HEALTHCARE

POLICY

Politiques de Santé

Health Services, Management and Policy Research
Services de santé, gestion et recherche de politique

Volume 15 • Special Issue

Training for Impact: Modernizing Health Services and Policy Research Training

Une formation qui a de l'impact : modernisation de la formation en recherche sur les politiques et les services de santé

A LONGWOODS PUBLICATION Fonds WWW.HEALTHCAREPOLICY.NET

HEALTHCARE QUARTERLY: Best practices, policy and innovations in the administration of healthcare. For administrators, academics, insurers, suppliers and policy leaders. *Edited by* Dr. G. Ross Baker, University of Toronto, Toronto ✦ CANADIAN JOURNAL OF NURSING LEADERSHIP: Covering politics, policy, theory and innovations that contribute to leadership in nursing administration, practice, teaching and research. Peer reviewed. *Edited by* Dr. Lynn Nagle, University of New Brunswick, Fredericton. ✦ HEALTHCARE PAPERS: Review of new models in healthcare. Bridging the gap between the world of academia and the world of healthcare management and policy. Authors explore the potential of new ideas. *Edited by* Prof. Adalsteinn Brown, University of Toronto, Toronto. HEALTHCARE POLICY: Healthcare policy research and translation. Peer reviewed. For health system managers, practitioners, politicians and their administrators, and educators and academics. Authors come from a broad range of disciplines including social sciences, humanities, ethics, law, management sciences and knowledge translation. *Edited by* Dr. Jennifer Zelmer, Adjunct Faculty, University of Victoria, Victoria. ✦ ELECTRONIC HEALTHCARE: Best practices, policy and innovations exploring e-models, e-practices and e-products for e-health. For administrators, academics, insurers, suppliers and policy pundits. ✦ LAW & GOVERNANCE: Within the framework of the law and the role of governance providing policies, programs, practices and opinions for the providers, administrators and insurers of healthcare services. ✦ HRRESOURCES: Cases, commentary and policy reviews for healthcare clinicians, human resources managers and the policy leaders, insurers, academics, administrators, boards and advisors of all healthcare organizations. ✦ LONGWOODS.COM: Enabling excellence in healthcare. Providing electronic access to news, information, career opportunities, conference schedules, research, case studies, policy reviews and commentary that cover politics, policy, theory, best practices and innovations in healthcare.

Longwoods Publishing | *Enabling Excellence*

HEALTHCARE
POLICY
Politiques de Santé

Health Services, Management and Policy Research
Services de santé, gestion et recherche de politique

VOLUME 15 SPECIAL ISSUE • OCTOBER 2019

Healthcare Policy/Politiques de Santé seeks to bridge the worlds of research and decision-making by presenting research, analysis and information that speak to both audiences. Accordingly, our manuscript review and editorial processes include researchers and decision-makers.

We publish original scholarly and research papers that support health policy development and decision-making in spheres ranging from governance, organization and service delivery to financing, funding and resource allocation. The journal welcomes submissions from researchers across a broad spectrum of disciplines in health sciences, social sciences, management and the humanities and from interdisciplinary research teams. We encourage submissions from decision-makers or researcher–decision-maker collaborations that address knowledge application and exchange.

While *Healthcare Policy/Politiques de Santé* encourages submissions that are theoretically grounded and methodologically innovative, we emphasize applied research rather than theoretical work and methods development. The journal maintains a distinctly Canadian flavour by focusing on Canadian health services and policy issues. We also publish research and analysis involving international comparisons or set in other jurisdictions that are relevant to the Canadian context.

—

Politiques de Santé/Healthcare Policy cherche à rapprocher le monde de la recherche et celui des décideurs en présentant des travaux de recherche, des analyses et des renseignements qui s'adressent aux deux auditoires. Ainsi donc, nos processus rédactionnel et d'examen des manuscrits font intervenir à la fois des chercheurs et des décideurs.

Nous publions des articles savants et des rapports de recherche qui appuient l'élaboration de politiques et le processus décisionnel dans le domaine de la santé et qui abordent des aspects aussi variés que la gouvernance, l'organisation et la prestation des services, le financement et la répartition des ressources. La revue accueille favorablement les articles rédigés par des chercheurs provenant d'un large éventail de disciplines dans les sciences de la santé, les sciences sociales et la gestion, et par des équipes de recherche interdisciplinaires. Nous invitons également les décideurs ou les membres d'équipes formées de chercheurs et de décideurs à nous envoyer des articles qui traitent de l'échange et de l'application des connaissances.

Bien que *Politiques de Santé/Healthcare Policy* encourage l'envoi d'articles ayant un solide fondement théorique et innovateurs sur le plan méthodologique, nous privilégions la recherche appliquée plutôt que les travaux théoriques et l'élaboration de méthodes. La revue veut maintenir une saveur distinctement canadienne en mettant l'accent sur les questions liées aux services et aux politiques de santé au Canada. Nous publions aussi des travaux de recherche et des analyses présentant des comparaisons internationales qui sont pertinentes pour le contexte canadien.

CONTENTS

TABLE DES MATIÈRES

HEALTHCARE
POLICY
Politiques de Santé

HOW TO REACH THE EDITORS AND PUBLISHER
Telephone: 416-864-9667; fax: 416-368-4443

ADDRESSES
All mail should go to: Longwoods Publishing Corporation, 260 Adelaide Street East, No. 8, Toronto, Ontario M5A 1N1, Canada.

For deliveries to our studio: 54 Berkeley St., Suite 305, Toronto, Ontario M5A 2W4, Canada.

SUBSCRIPTIONS
Individual subscription rates for one year are [C] $123 for online only and [C] $204 for print + online. Institutional subscription rates are [C] $535 for online only and [C] $729 for print + online. For subscriptions contact Barbara Marshall at telephone 416-864-9667, ext. 100 or by e-mail at bmarshall@longwoods.com.

Subscriptions must be paid in advance. An additional tax (GST/HST) is payable on all Canadian transactions. Rates outside of Canada are in US dollars. Our GST/HST number is R138513668.

SUBSCRIBE ONLINE
Go to www.healthcarepolicy.net and click on "Subscribe."

REPRINTS
Reprints can be ordered in lots of 100 or more. For reprint information call Barbara Marshall at 416-864-9667 or fax 416-368-4443 or e-mail to bmarshall@longwoods.com.

Return undeliverable Canadian addresses to: Circulation Department, Longwoods Publishing Corporation, 260 Adelaide Street East, No. 8, Toronto, Ontario M5A 1N1, Canada.

EDITORIAL
To submit material or talk to our editors please contact Ania Bogacka by e-mail at abogacka@longwoods.com. Author guidelines are available online at longwoods.com/pages/hpl-for-authors.

ADVERTISING
For advertising rates and inquiries, please contact Matthew Hart at 416-864-9667, ext. 113 or by e-mail at mhart@longwoods.com.

PUBLISHING
To discuss supplements or other publishing issues contact Rebecca Hart at 416-864-9667, ext. 114 or by e-mail at rhart@longwoods.com.

Healthcare Policy/Politiques de Santé is published four times per year by Longwoods Publishing Corp., 260 Adelaide St. East, No. 8, Toronto, ON M5A 1N1, Canada. Manuscripts are reviewed by the editors and a panel of peers appointed by the editors. Information contained in this publication has been compiled from sources believed to be reliable. While every effort has been made to ensure accuracy and completeness, these are not guaranteed. The views and opinions expressed are those of the individual contributors and do not necessarily represent an official opinion of *Healthcare Policy* or Longwoods Publishing Corporation. Readers are urged to consult their professional advisors prior to acting on the basis of material in this journal.

Healthcare Policy/Politiques de Santé is indexed in the following: PubMed/Medline, CINAHL, CSA (Cambridge), Ulrich's, Embase, IndexCopernicus, Scopus, ProQuest, EBSCO Discovery Service, is archived in PubMed Central, and is a partner of HINARI.

No liability for this journal's content shall be incurred by Longwoods Publishing Corporation, the editors, the editorial advisory board or any contributors.

ISSN No. 1715-6572
eISSN No. 1715-6580

Publications Mail Agreement No. 40069375

EDITORIAL

A Flight Simulator for Careers in Health Services and Policy Research

If you always do what you've always done, you'll always get what you have always gotten. This is true for most things in life; it is true, too, for health services and policy research graduate training. The case for modernization of training programs is strong if you track the career outcomes for graduates, as has been done for 20 years and is described in this issue.

Simply put, the market has changed, but the training programs have not adapted sufficiently and are largely preparing health services and policy research graduates for tenured faculty positions, which is only one of many career paths. With about one in five graduates on this tenure-track trajectory, what about the other 80% in healthcare delivery, healthcare delivery research and the public, private and not-for-profit sectors? It is apparent that the knowledge and skills for these career trajectories have to come from experience in real-world settings, dealing with real-world issues. This cannot be passive learning but is active and experiential learning, which is an ancient concept traceable to Aristotle: learn by doing. Consider professional training, such as medicine, nursing and accounting, and ask if you would want professional services from graduates if they had never treated a patient or offered client services as part of their training. Why would being a highly qualified participant in health services and policy be any different?

The papers in this issue arose from recognizing this need for training modernization and not doing what we have always done but, rather, achieving something different by training differently. The Health System Impact (HSI) Fellowship results in a new type of graduate with skills, practical experience and relationships to participate in and enable evidence-informed health system improvement. HSI Fellowships will become the qualified leaders of the system that we are trying to create. This training program is a unique and safe opportunity to experience and to learn, analogous to a flight simulator for a career in health services and policy research.

At the same time this program is evolving, the advancement of learning health systems in Canada is becoming a reality. The convergence of this training program and a shifting culture toward learning health systems augurs well for Canada's changing and challenging health system of the future. Graduates of these programs will be important and critical

contributors to learning systems – dynamic healthcare ecosystems in which scientific, social, technological, political and ethical dimensions are aligned and enable cycles of continuous learning and action to be routinized and embedded across the system. Every act of care is an opportunity to learn.

Although it is true that it is too early in the HSI Fellowship program to draw firm and generalizable conclusions, the papers in this issue show that the early signs are both positive and gratifying. From ideas and analysis came a plan and solutions; the solutions were implemented, and the outcomes are occurring and becoming more apparent. Moreover, there are now 62 health system organizations participating in fellowship training and representing all categories of employment opportunities that graduates are likely to pursue. A simulator for a future career – how good is that?

TOM NOSEWORTHY, MD
Guest Editor

ÉDITORIAL

Simulateur de vol pour carrières dans le domaine de la recherche sur les politiques et les services de santé

Si on refait toujours la même chose, on obtient toujours les mêmes résultats. Cela est vrai pour la plupart des aspects de la vie comme ce l'est pour la formation universitaire dans le domaine de la recherche sur les politiques et les services de santé. Les arguments en faveur d'une modernisation des programmes universitaires sont convaincants quand on retrace le parcours de carrière des titulaires de diplômes, comme c'est le cas depuis 20 ans et tel que décrit dans le présent numéro.

En un mot, le marché s'est transformé mais les programmes de formation n'ont pas suivi et visent encore principalement à préparer les diplômés à occuper des postes de professeurs universitaires, ce qui en fait représente une seule des nombreuses trajectoires de carrière possibles. Environ un diplômé sur cinq emprunte la trajectoire qui mène à un poste de professeur universitaire; mais qu'en est-il des 80 % qui œuvrent dans la prestation de soins de santé, dans la recherche sur les services de santé ou dans les secteurs public, privé et à but non lucratif? Il est évident que les connaissances et les compétences requises pour ces trajectoires de carrière doivent venir d'une expérience concrète sur le terrain, face à de réels enjeux. Cet apprentissage ne peut être passif, il doit être actif et expérientiel, ce qui est une pratique ancienne qu'on peut retracer jusqu'à Aristote : « ce que nous devons apprendre à faire, nous l'apprenons en le faisant ». Prenons par exemple la formation professionnelle, comme la médecine, les sciences infirmières ou la comptabilité. Voudrions-nous obtenir les services de diplômés qui n'ont jamais traité un patient ou n'ont jamais rencontré de clients dans le cadre de leur formation? Pourquoi en serait-il autrement pour les chercheurs en politiques et en services de santé?

Les articles du présent numéro émanent de la reconnaissance du besoin d'une modernisation et de la nécessité de ne pas refaire ce qui a toujours été fait, mais plutôt d'accomplir les choses autrement grâce à une formation différente. Le Programme des bourses d'apprentissage en matière d'impact sur le système de santé (BAIS) forme un nouveau type de titulaires dotés des compétences, de l'expérience pratique et des réseaux qui leur permettent d'apporter au système de santé des améliorations éclairées par les données probantes. Les boursiers du programme des BAIS deviendront les leaders qualifiés du système que nous

tentons de mettre en place. À l'instar d'un simulateur de vol, ce programme de formation propose une expérience et un apprentissage sécuritaires et uniques pour les carrières dans le domaine de la recherche sur les politiques et les services de santé.

Parallèlement à l'évolution de ce programme, les systèmes de santé apprenants se développent de plus en plus au Canada. La convergence de ce programme de formation et d'un changement de culture vers des systèmes apprenants est de bon augure pour l'avenir du système de santé canadien. Les diplômés de ces programmes seront des atouts importants pour les systèmes apprenants, c'est-à-dire des écosystèmes de santé dynamiques où les aspects scientifiques, sociaux, technologiques, politiques et éthiques sont alignés et facilitent une action et un apprentissage continus enchâssés dans l'ensemble du système. Chaque intervention devient donc une occasion d'apprentissage.

Bien qu'il soit encore trop tôt pour tirer des conclusions généralisables du programme des BAIS, les articles du présent numéro montrent que les signes avant-coureurs sont positifs et favorables. Les idées et analyses ont donné lieu à un plan et des solutions; celles-ci ont été mises en place et les résultats sont de plus en plus probants. De plus, 62 organismes de santé participent à la formation des boursiers et proposent toutes les catégories d'emploi susceptibles d'intéresser les diplômés. Un simulateur pour la carrière à venir : qu'en pensez-vous?

TOM NOSEWORTHY, MD
Éditorialiste de collaboration spéciale

INTRODUCTION

Training for Impact: PhD Modernization as a Key Resource for Learning Health Systems

Pour une formation qui a de l'impact : modernisation des études doctorales pour mieux connaître les systèmes de santé

MEGHAN MCMAHON, MSC, PHD
Associate Director, CIHR Institute of Health Services and Policy Research
Institute of Health Policy, Management and Evaluation
University of Toronto
Toronto, ON

STEPHEN BORNSTEIN, PHD
Professor, Division of Community Health and Humanities, Faculty of Medicine
Department of Political Science, Faculty of Arts
Memorial University
Director, Newfoundland and Labrador Centre for Applied Health Research
Co-Director, SafetyNet Centre for Occupational Health and Safety Research
St. John's, NL

ADALSTEINN BROWN, D.PHIL
Dean, Professor, Dalla Lana School of Public Health
University of Toronto
Toronto, ON

ROBYN TAMBLYN, PHD
Professor, Department of Medicine and Department of Epidemiology,
Biostatistics and Occupational Health
McGill University
Scientific Director (former), CIHR Institute of Health Services and Policy Research
Montreal, QC

Introduction

The Institute of Medicine (IOM) has articulated a vision of a learning health system (LHS) as one that provides the best care at lower costs and that constantly, systematically and seamlessly improves based on data and evidence (IOM 2013). The IOM identifies the four foundational characteristics of an LHS as the real-time use of data and informatics to capture the care experience, patient-clinician partnerships, incentives aligned for value and a leadership-instilled culture of learning (IOM 2013). Although much policy research and commentary has focused on informatics and incentives, relatively less has focused on the critical question of creating a culture of learning in these systems. And although its source is debated, most management gurus agree with the adage that "culture eats strategy for breakfast" (Cave 2017), which is why a focus on the cultural dimension is critically important. Some scholars have recognized the important role of human capital – and of front-line clinicians in particular – in the LHS (Verma and Bhatia 2016). In addition to clinicians, doctorally prepared individuals, such as those with a PhD in health services and policy research (HSPR) and fields such as health economics, epidemiology and health informatics, have the potential to make significant contributions to LHSs and health system reform (Bornstein 2016; Brown and Nuti 2016; CIHR-IHSPR 2016). But having a PhD in these fields is not the same as being prepared to support progress toward an LHS. As argued in other papers, substantial change in doctoral training is needed so that graduates can contribute to their full potential and help drive real innovation within the health system (Bornstein 2016; CIHR-IHSPR 2016; Reid 2016).

The collection of papers in this special issue of *Healthcare Policy/Politiques de Santé* is based on work led by the Canadian Institutes of Health Research's Institute of Health Services and Policy Research (CIHR-IHSPR) and the Canadian Health Services and Policy Research Alliance (CHSPRA) in collaboration with many partners across the country (please see the Acknowledgements section at the end of this introduction for the full list of our partners). It represents a response to a pan-Canadian consensus effort to modernize HSPR doctoral and post-doctoral training for greater health system impact. These modernization efforts have focused on preparing a cadre of Canada's PhD graduates for success as leaders of evidence-informed health system innovation in settings that bridge the academy and the health system at the juncture of health policy, health service delivery and LHSs. The papers cover emerging lessons learned from a new embedded fellowship program in Canada, the Health System Impact (HSI) Fellowship, as well as the Delivery System Science Fellowship in the US that inspired key design elements of the HSI Fellowship, both of which recognize the importance of experiential learning inside the health system. In line with the push-pull model suggested by Lomas and Brown (2009), these opportunities allow PhD trainees and post-doctoral fellows to apply and adapt their academic skills to real-world challenges – to embed evidence – into complex and dynamic settings. They also create a pull for more evidence by helping organizations whose leaders are committed to instilling a learning culture to experience first-hand the benefits that PhD talent can bring to problem solving,

innovation and decision-making. These experiences also help build leadership capacity in the trainees, primarily through supervision and mentorship from health system leaders who have taken on this role for every embedded fellow.

The issue opens with the first-ever study of HSPR PhD graduate career outcomes, which helps establish a case for training modernization efforts and programs such as the HSI Fellowship. Using social media sources, McMahon and colleagues (2019c) track the employment trajectories of 20 years of graduates from many of Canada's HSPR doctoral training programs. They find that employment in academic positions has declined over time and that today's graduates are more likely than past graduates to work in a variety of sectors and roles that stretch well beyond academia to include government, healthcare delivery and the not-for-profit and private sectors. This finding is in line with early work from the CHSPRA Training Modernization Working Group (TMWG), which described different career trajectories and role archetypes (Bornstein et al. 2018; CHSPRA TMWG 2015).

Canada is not alone in its commitment to modernizing HSPR training to better support and enable health system improvement. The second paper (McMahon et al. 2019a) examines an innovative fellowship program in the US, AcademyHealth's Delivery System Science Fellowship, and compares its key elements to those of Canada's HSI Fellowship in order to identify lessons learned from different approaches to a common goal and to propose future directions for training modernization in both jurisdictions.

The authors of the third paper, Blanchette and colleagues (2019), are members of the inaugural cohort of HSI fellows who were curious about the contributions they and their colleagues had made to their health system partner organizations in their first year of the program. Reflecting the desired culture of an LHS, they designed a research project to satisfy their curiosity and inform improvements to the HSI Fellowship program. The resulting eDelphi study reveals a strong consensus among fellows, health system supervisors and academic supervisors that fellows had made significant contributions to their respective health system partner organization, primarily through their research and analytic skills.

An enriched core competency framework that emphasizes traditional research and analytic skills but also professional skills such as leadership, change management and project management is at the foundation of the HSI Fellowship program (see Bornstein et al. 2018 for details). In the fourth paper, McMahon and colleagues (2019b) analyze the extent to which fellows' competencies improved over the course of the first year. Whereas Blanchette and colleagues found that fellows' research and analytic skills made the biggest contribution to health system organizations, McMahon and colleagues suggest that the program provides fellows with an opportunity to develop the full suite of enriched core competencies, particularly the professional competencies that are not currently emphasized in most HSPR doctoral curricula.

Finally, Bornstein and colleagues (2019) examine the role and value of mentorship by health system leaders in the training and professional development of embedded fellows. They find that the fellows' health system supervisors developed a range of innovative,

individualized and effective approaches for guiding their fellows. They also identify opportunities for improvement, such as strengthening the relationship between fellows' health system and academic supervisors for team-based co-mentorship.

Although the first years of the HSI Fellowship program appear to be a success, that is not sufficient in itself to create and sustain a culture of learning across our health system, for several reasons. First, culture needs to be enabled and reinforced for it to be lasting. This is why there are four foundational characteristics to an LHS, as highlighted above. Just as a culture of learning helps organizations use data, forge partnerships and respond appropriately to incentives, these factors can stimulate the development of a learning culture and sustain it beyond any one individual's fellowship. Second, the HSI Fellowship is in its formative phase. Although it is a remarkably fast-growing program, the HSI Fellowship can cover only a small part of what is a very large sector of our economy with many universities, health system organizations and employees. Others have noted that for programs such as the HSI Fellowship to succeed, the academic context in which they are situated must also evolve to value and support a diversity of career trajectories, performance measures that extend beyond peer-reviewed publications and partnerships with the health system (Hunter 2019; McKee 2019). Finally, the new fellows are in the early stage of their careers. Although their mentors are invariably senior leaders in their field, they also represent a small component of the overall leadership cohort in our health system. To accelerate progress toward an LHS through a leadership-instilled culture of learning, we will need to pay attention to the full career trajectories of a wide range of leaders in our system.

Despite Canada's sizable annual investment in healthcare (in 2015, 10.9% of GDP), our health system continues to rank average or below compared to other countries, regardless of whether we use Organisation for Economic Co-operation and Development (OECD), Commonwealth Fund or other rankings (Najafizada et al. 2017; OECD 2017; Schneider et al. 2017). We have a tremendous opportunity for improvement in the way healthcare is financed, organized and delivered and for research and innovation to be key enablers of this improvement. PhD-trained individuals can be a critical element of this improvement while building impactful careers within and outside the academy.

Acknowledgements

The HSI Fellowship program, which is a primary focus of the papers included in this special issue, is made possible because of partnerships with many organizations across the country. The CIHR-IHSPR team and the TMWG co-leads of the CHSPRA (Dr. Adalsteinn Brown and Dr. Stephen Bornstein) would like to acknowledge the invaluable engagement and support of the partners, who play an instrumental role in the program, including: the CIHR and its Institutes of Aging (IA), Cancer Research (ICR), Circulatory and Respiratory Health (ICRH), Gender and Health (IGH), Infection and Immunity (III), Indigenous Peoples' Health (IIPH), Musculoskeletal Health and Arthritis (IMHA), Neurosciences, Mental Health and Additions (INMHA), Nutrition, Metabolism and Diabetes (INMD),

Population and Public Health (IPPH) and the Science Policy Branch; Michael Smith Foundation for Health Research (MSFHR); Fonds de recherche du Québec – Santé (FRQS); New Brunswick Health Research Foundation (NBHRF); Research Nova Scotia (formerly the Nova Scotia Health Research Foundation [NSHRF]); the Saskatchewan Health Research Foundation (SHRF); Mitacs; and the 62 health system organizations and 23 universities that have partnered to host Health System Impact Fellows.

Correspondence may be directed to: Meghan McMahon, PhD; e-mail: mmcmahon.ihspr@ices.on.ca.

References

Blanchette, M.-A., M. Saari, K. Aubrecht, C. Bailey, I. Cheng, M. Embrett et al. 2019. "Making Contributions and Defining Success: An eDelphi Study of the Inaugural Cohort of CIHR Health System Impact Fellows, Host Supervisors and Academic Supervisors." *Healthcare Policy* 15(Special Issue): 49–60. doi:10.12927/hcpap.2019.25980.

