relatively more interested to join the course which led to the differences in the number of participants in each group. The TPRM programme itself was more focused and helpful for clinicians compared to basic science researchers as pointed earlier. Also a question may arise in the mind of the reader as to why there was no comprehensive final examination undertaken by the scholars. In this regard, it is to be noted that there was a final examination in the form of a presentation in a Regenerative Medicine Symposium in Toronto, Canada in the April of every year of the TPRM which was for the scholars who attended the regular curriculum at the Universities in Canada. This presentation could be viewed by the scholars who attended the course via online mode but their participation in the seminar was a voluntary one and was not included for assessment. Hence for the scholars who attended via online mode, only the three assignments including the mid-term examination was used for the assessment. In spite of these limiting factors, this analysis is valuable as it points to several needed changes needed such as the modifications in the course syllabus to improve exposure to the basic science researchers and

also proves that a trans-national course in a dynamic field like RM can actually contribute to knowledge growth in developing nations where medical advancements are most needed. Further the analysis made in this paper includes data obtained from the TPRM scholars who attended the course via online only and such analysis when conducted in scholars who attended the regular curriculum at the Universities in Canada might throw further light into issues like bridging clinicians and basic science researchers, the exposure levels of scholars in a developing nation compared to a developed nation and the use of online teaching in RM which will help to shape courses in RM according to the need of the day.

The TPRM is a unique course which has helped to connect scientists and clinicians. The course can be further enhanced to include more scope for basic scientists thus helping to bridge the gap from benchside to bedside. More analysis like this have to be conducted in the world, to develop new courses like the TPRM to improvise trans-national research in the growing field of regenerative Medicine which will help in the progress of medicine as a whole.

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CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

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