Bornstein, S. 2016. "Modernizing Our Doctoral and Post-Doctoral Training Programs: Bold New Initiatives." *HealthcarePapers* 16(Special Issue): 55–58. doi:10.12927/hcpap.2016.24727.

Bornstein, S., M. Heritage, A. Chudak, R. Tamblyn, M. McMahon and A. Brown. 2018. "Development of Enriched Core Competencies for Health Services and Policy Research." *Health Services Research* 53(5 Suppl. 2): 4004–23. doi:10.1111/1475-6773.12847.

Bornstein, S., M. McMahon, V. Yiu, V. Haroun, H. Manson, P. Holyoke et al. 2019. "Exploring Mentorship as a Strategy to Build Capacity and Optimize the Embedded Scientist Workforce." *Healthcare Policy* 15(Special Issue): 73–84. doi:10.12927/hcpap.2019.25978.

Brown, A.D. and S. Nuti. 2016. "The Continuing Relevance of Academics to Health System Reform." *HealthcarePapers* 16(Special Issue): 4–6. doi:10.12927/hcpap.2016.24718.

Canadian Health Services and Policy Research Alliance, Training Modernization Working Group (CHSPRA TMWG). 2015. *Modernizing Health Services and Policy Research Training: A Pan-Canadian Strategy*. Ottawa, ON: Canadian Institutes of Health Research. Retrieved December 4, 2018. <https://docs.wixstatic.com/ugd/5adc92_4b4c942ad5294494899538927034 73cc.pdf>.

Cave, A. 2017, November 9. "Culture Eats Strategy for Breakfast. So What's For Lunch?" Retrieved February 13, 2019. <https://www.forbes.com/sites/andrewcave/2017/11/09/culture-eats-strategy-for-breakfast-so-whats-for-lunch/#46e2b6a47e0f>.

CIHR Institute of Health Services and Policy Research (CIHR-IHSPR). 2016. *Strategic Plan 2015–19: Health System Transformation through Research Innovation*. Ottawa, ON: Author. Retrieved February 13, 2019. <http://www.cihr-irsc.gc.ca/e/documents/ihspr_strat_plan_2015-19-en.pdf>.

Hunter, D.J. 2019. "Meeting the Challenge of the 'Know-Do' Gap; Comment on 'CIHR Health System Impact Fellows: Reflections on 'Driving Change' Within the Health System." *International Journal of Health Policy and Management* 8(8): 498–500. doi:10.15171/ijhpm.2019.37.

Institute of Medicine (IOM). 2013. *Best Care at Lower Cost: The Path to Continuously Learning Health Care in America*. Washington, DC: The National Academies Press.

Lomas, J. and A.D. Brown. 2009. "Research and Advice Giving: A Functional View of Evidence-Informed Policy Advice in a Canadian Ministry of Health." *The Milbank Quarterly* 87(4):903–26. doi:10.1111/j.1468-0009.2009.00583.x.

McKee, M. 2019. "Bridging the Gap Between Research and Policy and Practice; Comment on 'CIHR Health System Impact Fellows: Reflections on "Driving Change" Within the Health System.'" *International Journal of Health Policy and Management* 8(9): 557–59. doi:10.15171/ijhpm.2019.46.

McMahon, M., S. Bornstein, A. Brown, L.A. Simpson, L. Savitz and R. Tamblyn. 2019a. "Training for Health System Improvement: Emerging Lessons from Canadian and US Approaches to Embedded Fellowships." *Healthcare Policy* 15(Special Issue): 32–45. doi:10.12927/hcpap.2019.25981.

McMahon, M., A. Brown, S. Bornstein and R. Tamblyn. 2019b. "Developing Competencies for Health System Impact: Early Lessons Learned from the Health System Impact Fellows." Healthcare Policy 15(Special Issue): 61–72. doi:10.12927/hcpap.2019.25979.

McMahon, M., B. Habib and R. Tamblyn. 2019c. "The Career Outcomes of Health Services and Policy Research Doctoral Graduates." *Healthcare Policy* 15(Special Issue): 16–33. doi:10.12927/hcpap.2019.25982.

Najafizada, S.A.M., T. Sivanandan, K. Hogan, D. Cohen and J. Harvey. 2017. "Ranked Performance of Canada's Health System on the International Stage: A Scoping Review." *Healthcare Policy* 13(1): 59–73. doi:10.12927/hcpol.2017.25191.

Organisation for Economic Co-operation and Development (OECD). 2017. *Health at a Glance 2017: OECD Indicators*. Paris, France: OECD Publishing. <http://dx.doi.org/10.1787/health_glance-2017-en>.

Reid, R.J. 2016. "Embedding Research in the Learning Health System." *HealthcarePapers* 16(Special Issue): 30–35. doi:10.12927/hcpap.2016.24724.

Schneider, E.C., D.O. Sarnak, D. Squires, A. Shan and M.M. Doty. 2017, July 14. "Mirror, Mirror 2017: International Comparison Reflects Flaws and Opportunities for Better U.S. Health Care." Retrieved February 14, 2019. <https://interactives.commonwealthfund.org/2017/july/mirror-mirror/>.

Verma, A. and S. Bhatia. 2016. "A Policy Framework for Health Systems to Promote Triple Aim Innovation." *HealthcarePapers* 15(3): 9–23. doi:10.12927/hcpap.2016.24469.

RESEARCH PAPER

The Career Outcomes of Health Services and Policy Research Doctoral Graduates

Perspectives de carrière pour les titulaires d'un doctorat en recherche sur les politiques et les services de santé

MEGHAN MCMAHON, MSC, PHD
Associate Director, CIHR Institute of Health Services and Policy Research
Institute of Health Policy, Management and Evaluation
University of Toronto
Toronto, ON

BETTINA HABIB, MSC, MSCPH
Research Assistant, Clinical and Health Informatics Research Group
McGill University
Montreal, QC

ROBYN TAMBLYN, PHD
Professor, Department of Medicine and Department of Epidemiology, Biostatistics and Occupational Health
McGill University
Scientific Director (former), CIHR Institute of Health Services and Policy Research
Montreal, QC

Abstract

Objective: To examine the career outcomes of 20 years of PhD graduates from Canadian health services and policy research (HSPR) doctoral training programs.
Methods: The deans of the doctoral training programs were invited to participate in this national cohort study. A standardized career-tracking template was developed. Internet searches of publicly accessible sources were used to track graduates' employment. Descriptive analyses summarized PhD program characteristics and current employment.
Results: Of the 1,208 trainees who graduated during our study period, 884 (73.2% of

1,208, or 90.3% of the 979 with complete data) could be successfully tracked. HSPR PhD graduates are highly employable, but employment trends have changed over time. Today's graduates are more likely to enter careers in a wider variety of sectors and roles and are less likely to be employed in academia than previous graduates. However, over 50% of graduates are currently employed in professorial positions within the academic sector or in research roles or departments within healthcare delivery organizations.
Conclusions: This article provides an initial descriptive profile of the career outcomes of HSPR PhD graduates in Canada from 10 university-based doctoral training programs. To ensure that PhD graduates are prepared to contribute fully within diverse sectors and roles, doctoral training must evolve to keep pace with employment trends and encompass, in addition to research skills, the professional skills demanded in the public, private, not-for-profit and healthcare delivery sectors.

Résumé

Objectifs : Examiner les perspectives de carrière, sur 20 ans, pour les titulaires d'un doctorat issu d'un programme canadien en recherche sur les politiques et les services de santé (RPSS).
Méthode : Nous avons invité les doyens des programmes de doctorat à participer à cette étude de cohortes à l'échelle nationale. Nous avons mis au point un modèle normalisé pour suivre les parcours de carrière. Des recherches menées dans des sources publiques accessibles sur Internet ont permis de suivre les parcours des titulaires. L'analyse descriptive a permis de résumer les caractéristiques des programmes de doctorat ainsi que l'état actuel de l'embauche.
Résultats : Parmi les 1 208 doctorants qui ont obtenu leur diplôme au cours de la période visée par l'étude, on a pu suivre le parcours de 884 titulaires (73,2 % de 1 208 ou 90,3 % des 979 sujets pour qui les données sont complètes). Les titulaires d'un doctorat en RPSS sont hautement employables, mais les tendances du marché de l'emploi ont changé avec le temps. Les titulaires d'aujourd'hui ont davantage de chances de commencer une carrière dans une variété de secteurs et de postes et sont moins susceptibles d'être employés en milieu universitaire, comparativement aux titulaires antérieurs. Cependant, plus de 50 % des titulaires occupent actuellement un poste professionnel dans un milieu universitaire ou dans un service ou poste de recherche au sein d'une organisation de prestation de services de santé.
Conclusion : Cet article apporte une première description des perspectives de carrière pour les titulaires d'un doctorat en RPSS issu d'un programme de formation doctorale dans 10 universités au Canada. Pour s'assurer que les titulaires d'un doctorat soient en mesure d'apporter leur entière contribution dans divers secteurs et postes, la formation doctorale doit évoluer afin de répondre aux tendances du marché de l'emploi et doit comprendre – en plus des compétences en recherche – les compétences professionnelles qui sont en demande dans les secteurs public, privé, à but non lucratif et de la santé.

Background

The healthcare landscape in Canada is evolving. The multitude of complex challenges and the financial pressures confronting health systems are not new. But as governments and health service delivery and other organizations experiment with new ways of organizing, funding and delivering high-value care, they are beginning to invest in people and data to help understand which interventions work and to dynamically modify, adapt and innovate based on evidence. A range of health system and related organizations in Canada – including hospitals, ministries of health, health authorities, health charities, health technology companies and consulting firms – now have embedded research and/or quality improvement units and are employing health services and policy researchers in a variety of roles (Chafe and Dobrow 2008; Lomas and Brown 2009). As the concept of the learning health system (LHS) spreads – where organizations combine research, data science and quality improvement to continuously learn and improve outcomes (IOM 2013) – there will be a critical need for research leadership embedded within health system organizations to experiment with innovation, spearhead the adoption of evidence-informed successes and drive continuous improvement (Bindman 2017; Forrest et al. 2018; Psek et al. 2015; Reid 2016; Rich and Collins 2018; Tamblyn et al. 2016). This evolving landscape creates exciting opportunities for PhD graduates in health services and policy research (HSPR), who have received extensive academic training in the research techniques and evaluative methodologies required to analyze complex challenges and test innovations, to pursue impactful careers outside of the academy.

Alongside the heightened research capacity needs of health system organizations, there has been a decline in the number of tenure-track professor positions in universities relative to the number of PhD graduates. This trend is evident in Canada, in the US and across Europe (Porter et al. 2017). Although most doctoral programs were principally designed to prepare trainees for academic careers, with the traditional university professor role viewed as the pinnacle of success (Sinche et al. 2017), recent data from Canada indicate that only about 19% (Edge and Munro 2015) to 30% (University of Toronto 2016) of graduates (in all disciplines) find employment in tenure-track professor positions. In the US, some universities report that approximately 40% of their PhD graduates are employed in tenure-track positions (examples include Cornell University [2018] and Princeton University [2019]). Overall, however, the majority of PhD graduates, ranging from 60 to 80% depending on the study, have entered careers in other roles and sectors.

In Canada, there has been mounting attention to modernizing HSPR doctoral programs to better prepare PhD graduates for stronger career readiness and greater impact in a wider variety of sectors and roles, within and beyond the academy. In addition to the demand from health system organizations for research talent in their teams, the excitement about the LHS and the career trends of PhD graduates, Canada's prioritization of HSPR training modernization also stems from demand from PhD trainees themselves. For many HSPR trainees, a traditional academic career is no longer the primary end goal (IHSPR 2017, 2019; Morrison

et al. 2008). Instead, trainees want to contribute their skills at the coalface of health policy and delivery – in hospital settings, regional health authorities, health charities, tech firms and other arenas – where they can make an impact by leading evidence-informed innovation and health system improvement. However, their doctoral training was not designed with this end goal in mind. Trainees receive limited information about alternative career possibilities, little to no formal training in many of the competencies demanded in the non-academic labour market, such as leadership and project management, and few formal opportunities to apply and adapt their PhD skills within health system organizations (IHSPR 2016). To optimize investments in doctoral training for future career preparedness, it is essential to ensure that trainees are equipped with the skills, experiential learning opportunities and networks to make health, societal and economic contributions in a variety of sectors.

The Canadian Health Services and Policy Research Alliance's (CHSPRA) HSPR Training Modernization Strategy (2015) provided a catalyst for HSPR doctoral training programs, health system organizations, research funders and trainees to come together to identify strategies to train the next generation of research-skilled health system leaders. But very little is known about the career outcomes of past HSPR PhD graduates, in particular about the sectors in which they work, the positions they hold and the contributions they make in these careers. Understanding the career outcomes of past HSPR PhD graduates is important for informing training modernization endeavours, for helping pre-doctoral and doctoral trainees make informed career choices and for improving the evidence base regarding the breadth of societal impact that graduates are making by way of their career choices.

The dearth of information about PhD employment outcomes is not unique to the field of HSPR or to Canada (Benderly 2018). The statistic that 80% of PhD graduates work outside of traditional academic careers (Edge and Munro 2015) is often emphasized in discussions and presentations about PhD career transitions and outcomes; however, very little is known about this 80%. Both the Canadian Council of Academies (2019) and the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine (2014, 2018) in the US have signalled the importance of an improved understanding of labour market transitions and outcomes of PhD graduates. In an effort to address this information gap, universities and other higher education organizations have started to track PhD employment outcomes (Cornell University 2018; Duke University 2018; Jonker 2016; Porter et al. 2017; Princeton University 2019; Stanford University n.d.; University of Toronto 2016). These studies, which focus on PhD graduates from all faculties and disciplines within a university or province, have revealed that PhD graduates are highly employable and transition to careers in a variety of sectors, within and outside of academia (Jonker 2016; Porter et al. 2017; Stanford University n.d.; University of Toronto 2016). These studies, which harness publicly available information on the Internet to track career outcomes, provide a valuable starting point for the first-ever national cohort study of the employment outcomes of Canadian HSPR PhD graduates.

The objective of the present project was to improve the evidence base regarding the career outcomes of 20 years of PhD graduates from Canadian HSPR and related doctoral training programs. The article provides an initial descriptive profile of the career outcomes of HSPR PhD graduates in Canada from 10 university training programs across the country. It is a core project of CHSPRA's Training Modernization Working Group and of the Canadian Institutes of Health Research's Institute of Health Services and Policy Research (CIHR-IHSPR).

Methods

The methods build on data collection approaches tested and used by the leaders of the University of Toronto's 10,000 PhDs Project and other PhD career outcomes studies (Jonker 2016; Porter et al. 2017; Stanford University n.d.; University of Toronto 2016). These studies relied on social media and other online sources of publicly accessible information to track graduates' employment outcomes, an approach that has been adopted in the present study. No contact with any graduate was made.

The deans and directors of 23 of Canada's HSPR and related doctoral training programs received a letter of invitation to participate in this national cohort study of PhD graduates' career outcomes, which outlined the project's objectives, inquired about their interest in participating, and committed to reporting back program-specific dashboards and raw data files.[1] Programs that expressed an interest were sent a data collection template requesting preliminary information about their graduates that would be used to track career trajectories including name, PhD start and graduation date, thesis title, university department, program stream if relevant, and thesis supervisor.

A standardized career-tracking template and corresponding codebook that defined each variable were developed, informed by the work of the University of Toronto's 10,000 PhDs Project (University of Toronto 2016). An HSPR-specific categorization scheme for employment sectors, subsectors and roles was used (Bornstein et al. 2018) that included the following seven key sectors: academic, public, healthcare delivery, healthcare delivery research, private, not-for-profit and other (Table 1). When relevant, the first employment position after PhD graduation; the current primary, secondary and tertiary employment positions (e.g., physician and adjunct professor); and up to five primary employment positions in between were documented. For each employment position, the job title, name and geographical location of the organization and the organization's employment sector and subsector were recorded. A reporting dashboard of key employment indicators was piloted with three of the participating programs, and their feedback was used to refine the final set of indicators, which included the:

- percentage of graduates who pursued a post-doctoral position (at any point, either as the first employment position after PhD graduation or as a subsequent employment position);

- percentage of graduates currently in university professorial positions (assistant professor, associate professor, professor, lecturer);
- current primary employment sector and subsector (see Bornstein et al. 2018);
- employment location of current academics (same university as PhD; same province but different university; in Canada but different province; US; outside of North America); and
- first employment sector after PhD graduation versus current primary employment sector (to examine sector retention).

TABLE 1. General descriptive statistics

School	Number of graduates*	Female, n (%)§	Number of graduates with follow-up data	Graduates who completed post-doc, n (%)	Graduates who are current professors, n (%)
All Schools	1,208	639 (65.3)	884	170 (19.2)	375 (42.4)
U of Montreal	229	–	0	–	–
U of T DLSPH	184	128 (69.6)	170	16 (9.4)	66 (38.8)
U of T IHPME	183	123 (67.2)	180	15 (8.3)	64 (35.6)
McGill	169	107 (63.3)	150	45 (30.0)	66 (44.0)
McMaster	127	70 (55.1)	112	21 (18.8)	44 (39.3)
UBC	125	79 (63.2)	107	42 (39.3)	52 (48.6)
Waterloo	72	48 (66.7)	64	14 (21.9)	34 (53.1)
U of Manitoba	56	41 (73.2)	47	3 (6.4)	29 (61.7)
Western	53	35 (66.0)	45	10 (22.2)	19 (42.2)
Queen's	10	8 (80.0)	9	4 (44.4)	1 (11.1)

*Variation in the number of graduates across programs reflects a combination of factors, including program size and program longevity.
§Fifteen (8.9%) from McGill, 3 (2.4%) from McMaster and 1 (1.4%) from Waterloo are of uncertain sex; 229 (100%) from U of Montreal are unknown.

To track graduates, Internet searches of publicly accessible sources were used to collect employment data. The graduates' first and last names were the primary variables used to identify and track them, and their PhD start and graduation dates, thesis title, university and/or program and/or thesis supervisor's name were used to validate the match. The primary sources of data were university and employer websites, followed by LinkedIn. Additional data sources, if needed, included Google+, ResearchGate, Twitter and Facebook. A data analyst with expertise from the 10,000 PhDs Project completed all data collection between January and August 2018. A second member of the team validated the employment sector and subsector categorization. Program-specific data files were merged to create a pan-Canadian data file.

Descriptive analyses were used to summarize PhD program characteristics and career trajectories for all graduates, as well as by graduation cohort (1996–1999, 2000–2004, 2005–2009, 2010–2014, 2015–2016), gender and program. All analyses were conducted in R, and figures were created in Excel.

Results

Overall, nine of the 23 HSPR PhD training programs provided complete data on their graduates between 1996 and 2016, a 10th program provided partial data (but not the names of its graduates) and an 11th program was included because of the availability of the university's publicly accessible dissertation database that provided graduates' names. Three programs expressed interest but were unable to participate as they were newly established and had not yet graduated students. Three programs opted not to participate. Seven programs did not respond. The 11 programs included in the analysis collectively graduated 1,208 PhDs between 1996 and 2016. Of these 1,208 graduates, names were provided for 979, and these individuals were included in the career-tracking analysis.

Of the 1,208 trainees who graduated during our study period, 884 (73.2% of 1,208, or 90.3% of the 979 with nominal data) could be successfully tracked through social media (see Table 1). Sixty-five per cent were female, 19.2% completed a post-doctoral fellowship and 37.3% currently hold professorial posts within academic institutions. University of Manitoba graduates were least likely to complete post-doctoral training but most likely to hold professorial positions in academic institutions relative to the other programs. The proportion of graduates who completed post-doctoral training increased from 10.2% for the 49 individuals who graduated between 1996 and 1999 to 36.5% for the 148 individuals who graduated between 2015 and 2016.

Among the 884 PhD students who could be tracked, 47.5% were employed in academia at the time of tracking (January–August 2018), mainly as assistant, associate or full professors (Table 2).[2] Male graduates (51.0%) were more likely to be in academia than females (45.9%) and were more likely to be employed in a professorial post within academia (41.9% males versus 35.4% females). Employment in the healthcare delivery research sector (13.8%) was the next most common career location, particularly for females (14.2%), followed by the public sector in health-related fields (11.1%). Although only a small proportion of graduates were employed in the private sector in 2016 (6.1%), male graduates (8.1%) were more likely to be in these locations than females (4.5%). Overall, more than 50% of graduates were employed in professorial positions within the academic sector or in research-related positions within the healthcare delivery research sector in 2018.

TABLE 2. Current employment sector and subsector, by sex

	Overall, N (%) 884	Females, n (%) 577	Males, n (%) 298
Continued Training	**38 (4.3)**	**28 (4.9)**	**10 (3.4)**
Post-doctoral fellow	38 (4.3)	28 (4.9)	10 (3.4)
Academic Sector	**420 (47.5)**	**265 (45.9)**	**152 (51.0)**
University professor*	330 (37.3)	204 (35.4)	125 (41.9)
Research associate/assistant	21 (4.3)	17 (2.9)	3 (1.0)
Administration	16 (1.8)	10 (1.7)	5 (1.7)
College lecturer	4 (0.5)	3 (0.5)	1 (0.3)
Other (status, adjunct)	49 (5.5)	31 (5.4)	18 (6.0)
Public Sector	**98 (11.1)**	**73 (12.7)**	**23 (7.7)**
Broader public sector – health	61 (6.9)	45 (7.8)	15 (5.0)
Government – health	30 (3.4)	22 (3.8)	7 (2.4)
Broader public sector – non-health	3 (0.3)	3 (0.5)	0 (0.0)
Government – other/non-health	4 (0.5)	3 (0.5)	1 (0.0)
Healthcare Delivery Sector	**62 (7.0)**	**38 (6.6)**	**24 (8.1)**
Hospital	48 (5.4)	26 (4.5)	22 (7.4)
Primary and community-based care	12 (1.4)	10 (1.7)	2 (0.7)
Other	2 (0.2)	2 (0.4)	0 (0.0)
Healthcare Delivery (Research) Sector	**122 (13.8)**	**82 (14.2)**	**40 (13.4)**
Hospital (research)	90 (10.2)	60 (10.4)	30 (10.1)
Research scientist/associate/assistant	31 (3.5)	22 (3.8)	9 (3.0)
Primary and community-based care (research)	1 (0.1)	0 (0.0)	1 (0.3)
Private Sector	**54 (6.1)**	**26 (4.5)**	**24 (8.1)**
Biotechnology/Pharmaceuticals	26 (2.9)	16 (2.8)	8 (2.7)
Consulting	12 (1.4)	3 (0.5)	9 (3.0)
Other (Ttechnology)	7 (0.8)	2 (0.4)	4 (1.3)
Other	9 (1.0)	5 (0.9)	3 (1.0)

TABLE 2. Current employment sector and subsector, by sex (cont'd)

	Overall, N (%) 884	Females, n (%) 577	Males, n (%) 298
Not-for-Profit Sector	**49 (5.5)**	**35 (6.1)**	**14 (4.7)**
Research and Ppublic Ppolicy	24 (2.7)	17 (2.9)	7 (2.3)
Pan-Canadian Hhealth Oorganization	9 (1.0)	7 (1.2)	2 (0.7)
Health Ccharity	7 (0.8)	6 (1.0)	1 (0.3)
Other (Hhealth- Rrelated)	9 (1.0)	5 (0.9)	4 (1.3)
Other Sector	**41 (4.6)**	**30 (5.2)**	**11 (3.7)**
Consulting	11 (1.2)	10 (1.7)	1 (0.3)
International Aagency (Hhealth Rrelated)	12 (1.4)	7 (1.2)	5 (1.7)
Independent Bbusiness/Sself-Eemployed	7 (0.8)	5 (0.9)	2 (0.7)
Retired	4 (0.5)	2 (0.4)	2 (0.7)
Other/Unknown	7 (0.8)	6 (1.0)	1 (0.3)

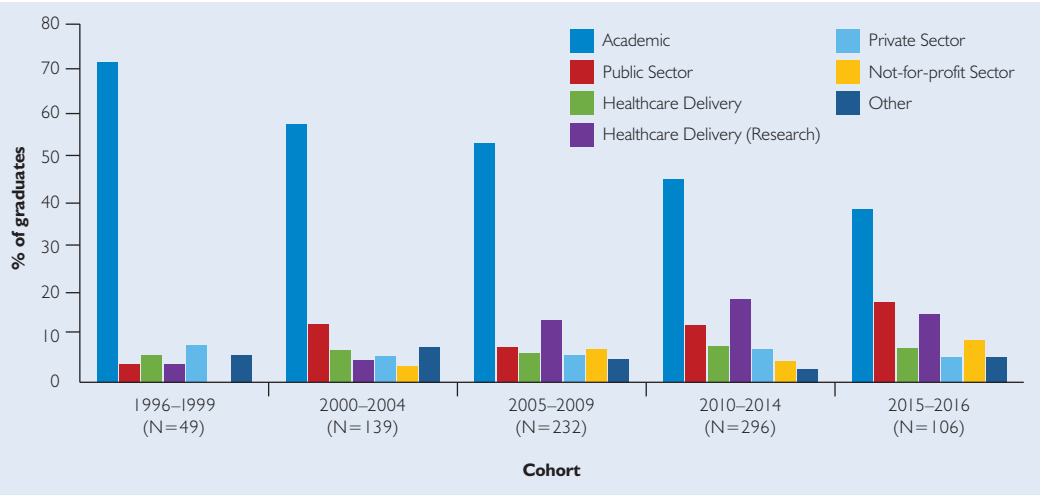
*University professor was defined to include assistant/associate/professor/lecturer. In a sensitivity analysis, we excluded "lecturer" and the number and percentage of university professors changed to 320 (36.2%).
Notes: (1) The employment sector is unknown for 95 graduates: 62 females and 23 males (besides the 229 unknown from U of Montreal). (2) Among those whose sector is known, sex is uncertain for 9 graduates.

Current employment sector has changed through time (Figure 1 and Box 1). Compared to the 49 individuals who graduated between 1996 and 1999 (of whom 71.4% were employed in academic settings in 2016), a decreasing number of graduates in subsequent years were employed in academia in 2016. Among graduates between 2010 and 2014, 45.3% were employed in academia in 2016 – 38.7% for those graduating after 2014. Over the 20-year study period, the main sectors that have seen an increase in employment of PhD-trained graduates are the public sector (from 4.1% of individuals who graduated between 1996 and 1999 to 17.9% of those who graduated after 2014) and the healthcare delivery research sector (from 4.1% of the 1996–1999 graduating cohort to 15.1% of the post-2014 graduating cohort).

BOX 1. Changing employment trends

Less than 30% of HSPR graduates from the 1996–1999 cohort are currently employed outside of academia, whereas more than 60% of HSPR graduates from the 2015–2016 cohort are currently employed outside of academia. Current graduates (i.e., 2015–2016 cohort) are more likely than previous graduates to work in research departments within healthcare delivery organizations (including academic teaching hospitals) and the public sector.

FIGURE 1. Current employment sector, by cohort (graduation year)



Results presented are based on data from 822 (68%) graduates, excluding the 5 graduates whose graduation year is unknown and the 57 graduates whose current position is a post-doctorate fellowship (15 from cohort 2010–2014, 42 from cohort 2015–current).

Among the 457 (51.7%) graduates whose first post-PhD employment sector and current employment in 2016 could be tracked, 67.8% were working in the same sector as when they completed their PhD (Table 3, available online at longwoods.com/content/25982). Those first employed in academia (77.2%) and the private sector (79.2%) were most likely to remain in the same employment sector. Those first employed in not-for-profit agencies were the least likely to remain employed in this sector (45.0%), primarily moving on to academia (22.5%) or the public sector (12.5%). In 2016, most graduates were employed in Canada (83.1%), with a slightly higher proportion of female graduates (85.5%) than male graduates (78.4%).

Among the 293 female and 162 male graduates currently employed in academia, 36.9% of female graduates and 35.2% of male graduates were employed in the same university in which they completed their PhD. This varied by university, from 17.4 to 70.8%, although the sample size in some programs is small and the proportions may be unreliable. Interestingly, male graduates were more likely to be employed in academic positions outside of Canada (24.1%) compared to females (14.3%).

Overall, Canada's HSPR PhD graduates are highly successful in finding employment in a variety of sectors, including academia, the public sector, the healthcare delivery sector, the private

BOX 2. Where are Canada's health services and policy PhD graduates working and in what types of roles?

Examples of the kinds of organizations where Canada's HSPR graduates are employed include: ministries of health, provincial health authorities, technology assessment agencies, public health units, health quality councils, academic teaching and community hospitals and their embedded research units, research funding organizations, federal agencies, health charities, international organizations, pharmaceutical companies, consulting firms, universities and more.

Examples of current employment roles include: associate medical officer, vice president of research, chief scientist, data scientist, director of research/health economics/knowledge synthesis/surveillance, senior economist, president and CEO, global director, partner, professor, epidemiologist, scientist, post-doctoral fellow and more.

sector, the not-for-Profit sector and the independent sector (i.e., self-employed, independent business). They work primarily in Canada but in 38 countries overall (including Canada). They are working and contributing their expertise in over 350 distinct organizations (Box 2). Within these organizations, PhD graduates have a variety of job titles and occupations, typically within a science-related role (see Box 2). Within the academic sector, PhD graduates are working in 115 universities in Canada and elsewhere. Their HSPR skills are in demand by many different faculties and departments, as evidenced by employment in faculties/schools/departments of public health, medicine, pharmacy, health policy, nursing, health science, epidemiology, community health sciences and more.

Discussion

The present study examined the employment outcomes of PhD graduates from 10 Canadian HSPR doctoral training programs who completed their PhD between 1996 and 2016. It provides a comprehensive and first-ever profile of the careers of HSPR PhD graduates in Canada, including the sectors, subsectors, occupations and locations in which they currently work. The discussion that follows focuses on the main HSPR employment trends and how they compare to broader PhD employment trends and offers suggestions regarding the implications for doctoral training.

The study found that HSPR PhD graduates are highly employable but that employment trends have changed over time. Today's graduates are more likely than before to enter careers in a wider variety of sectors and occupations and are less likely to be employed in academia than previous graduates. This is not an HSPR-specific trend but a wider phenomenon: the decline in employment of PhD graduates in academic tenure-track positions and the increase in employment in other sectors and occupations is ubiquitous across all fields in all universities that have tracked their PhD graduates' career outcomes over time (Porter et al. 2017; Stanford University n.d.; University of Toronto 2016). A 2013 study from the Organisation for Economic Co-operation and Development (OECD) examining the careers of doctorate holders in OECD countries showed that in the US, Belgium, Denmark and the Netherlands, at least one in three employed doctorate holders worked in the private sector and between 20 and 35% worked in the public (government) and/or not-for-profit sectors (Auriol et al. 2013). The increasing diversification of career choices of PhD graduates raises exciting possibilities for the spread of innovation through all facets of society. It also raises important questions about the value of the doctoral degree and implications for doctoral training curricula.

Given employment trends, there has been some debate about the value of the doctoral degree. Some argue that there is an oversupply of PhDs and an underutilization of their skills and that doing a PhD is "a waste of time" ("The Disposable Academic" 2010). The expansion in PhD enrolment levels in many countries – between 2000 and 2009, the number of doctoral degrees awarded in OECD countries increased by 38% (Auriol et al. 2013) – and the decline in tenure-track employment are often cited as evidence (Auriol 2010). This argument's underlying assumption is that the value of a doctoral degree is limited

to the availability of jobs in the academic sector. Others counter that PhD-trained individuals are a crucial resource in the knowledge economy and that, as a highly qualified workforce, they are essential to ensuring innovation in all sectors of society (Auriol 2010; Auriol et al. 2013). Of note is the fact that, in both 2000 and 2009, Canada's share of PhD graduates as a percentage of the population was well below the OECD average, ranking 25th out of the 36 countries for which data were available. While other OECD countries invested in increasing their supply of PhD graduates between 1998 and 2009, the supply in Canada stagnated (Auriol 2010; Auriol et al. 2013). The expansion of Canada's HSPR PhD supply over the last decade with the establishment of new doctoral training programs[3] and schools of public health is, therefore, encouraging, particularly given that healthcare is a knowledge-intensive industry that demands a highly skilled workforce (Wolfson 2011). Recent survey data from a sample of 21 different types of healthcare and related organizations (e.g., delivery organizations, life sciences companies, health technology and data analytics companies, payers and purchasers) in the US indicate that the demand for HSPR skills is expected to increase over the coming years owing to the changing healthcare context (Rich and Collins 2018). The strong interest expressed by health system organizations to host Health System Impact fellows is a promising indication of demand in Canada, but it will be important to monitor demand over time.

There is some evidence to indicate that whereas PhD graduates who enter the academic sector in professor positions feel prepared for their careers, those in careers outside the academy vary in their feeling of preparedness (Bornstein et al. 2018; Porter et al. 2017). In the consultations leading up to the creation of the pan-Canadian Training Modernization Strategy, PhD trainees spoke of feeling underprepared to effect change in their non-academic workplaces, and health system employers commented on the substantial differences between academic and non-academic workplace cultures (Bornstein et al. 2018). This is perhaps not surprising given that the HSPR doctoral curriculum in most Canadian universities remains geared toward an academic career. A 2016 environmental scan of the PhD curriculum in Canada's HSPR doctoral programs and a 2016 survey of the directors of these programs found that few programs enrich their research-focused course offerings with professional development or "transferrable skills" courses (e.g., leadership, project management) and none require an experiential learning component (IHSPR 2016). The survey also revealed a strong appetite to incorporate such training elements moving forward.

The HSPR career trends documented in the present study suggest the need for a broader scope of doctoral training and better preparation for increasingly diverse roles. To contribute fully within today's healthcare ecosystem and to be prepared to lead in the LHS, new research on core competencies suggests that in addition to research methods and data analytics, PhD graduates also need skills in leadership, change management and implementation (also referred to as improvement and implementation science), engagement (also called interdisciplinary collaboration), communication and management (Atkins 2018; Bornstein et al. 2018; Burgess et al. 2018; Forrest et al. 2018; Rich and Collins 2018).

In Europe, greater attention to preparing doctoral trainees for careers in industry has led to the creation of innovative new programs that emphasize research, innovation and transferable skills (Doonan et al. 2018). Programs such as the European Union's Innovative Training Networks and the industrial doctorate through the Marie Skłodowska-Curie Actions provide support for academia-industry partnerships and opportunities for doctoral trainees to benefit from hands-on opportunities to innovate with industry and develop transferable skills (Doonan et al. 2018; European Commission 2018). In the US, HSPR-specific training programs, such as AcademyHealth's Delivery System Science Fellowship, have been developed to prepare doctorate holders for careers in delivery organizations (see McMahon et al. [2019] in this issue and Kanani et al. [2017] for details).

In Canada, the HSPR community is learning from these and other training innovations in Canada, including training platforms such as Quebec's Training Program in Transdisciplinary Research on Public Health Interventions (the 4P Program) (Paradis et al. 2017) and others that were created through the CIHR Strategic Training Initiative in Health Research (STIHR) and the Regional Training Centres that were funded through the Capacity for Applied and Developmental Research and Evaluation (CADRE) program (Conrad 2008; Martens 2008), and making a concerted effort to ensure that trainees and post-doctoral fellows are poised for success in academic, applied and hybrid careers. For example, the recently developed Health System Impact Fellowship program led by the CIHR-IHSPR and CHSPRA provides PhD trainees and post-doctoral fellows with the opportunity to work within health system and related organizations on impact-oriented projects of high priority to their host partner organization. Fellows are supervised and mentored by senior-level leaders in the organization and receive a dedicated training allowance to support their development of an enriched set of core competencies (see Bornstein et al. [2018] for details and McMahon et al. [2019] in this issue). Although the program is in its early days, 97% of the first cohort of fellows (n = 46) reported that the fellowship provided them with opportunities to develop their leadership skills, 92% indicated that they had the opportunity to develop their change management and implementation skills and 97% had the opportunity to improve their understanding of health systems and policy-making processes. It is promising that the second launch of the program witnessed a 31% increase in application pressure to the post-doctoral stream and that demand from health system organizations to embed fellows is rising concomitantly. Although these are promising signs, the ultimate success of training modernization efforts will depend on the extent to which doctoral training programs embrace these modernized elements as core features of their curricula. All signs to date are promising.

Finally, the gender-specific trends in employment outcomes that this study observed are worthy of comment and further attention. The results indicate that women are less likely than men to have careers in the private sector, less likely to be in academia and less likely to be employed in academic positions outside of Canada. These gender trends have been

observed in other PhD career outcomes studies too (Porter et al. 2017). An important area for future research is to understand the factors that drive these trends and whether there are systemic barriers in the labour market, gaps in doctoral training and supports, differences in career preferences or a combination of these and other factors that require policy attention.

Limitations

This project documented career outcomes, but it is not known whether outcomes align with graduates' underlying career preferences, whether career preferences have changed over time (and if so, why), the extent to which graduates are satisfied with their careers or whether and how doctoral training contributed to employment performance. A mixed-methods research study that includes interviews with graduates and their employers could examine important questions such as the following: Is the increasing employment in non-academic fields a reflection of increased desire to contribute in applied settings or a reflection of disillusionment with career prospects in academia? To what extent are HSPR doctoral holders using their research skills when employed outside of the academic sector? To what extent are HSPR doctorate holders satisfied in their careers? A recent survey of over 8,000 PhD graduates in a diverse array of fields from over 500 science-related PhD training programs in the US found that job satisfaction among graduates was high and not statistically different for those employed in research-intensive positions (including tenure-track research and industry and government research) and non-research-intensive positions (such as science policy, administration, business development, consulting and others) (Sinche et al. 2017). There is no evidence to indicate that the preferences or satisfaction among HSPR PhD graduates would differ, and it is not a stretch to imagine stronger preferences for careers outside of the university setting given the applied nature of the HSPR field. However, future research that examines, empirically, the career preferences and satisfaction of HSPR PhD graduates would be a valuble contribution to the evidence base in Canada.

Our project was based on data from a subset of Canada's HSPR PhD programs. It is unknown whether the employment outcomes of participating programs differ from those of non-participants, and the results should therefore be interpreted as directional in nature rather than definitive. However, most of the major hubs of HSPR training (based on grants and awards dollars [Sullivan and Associates 2014]) were included, and the findings are consistent with the results of other PhD career-tracking studies. The analysis relied on publicly available data sources, and it is not known whether the information retrieved is fully accurate. However, data that appeared to be potentially erroneous were checked with the training program (e.g., PhD completion times of one year) and updated if necessary. Finally, the original intent of the analysis was to track career trajectories, including employment transitions, over time. However, the publicly available online data contained too many gaps to accurately identify an individual's full career trajectory. Future research that couples Internet searches with surveys of PhD graduates could help address this gap.

Conclusions

Employment trends for Canada's HSPR PhD graduates have changed over time and remain bright. Recent graduates are more likely to work in a variety of sectors, including but not limited to academia. That HSPR PhD graduates are employed in the public, private, not-for-profit, healthcare delivery and independent sectors in a variety of leadership and science-related roles is promising for the knowledge economy and societal innovation. It is notable that more than 50% of the HSPR PhD graduates who could be tracked are currently employed in professorial positions or in research-related roles (e.g., scientist, epidemiologist, research director) within healthcare delivery organizations, such as in academic teaching hospitals. However, to ensure that PhD graduates are prepared to contribute fully within diverse sectors and roles, doctoral training must evolve to keep pace with employment trends and encompass, in addition to research and analytic skills, the professional skills demanded in the public, private, not-for-profit and healthcare delivery sectors.

As doctoral training and research funding programs evolve, it will be important to replicate this initial project and assess whether and how career outcomes change. Future career outcomes studies may also benefit from incorporating key informant interviews or surveys of graduates to assess the factors driving career choices and to better understand employment satisfaction, job stability, self-perceived preparedness for their job and the contributions they make in their roles. It is hoped that the data collection tools developed for the present study will be a resource for doctoral training programs in Canada to incorporate tracking as a routine element of their impact assessment and that use of a common set of indicators, such as those used in this study, will enable comparisons across the country and over time.

Notes

1. The 23 HSPR training programs were identified using a list that CIHR-IHSPR compiled in 2016 (http://www.cihr-irsc.gc.ca/e/49884.html). It is possible that some programs were missed and that the list and outreach were comprehensive but not exhaustive.
2. To examine the sensitivity of our findings to how the "university professor" subsector variable was defined, we excluded "lecturer" and re-estimated our descriptive analyses. When "lecturer" is excluded and re-categorized as "other," 36.2%, rather than 37.3%, are employed in university professorial positions. The overall percentage of graduates employed in the academic sector – 47.5% – is unaffected.
3. New programs that have entered the market include, for example, McMaster University's PhD in Health Policy program in 2008, the University of Ottawa's Telfer School of Management's PhD in Health Systems and Dalhousie University's PhD in Epidemiology and Applied Health Research and PhD in Health programs in 2015.

Acknowledgements

The authors would like to thank Dr. Reinhart Reithmeier for inspiring this career-tracking study and for sharing his methodology and insight from the 10,000 PhDs Project that he led at the University of Toronto. The authors thank Chang Zou for his help with data collection, without which this study would not have been possible. The authors would also like to thank the participating programs for their contributions to this first-ever profile of the career outcomes of HSPR PhD graduates in Canada.

Correspondence may be directed to: Meghan McMahon, PhD; e-mail: mmcmahon.ihspr@ices.on.ca.

References

Atkins, D. 2018. "Are We Growing the Right Health Services Research Workforce of the Future? Thoughts from a National Delivery System." *Health Services Research* 53(Suppl. 2): 54030–40. doi:10.1111/1475-6773.13032.

Auriol, L. 2010. "Careers of Doctorate Holders: Employment and Mobility Patterns." *OECD Science, Technology and Industry Working Papers*. No. 2010/04. Paris, France: OECD Publishing. Retrieved November 24, 2018. <http://dx.doi.org/10.1787/5kmh8phxvvf5-en>.

Auriol, L., M. Misu and R. Freeman. 2013. "Careers of Doctorate Holders: Analysis of Labour Market and Mobility Indicators." *OECD Science, Technology and Industry Working Papers*. No. 2013/04. Paris, France: OECD Publishing. Retrieved November 24, 2018. <http://dx.doi.org/10.1787/5k43nxgs289w-en>.

Benderly, B.L. 2018, March 7. "A Trend Toward Transparency for Ph.D. Career Outcomes?" *Science*. Retrieved November 24, 2018. <https://www.sciencemag.org/careers/2018/03/trend-toward-transparency-phd-career-outcomes>.

Bindman, A.B. 2017. "The Agency for Healthcare Research and Quality and the Development of a Learning Health Care System." *JAMA Internal Medicine* 177(7): 909–10. doi:10.1001/jamainternmed.2017.2589.

Bornstein, S., M. Heritage, A. Chudak, R. Tamblyn, M. McMahon and A. Brown. 2018. "Development of Enriched Core Competencies for Health Services and Policy Research." *Health Services Research* 53(5 Suppl. 2): 4004–23. doi.org/10.1111/1475-6773.12847.

Burgess, J.F., N. Menachemi and M. Maciejewski. 2018. "Update on the Health Services Research Doctoral Core Competencies." *Health Services Research* 53(5 Suppl. 2): 3985–4003. doi:10.1111/1475-6773.12851.

Canadian Council of Academies. 2019. *The Labour Market Transition of PhD Graduates*. Retrieved August 7, 2019. <https://cca-reports.ca/reports/the-labour-market-transition-of-phd-graduates/>.

Canadian Health Services and Policy Research Alliance Training Modernization Working Group. 2015. Challenges, Opportunities, and Future Directions for Health Services and Policy Research in Canada: A White Paper. Ottawa, ON: Canadian Institutes of Health Research.

Chafe, R. and M. Dobrow. 2008. "Health Services Researchers Working within Healthcare Organizations: The Intriguing Sound of Three Hands Clapping." *Healthcare Policy* 4(2): 37–45.

Conrad, P. 2008. "To Boldly Go: A Partnership Enterprise to Produce Applied Health and Nursing Services Researchers in Canada." *Healthcare Policy* 3(Special Issue): 13–30. doi:10.12927/hcpol.2008.19810.

Cornell University. 2018. "Doctoral Career Outcomes." Retrieved August 7, 2019. <https://gradschool.cornell.edu/degrees-fields/program-metrics-assessments-and-outcomes/doctoral-career-outcomes/>

Doonan, F., L. Taylor, P. Branduardi and J.P. Morrissey. 2018. "Innovative Training Networks: Overview of the Marie Skłodowska-Curie PhD Training Model." *FEMS Microbiology Letters* 365(19). doi:10.1093/femsle/fny207.

Duke University. 2018. "All Departments: PhD Career Outcomes Statistics." Retrieved August 7, 2019. <https://gradschool.duke.edu/about/statistics/all-departments-phd-career-outcomes-statistics>.

Edge, J. and D. Munro. 2015. *Inside and Outside the Academy: Valuing and Preparing PhDs for Careers*. Ottawa, ON: Conference Board of Canada.

European Commission. 2018. *Marie Skłodowska-Curie Actions: Research Networks*. Retrieved November 25, 2018. <https://ec.europa.eu/research/mariecurieactions/actions/research-networks_en>.

Forrest, C.B., F.D. Chesley Jr., M.L. Tregear and K.B. Mistry. 2018. "Development of the Learning Health System Researcher Core Competencies." *Health Services Research* 53(4): 2615–32. doi:10.1111/1475-6773.12751.

Institute of Health Services and Policy Research (IHSPR). 2016. *A Pan-Canadian Health Services and Policy Research Curriculum for Enriched Core Competencies: An Environmental Scan*. Internal report.

Institute of Health Services and Policy Research (IHSPR). 2017. *HSPR Community Engagement Survey: Informing the Training Modernization Funding Strategy*. Internal document.

Institute of Health Services and Policy Research (IHSPR). 2019. *Analysis of HSIF Enriched Core Competency Assessments*. Internal document.

Institute of Medicine (IOM). 2013. *Best Care at Lower Cost: The Path to Continuously Learning Health Care in America*. Washington, DC: The National Academies Press.

Jonker, L. 2016. *Ontario's PhD Graduates from 2009: Where Are They Now?* Toronto, ON: Higher Education Quality Council of Ontario. Retrieved August 10, 2018. <http://www.heqco.ca/SiteCollectionDocuments/Ontario%27s-PhD-Graduates-from-2009-ENG.pdf>.

Kanani, N., E.E. Hahn, M.K. Gould, K.D. Brunisholz, L.A. Savitz and E.C. Holve. 2017. "AcademyHealth's Delivery System Science Fellowship: Training Embedded Researchers to Design, Implement, and Evaluate New Models of Care." *Journal of Hospital Medicine* 12(7): 570–74. doi:10.12788/jhm.2776.

Lomas, J. and A.D. Brown. 2009. "Research and Advice Giving: A Functional View of Evidence-Informed Policy Advice in a Canadian Ministry of Health." *The Milbank Quarterly* 87(4): 903–26. doi:10.1111/j.1468-0009.2009.00583.x.

Martens, P.J. 2008. "The Regional Training Centre: If We Build It [Well], They Will Come." *Healthcare Policy* 3(Special Issue): 7–12. doi:10.12927/hcpol.2008.19809.

McMahon, M., S. Bornstein, A. Brown, S. Simpson, L. Savitz and R. Tamblyn. 2019. "Training for Health System Improvement: Emerging Lessons from Canadian and US Approaches to Embedded Fellowships." *Healthcare Policy* 15(Special Issue): 34–48. doi:10.12927/hcpap.2019.25981.

Morrison, E., J. Thornhill and S. Sheps. 2008. "A Foot in Both Camps: Graduate Voices at the Interface of Applied Health Services Research, Policy and Decision-Making." *Healthcare Policy* 3(Special Issue): 118–30. doi:10.12927/hcpol.2008.19818.

National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. 2014. *The Postdoctoral Experience Revisited*. Washington, DC: The National Academies Press.

National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. 2018. *The Next Generation of Biomedical and Behavioral Sciences Researchers: Breaking Through*. Washington, DC: The National Academies Press.

Paradis, G., A.-M. Hamelin, M. Malowany, J. Levy, M. Rossignol, P. Bergeron et al. 2017. "The University-Public Health Partnership for Public Health Research Training in Quebec, Canada." *American Journal of Public Health* 107(1): 100–04. doi:10.2105/AJPH.2016.303529.

Porter, S., L. Mol, J. Locher and M. Johnston. 2017. *UBC PhD Career Outcomes: Graduates from 2005 to 2013 UBC Vancouver Campus*. UBC Graduate & Postdoctoral Studies. Retrieved November 22, 2018. <http://outcomes.grad.ubc.ca/docs/UBC_PhD_Career_Outcomes_April2017.pdf>.

Princeton University. 2019. "Ph.D. Long-Term Career Outcomes." Retrieved August 7, 2019. <https://gradschool.princeton.edu/about/statistics/phd-long-term-career-outcomes>.

Psek, W.A., R.A. Stametz, L.D. Bailey-Davis, D. Davis, J. Darer, W.A. Fawcett et al. 2015. "Operationalizing the Learning Health Care System in an Integrated Delivery System." *eGEMs (Generating Evidence & Methods to Improve Patient Outcomes)* 3(1): 1122. doi:10.13063/2327-9214.1122.

Reid, R.J. 2016. "Embedding Research in the Learning Health System." *HealthcarePapers* 16(Special Issue): 30–35. doi:10.12927/hcpap.2016.24724.

Rich, E. and A. Collins. 2018. "Current and Future Demand for Health Services Researchers: Perspectives from Diverse Research Organizations." *Health Services Research* 53(5 Suppl. 2): 3927–44. doi:10.1111/1475-6773.12999.

Sinche, M., R.L. Layton, P.D. Brandt, A.B. O'Connell, J.D. Hall, A.M. Freeman et al. 2017. "An Evidence-Based Evaluation of Transferrable Skills and Job Satisfaction for Science PhDs." *PLoS ONE* 12(9):e0185023. doi:10.1371/journal.pone.0185023.

Stanford University (n.d.). "PhD Jobs: The Stanford PhD Alumni Employment Project." Retrieved August 8, 2018. <https://irds.stanford.edu/phd-jobs>.

Sullivan, T. and Associates. 2014. *A Pan-Canadian Vision and Strategy for Health Services and Policy Research. Phase 1: Building the Foundation*. Retrieved August 4, 2019. <http://www.cihr-irsc.gc.ca/e/47946.html#tab_7>.

Tamblyn, R., M. McMahon, J. Nadigel, B. Dunning and E. Drake with the Institute of Health Services and Policy Research Advisory Board. 2016. "Health System Transformation Through Research Innovation." *HealthcarePapers* 16(Special Issue): 8–19. doi:10.12927/hcpap.2016.24719.

"The Disposable Academic." 2010, December 16. Retrieved November 25, 2018. <https://www.economist.com/christmas-specials/2010/12/16/the-disposable-academic>.

University of Toronto. 2016. *Employed and Engaged: An Overview of the 10,000 PhDs Project*. Retrieved August 8, 2018. <http://www.sgs.utoronto.ca/Documents/SGS_Overview_10KPhDsProject.pdf>.

Wolfson, M. 2011. "Health Care Is a Knowledge Industry, and Should Be More So." In F. Gorbet and A. Sharpe, eds., *New Directions for Intelligent Government in Canada: Papers in Honour of Ian Stewart*. Ottawa, ON: Centre for the Study of Living Standards. Retrieved November 24, 2018. <http://www.csls.ca/festschrift/StewartFestschrift.pdf#page=257>.

RESEARCH PAPER

Training for Health System Improvement: Emerging Lessons from Canadian and US Approaches to Embedded Fellowships

Formation pour l'amélioration du système de santé : leçons retenues des programmes de bourses enchâssées dans les systèmes, au Canada et aux États-Unis

MEGHAN MCMAHON, MSC, PHD
Associate Director, CIHR Institute of Health Services and Policy Research
Institute of Health Policy, Management and Evaluation
University of Toronto
Toronto, ON

STEPHEN BORNSTEIN, PHD
Professor, Division of Community Health and Humanities, Faculty of Medicine
Department of Political Science, Faculty of Arts
Memorial University
Director, Newfoundland and Labrador Centre for Applied Health Research
Co-Director, SafetyNet Centre for Occupational Health and Safety Research
St. John's, NL

ADALSTEINN BROWN, D.PHIL
Dean, Professor, Dalla Lana School of Public Health
University of Toronto
Toronto, ON

LISA A. SIMPSON, MB, BCH, MPH
President and CEO
AcademyHealth
Washington, DC

LUCY SAVITZ, PHD, MBA
Vice President, Health Research
Kaiser Permanente Northwest
Portland, OR

ROBYN TAMBLYN, PHD
Professor, Department of Medicine and Department of Epidemiology, Biostatistics and Occupational Health
McGill University
Scientific Director (former), CIHR Institute of Health Services and Policy Research
Montreal, QC

Abstract

The benefits of supporting experiential learning for improved health and societal outcomes have been recognized in many countries. A number of funding organizations have developed competitive funding opportunities to support experiential learning in health system organizations outside of the traditional university setting. AcademyHealth in the US is an early innovator that pioneered the Delivery System Science Fellowship (DSSF) and inspired Canada's creation of the Health System Impact (HSI) Fellowship program. The DSSF and HSI Fellowship have similar objectives: to improve the career readiness of doctorally prepared graduates and to build research capacity within health system organizations. However, the programs have taken different approaches to achieve these objectives and operate in different healthcare systems. This paper outlines the two models of embedded fellowships, analyzes their commonalities and differences, discusses lessons learned and suggests future directions for health services and policy research training.

Résumé

Plusieurs pays reconnaissent les bienfaits de l'apprentissage expérientiel pour améliorer les résultats dans la société et dans les systèmes de santé. Certains organismes subventionnaires ont développé des possibilités de financement afin d'appuyer l'apprentissage expérientiel dans des organismes de santé en dehors des établissements universitaires habituels. Aux États-Unis, l'organisme AcademyHealth a mis au point le Delivery System Science Fellowship (DSSF), qui à son tour a inspiré la création, au Canada, du Programme des bourses d'apprentissage en matière d'impact sur le système de santé (BAIS). Ces deux programmes ont des objectifs similaires : améliorer l'aptitude à la carrière des titulaires de doctorat et accroître la capacité de recherche dans les établissements de santé. Cependant, ces programmes se déroulent dans des systèmes de santé distincts et ont pris des tangentes différentes pour atteindre leurs objectifs. Cet article présente les deux modèles de bourses enchâssées, analyse leurs similitudes et différences, discute des leçons retenues et propose des pistes d'orientation en matière de formation en recherche sur les politiques et les services de santé.

Introduction

Health services and policy research (HSPR) is the innovation engine of a healthcare system (Tamblyn et al. 2016a). The Canadian Institutes of Health Research Institute of Health Services and Policy Research (CIHR-IHSPR) defines it as the field of scientific investigation that generates evidence on how to invest in programs, services and technologies that maximize health and health system outcomes (CIHR-IHSPR 2016), and it is similarly defined by AcademyHealth and the Agency for Healthcare Research and Quality (AHRQ) in the US (Mor and Wallace 2018). Countries worldwide are grappling with rising expenditures, inefficient service delivery and suboptimal patient outcomes, and doctoral graduates in HSPR

have the skills to tackle such challenges and the potential to make significant contributions to health system improvement (Bornstein et al. 2019; Brown and Nuti 2016; Tamblyn et al. 2016b). The contributions of doctorally trained health services and policy researchers can come through investigator-driven research in academic institutions and be published in peer-reviewed journals, as is typical in the basic sciences. But their contributions can also take the form of applied research driven by the health system's needs that is conducted in real-world settings such as healthcare delivery organizations, and their research can be used to inform the policies, programs and services that directly impact people and populations (Atkins 2018; Atkins et al. 2017; Boaz et al. 2015; Chafe and Dobrow 2008; CIHR 2013; Hanney et al. 2003; Lomas and Brown 2009; Marshall et al. 2016). To date, however, university-based doctoral training curricula and research funding programs in Canada and the US have tended to emphasize the former type of contribution by encouraging and rewarding careers within the academy. To ensure that HSPR drives tangible improvement on the ground, there is emerging consensus in both countries that doctoral training and research funding programs must modernize to prepare graduates for embedded research and leadership roles within health system organizations and emerging learning health systems (LHSs) (Forrest et al. 2018; Tamblyn et al. 2016b).

CIHR-IHSPR in Canada and AcademyHealth in the US are two organizations that are experimenting with new models of post-doctoral fellowships that train for real-world impact by embedding HSPR trainees directly within systems and organizations at the coalface of policy making and service delivery. The underlying program logic is twofold: (1) increased support and recognition for post-doctoral training that occurs within applied health system settings – such as within health policy and service delivery organizations – will improve the success and impact of these individuals in a broader range of employment roles and settings and (2) embedding research expertise directly within health system organizations to help tackle complex and high-priority challenges will, as postulated by theories on integrated knowledge translation and participatory research (CIHR 2012; Cornwall and Jewkes 1995; Lomas 2000), lead to the creation of more relevant, useful research findings that are more likely to inform policy and practice. In the UK, this embedded researcher model is referred to as the "researcher-in-residence" and is viewed there as a participatory research approach that can help bridge the "know-do gap" and increase the influence of HSPR on policy and service delivery (Marshall et al. 2014, 2016). Given the small number of embedded fellowship and applied research training programs that have been evaluated to date, which come primarily from Canada and the pre-LHS era (see, for example, CIHR [2016]; Martens [2008] and the other articles in the 2008 *Healthcare Policy/Politiques de Santé* special issue on Canada's Regional Training Centres; and Paradis et al. [2017]), it is useful to compare two embedded fellowship models: the recently created CIHR-IHSPR model and the AcademyHealth fellowships. These two models have similar objectives and share several common elements but also differ in important ways and operate in different countries and contexts. They provide a valuable opportunity to compare approaches and reflect on what appears to be working and

why. The purpose of this commentary is to compare the objectives, attributes and outcomes of the CIHR-IHSPR and AcademyHealth embedded fellowship models, discuss the lessons learned and introduce future directions for HSPR training and LHSs.

Description of the Canadian and US Embedded Fellowship Programs

The Canadian approach: the Health System Impact Fellowship

CORE OBJECTIVES

The Health System Impact (HSI) Fellowship program was designed in 2016 to fill a gap in Canada's HSPR doctoral and post-doctoral training programs. The Training Modernization Working Group (TMWG) of the Canadian Health Services and Policy Research Alliance (CHSPRA) found that although a very high proportion of Canada's HSPR PhD graduates enter careers in research and administrative jobs in health system organizations rather than in professorial positions in university departments (see McMahon et al. [2019b] in this issue), universities are continuing to train them in traditional ways, with a focus on academically relevant skills and university careers. Accordingly, through consultations with the TMWG and key stakeholders across the country, CIHR-IHSPR designed a new, competitive national program of embedded fellowships that prepares PhD trainees and post-doctoral fellows for careers and impact in a diverse array of health system settings. By enhancing the employability and effectiveness of Canada's PhD graduates for careers within the health system, the HSI Fellowship program also seeks to make a longer-term contribution to the development of LHSs in Canada.

INNOVATIVE FEATURES

The HSI Fellowship program has five distinctive features: (1) It involves a modernized, pan-Canadian curriculum focused on a set of enriched core competencies (e.g., leadership, change management) designed to prepare fellows for success in careers outside the university (see Bornstein et al. [2018] and McMahon et al. [2019b] in this issue), and they include a dedicated professional development allowance to support fellows' pursuit of these core competencies; (2) It includes substantial experiential learning placements that embed fellows in a "host partner organization" that also provides co-funding for a program of work designed to address a high-priority challenge (an "impact goal") identified by the organization; (3) It involves co-supervision and mentorship by a health system leader and an academic leader; (4) It permits fellows to protect up to 30% of their time for academic research within the university in order to stay at the forefront of their field and bring the latest academic developments to bear on "real-world" challenges; and (5) It brings all the funded fellows, and their health system and academic mentors, together in a national cohort whose annual in-person meeting and quarterly webinar sessions contribute to training, peer-to-peer collaborations and cross-cohort learning. These innovative features come together in a two-year fellowship for

post-doctoral fellows and a one-year fellowship for doctoral trainees that are jointly funded by federal and provincial funders and by the host partner organizations.

PARTNERS INVOLVED

In the program's first two years, 62 health system organizations and 23 academic training programs across the country have hosted fellows. The organizations involved have included healthcare delivery organizations, federal and provincial government agencies, provincial and regional health systems, public health offices, health charities, consulting firms, health professional associations and non-university research institutes. Their number and diversity are an encouraging indication of the demand for doctoral-level skills within Canada's health systems. Together with the funding partners, these organizations have, since 2017, funded 95 HSI Fellowship awards.

The US Approach: The Delivery System Science Fellowship

CORE OBJECTIVES

In contrast to the Canadian initiative that is jointly spearheaded by an alliance of funders, training programs and health system organizations, including the federal funder of HSPR (CIHR-IHSPR), the US program is led by AcademyHealth, a private, professional organization of health services and policy researchers in the US. AcademyHealth convened the Health Services Research Consortium over the course of several years to support dialogue between directors of HSPR training programs and employers of health services and policy researchers. Examining changing membership trends, AcademyHealth identified a shift in the employment settings of its researcher members from primarily academic jobs toward the inclusion of positions in the healthcare industry (Menachemi et al. 2018). At the same time, it also found that its employer members faced growing hiring challenges. Based on this work and the expressed needs of delivery systems, the Delivery System Science Fellowship (DSSF) was launched in 2012. Background for the program and examples of fellow experiences are described in detail by Kanani et al. (2017).

To date, 29 post-doctoral fellows have completed their training as DSSFs and five individuals started their fellowship in 2018 (AcademyHealth internal DSSF program records). There is an annual application process and review of these applications by a national advisory committee and participating host sites, which then reach out to those highly ranked applicants who best meet their needs. Key objectives of the DSSF have been to:

- provide a real-world learning experience in host delivery systems;
- generate insights by answering relevant, operational questions faced by delivery systems and developing new measures and methods to support embedded work; and
- expand the available research workforce by eliminating the gap in available training experiences.

Mentorship of fellows is structured to include at least three components: an on-site mentor to provide guidance on program activities, an external individual with shared interests who can advise fellows on their career track and broader professional development issues and a peer-mentoring component through monthly fellow calls. Additionally, quarterly webinars and an annual in-person meeting promote shared learning and peer mentorship. Of the 29 graduate fellows, approximately one-third stayed in the fellowship more than a year and approximately half have been hired permanently by their host site.

INNOVATIVE FEATURES

This program is a joint venture executed by AcademyHealth and sponsored by delivery system partners. AcademyHealth markets the opportunity annually, manages the application review process, supports health systems and fellows during the hiring and onboarding, serves as the national home for convening DSSF holders (both virtually and in person) and provides a respected, nationwide community of fellows. Salaries, benefits, travel to AcademyHealth meetings, requisite work tools and mentoring are provided by the delivery system for a minimum of one year, although several health systems have extended fellows for a second year and/or eventually hired them full time. This arrangement delivers a win-win experience whereby a delivery system can assess whether or not the fellow is a good organizational fit and the fellow can make an informed decision on whether operationally relevant research is compatible with his or her career goals. Particularly noteworthy is that this program was launched seven years ago and has never received a grant or other support from the US government or philanthropic sources. It has been sustainable due to hosts' demand for fellows and their willingness to cover the fellowship costs.

PARTNERS INVOLVED

The commitment of DSSF partners in terms of resources, access to data, mentoring and support for attendance at the AcademyHealth Annual Research Meeting requires health systems to make significant investments in an on-the-job training program. Fellows have now been placed in 21 delivery systems across the US that provide care to over 100 million people, including some of the most well-known delivery networks (e.g., Kaiser Permanente, Intermountain Healthcare and Geisinger). Some of the DSSF host sites are now funded by the AHRQ (a governmental agency) and the Patient-Centered Outcomes Research Institute (a non-governmental organization funded by public dollars) through a $40 million initiative over five years to support the training of clinician and research scientists to conduct patient-centred outcomes research within LHSs (AHRQ 2018).

Comparing the Approaches

Although the DSSF model directly inspired the design and creation of Canada's HSI Fellowship, the two fellowships differ in a number of key features, as shown in Table 1. The contexts – including the political, societal and economic contexts – in which the two

fellowships emerged and are situated also differ, but an in-depth comparison of those is beyond the scope of the present paper and is recommended as an area for future research attention.

TABLE 1. Comparison of key features of the Canadian and US embedded fellowships

Program feature	AcademyHealth Delivery System Science Fellowship	CIHR-IHSPR Health System Impact Fellowship
Eligibility	Post-doctoral – multiple disciplines (e.g., PhD, MD, DrPH)	Doctoral trainees and post-doctoral fellows (PhD only or MD + PhD)
Host site mandate and eligibility	Host sites are US health service delivery organizations and integrated delivery systems and other sites with a mandate to deliver care (e.g., healthcare, dental care), identified and deemed eligible by AcademyHealth	Canadian health system and related organizations (public, private, not-for-profit) with a health-related mandate that are not universities or university-based research institutes, identified by CIHR or the applicant
Examples of host sites	Atrius Health; Geisinger Health System; Kaiser Permanente Northwest; US Department of Veterans Affairs; additional examples available at: https://www.academyhealth.org/dssf.	Ministries of health; regional health authorities; hospitals; health charities; health-focused consulting firms; additional examples available at: http://www.cihr-irsc.gc.ca/e/50612.html.
Duration	1 year minimum (may be longer, as determined by host site)	• Doctoral: 1 year • Post-doctoral: 2 years
% time embedded	100%	• Doctoral: 60% (minimum) • Post-doctoral: 70% (minimum) • The balance of time, if any, is protected for academic research with the fellow's academic supervisor.
Supervision	Senior leader of host health system organization	Co-supervised by a senior leader in host health system organization and an academic at a Canadian graduate training program
Mentorship	Formal mentoring and professional development training plan created jointly by supervisor and fellow, discussed and reviewed regularly	Formal mentoring and professional development training plan jointly created by co-supervisors and fellow, discussed and reviewed regularly
University involvement	Not required	Required. Fellow must have a formal affiliation (as a registered post-doctoral fellow with a Canadian university) and an academic supervisor who has an academic appointment with a university-based graduate training program and has expertise in HSPR or a related field. Fellows may protect up to 40% of their time for academic work.
Professional development	Program level (through AcademyHealth) and host site level	Program level (through CIHR), fellowship level (dedicated training allowance) and host site level
Program seminars	Annual meeting and AcademyHealth-organized webinars	Annual National Cohort Retreat and quarterly CIHR-organized webinars

TABLE 1. Comparison of key features of the Canadian and US embedded fellowships (cont'd)

Amount	Determined by host site but must meet the National Research Service Awards' stipend minimum (as of January 2019, min. US$50,004[§])	• Doctoral: $45,000 stipend + $5,000 training allowance • Post-doctoral: $70,000 stipend (per year) + $7,500 training allowance (per year)
Funder	Host site (100%)	Co-funded by CIHR and provincial funders (together provide 70% of each award's funds) + host partner organization (provides 30% of the award's funds)
Number of host sites*	21	62
Number of funded fellows*	34	95

*as of December 2018
[§]https://grants.nih.gov/grants/guide/notice-files/NOT-OD-19-036.html

Lessons Learned and Future Directions

The comparison of fellowship models (Table 1), a review of program evaluation reports and in-depth discussions between the heads of CIHR-IHSPR and AcademyHealth and their fellowship advisory committees have revealed four principal lessons learned thus far and four future directions for HSPR training and LHSs.

Lessons learned

1. A FLEXIBLE PROGRAM DESIGN FOSTERS UPTAKE AND ALLOWS ADAPTABILITY.

Every health system is a complex entity composed of a diverse mix of organizations. For an embedded fellowship program to gain traction and widespread uptake, it must have clear objectives but also a flexible design that permits adaptation to the local organizational context. AcademyHealth provides concrete guidance to its host partner organizations on *what* the fellowship objectives are but not on *how* to operationalize the objectives. Organizations, most of whom have a long-standing tradition of research and existing research capacity, can tailor the implementation and execution of the fellowship to their unique needs and the interests and skills of the trainee. Similarly, CIHR-IHSPR provides clear objectives, eligibility conditions and peer review criteria but allows flexibility to fellows and host organizations to tailor their projects, training plans and the allocation of their embedded and academic time to their unique goals and needs. Given the diversity of organizations involved in the HSI Fellowship program and differences in these organizations' previous experience with and capacity for research, additional guidance regarding research processes and outputs, strategies for dual health system and academic mentorship and models of successful partnerships with universities could be beneficial.

2. THE CULTURE AND OPERATIONS OF UNIVERSITY INSTITUTIONS AND HEALTH SYSTEM ORGANIZATIONS DIFFER, AND ACCULTURATION TAKES TIME AND ATTENTION.

It has been recognized in both Canada and the US that the work environments in health system organizations differ from the university settings in which doctoral students are currently trained and that the skill set required to contribute to and lead transformative change within these organizations differs from those emphasized in most doctoral programs (Bornstein et al. 2018; Hamelin and Paradis 2018; Kanani et al. 2017; Paradis et al. 2017; Reid 2016; Tamblyn et al. 2016b) and from those currently prioritized and rewarded within academic institutions (Hunter 2019; Marshall et al. 2016). Many PhD graduates have extensive academic training but lack experience working in other settings. It can take months to grasp the language and cadence of an organization and even longer to learn to work effectively in the operation and contribute value to it (Marshall et al. 2016; Sheps et al. 2008). A different set of competencies than those conventionally emphasized in university training programs is needed to prepare graduates for success in health system organizations (see Bornstein et al. 2018; Burgess et al. 2018; Forrest et al. 2018; Paradis et al. 2017; Reid 2016). CIHR-IHSPR experimented with one- and two-year post-doctoral awards and learned that one year is too short to make a real impact. In its subsequent rounds, it offered two-year fellowships only. DSSF host sites have had a similar experience, and, although not mandated by the program, some are now offering only two-year fellowships. Additional guidance to host sites regarding promising strategies for onboarding fellows and creating initial conditions for long-term success, to health system and academic supervisors regarding the importance of mentorship (Bornstein et al. 2019; Hamelin and Paradis 2018; Sambunjak et al. 2010) and to fellows regarding the policy- and decision-making process may accelerate acculturation.

3. THE COHORT EFFECT IS VALUABLE AND WORTH FOSTERING.

The DSSF and HSI Fellowship have both deliberately fostered connectivity among fellows and the establishment of a community of peers. Both programs provide structured opportunities via annual meetings and regular webinars to help the fellows establish relationships and collaborations. This helps with acculturation and helps fellows learn from one another's experiences, strategies and advice. The efforts to establish these cohorts have proven valuable in both countries. In Canada, the structured opportunities, such as the National Cohort Retreat, have catalyzed collaborations among fellows to develop research studies (see, for example, the paper included in this special issue by Blanchette et al. [2019]; Sim et al. [2019]; Weijs et al. [2019]), to submit multi-authored abstracts for panels at national conferences and to organize informal regional and thematic communities of practice.

4. THE FELLOWSHIP PROGRAMS HAVE LEGITIMIZED CAREER PATHWAYS WITHIN HEALTH SYSTEM ORGANIZATIONS.

There is considerable demand for doctoral-level talent within health system organizations and demand from trainees for real-world training opportunities. Traditionally, however,

trainees have been encouraged to pursue academic careers within universities, and anything else has been perceived (within academic circles) as second class. Similarly, health system organizations have lacked structured opportunities to recruit high-calibre doctoral talent. National championship of the DSSF has legitimized the choice to work within the health system and recognized it as a credible career pathway within the broader HSPR enterprise. It is hoped that the HSI Fellowship is helping to accelerate a similar culture change in Canada, a shift that was sparked almost two decades ago with the creation of innovative training programs such as Quebec's Training Program in Transdisciplinary Research on Public Health Interventions (Hamelin and Paradis 2018; Paradis et al. 2017), the Capacity for Applied and Developmental Research and Evaluation (CADRE) Regional Training Centres (Conrad 2008; Martens 2008; Sheps et al. 2008) and others that made significant contributions to building capacity for applied and embedded research but that were grant-funded with fixed funding terms that have ended. The DSSF and HSIF Fellowship have provided a structure to meet, funnel and shape current demand from both health system organizations and doctoral trainees.

Future directions for health services and policy research training and learning health systems

1. EVALUATE PROGRAMS FOR CONTINUOUS IMPROVEMENT.

There is strong enthusiasm across much of the Canadian health system for how HSPR training modernization can support emerging LHSs and overall health system improvement. However, major initiatives in human capital development, such as the DSSF and the HSI Fellowship, are far too rarely evaluated. There are notable exceptions upon which to learn and build, such as those identified earlier in this paper. So, to contribute to the currently limited evidence on impact-oriented HSPR training, it will be important to evaluate their impact at regular intervals, adjust their parameters for continued relevance to employment trends and health system needs and report on lessons learned. The papers in the present issue reflect initial efforts to learn from early experiences with the HSI Fellowship program, including whether and how fellows' enriched core competencies evolved over the course of the first year (see McMahon et al. 2019a), what contributions fellows made to their host partner organizations (see Blanchette et al. 2019) and the role and value of mentors in embedded research settings (see Bornstein et al. 2019). Over time, as the Canadian and US programs expand and evolve, it will be important to investigate questions such as the following: Does hosting a fellow generate spillover effects for an organization's internal culture of research and continuous learning? What are the impacts of the dual health system and academic supervisor approach on the quality of the research and training experience? Do embedded research programs successfully enhance career opportunities for fellows and increase their capacity to drive health system improvement? How can we increase the implementation of

embedded research to inform organizational decision-making? Are the HSI Fellowship's enriched core competencies the right ones, given the emergence of LHSs, the explosion of big data and the importance of patient and citizen engagement?

2. DEVELOP CONSENSUS ON THE CONCEPT OF EMBEDDED RESEARCH IMPACT.

Related to future direction #1 is the importance of developing consensus on the concept of embedded research impact – particularly from the perspective of the health system organizations that are embedding researchers. Recent efforts in Canada have focused on developing a framework for measuring the impact of HSPR on policy- and decision-making (CHSPRA, Impact Analysis Working Group 2018) and on understanding the contributions that HSI fellows have made within their host partner organizations (see Blanchette et al. 2019). In the US, the AcademyHealth team has engaged its host sites to better understand what impact looks like and means from their perspective. Developing an enhanced understanding of embedded research impact and moving toward a framework with meaningful and measurable indicators will support efforts to understand the value of embedded research and can help inform the design of embedded research funding programs and embedded research positions and units within delivery systems (Atkins et al. 2017). It may also help expand the emphasis beyond peer-reviewed publications and bibliometric citation indexes that prevail in many academic institutions, which has been identified as crucial to the long-term success of embedded research programs (Hunter 2019). Efforts to understand the full breadth of research impact, and to measure and communicate such impacts, are under way in other countries too, and it will be important that embedded fellowship programs continue to study and learn from innovative approaches such as the Research Excellence Framework in the UK (https://www.ref.ac.uk/).

3. ALIGN GOALS, POLICIES AND PROGRAMS.

Prestigious national fellowship awards have helped accelerate a promising shift in training, but sustaining this shift and its impact will require alignment of the policies of health research funders (public and private), the curricula and reward schemes of universities and the commitment of health system organizations to embedded research and data-driven operation. Pioneering changes in the remit of funding agencies have increased investment in implementation science and knowledge translation to enable the benefits of research to be realized in practice (e.g., the Patient-Centred Outcomes Research Institute, the Strategy for Patient-Oriented Research, European Union TO-REACH). Similarly, the addition of new fellowship programs, such as the DSSF, the HSI Fellowship and others, such as the Mitacs Elevate (Mitacs 2019) and Accelerate programs in Canada, to the existing choices available, has increased investment in embedded research. This, in turn, has created new opportunities for organizations to harness research evidence to inform decisions and continuous improvement efforts. However, Canada's experience with innovative grant-funded training programs,

such as the CADRE Regional Training Centres and the CIHR Strategic Training Initiative in Health Research (STIHR) training programs (both of which included elements such as field immersion and enriched competency development), suggests that although changes in grant funding can catalyze innovation (see, for example, Conrad 2008; Hamelin and Paradis 2018; Martens 2008; Paradis et al. 2017; Sheps et al. 2008; Straus et al. 2011), sustainability requires that university training programs also be engaged (CIHR 2016).

The ability of doctoral programs to adopt the required new competencies will likely depend on several factors: faculty who have ongoing partnerships with health system organizations for co-designing and collaborating on research (the extent to which funding programs require and value these partnerships will be important too); a fundamental shift in how academics value careers outside the academy; development of a co-ordinated national curriculum that can be modularized and adopted by existing training programs; recognition of the value of embedded research for healthcare organizations; programs that support the career trajectories of these embedded scientists from doctoral awards to early career investigator roles and senior leadership; and the accreditation of health system organizations to both develop and hold research funding to support innovation and transformation in healthcare.

4. HARNESS THE LESSONS LEARNED TO INSPIRE SCALE, SPREAD AND FURTHER INNOVATION.

Both the American and the Canadian fellowship programs have spawned imitation and emulation, and these should be encouraged. In the US, the Education Council of AcademyHealth has overseen a workforce initiative that has underscored the importance of embedded experiences and the growing role of health systems in health services research (Atkins 2018; Javadi et al. 2018; Menachemi et al. 2018; Mor and Wallace 2018; Rich and Collins 2018). Second, several other groups have become interested in sponsoring similar, real-world learning opportunities for post-doctoral fellows. Sanofi is co-sponsoring with AcademyHealth the first Real World Evidence Fellowship in 2018–2019, which is modelled on the successful DSSF, and the National Cancer Institute (NCI) partnered with AcademyHealth in 2017 to launch the NCI/AcademyHealth Healthcare Delivery Research Fellowship. Third, AcademyHealth helped to inform a community-wide interest in LHSs and is poised to serve as a home and convener for cross-program sharing among the new LHS training programs noted above through its establishment of a new interest group on LHSs. Lastly, the development of a comprehensive measure of impact for this work that assesses value from the host site perspective will be important to sustain these activities.

In Canada, the alliance of organizations (CHSPRA) that initially identified training modernization as a top priority is also spearheading efforts to move Canada along the path toward LHSs and sees the HSI fellows and their host partner organizations as pivotal enablers and partners in these efforts. An LHS working group, the co-chairs of which are both health system supervisors to HSI fellows, has been established, and a strategy that will prominently feature embedded research is in development.

Conclusion

The spread of LHSs presents an important opportunity to increase the health system's demand and capacity for doctorally trained talent, to improve the alignment between HSPR doctoral training and the employment trends and needs of the health system and, ultimately, to help ensure that investments in doctoral education and post-doctoral training generate concrete improvements in health and healthcare. Organizations such as CIHR-IHSPR and AcademyHealth that directly and indirectly support the training of a country's HSPR workforce can help catalyze change through leadership, collaboration, funding and well-designed incentives. Robust evaluation of the impacts of these and other embedded researcher models is needed to advance the science and impact of doctoral training and research funding design and to inform our understanding of the extent to which embedded researcher models can facilitate, enable and catalyze evidence-informed health system impact.

Correspondence may be directed to: Meghan McMahon, PhD; e-mail: mmcmahon.ihspr@ices.on.ca.

References

Agency for Healthcare Research and Quality (AHRQ). 2018. "Supporting the Next Generation of Learning Health Systems Researchers." Retrieved April 24, 2019. <https://www.ahrq.gov/funding/training-grants/lhs-k12.html>.

Atkins, D. 2018. "Are We Growing the Right Health Services Research Workforce of the Future? Thoughts from a National Delivery System." *Health Services Research* 53(Suppl. 2): 4034–40. doi:10.1111/1475-6773.13032.

Atkins, D., A.M. Kilbourne and D. Schulkin. 2017. "Moving from Discovery to System-Wide Change: The Role of Research in a Learning Health Care System: Experience from Three Decades of Health Systems Research in the Veterans Health Administration." *Annual Review of Public Health* 38: 467–87. doi.org/10.1146/annurev-publhealth-031816-044255.

Blanchette, M.-A., M. Saari, K. Aubrecht, C. Bailey, I. Cheng, M. Embrett et al. 2019. "Making Contributions and Defining Success: An eDelphi Study of the Inaugural Cohort of CIHR Health System Impact Fellows, Host Supervisors and Academic Supervisors." *Healthcare Policy* 15(Special Issue): 49–60. doi:10.12927/hcpap.2019.25980.

Boaz, A., S. Hanney, T. Jones and B. Soper. 2015. "Does the Engagement of Clinicians and Organisations in Research Improve Healthcare Performance: A Three-Stage Review." *BMJ Open* 5(12): e009415. doi:10.1136/bmjopen-2015-009415.

Bornstein, S., M. Heritage, A. Chudak, R. Tamblyn, M. McMahon and A.D. Brown. 2018. "Development of Enriched Core Competencies for Health Services and Policy Research." *Health Services Research* 53(5 Suppl. 2): 4004–23. doi.org/10.1111/1475-6773.12847.

Bornstein, S., M. McMahon, V. Yiu, V. Haroun, H. Manson, P. Holyoke et al. 2019. "Exploring Mentorship as a Strategy to Build Capacity and Optimize the Embedded Scientist Workforce." *Healthcare Policy* 15(Special Issue): 73–84. doi:10.12927/hcpap.2019.25978.

Brown, A. and S. Nuti. 2016. "The Continuing Relevance of Academics to Health System Reform." *HealthcarePapers* 16(Special Issue): 4–6. doi:10.12927/hcpap.2016.24718.

Burgess, J.F., N. Menachemi and M.L. Maciejewski. 2018. "Update on the Health Services Research Doctoral Core Competencies." *Health Services Research* 53(Suppl. 2): 3985–4003. doi:10.1111/1475-6773.12851.

Canadian Health Services and Policy Research Alliance (CHSPRA), Impact Analysis Working Group. 2018. *Making an Impact: A Shared Framework for Assessing the Impact of Health Services and Policy Research on Decision-Making*. Ottawa, ON: Author. Retrieved August 14, 2019. <https://docs.wixstatic.com/ugd/5adc92_3ae941eaedb04ab4a66b6f83f98a479d.pdf>.

Canadian Institutes of Health Research (CIHR). 2012. *Guide to Knowledge Translation Planning at CIHR: Integrated and End-of-Grant Approaches*. Retrieved August 14, 2019. <http://www.cihr-irsc.gc.ca/e/45321.html#a3>.

Canadian Institutes of Health Research (CIHR). 2013. *Evaluation of CIHR's Knowledge Translation Funding Program*. Ottawa, ON: Author. Retrieved August 14, 2019. <http://www.cihr-irsc.gc.ca/e/47332.html>.

Canadian Institutes of Health Research (CIHR). 2016. *Strategic Training Initiative in Health Research (STIHR) – CIHR Evaluation Report 2008–2013*. Ottawa, ON: Author. Retrieved August 14, 2019. <http://www.cihr-irsc.gc.ca/e/50282.html>.

Chafe, R. and M. Dobrow. 2008. "Health Services Researchers Working within Healthcare Organizations: The Intriguing Sound of Three Hands Clapping." *Healthcare Policy* 4(2): 37–45.

CIHR Institute of Health Services and Policy Research (CIHR-IHSPR). 2016. Strategic Plan 2015–19: Health System Transformation through Research and Innovation. Ottawa, ON: Author. Retrieved January 4, 2019. <http://www.cihr-irsc.gc.ca/e/documents/ihspr_strat_plan_2015-19-en.pdf>.

Conrad, P. 2008. "To Boldly Go: A Partnership Enterprise to Produce Applied Health and Nursing Services Researchers in Canada." *Healthcare Policy* 3(Special Issue): 13–30.

Cornwall, A. and R. Jewkes. 1995. "What Is Participatory Research?" *Social Science & Medicine* 41(12): 1667–76.

Forrest, C.B., F.D. Chesley Jr., M.L. Tregear and K.B. Mistry. 2018. "Development of the Learning Health System Researcher Core Competencies." *Health Services Research* 53(4): 2615–32. doi:10.1111/1475-6773.12751.

Hamelin, A.-M. and G. Paradis. 2018. "Population Health Intervention Research Training: The Value of Public Health Internships and Mentorship." *Public Health Reviews* 39: 6. doi:10.1186/s40985-018-0084-9.

Hanney, S.R., M.A. Gonzalez-Block, M.J. Buxton and M. Kogan. 2003. "The Utilisation of Health Research in Policy-Making: Concepts, Examples and Methods of Assessment." *Health Research Policy and Systems* 1: 2.

Hunter, D.J. 2019. "Meeting the Challenge of the 'Know-Do' Gap; Comment on 'CIHR Health System Impact Fellows: Reflections on "Driving Change" within the Health System.'" *International Journal of Health Policy and Management* 8(8): 498–500. doi:10.15171/ijhpm.2019.37.

Javadi, D., N. Tran and A. Ghaffar. 2018. "Building a Workforce for Future Health Systems: Reflections from Health Policy and Systems Research." *Health Services Research* 53(Suppl. 2): 4024–33. doi:10.1111/1475-6773.12978.

Kanani, N., E.E. Hahn, M.K. Gould, K.D. Brunisholz, L.A. Savitz and E.C. Holve. 2017. "AcademyHealth's Delivery System Science Fellowship: Training Embedded Researchers to Design, Implement, and Evaluate New Models of Care." *Journal of Hospital Medicine* 12(7): 570–74. doi:10.12788/jhm.2776.

Lomas, J. 2000. "Using 'Linkage and Exchange' to Move Research into Policy at a Canadian Foundation." *Health Affairs* 19(3): 236–40.

Lomas, J. and A.D. Brown. 2009. "Research and Advice Giving: A Functional View of Evidence-Informed Policy Advice in a Canadian Ministry of Health." *The Milbank Quarterly* 87(4): 903–26. doi:10.1111/j.1468-0009.2009.00583.x.

Marshall, M., C. Pagel, C. French, M. Utley, D. Allwood, N. Fulop et al. 2014. "Moving Improvement Research Closer to Practice: The Researcher-in-Residence Model." *BMJ Quality & Safety* 23(10): 801–05. doi:10.1136/bmjqs-2013-002779.

Marshall, M., L. Eyre, M. Lalani, S. Khan, S. Mann, D. de Silva et al. 2016. "Increasing the Impact of Health Services Research on Service Improvement: The Researcher-in-Residence Model." *Journal of the Royal Society of Medicine* 109(6): 220–25. doi:10.1177/0141076816634318.

Martens, P.J. 2008. "The Regional Training Centre: If We Build It [Well], They Will Come." *Healthcare Policy* 3(Special Issue): 7–12. doi:10.12927/hcpol.2008.19809.

McMahon, M., A. Brown, S. Bornstein and R. Tamblyn. 2019a. "Developing Competencies for Health System Impact: Early Lessons Learned from the Health System Impact Fellows." *Healthcare Policy* 15(Special Issue): 61–72. doi:10.12927/hcpap.2019.25979.

McMahon, M., B. Habib and R. Tamblyn. 2019b. "The Career Outcomes of Health Services and Policy Research Doctoral Graduates." *Healthcare Policy* 15(Special Issue): 16–33. doi:10.12927/hcpap.2019.25982.

Menachemi, N., L.A. Simpson and M.J. Wolfe. 2018. "Positioning the Health Services Research Workforce for Continued Success: Recommendations from AcademyHealth Stakeholders." *Health Services Research* 53(Suppl. 2): 4041–50. doi:10.1111/1475-6773.13039.

Mitacs. 2019. "Elevate." Retrieved August 14, 2019. <https://www.mitacs.ca/en/programs/elevate>.

Mor, V. and P. Wallace. 2018. "Funding the Training of Future Health Services Researchers." *Health Services Research* 53(Suppl. 2): 3976–84. doi:10.1111/1475-6773.12844.

Paradis, G., A.-M. Hamelin, M. Malowany, J. Levy, M. Rossignol, P. Bergeron et al. 2017. "The University-Public Health Partnership for Public Health Research Training in Quebec, Canada." *American Journal of Public Health* 107(1): 100–04. doi:10.2105/AJPH.2016.303529.

Reid, R.J. 2016. "Embedding Research in the Learning Health System." *HealthcarePapers* 16(Special Issue): 30–35. doi:10.12927/hcpap.2016.24724.

Rich, E. and A. Collins. 2018. "Current and Future Demand for Health Services Researchers: Perspectives from Diverse Research Organizations." *Health Services Research* 53(Suppl. 2): 3927–44. doi:10.1111/1475-6773.12999.

Sambunjak, D., S.E. Straus and A. Marusic. 2010. "A Systematic Review of Qualitative Research on the Meaning and Characteristics of Mentoring in Academic Medicine." *Journal of General Internal Medicine* 25(1): 72–78. doi:10.1007/s11606-009-1165-8.

Sheps, S., R.W. Pong, M. Lavoie-Tremblay and D. MacLellan. 2008. "'Between Two Worlds': Healthcare Decision-Maker Engagement within Regional Training Centres." *Healthcare Policy* 3(Special Issue): 58–67.

Sim, S.M., J. Lai, K. Aubrecht, I. Cheng, M. Embrett, E. Kebir Ghandour et al. 2019. "CIHR Health System Impact Fellows: Reflections on 'Driving Change' within the Health System." *International Journal of Health Policy and Management* 8(6): 325–28. doi:10.15171/IJHPM.2018.124.

Straus, S.E., M. Brouwers, D. Johnson, J.N. Lavis, F. Légaré, S.R. Majumdar et al. 2011. "Core Competencies in the Science and Practice of Knowledge Translation: Description of a Canadian Strategic Training Initiative." *Implementation Science* 6: 127. doi:10.1186/1748-5908-6-127.

Tamblyn, R., M. McMahon, N. Girard, E. Drake, J. Nadigel and K. Gaudreau. 2016a. "Health Services and Policy Research in the First Decade at the Canadian Institutes of Health Research." *CMAJ Open* 4(2): E213–21. doi:10.9778/cmajo.20150045.

Tamblyn, R., M. McMahon, J. Nadigel, B. Dunning, E. Drake with the Institute of Health Services and Policy Research Advisory Board. 2016b. "Health System Transformation through Research Innovation." *HealthcarePapers* 16(Special issue): 8–19. doi:10.12927/hcpap.2016.24719.

Weijs, C., J. McConnell-Nzunga, S.A. Prince and S.M. Sim. 2019. "Strengthening the Health System through Novel Population and Public Health Fellowships in Canada." *Canadian Journal of Public Health* 110(3): 323–26. doi:10.17269/s41997-019-00195-3.

RESEARCH PAPER

Making Contributions and Defining Success: An eDelphi Study of the Inaugural Cohort of CIHR Health System Impact Fellows, Host Supervisors and Academic Supervisors

Contribution et réussite : enquête Delphi électronique sur la première cohorte de boursiers et superviseurs dans le cadre des bourses des IRSC en matière d'impact sur le système de santé

MARC-ANDRÉ BLANCHETTE, DC, PHD
Département de chiropratique, Université du Québec à Trois-Rivières
Epidemiology, Biostatistics and Occupational Health McGill University
Institut national d'excellence en santé et services sociaux
Trois-Rivières, QC

MARGARET SAARI, RN, PHD
SE Research Centre, SE Health and School of Public Health and Health Systems
University of Waterloo
Waterloo, ON

KATIE AUBRECHT, PHD
Nova Scotia Health Authority Continuing Care-Research
Mount Saint Vincent University
Halifax, NS

CHANTELLE BAILEY, PHD
Canadian Nurses Association and the Lawrence S. Bloomberg Faculty of Nursing
University of Toronto
Toronto, ON

IVY CHENG, MD, MSC, PHD
Sunnybrook Health Sciences Centre, University of Toronto
Toronto, ON

MARK EMBRETT, PHD
Canada Health Infoway
McMaster University
Toronto, ON

EL KEBIR GHANDOUR, MD, PHD
CISSS Chaudière-Appalaches, Université Laval
Lévis, QC

JENNIE HAW, PHD
Canadian Blood Services, Western University
Ottawa, ON

ANDRIY KOVAL, PHD
Observatory for Population and Public Health
University of British Columbia
Vancouver, BC

REBECCA H. LIU, PHD
University of Ottawa, Region of Peel Public Health
Toronto, ON

KIRAN POHAR MANHAS, JD, PHD
Alberta Health Services, University of Alberta
Calgary, AB

FARAH N. MAWANI, MSC, PHD
MAP Centre for Urban Health Solutions
St. Michael's Hospital
Faculty of Environmental Studies, York University
Toronto, ON

JENNIFER MCCONNELL-NZUNGA, PHD
Child Health BC, University of Victoria
Vancouver, BC

KADIA PETRICCA, MSC, PHD
North York General Hospital, Department of Research and Innovation
University of Toronto, IHPME
Toronto, ON

MEAGHAN SIM, RD, PHD
Nova Scotia Health Authority;
Healthy Populations Institute, Dalhousie University
Halifax, NS

DEEPA SINGAL, PHD
Manitoba Centre for Health Policy
University of Manitoba
Winnipeg, MB

ANIA SYROWATKA, PHD
Canadian Foundation for Healthcare Improvement
University of Toronto, Institute of Health Policy, Management and Evaluation
Toronto, ON

JONATHAN LAI, MSC, PHD
Centre for Innovation in Autism and Intellectual Disabilities
Miriam Foundation, co-funded by Mitacs
School of Physical and Occupational Therapy
McGill University
Montreal, QC

Abstract

Context: The Health System Impact (HSI) Fellowship, an innovative training program developed by the Canadian Institutes of Health Research's Institute of Health Services and Policy Research, provides PhD-trained health researchers with an embedded, experiential learning opportunity within a health system organization.

Methods/Design: An electronic Delphi (eDelphi) study was conducted to: (1) identify the criteria used to define success in the program and (2) elucidate the main contributions fellows made to their organizations. Through an iterative, two-round eDelphi process, perspectives were elicited from three stakeholder groups in the inaugural cohort of the HSI Fellowship: HSI fellows, host supervisors and academic supervisors.

Discussion: A consensus was reached on many criteria of success for an embedded research fellowship and on several perceived contributions of the fellows to their host organization and academic institutions. This work begins to identify specific criteria for success in the fellowship that can be used to improve future iterations of the program.

Résumé

Contexte : Les bourses d'apprentissage en matière d'impact sur le système de santé (BAIS) – un programme de formation novateur mis au point par l'Institut des services et des politiques de santé des Instituts de recherche en santé du Canada – offrent aux chercheurs titulaires d'un

doctorat des occasions d'apprentissage expérientiel enchâssées dans un organisme de santé.
Méthode/concept : Nous avons mené une enquête Delphi électronique pour : (1) identifier les critères employés pour définir le succès du programme; et (2) dégager les principales contributions apportées par les boursiers à leur organisation. Un processus Delphi itératif mené à deux reprises a permis de dégager les points de vue de trois principaux groupes liés à la première cohorte des BAIS : les boursiers, les superviseurs des organismes d'accueil et les superviseurs universitaires.
Discussion : Un consensus a été atteint sur plusieurs critères liés au succès des bourses de recherche enchâssées ainsi que sur la perception des contributions apportées par les boursiers à leur organisme d'accueil et à leur université. Ce travail permet de dégager les critères spécifiques au succès des bourses, lesquels pourront être utilisés pour améliorer d'éventuelles moutures du programme.

Introduction

Health systems of developed countries are facing complex and multifaceted challenges in meeting the needs of patients and providers. Sophisticated research and analytic expertise are critically needed to aid in the design, implementation and evaluation of evidence-based solutions (CIHR 2018c). A capacity-building initiative gaining international recognition is embedding PhD-trained researchers into health system organizations outside of traditional academic settings (Cheetham et al. 2018; Ghaffar et al. 2017; Marshall et al. 2014, 2016; Vindrola-Padros et al. 2017, 2019). According to previously published case studies, embedding academic researchers into health systems is a promising approach to facilitate the integration of evidence- and practice-informed research in policy implementation, build research capacity and meet stakeholder and patient needs (Cheetham et al. 2018; Ghaffar et al. 2017; Hamelin and Paradis 2018; Paradis et al. 2017; Vindrola-Padros et al. 2017). A more rigorous evaluation of the embedded research model is ongoing in the UK (National Institute for Health Research 2017).

In October 2017, the Canadian Institutes of Health Research's Institute of Health Services and Policy Research (CIHR-IHSPR) launched the Health System Impact (HSI) Fellowship. The HSI Fellowship is a $5.5 million national initiative to train the next generation of embedded researchers to promote health system transformation in Canada (Bornstein et al. 2018; Tamblyn et al. 2016). The HSI Fellowship aims to: (1) prepare PhD graduates for a wide variety of careers (both inside and outside of academia) by enriching post-doctoral training with opportunities for "real-world" experience within health system organizations and (2) demonstrate the value of adding PhD-trained researchers to organizations outside traditional academic settings. More information about this dynamic program is available in the CIHR funding opportunity (CIHR 2018c). A central facet to this program is the co-mentorship of fellows by high-level, senior leaders in both the academic and the health system setting.

Although embedded research training opportunities are gaining popularity, there is limited Canadian research evaluating the preliminary impacts of these fellows within the health system organization. To the best of our knowledge, only one narrative review has explored the role embedded researchers could play in quality improvement efforts in healthcare settings (Vindrola-Padros et al. 2017). Although the review included a wide array of organizations across the world, there was no Canadian representation, an exclusive focus on quality improvement and little emphasis on the training of early-career researchers. Therefore, more evidence is needed from the Canadian context to inform program development, assess the impact of embedded fellows on health systems and facilitate the success of future fellows.

This present study fills a gap in the literature by: (1) identifying the criteria of a successful fellowship as defined by HSI fellows, host supervisors and academic supervisors and (2) elucidating each group's perspectives on key contributions made by fellows to their respective academic and health system organizations after the first year of operation of the HSI Fellowship.

Methods

An eDelphi (Diamond et al. 2014; Hasson et al. 2000) study was conducted to elicit the perspectives of fellows, host supervisors and academic supervisors regarding: (1) the criteria that each group uses to define a successful fellowship and (2) key contributions fellows have made in their academic and health system organizations. The eDelphi method was chosen due to the distribution of fellows and their host organizations and academic institutions across Canada.

The entire 2017 cohort of fellows (n = 46), their host organization supervisors and academic supervisors were invited to complete the survey (CIHR 2018b). As the first cohort of this innovative program, participants were considered the experts of their experience. Data were collected through two rounds of online questions administered by CIHR-IHSPR. These were sent four weeks apart, with two weekly follow-up reminders sent to non-responders.

In Round 1, two open-ended questions were administered to each of the three stakeholder groups asking their views on the main contributions of the fellow to their host organization and the criteria they would use to define a successful fellowship. For each stakeholder group, a team of three researchers analyzed the qualitative data generated in Round 1 using content analysis to identify themes (Hsieh and Shannon 2005). Items to be included in Round 2 were developed by each team from the list of themes for their respective stakeholder group. Next, one researcher who was not part of any of the three qualitative analysis groups identified themes common to the three groups as well as unique themes in each group. Prior to distribution of the Round 2 survey, all the authors met to discuss the themes. From this discussion, it was decided that common themes would be presented to all three stakeholder groups in the Round 2 survey to facilitate comparison across the groups and themes unique to one group would be presented to that group only.

In Round 2, participants were asked to rank their agreement with the themes generated in Round 1 on a 5-point Likert-type scale (range: 1 to 5). Descriptive statistics (mean and standard deviation [SD]) were used to assess the level of agreement (item endorsement). Although there is no universally agreed upon proportion to define consensus, a conservative threshold of 70% (mean 3.5/5) was set a priori (Hasson et al. 2000). All quantitative analyses were performed using R software (R Core Team 2019). Ethical clearance for the study was approved by the University of Waterloo Ethics Review Board (#32105).

Results

Of 134 potential participants, 113 completed the first survey, resulting in an overall 85% response rate for Round 1 (fellows, n = 42/46 [91%]; host supervisors, n = 34/43 [79%]; academic supervisors, n = 37/45 [82%]). The Round 2 survey was only sent to individuals who participated in Round 1. In Round 2, 78 of 113 participants completed the survey, resulting in an overall 69% response rate (fellows, n = 36/42 [86%]; host supervisors, n = 21/34 [62%]; academic supervisors, n = 21/37 [57%]).

Criteria of a successful fellowship experience

ROUND 1

Seven common criteria of a successful fellowship were identified across two or more stakeholder groups in Round 1 (Figure 1). In addition to common criteria across groups, some criteria of success were identified by only one group of stakeholders. Fellows identified better understanding of their desired career trajectory (employment preparedness) as a success criterion. Host supervisors identified four additional criteria, including capacity of adaptation to different working environments, openness to new learning experiences, team cohesion (collegial interaction) and positive experience by the fellow. Finally, academic supervisors considered measurable impacts within the health system and building a foundation for fellow research success as criteria for defining success.

FIGURE 1. Shared themes of criteria of a successful fellowship experience identified by two or more stakeholder groups

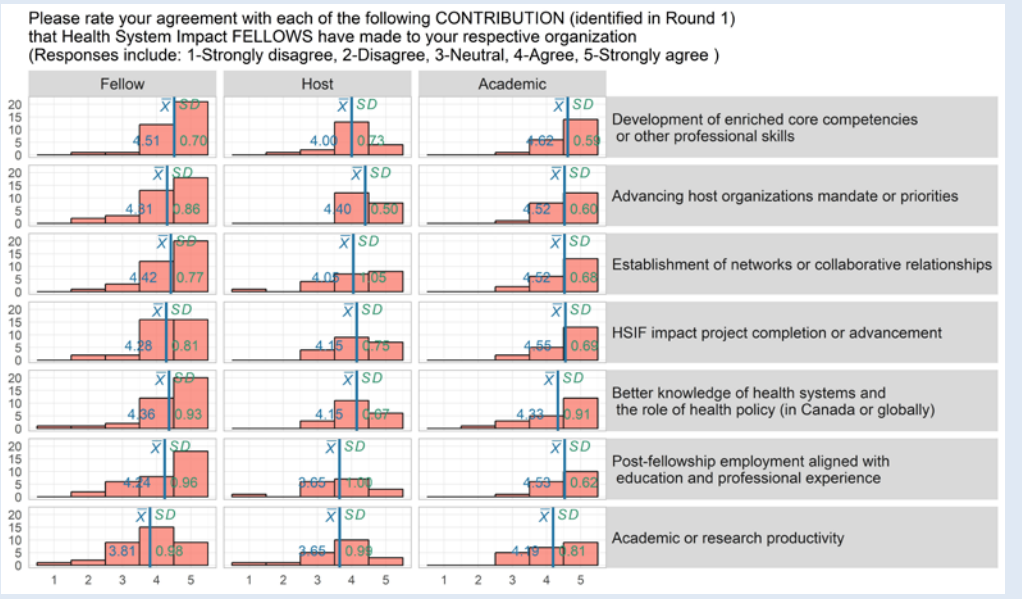
Host Supervisor	Health System Impact Fellow	Academic Supervisor
HSIF impact project completion or advancement		
Development of enriched core competencies or other professional skills		
Academic or research productivity		
Better knowledge of health systems and the role of health policy (in Canada and globally)		
	Establishment of networks and collaborative relationships	
	Post-fellowship employment aligned with education and fellow experience	
Advancing host organization's mandate or priorities		

HSIF = Health System Impact Fellowship.

ROUND 2

All common criteria of success reached consensus (Figure 2). Among the common success criteria, academic supervisors had the highest level of agreement on all items, followed by fellows and host supervisors, respectively, with the exception of better knowledge of health systems and the role of health policy. The sole criterion with higher agreement among host supervisors versus fellows was advancing the host organization's mandate or priorities.

FIGURE 2. Level of agreement with identified criteria of success by stakeholder group



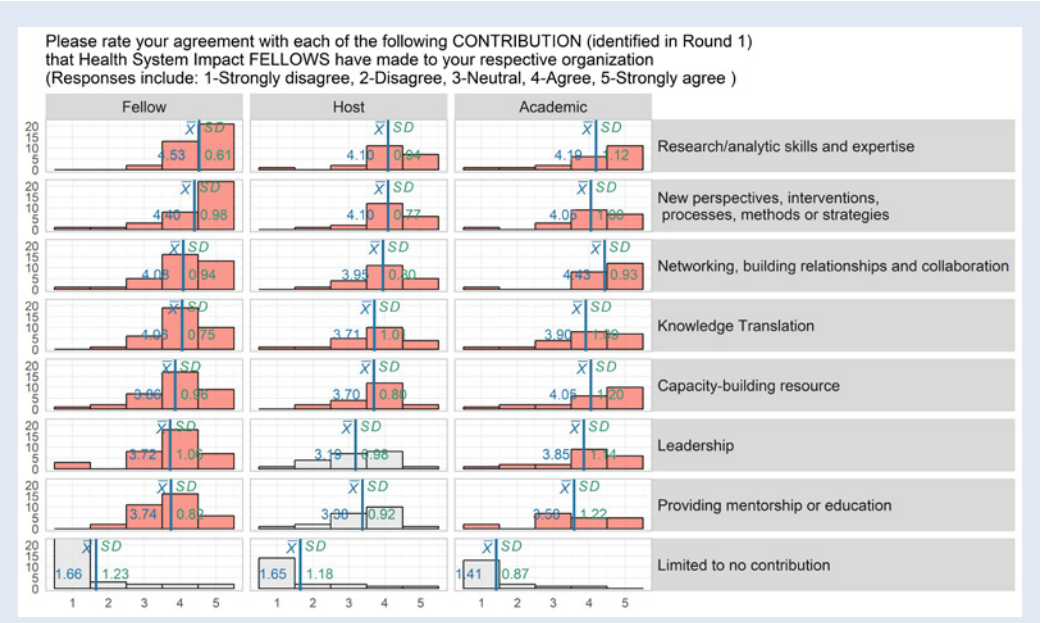
Pink = reached consensus, level of agreement of 3.5 or more.
Grey = did not reach consensus, level of agreement less than 3.5.
HSIF = Health System Impact Fellowship.

Among the unique criteria for success, only difficult to define success (mean 2.09; SD 0.87) did not reach the level of consensus. Fellows rated better understanding of their desired career trajectory to an average score of 4.22 (SD 0.87). The average scores of the host supervisors' specific criteria were 4.05 (SD 0.83) for capacity of adaptation to different working environments; 4.15 (SD 0.75) for openness to new learning experiences; 4.15 (SD 0.88) for team cohesion; and 4.40 (SD 0.80) for positive experience by the fellow. The mean scores for the academic supervisors' specific criteria were 3.52 (SD 1.03) for measurable impacts within the health system and 4.24 (SD 0.89) for building the foundation for fellow research success.

KEY CONTRIBUTIONS OF THE FELLOWS – ROUND 1

Seven common themes emerged among all three groups highlighting the key contributions of fellows to their respective organizations (Figure 3). In addition to the common themes, the HSI Fellowship impact project and grantsmanship (applying for or obtaining funding) were contributions identified only by fellows. The strong work ethic of the fellow was a contribution only identified by the host supervisors. Academic supervisors identified two additional contributions: revealing the strengths and weaknesses of current academic training and identifying challenges and barriers to learning health systems.

FIGURE 3. Level of agreement with key contributions of fellows to their respective organizations by group



Pink = reached consensus, level of agreement of 3.5 or more.
White = did not reach consensus, level of agreement less than 3.5.

ROUND 2

The results of Round 2 are presented in Figure 3. All three stakeholder groups had the highest level of agreement on the same three common key contributions (although the order of rankings differed). These included: research/analytic skills and expertise, networking, building relationships and collaboration and new perspectives, interventions, processes, methods or strategies. In comparison with host supervisors, the fellows' level of agreement was higher across all items with respect to key contributions to their respective organization. Whereas both fellows and academic supervisors reached consensus on leadership and providing mentorship or education as key contributions made by the fellow, host supervisors did not. All three groups strongly disagreed that fellows provide limited to no contribution to their respective organizations. As this item was negatively worded, lack of consensus in this case actually represents agreement across the three groups that fellows made some contribution to their host organization.

Among the unique themes identified by respondents, only grantsmanship (mean 2.94; SD 1.59), identified by fellows, did not reach the level of consensus. All other unique themes reached consensus in their respective groups. Fellows rated the HSI Fellowship impact project to an average score of 4.14 (SD 1.09). The average score of host supervisors for strong work ethic was 4.29 (SD 0.56). The mean score for key contributions identified by academic supervisors were 3.95 (SD 0.80) for revealing the strength and weakness of the current academic training and 3.65 (SD 0.88) for identifying challenges and barriers to learning health systems.

Discussion

The objectives of this study focused on identifying the criteria of success for an embedded research fellowship and the perceived contributions of the fellows to their host organization and academic institutions. To our knowledge, this study is the first to use an eDelphi approach to examine and compare the experiences of three stakeholder groups participating in an embedded research training opportunity. Insights gained through this research will be explored further and implications for each group, and the program as a whole, will be presented.

A high level of agreement was found across the participant groups on the common criteria of success as well as fellows' contributions to respective organizations. Although fellows and academic supervisors strongly agreed, the primary differences in the perspectives were found among the host organizations. This may be attributed to the heterogeneity of the host organizations as they have different objectives and more variability in their characteristics, structures and organizational cultures than academic institutions. Host organizations included in the inaugural cohort of the HSI Fellowship represented over 30 different public, private for-profit, not-for-profit and Indigenous health organizations (CIHR 2018b). The high level of agreement, particularly within fellows and academic supervisors, may be a result of their familiarity with a post-doctoral program design and program core competencies.

Criteria of a successful fellowship experience

Consensus was shared among fellows and host and academic supervisors pertaining to their criteria for HSI Fellowship program success; however, there was variability of agreement within groups for some criteria. Although reaching the threshold for consensus across all three groups, academic or research productivity as a criterion of success demonstrated less within-group agreement for fellows and host supervisors. This is not surprising given the HSI Fellowship's stated program objectives, which focus primarily on experiential learning and enriched competency development outside the traditional academic setting. Despite calls for new or additional metrics to assess real-world research impact, peer-reviewed publications, grants and teaching continue to be valued above demonstrable improvements in health and health systems (Cruz Rivera et al. 2017; Robert 2016). This misalignment of program goals and contemporary academic career path rewards may create tension between academic and host supervisors, leading to unmanageable workloads as fellows attempt to succeed in both worlds. In the UK, embedded researchers have highlighted similar challenges of defining their project scope and maintaining academic identity (Vindrola-Padros et al. 2017, 2019).

Contributions of the fellows

Academic supervisors and fellows had a high level of agreement on contributions of the fellow, reinforcing the fact that the design of the HSI Fellowship program (Tamblyn et al. 2016) aligns with the core competencies identified for the program (Bornstein et al. 2018). All three groups reached consensus that a key contribution of fellows included research and analytic skills/expertise, which is consistent with previous literature on the characteristic features of embedded research (Vindrola-Padros et al. 2017).

Fellows and academic supervisors reached consensus on all the common key contributions of fellows identified in Round 1; however, host supervisors did not reach consensus on fellows' contributions for leadership and mentorship. This may reflect the differences in culture between academic institutions and host organizations. For example, some host organizations may not perceive fellows as leaders or mentors because they have established hierarchies that are based on tenure within their or similar organizations rather than academic qualifications. In academic settings, however, post-doctoral fellows are in leadership and mentorship roles, including teaching, supervising theses and research projects and/or more general mentorship for undergraduate and graduate students (Åkerlind 2005, 2009; Chen et al. 2015). It may also reflect the program's design, which featured leadership and mentorship as a core competency for fellows to develop with the mentorship and support of their health system and academic supervisors.

Strengths and limitations

There are several strengths to the present study. First, this study included perspectives from the three key stakeholder groups collaborating in an innovative training initiative to better understand key features of success and fellows' contributions. By examining the program

from these three different perspectives, we have been able to elucidate areas where there may be tensions or misalignment between stakeholders. This study also begins to establish specific criteria for success in the fellowship that can improve future iterations of the program.

There are also several limitations of the current study. First, it is unclear how findings may have been affected if we had presented a list of all themes, both common and unique, to all participant groups in Round 2 of the eDelphi. Second, although there are structural differences in the three programs (e.g., one-year, two-year, start-up grant) (CIHR 2018a) included in the inaugural cohort, the study design did not enable us to stratify results based on fellowship type. Furthermore, the application processes were different. Either the organization formed a relationship and pursued work with a fellow (CIHR-IHSPR 2016) or the fellow forged a relationship with the preferred organization (CIHR 2018c). It remains to be determined if both approaches are of similar benefit. Variations within and across the three participant groups and the degree of consensus must be interpreted with caution.

Third, there were limited options presented to respondents that may not have captured their full range of perspectives. Although this is a general limitation of Delphi studies (Keeney et al. 2001), in this study, it was not possible to disentangle contributions based on fellows' previous experience and skills versus those based on program elements. Fourth, this study was conducted after the first year of the program, while many of the fellowships were still in progress or recently completed. Therefore, it may have been too early to gain a complete understanding of the criteria for success or the value of the fellows' roles. Finally, there may also have been differences between respondents and non-respondents for which there is insufficient consideration.

Implications

Although findings confirm high agreement among the three groups on criteria for success and fellows' contributions, discrepancies between the three groups suggest opportunities for program improvement. First, there is an opportunity to strengthen communication regarding the intention of the fellowship and facilitate discussion of the criteria for success among members of each fellowship triad. This includes structured communication between the funder and all parties at the program outset and communication between fellows and their hosts and academic supervisors throughout the fellowship. Currently, the program requires that the three parties complete a professional development plan at baseline and at three and 12 months. This plan is an important guide for goal-setting (for the fellowship and long-term career), self-reflection and supervisor assessment. An expectation management activity might be an interesting complement to reflect on the tripartite relationship in addition to the fellow's career.

Our findings highlight the heterogeneity within groups and the potential for competing priorities of the host organizations and academic institutions to impact fellowship success. Existing program orientation and training provided for all three groups may be

enhanced based on this new knowledge concerning the criteria for success and fellows' key contributions.

Conclusion

This study is a first step toward gaining an understanding of the experiences of a complex, pan-Canadian embedded researcher training program from the perspectives of three key stakeholder groups. A consensus was reached on many criteria of success for an embedded research fellowship and on several perceived contributions of the fellows to their host organization and academic institutions. Future research should include a qualitative, in-depth exploration of the experiences of HSI fellows, host supervisors and academic supervisors to expand on emerging definitions of success and the program as a contributor to learning health systems.

Acknowledgement

The authors would like to thank Meghan McMahon for her invaluable help during our respective fellowships and for her logistical support, without which this study could not have been completed.

Correspondence may be directed to: Marc-André Blanchette, DC, PhD, Département de chiropratique, Université du Québec à Trois-Rivières; Epidemiology, Biostatistics and Occupational Health, McGill University; Institut national d'excellence en santé et services sociaux; e-mail: marc-andre.blanchette1@uqtr.ca.

References

Åkerlind, G.S. 2005. "Postdoctoral Researchers: Roles, Functions and Career Prospects." *Higher Education Research & Development* 24(1): 21–40.

Åkerlind, G.S. 2009. "Postdoctoral Research Positions as Preparation for an Academic Career." *International Journal for Researcher Development* 1(1): 84–96.

Bornstein, S., M. Heritage, A. Chudak, R. Tamblyn, M. McMahon and A.D. Brown. 2018. "Development of Enriched Core Competencies for Health Services and Policy Research." *Health Services Research* 53(Suppl. 2): 4004–23. doi:10.1111/1475-6773.12847.

Canadian Institutes of Health Research (CIHR). 2018a. "Canadian Health Services and Policy Research Alliance – Modernizing Training in Health Services and Policy Research." Retrieved July 24, 2019. <http://www.cihr-irsc.gc.ca/e/50024.html>.

Canadian Institutes of Health Research (CIHR). 2018b. "2017 Health System Impact Fellow Profiles." Retrieved July 24, 2019. <http://www.cihr-irsc.gc.ca/e/50660.html>.

Canadian Institutes of Health Research (CIHR). 2018c. "The Health System Impact Fellowship." Retrieved July 24, 2019. <http://www.cihr-irsc.gc.ca/e/51211.html>.

Cheetham, M., A. Wiseman, B. Khazaeli, E. Gibson, P. Gray, P. Van der Graaf et al. 2018. "Embedded Research: A Promising Way to Create Evidence-Informed Impact in Public Health?" *Journal of Public Health* 40(Suppl. 1): i64–70. doi:10.1093/pubmed/fdx125.

Chen, S., L. McAlpine and C. Amundsen. 2015. "Postdoctoral Positions as Preparation for Desired Careers: A Narrative Approach to Understanding Postdoctoral Experience." *Higher Education Research & Development* 34(6): 1083–96.

CIHR Institute of Health Services and Policy Research (CIHR-IHSPR). 2016. "Training Modernization Start-Up Grant in Health Services and Policy Research." Retrieved July 24, 2019. <https://www.researchnet-recherchenet.ca/rnr16/vwOpprtntyDtls.do%3Fprog=2540%26view=currentOpps%26type=EXACT%26resultCount=25%26sort=program%26all=1%26masterList=true>.

Cruz Rivera, S., D.G. Kyte, O.L. Aiyegbusi, T.J. Keeley and M.J. Calvert. 2017. "Assessing the Impact of Healthcare Research: A Systematic Review of Methodological Frameworks." *PLoS Medicine* 14(8): e1002370. doi:10.1371/journal.pmed.1002370.

Diamond, I.R., R.C. Grant, B.M. Feldman, P.B. Pencharz, S.C. Ling, A.M. Moore et al. 2014. "Defining Consensus: A Systematic Review Recommends Methodologic Criteria for Reporting of Delphi Studies." *Journal of Clinical Epidemiology* 67(4): 401–09. doi:10.1016/j.jclinepi.2013.12.002.

Ghaffar, A., E.V. Langlois, K. Rasanathan, S. Peterson, L. Adedokun and N.T. Tran. 2017. "Strengthening Health Systems through Embedded Research." *Bulletin of the World Health Organization* 95(2): 87. doi:10.2471/BLT.16.189126.

Hamelin, A.-M. and G. Paradis. 2018. "Population Health Intervention Research Training: The Value of Public Health Internships and Mentorship." *Public Health Reviews* 39: 6. doi:10.1186/s40985-018-0084-9.

Hasson, F., S. Keeney and H. McKenna. 2000. "Research Guidelines for the Delphi Survey Technique." *Journal of Advanced Nursing* 32(4): 1008–15.

Hsieh, H.F. and S.E. Shannon. 2005. "Three Approaches to Qualitative Content Analysis." *Qualitative Health Research* 15(9): 1277–88. doi:10.1177/1049732305276687.

Keeney, S., F. Hasson and H.P. McKenna. 2001. "A Critical Review of the Delphi Technique as a Research Methodology for Nursing." *International Journal of Nursing Studies* 38(2): 195–200.

Marshall, M., L. Eyre, M. Lalani, S. Khan, S. Mann, D. de Silva and J. Shapiro. 2016. "Increasing the Impact of Health Services Research on Service Improvement: The Researcher-in-Residence Model." *Journal of the Royal Society of Medicine* 109(6): 220–25. doi:10.1177/0141076816634318.

Marshall, M., C. Pagel, C. French, M. Utley, D. Allwood, N. Fulop et al. 2014. "Moving Improvement Research Closer to Practice: The Researcher-in-Residence Model." *BMJ Quality & Safety* 23(10): 801–05.

National Institute for Health Research. 2017. *System Reference Number 122620 / NETSCC ID 16/52/21*. Retrieved July 24, 2019. <https://njl-admin.nihr.ac.uk/document/download/2014583>.

Paradis, G., A.-M. Hamelin, M. Malowany, J. Levy, M. Rossignol, P. Bergeron et al. 2017. "The University-Public Health Partnership for Public Health Research Training in Quebec, Canada." *American Journal of Public Health* 107(1): 100–04. doi:10.2105/ajph.2016.303529.

R Core Team. 2019. *The R Project for Statistical Computing*. Retrieved July 24, 2019. <https://www.r-project.org>.

Robert, R.J. 2016. "Embedding Research in the Learning Health System." *HealthcarePapers* 16(Special Issue): 30–35. doi:10.12927/hcpap.2016.24724.

Tamblyn, R., M. McMahon, J. Nadigel, B. Dunning and E. Drake with the Institute of Health Services and Policy Research Advisory Board. 2016. "Health System Transformation through Research Innovation." *HealthcarePapers* 16(Special Issue): 8–19. doi:10.12927/hcpap.2016.24719.

Vindrola-Padros, C., L. Eyre, H. Baxter, H. Cramer, B. George, L. Wye et al. 2019. "Addressing the Challenges of Knowledge Co-Production in Quality Improvement: Learning from the Implementation of the Researcher-in-Residence Model." *BMJ Quality & Safety* 28(1): 67–73. doi:10.1136/bmjqs-2017-007127.

Vindrola-Padros, C., T. Pape, M. Utley and N.J. Fulop. 2017. "The Role of Embedded Research in Quality Improvement: A Narrative Review." *BMJ Quality & Safety* 26(1): 70–80. doi:10.1136/bmjqs-2015-004877.

RESEARCH PAPER

Developing Competencies for Health System Impact: Early Lessons Learned from the Health System Impact Fellows

Développement des compétences pour un impact sur le système de santé : premières leçons tirées du Programme des bourses d'apprentissage en matière d'impact sur le système de santé

MEGHAN MCMAHON, MSC, PHD
Associate Director, CIHR Institute of Health Services and Policy Research
Institute of Health Policy, Management and Evaluation
University of Toronto
Toronto, ON

ADALSTEINN BROWN, D.PHIL
Dean, Professor, Dalla Lana School of Public Health
University of Toronto
Toronto, ON

STEPHEN BORNSTEIN, PHD
Professor, Division of Community Health and Humanities, Faculty of Medicine
Department of Political Science, Faculty of Arts
Memorial University
Director, Newfoundland and Labrador Centre for Applied Health Research
Co-Director, SafetyNet Centre for Occupational Health and Safety Research
St. John's, NL

ROBYN TAMBLYN, PHD
Professor, Department of Medicine and Department of Epidemiology, Biostatistics and Occupational Health
McGill University
Scientific Director (former), CIHR Institute of Health Services and Policy Research
Montreal, QC

Abstract

Background: The Health System Impact (HSI) Fellowship program provides highly qualified post-doctoral fellows studying health services and policy research (HSPR) with opportunities for experiential learning, enriched core competency development and mentorship from senior-level leaders within health system organizations. Its overall aim is to prepare post-doctoral fellows with the research and professional skills, experiences and networks to make meaningful and impactful contributions in careers in academic and applied health system settings.

Objective: This study examined whether this HSI Fellowship program has contributed to the development of enriched core competencies in HSPR.

Methods: A competency assessment tool was developed and administered to the 46 fellows and their health system and academic supervisors from the inaugural HSI Fellowship cohort. Fellows' self-assessments at baseline, three months and 12 months were analyzed, along with supervisors' assessments at three and 12 months. Descriptive analyses were used to examine competency development over time. Differences by gender and between supervisor and fellow ratings were analyzed.

Results: HSI fellows' self-assessments indicate that they strengthened their skills in all 10 enriched core competencies. Supervisors' assessments of the fellows' competencies also improved from baseline to 12 months. Gender differences at baseline disappeared by the 12-month assessment.

Conclusion: The HSI Fellowship provides an opportunity to develop the full suite of enriched core competencies, particularly in competency domains that are not currently emphasized in HSPR doctoral curriculum.

Résumé

Contexte : Le Programme des bourses d'apprentissage en matière d'impact sur le système de santé (BAIS) permet, à des postdoctorants hautement qualifiés en RPSS, de profiter d'un apprentissage expérientiel, de développer des compétences fondamentales enrichies et de bénéficier d'un mentorat de la part de cadres au sein des organismes de santé. Le programme a comme objectif principal de doter les doctorants des compétences, de l'expérience et des réseaux qui leur permettront, au cours de leur carrière, d'apporter d'importantes contributions dans les milieux universitaires et les établissements de santé.

Objectif : Cette étude vise à connaître à quel point le programme des BAIS a contribué au développement des compétences fondamentales enrichies dans le domaine de la recherche sur les politiques et les services de santé.

Méthode : Un outil d'évaluation des compétences a été développé puis soumis aux 46 boursiers formés depuis la création du programme, ainsi qu'à leurs superviseurs universitaires et des organismes d'accueil. Les autoévaluations des boursiers au début, à trois mois puis à 12 mois ont été analysées parallèlement aux évaluations des superviseurs à 3 mois et à 12 mois. Des analyses descriptives ont été employées pour étudier au cours du temps le développement des

compétences. Les différences en fonction du genre ainsi qu'entre les notations des superviseurs et celles des boursiers ont été analysées.
Résultats : Les autoévaluations des boursiers font voir qu'ils ont renforcé leurs capacités dans chacune des 10 compétences fondamentales enrichies. Les évaluations remises par les superviseurs au sujet des compétences des boursiers permettent aussi d'observer une amélioration entre le début et à 12 mois. Les différences selon le genre observées au début se sont estompées à l'évaluation effectuée à 12 mois.
Conclusion : Le programme des BAIS permet de développer l'ensemble des compétences fondamentales enrichies, particulièrement dans les domaines sur lesquels les programmes de doctorat en RPSS ne mettent pas encore l'accent.

Background

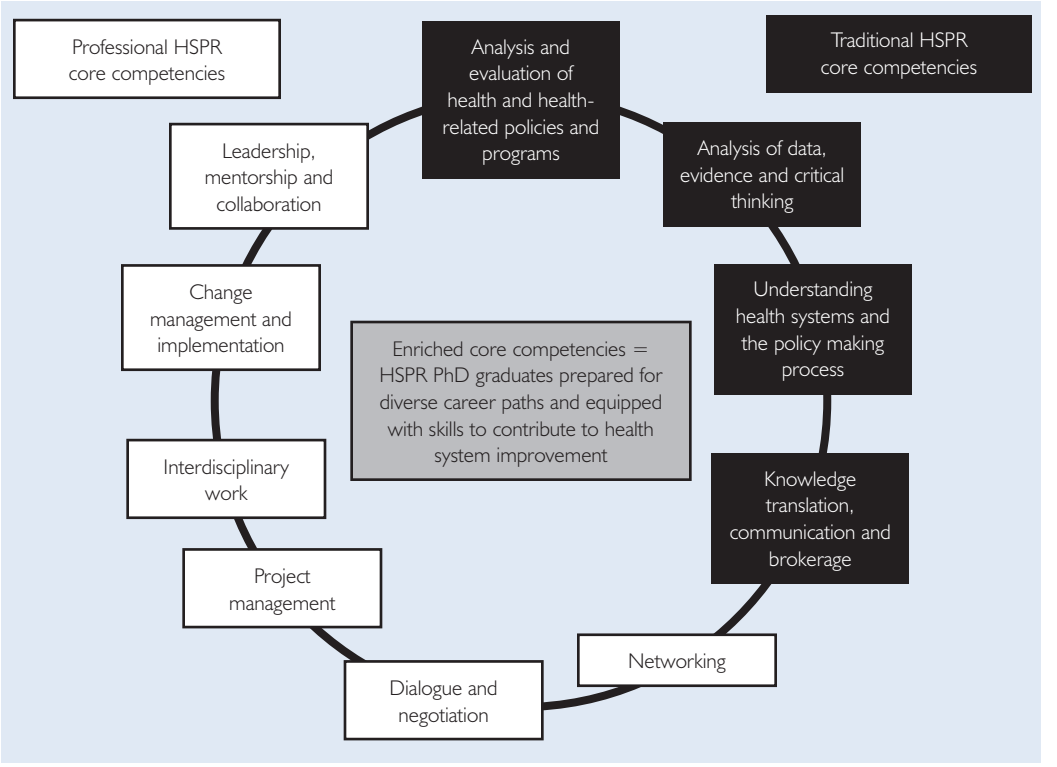
An enriched core competency framework for health services and policy research (HSPR) doctoral and post-doctoral training was introduced in Canada in 2016 (Bornstein et al. 2018; CHSPRA TMWG 2015). Its goal was to align the competencies emphasized in doctoral curriculum with the skills needed to maximize the impact of health services and policy research (HSPR) graduates in the diverse range of employment sectors and roles they are entering based on employment trends (see McMahon et al. 2019b) and emerging career opportunities, such as embedded scientist roles within organizations seeking to be learning health systems (Reid 2016). The enriched core competency framework maintains emphasis on rigorous scholarly training and research and analytic skills but also introduces a core suite of professional skills that are demanded in the non-academic labour market and necessary to effect change and make an impact in applied health system settings (Figure 1).[1]

The inaugural cohort of 46 Health System Impact (HSI) fellows was the first to pilot a training program for the enriched core competencies. The HSI Fellowship program provides fellows with an experiential learning opportunity within a health system organization (defined as a public, private, or not-for-profit organization based in Canada with a mandate focused on health, such as a ministry of health, regional health authority, health service delivery organization, health quality council, public health unit, health charity, health professional association, consulting firm with a health-focused mandate, etc.) where they spend the majority of their time, as well as protected time for academic research at a Canadian university; co-supervision and mentorship from a health system leader within the health system organization and an academic supervisor with expertise in HSPR at the university; a professional development training allowance; and participation in a national cohort of fellows and health system and academic leaders that includes an annual in-person National Cohort Retreat and quarterly webinar training sessions in enriched core competencies (for a full description, see CIHR-IHSPR [2016]; McMahon et al. [2019a]; and McMahon and

Tamblyn [2019c]). Each of these program elements is deliberately aligned with the suite of enriched core competencies and provides opportunities for fellows to complement their research skills with professional competencies and enhanced skills.

At the outset of the fellowship, fellows identify three enriched core competencies from the suite of 10 (see Figure 1) to target for development. Fellows create a professional development plan (PDP) and meet with their health system and academic supervisors to discuss their mentorship and support. To track competency development over time, fellows use a standardized framework to self-assess their competencies at the start of their fellowship (baseline) and two subsequent time points. Each fellow's health system and academic supervisor also assesses the fellow's competency strength and development.

FIGURE 1. Enriched core competencies for health services and policy research



Note: A definition of each enriched core competency in Figure 1 is provided on CIHR's website (http://www.cihr-irsc.gc.ca/e/49883.html).

The competency assessments provide an opportunity to learn whether the HSI Fellowship is contributing to the development of enriched core competencies and preparing a new cadre of doctoral graduates equipped with the research and professional skills to make an impact in a broad range of employment sectors and roles.

The objective of the present study was to analyze whether the inaugural cohort of HSI fellows' competencies evolved over the first year of the fellowship, if development occurred primarily in the self-identified target areas, and to assess the degree of alignment between fellows' and supervisors' competency assessments.

Methods

To measure the fellows' development of the enriched core competencies over the first year of the HSI Fellowship, the CIHR HSI Fellowship Professional Development Plan and Competency Tracking Tool assessments were analyzed.

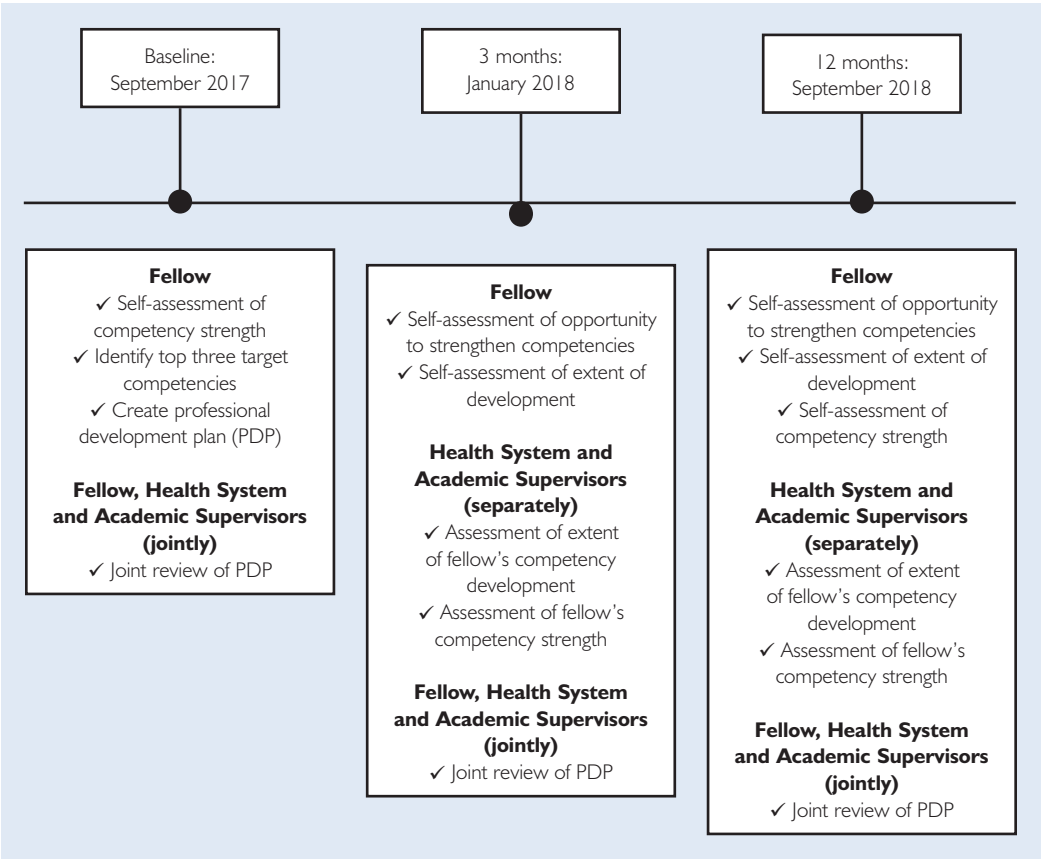
The competency tracking tool was created by the Canadian Institutes of Health Research Institute of Health Services and Policy Research (CIHR-IHSPR) in collaboration with the Training Modernization Working Group of the Canadian Health Services and Policy Research Alliance (CHSPRA) based on a review of the literature and an environmental scan of existing competency assessment tools used in relevant fields.[2] The draft tool was presented to a group of deans and directors of 10 of Canada's HSPR doctoral training programs and health system leaders from across the country[3] for feedback and refinement prior to finalizing. It was introduced to the HSI Fellows and their supervisors via an orientation webinar in the first month of the fellowship prior to its implementation for baseline assessment. Completion of the competency assessments was a mandatory requirement of the HSI Fellowship.

Competency assessments were completed using an online survey platform at three defined time points: at baseline, three months and 12 months (see Figure 2 for a timeline overview). Questions and response scales were consistent in all assessments to allow for the analysis of change over time and comparisons between fellow and supervisor ratings. At baseline, fellows were asked to:

- identify their top three competencies for development over the course of their fellowship;
- rate the strength of their competence on a Likert-type scale (range: 1 to 5) in each of the 10 competencies relative to their perception of others' competence in their peer group; and
- discuss their PDP with their health system and academic supervisors, who were required to indicate how they intended to help the fellow achieve his or her goals.

At three months, fellows and their health system and academic supervisors completed the assessment (separately). Fellows were asked to indicate which competencies they had the opportunity to strengthen over the past three months and, for each competency, to rate how much they felt they learned (response options: a lot, a fair bit, a little bit, nothing). Similarly, health system and academic supervisors rated the extent of their fellow's development in each of the competency domains (response options: a lot, a fair bit, a little, not at all) and rated the overall strength of the fellow's competence in each domain using the 5-point Likert-type scale.

FIGURE 2. Competency assessment timeline



At 12 months, fellows and supervisors rated the fellows' competency strength in each domain using the 5-point Likert-type scale. Additionally, fellows were asked to rate the importance of nine program-specific enablers to their competency development. These included: (1) being embedded in a health system organization, (2) mentorship from a health system leader, (3) working on an impact-oriented program of work of high relevance to a health system organization, (4) mentorship from the academic supervisor, (5) co-mentorship (team-based approach) from the health system and academic supervisors, (6) fellow-to-fellow interactions, (7) protected time for academic research, (8) the professional development training allowance and (9) the National Cohort Retreat and quarterly webinar training sessions.

Descriptive analyses were used to assess competency development over time for all fellows, as well as by gender. Gender differences were assessed using a two-sample t-test, and differences between the three-month and 12-month assessments were assessed using a paired-sample t-test in the sample of fellows for whom both a baseline and a 12-month assessment were available (n = 38/46 [82%]). The magnitude of change over time was assessed by calculating the difference in self-rated ability at baseline and 12 months, expressed as a per cent change of the difference relative to baseline. The same methods were

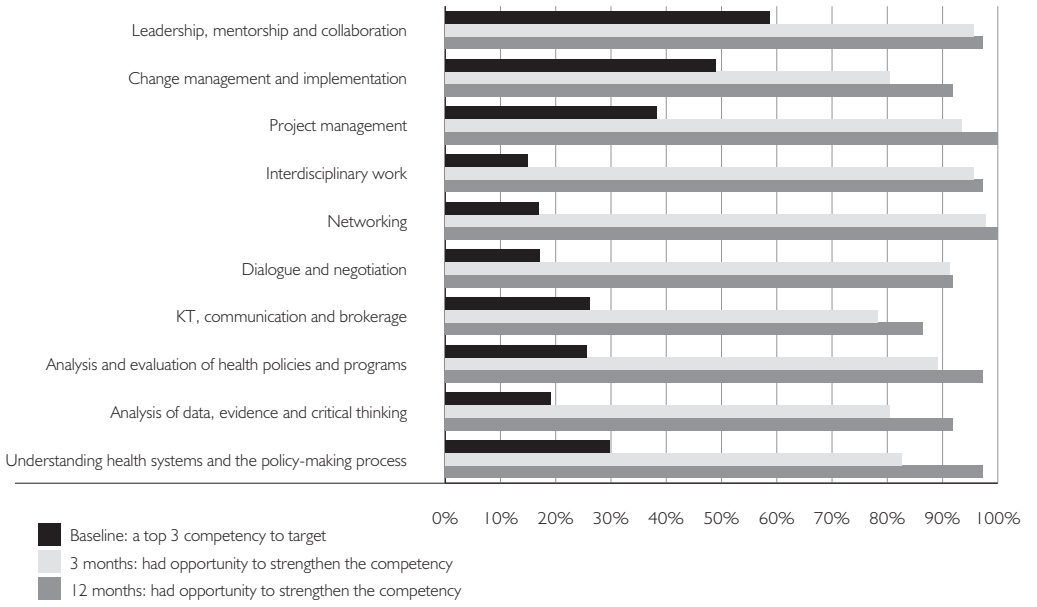
used to assess differences between health system and academic supervisor ratings and differences between the supervisors' three- and 12-month ratings. Analyses and figures were conducted using Excel.

Results

Overall, all 46 fellows completed the baseline and three-month competency assessments and 38 completed the 12-month assessment. Of the nine non-responders, five had transitioned into employment positions or were on leave at the time of the 12-month assessment. Seventy-eight of 92 supervisors completed the three-month assessment (84.8%), and 69 completed the 12-month assessment (75%). For all but two fellows, at least one of the health system and academic supervisors completed a three- and a 12-month assessment.

At baseline, fellows were asked to identify their top three competencies to develop. Figure 3 illustrates some consistency in fellows' top two selections, which were leadership, mentorship and collaboration (identified by 60% of fellows) and change management and implementation (identified by 49% of fellows). There was heterogeneity thereafter in fellows' self-identified target competencies.

FIGURE 3. Fellows' baseline target competencies and opportunity to develop competencies over time



KT = knowledge translation.

Figure 3 also shows that although fellows identified three competencies to develop at the outset of their fellowship, by the three-month mark, approximately 80% of fellows reported that they had the opportunity to strengthen their competence in all 10 domains, and by 12 months, 85% had. Even competencies that were not prevalent selections at the start of

the fellowship witnessed considerable development over time. For example, at baseline, only 15% and 17% of fellows identified interdisciplinary work and networking, respectively, as a top three target competency for development, but by 12 months, more than 97% of fellows reported that they had the opportunity to strengthen their skills in these domains.

Table 1, available at longwoods.com/content/25979, presents fellows' self-assessed ratings of their strength in each competency domain at baseline and 12 months. At baseline, the mean overall cohort rating was highest in the analysis of data, evidence and critical thinking and lowest in the change management and implementation competencies. By 12 months, the mean cohort rating in all 10 competencies had significantly increased ($p < 0.01$), ranging from a 9.5% increase in the analysis of data competency to a 44% increase in the change management and implementation competency. Next to change management, self-assessed competence in understanding health systems and the policy-making process exhibited the greatest increase over time (31.2% increase), followed closely by networking (28.8% increase) and dialogue and negotiation (29.2% increase).

At baseline, the mean competency assessment rating for female fellows ($n = 38$) was higher than the mean for male fellows ($n = 9$) in six of the 10 domains, although statistically significantly higher in only two: project management and networking (see Table 1). At 12 months, there were no statistically significant gender differences in competency assessment ratings.

Table 2, available at longwoods.com/content/25979, presents the supervisor ratings of their fellows' competency strength in each domain at three and 12 months, overall and by supervisor type. At both time points, the mean overall supervisor ratings were highest in networking and analysis of data, evidence and critical thinking and lowest in change management. As with the fellows' self-assessments, the overall supervisor assessments of fellows' competency strength increased significantly over time in each domain ($p < 0.01$), ranging from a 12.2% increase in dialogue and negotiation to a 22% increase and in the analysis and evaluation of health policies and programs. When assessed separately by supervisor type, health system supervisor assessments increased significantly over time in all 10 competency domains and academic supervisor assessments increased significantly in all but two domains: project management and dialogue and negotiation.

Differences between health system and academic supervisor competency assessments were not statistically significant except for the three-month assessment of the leadership competency and the 12-month assessment of interdisciplinary work where, in both cases, the mean academic supervisor assessment was higher (see Table 2).

Table 3 compares the fellow and overall supervisor competency assessments at 12 months and shows that in seven of 10 competencies, the supervisors' assessment of the fellows' competency strength is higher than the fellows' self-assessment; however, the differences are not statistically significant.

TABLE 3. Fellows' and supervisors' competency assessments at 12 months

Competency	Fellows Mean (SD) (*n* = 38)	Supervisors Mean (SD) (*n* = 69)	Δ Mean, baseline to 12 months (fellows)	Δ Mean, 3 to 12 months (supervisors)
Leadership, mentorship and collaboration	3.81 (0.61)	4.00 (0.73)	0.61	0.5
Change management and implementation	3.50 (0.95)	3.45 (0.93)	1.07	0.41
Project management	3.68 (0.93)	3.96 (0.93)	0.59	0.46
Interdisciplinary work	4.21 (0.70)	4.13 (0.82)	0.61	0.49
Networking	4.03 (0.72)	4.26 (0.72)	0.9	0.53
Dialogue and negotiation	3.76 (0.79)	3.67 (0.93)	0.85	0.4
KT, communication and brokerage	3.76 (0.71)	3.97 (0.82)	0.76	0.55
Analysis and evaluation of health policies/programs	3.82 (0.77)	3.94 (0.94)	0.33	0.71
Analysis of data, evidence and critical thinking	4.14 (0.66)	4.30 (0.77)	0.43	0.58
Understanding health systems and the policy-making process	3.74 (0.89)	3.87 (0.78)	0.89	0.68

KT = knowledge translation.

TABLE 4. Fellow ratings of the importance of nine program elements designed to enhance competency development

Program element	Mean rating (SD)
The professional development training allowance	4.73 (0.56)
Being embedded in a health system organization	4.72 (0.57)
Mentorship from my health system supervisor	4.35 (0.98)
Working on an impact-oriented project of high importance to a health system organization	4.32 (0.94)
Mentorship from my academic supervisor	4.24 (0.95)
Co-mentorship (team-based approach) from my health system and academic supervisors	4.12 (1.19)
Protected time for my academic research	3.91 (1.26)
National Cohort Retreat and quarterly webinar training sessions	3.84 (1.09)
Fellow-to-fellow interactions	3.35 (1.25)

Note: Ratings are based on a 5-point Likert-type scale.

Table 4 shows that of nine defined HSI Fellowship program enablers designed to support fellows' competency development, fellows rated being embedded in a health system organization (mean rating 4.72, SD 0.57) and having a dedicated professional development training allowance (4.73, SD 0.56) as the top two enablers, followed by mentorship from the health system supervisor (4.35, SD 0.98). All nine enablers were rated at least moderately important (mean rating of 3 or higher).

Discussion and Conclusion

This study examined whether the HSI Fellowship contributed to the development of enriched core competencies in HSPR, if development occurred primarily in fellows' self-identified target competencies and the extent to which fellows' and supervisors' competency assessments align. The study's overall goal is to advance knowledge about the effectiveness of embedded fellowship training programs in fostering the development of competencies that are demanded in the labour market and needed to create a cadre of research-savvy health system leaders with the skills to drive health system innovation and transformation.

This study found that HSI fellows strengthened their skills in all 10 enriched core competencies over the first year of the fellowship. Fellows' baseline assessments were, in general, lower in the professional competency domains that are not yet emphasized in doctoral training programs (e.g., change management) and higher in the traditional research and analytic competencies that are the focus of doctoral curriculum (e.g., analysis of data). However, fellows' self-assessment of their competencies improved from baseline to 12 months in both the professional and research competencies, as did the supervisors' assessments of the fellows' competencies. Improvements were observed in fellows' top three targeted competencies and in less-targeted competencies. Gender differences at the baseline assessment disappeared by the 12-month assessment. Overall, these findings suggest that the HSI Fellowship provides an opportunity for exposure to and development of the full suite of enriched core competencies and, in particular, in competency domains that are not currently emphasized in HSPR doctoral curricula.

According to the fellows, being embedded in a health system organization, having a dedicated professional development training allowance, receiving mentorship from a health system leader and working on an impact-oriented project of high importance to a health system organization were key enablers to their development of the enriched core competencies. These program elements are unique to the HSI Fellowship program when compared to conventional fellowships and are not yet systematically offered within HSPR doctoral training programs. To ensure the long-term sustainability of training modernization that maximizes doctoral graduates' impact in a broad array of employment sectors and roles, it will be important for Canada's university-based HSPR doctoral training programs to institutionalize the enriched core competencies within their curriculum, provide trainees with opportunities

for field immersion within health system organizations and consider greater involvement of health system leaders in graduate training and mentorship.

This study has strengths and limitations. A notable strength is the use of a competency assessment tool to study and learn whether and how the program is working. The tool was administered at baseline and two subsequent time points to allow for assessment of change over time and was administered to fellows and their supervisors to allow for analysis of alignment in ratings. A limitation is the lack of a control group, such as a cohort of fellows funded through a conventional research fellowship, to test for a causal relationship between the intervention (the fellowship) and the outcomes (the competency development). Additionally, the assessments are based on fellow self-report and supervisor report and not on a validated evaluation of competencies. Potential bias could arise if fellows or supervisors underassessed early on in the fellowship in order to demonstrate improvement over time or, similarly, if they inflated their assessments at the 12-month mark in an effort to show improvement and program success.

Moving forward, analyzing the career trajectories of HSI fellows will be critical to understanding whether the program is achieving its objective of preparing doctoral graduates for success and impact in a broader array of employment settings, both within and beyond the academy. Emerging evidence based on the career transitions of the first cohort of one-year fellows (n = 24) is promising. HSI fellows have secured academic roles within universities as well as research and managerial roles within health system organizations. Examples include applied research scientist within public sector organizations, managerial positions within not-for-profit and healthcare delivery organizations and renewed fellowship positions. Although it is in its early days, the HSI Fellowship program appears to be successfully fostering the development of the enriched core competencies in HSPR and preparing fellows for careers in academic and applied health system settings.

Notes

1. For a complete description of the enriched core competencies for HSPR and the process used to develop the framework, see Bornstein et al.'s 2018 paper.
2. The competency assessment tools that were reviewed and that informed the HSI Fellowship competency tracking tool include the Pardee RAND Program Review Self-Study (2014), the University of Alberta's Individual Development Plan Workbook, myIDP, the NCHL Health Leadership Competency Model, LEADS in a Caring Environment Framework and the Vitae Researcher Development Framework.
3. The group of deans/directors and health system leaders were the co-leads of the 10 CIHR Training Modernization Start-Up Grants, who received funding in March 2016 to pave the path for training modernization. The 10 co-lead pairs (n = 20 individuals total) represented eastern, central and western Canada.

Acknowledgement

The authors would like to thank Dr. Gery Ryan at the Pardee RAND Graduate School for inspiring our commitment to track and understand the fellows' competency development in order to continuously refine and improve the program and for sharing his insight and advice based on the Pardee RAND experience.

Correspondence may be directed to: Meghan McMahon, PhD; e-mail: mmcmahon.ihspr@ices.on.ca.

References

Bornstein, S., M. Heritage, A. Chudak, R. Tamblyn, M. McMahon and A.D. Brown. 2018. "Development of Enriched Core Competencies for Health Services and Policy Research." *Health Services Research* 53(5 Suppl. 2): 4004–23. doi.org/10.1111/1475-6773.12847.

Canadian Health Services and Policy Research Training Modernization Working Group (CHSPRA TMWG). 2015. *Modernizing Health Services and Policy Research Training: A Pan-Canadian Strategy*. Ottawa, ON: Canadian Institutes of Health Research. Retrieved December 4, 2018. <https://docs.wixstatic.com/ugd/5adc92_4b4c942ad5294494899538927034 73cc.pdf>.

CIHR Institute of Health Services and Policy Research (CIHR-IHSPR). 2016. "Canadian Health Services and Policy Research Alliance – Modernizing Training in Health Services and Policy Research." Retrieved December 4, 2018. <http://www.cihr-irsc.gc.ca/e/50024.html>.

McMahon, M., S. Bornstein, A. Brown, L. Simpson, L. Savitz and R. Tamblyn. 2019a. "Training for Health System Improvement: Emerging Lessons from Canadian and US Approaches to Embedded Fellowships." *Healthcare Policy* 15(Special Issue): 34–48. doi:10.12927/hcpap.2019.25981.

McMahon, M., B. Habib and R. Tamblyn. 2019b. "The Career Outcomes of Health Services and Policy Research Doctoral Graduates." *Healthcare Policy* 15(Special Issue): 16–33. doi:10.12927/hcpap.2019.25982.

McMahon, M. and Tamblyn, R. 2019c. "The Health System Impact Fellowship: Perspectives from the Program Leads: Comment on 'CIHR Health System Impact Fellows: Reflections on "Driving Change" within the Health System.'" *International Journal of Health Policy Management* 8(10): 623–26. doi:10.15171/ijhpm.2019.59.

Pardee RAND Graduate School. 2014. *Program Review Self Study*. Retrieved August 27, 2019. <https://www.prgs.edu/content/dam/prgs/documents/program-review-self-study.pdf>.

Reid, R.J. 2016. "Embedding Research in Learning Health Systems." *HealthcarePapers* 16(Special Issue): 30–35. doi:10.12927/hcpap.2016.24724.

RESEARCH PAPER

Exploring Mentorship as a Strategy to Build Capacity and Optimize the Embedded Scientist Workforce

Le mentorat comme stratégie pour le renforcement des capacités et pour l'optimisation de la main-d'œuvre scientifique enchâssée

STEPHEN BORNSTEIN, PHD
Professor, Division of Community Health and Humanities, Faculty of Medicine
Department of Political Science, Faculty of Arts
Memorial University
Director, Newfoundland and Labrador Centre for Applied Health Research
Co-Director, SafetyNet Centre for Occupational Health and Safety Research
St. John's, NL

MEGHAN MCMAHON, MSC, PHD
Associate Director, CIHR Institute of Health Services and Policy Research
Institute of Health Policy, Management and Evaluation
University of Toronto
Toronto, ON

VERNA YIU, MD
President and CEO, Alberta Health Services
Professor of Pediatrics, Faculty of Medicine/Dentistry
University of Alberta
Edmonton, AB

VINITA HAROUN, MSC, HBSC
Director, Centre for Research and Innovation Support
University of Toronto
Toronto, ON

HEATHER MANSON, MD, MHSC
Chief, Health Promotion, Chronic Disease and Injury Prevention, Public Health Ontario
Toronto, ON

PAUL HOLYOKE, PHD
Director, SE Research Centre
SE Health
Markham, ON

TRACY WASYLAK, BN, MSC, CHE
Chief Program Officer, Strategic Clinical Networks™, Alberta Health Services
Adjunct Appointment, Faculty of Nursing, University of Calgary
Calgary, AB

ROBYN TAMBLYN, PHD
Professor, Department of Medicine and Department of Epidemiology, Biostatistics and Occupational Health
McGill University
Scientific Director (former), CIHR Institute of Health Services and Policy Research
Montreal, QC

ADALSTEINN BROWN, D.PHIL
Dean, Professor, Dalla Lana School of Public Health
University of Toronto
Toronto, ON

Abstract

Background: Mentorship plays a significant role in career development in academic and applied settings, but little is documented about its role in the experiential learning of academic trainees embedded in health system organizations. The experiences of the first cohort of Canada's Health System Impact (HSI) Fellowship program can provide insights into how mentorship in this innovative type of training can work.

Objectives: To understand the mentorship strategies that were used and to explore fellows' and supervisors' perspectives and experiences on the effectiveness and value of those strategies.

Methods: Data from the surveys of fellows and their supervisors and a panel rooted in the lived experience of the first HSI Fellowship cohort were used.

Results: Health system and academic supervisors developed a range of innovative, individualized and effective approaches for guiding their fellows, such as providing the fellow with a committee of mentors within the organization, holding regular meetings with the fellow and both the health system and the academic supervisor and leveraging their own network to expand the network and resources available to the fellow.

Conclusion: The results suggest that engaging senior leadership in health system settings has provided positive experiences for both fellows and their mentors.

Résumé

Contexte : Le mentorat joue un rôle important pour le développement de carrière dans les établissements universitaires ou de santé, mais il y a peu de documentation sur son rôle dans l'apprentissage expérientiel d'étudiants universitaires enchâssés dans des organismes de santé. L'expérience de la première cohorte de boursiers du programme des bourses d'apprentissage en matière d'impact sur le système de santé (BAIS) offre des pistes sur le fonctionnement du mentorat dans ce type novateur de formation.

Objectifs : Mieux comprendre les stratégies de mentorat utilisées et étudier les points de vue et expériences des boursiers et des superviseurs quant à l'efficacité et à l'importance de ces stratégies.

Méthode : Nous avons utilisé les données recueillies lors d'enquêtes auprès des boursiers et des superviseurs ainsi que celles d'un panel ancré dans l'expérience vécue par la première cohorte de boursiers.

Résultats : Les superviseurs universitaires et ceux des organismes d'accueil ont développé une gamme d'approches novatrices, personnalisées et efficaces pour guider les boursiers, telles que leur permettre d'accéder à un comité de mentors au sein de l'organisme, la tenue de rencontres régulières et la mise à profit de leurs propres réseaux afin d'accroître le réseau et les ressources pour les boursiers.

Conclusion : Les résultats font voir que l'engagement de la haute direction dans l'organisme d'accueil se traduit par une expérience positive pour les boursiers et leurs mentors.

Background

Canada's Health System Impact (HSI) Fellowship program provides a new type of training for highly qualified post-doctoral (and now doctoral) students to support their experiential learning and enriched competency development within health system organizations. Its primary goal is to enhance the career readiness of health services and policy research (HSPR) doctoral graduates and elevate their capacity to make an impact on our healthcare systems in careers within and beyond the academy. It is led by the Canadian Institutes of Health Research's Institute of Health Services and Policy Research (CIHR-IHSPR) in collaboration with many partner organizations and is a key initiative of Canada's HSPR Training Modernization Strategy (CHSPRA TMWG 2015a).

Each fellowship is co-sponsored by a health system (i.e., partner) organization. The partner organization provides an embedded position inside its structure for a period of one or two years. A key feature is a dual supervision and mentorship approach in which each fellow receives supervision and guidance from a senior decision-maker from the partner organization (the health system supervisor [HSS]) and an academic [the academic supervisor [AS]) at a Canadian university (see McMahon et al. 2019 for a detailed program overview). Although there is considerable literature on mentorship in academic and non-academic organizations (Allen et al. 2004; Claman 2010; Eller et al. 2014; Gagliardi et al. 2014; Pfund et al. 2014; Sambunjak et al. 2006, 2010; Sherrill et al. 2012; Tjan 2017; Tong and Kram 2013; Walsh and Borkowski 1999), less is known about mentorship in the experiential learning of doctoral and post-doctoral trainees embedded in health system organizations (including this dual mentorship approach [Halvorson et al. 2015; Hamelin and Paradis 2018]).

The HSI Fellowship program has now funded two cohorts (see Table 1 for key details). There is considerable heterogeneity in the types of partner organizations involved (e.g., government, delivery organizations, health charities, pan-Canadian health organizations, small not-for-profit organizations), their organizational characteristics (e.g., size and complexity) and their existing research infrastructures (Ellen et al. 2011). The range of HSSs includes CEOs of major provincial and regional health systems, hospitals and associations of health professionals to directors of units within small, medium and large health organizations. Table 1 identifies HSS's educational, research and clinical backgrounds.

CIHR-IHSPR emphasized the importance of the mentorship dimension in all stages of the program – including from the initial funding opportunity peer review criteria (CIHR 2017) to the professional development plans required by fellows and supervisors at regular intervals throughout the fellowship – but did not define mentorship or prescribe what the mentorship plans should look like or how they were to be implemented. Flexibility in the approach was intended to allow each fellowship to be adapted to the individual fellow's goals and to the partner organization's context.

TABLE 1. Health System Impact Fellowship: description of cohorts

	Round 1 (2017)	Round 2 (2018)
Number of funded fellows	46 post-doctoral fellows • 24 1-year fellows • 22 2-year fellows	49 fellows • 20 doctoral fellows (1-year) • 29 post-doctoral fellows (2-years)
Number of host partner organizations	38 organizations • 6 (16%) healthcare delivery sector • 17 (45%) public sector • 14 (37%) not-for-profit sector • 1 (3%) private sector	39* • 4 (10%) healthcare delivery sector • 21 (54%) public sector • 13 (33%) not-for-profit sector • 1 (3%) private sector
Number of health system supervisors	43	47**
Educational background of health system supervisor	• PhD: 15 (35%) • MD: 10 (23%) • Other clinical degree: 6 (14%) • Master's–research***: 16 (37%) • Master's–non-research: 10 (23%) • Other professional degree: 1 (2%)	• PhD: 17 (36%) • MD: 13 (28%) • Other clinical degree: 4 (8%) • Master's–research***: 12 (25%) • Master's–non-research: 6 (13%) • Other professional degree: 5 (11%)
Number of academic training programs	17	19
Number of academic supervisors	44	49

*36% of host partners participated in Round 1.
**15% also supervised a fellow in Round 1.
***Includes MDs with MSc.

The objective of the present study was to examine the mentorship approaches used by HSSs in the HSI Fellowship program, identify those that were perceived to be effective by fellows and supervisors and ascertain the benefits and impacts that supervisors observed from participating in the program. The overall goal is to contribute to our understanding of the role and value of mentorship in embedded fellowships and to help identify promising practices that can be used to improve this and similar programs moving forward.

Methods

The initial design of the fellowship program was informed by a review of the literature on the changing profile of graduate education and on experiential training programs in the US, Europe and elsewhere (summarized in CHSPRA TMWG [2015a,b]). Delineation of the core issues about the mentorship component was based on a review of the literature on the role of mentorship in career development in business organizations, health systems and universities (Allen et al. 2004; Claman 2010; Eby et al. 2008; Eller et al. 2014; Gagliardi et al. 2014; Nowell et al. 2017; Sambunjak et al. 2006; Sherrill et al. 2012; Tjan 2017; Tong and Kram 2013; Walsh and Borkowski 1999). Given that the HSI Fellowship program set clear objectives regarding the importance of supervision and mentorship but did not prescribe the

details of what should be offered or how to do so, the Training Modernization Working Group (TMWG) identified an opportunity to study the initial years of the program in order to learn about the mentorship strategies that were used and to explore fellows' and supervisors' perspectives and experiences regarding the effectiveness and value of those strategies.

Informed by the mentorship literature and by the experience of the TMWG co-leads (S.B. and A.B.), a set of questions was developed (Box 1) around which this study's efforts were structured. The approach involved four components and the inaugural cohort of fellows (n = 46) and supervisors (n = 87):

BOX 1. Key questions posed to mentors

1. Why did you get involved in the HSI Fellowship program? What were your primary motivations?
2. What were your "essential ingredients" to your mentorship approach (what did you do that worked well)?
3. Were there any challenges? What would you do differently next time?
4. Fellows also have an academic supervisor. To what extent do you and the academic supervisor collaborate to support the fellow? What are some of the benefits of this joint health system and academic involvement in the fellowship (benefits to the fellow, to you, to your organization)?
5. What were the impacts (instrumental, conceptual, symbolic) for you as a mentor and for your organization?

1. a questionnaire sent to the inaugural cohort of fellows inviting them to nominate an "outstanding health system and/or academic mentor";
2. sharing of the structured questions with the nominated mentors for response and inviting them to participate on a mentorship panel at the National Cohort Retreat and contribute to the present study to incorporate their lived experience;
3. including in the fellows' 12-month competency assessments a set of 13 Likert-scaled questions about their satisfaction with various aspects of the program and mentorship received; and
4. including in the supervisors' 12-month competency assessments of their fellow(s) three of the questions in Box 1 (#2, #3 and #5) and a question about how frequently they had met with their fellow to discuss professional development.

Results

The results are structured around the five key questions that informed this work (see Box 1) and draw primarily on the experiences of the HSSs (n = 43) given the program's emphasis on experiential learning within health system organizations.

Motivation for involvement

The primary motivation for HSS's involvement was to add research capacity in a partnered and cost-effective manner to address organizational priorities and to implement studies and program evaluations that they would not otherwise be able to undertake. Several panelists and survey respondents noted that adding university-affiliated research capacity and a partnership with well-established academic experts would give their reports and

recommendations added credibility in the eyes of key stakeholders. Several contributors used the term "learning health system" and indicated that they hoped that having researchers and research projects active within their organization would increase awareness among their colleagues of the importance of evidence and of academic partnerships in supporting effective decision-making. One participant noted that he/she regularly hired new post-graduate employees and hoped that the HSI Fellowship could generate lessons about a more codified, efficient and effective approach to training graduates for success within health system organizations.

Mentorship techniques: essential ingredients

HSSs emphasized regular, frequent, face-to-face meetings (ranging from weekly to every few months) with their fellow as a crucial element in effective mentorship, and many noted the importance of meeting simultaneously with the fellow and the AS. Several panelists and survey respondents, especially among the HSSs, emphasized the importance of having an open-door policy so that the fellow had good access to them. A number of HSSs were adamant that the key to effective mentorship with their fellows was listening.

HSSs noted the importance of "co-creating" the fellow's project as a key to developing a productive partnership. They emphasized the importance of getting off to a good and quick start through intensive upfront involvement with the fellow and the AS. Supervisors whose fellows were funded for one year identified designing a project with a feasible scope to ensure completion as critical. Also perceived as important was providing positive and encouraging feedback, especially when a new fellow was grappling with the complexity of the challenges involved in combining academic and applied work. Many supervisors recommended seeking to understand the fellow beyond academic credentials and interests in order to attain an enhanced understanding of the fellow's motivation and potential. HSSs placed considerable emphasis on working to integrate the fellow effectively into the regular operations of their organization by actively brokering relationships, leveraging the supervisor's own network of contacts to expand the people and resources available to the fellow and involving the fellow in initiatives other than the fellow's primary project, including giving the fellow leadership opportunities in some of these activities. Some HSSs involved other key figures in the organization to collaborate in providing the fellow with a committee of mentors in the organization. There was variation in the frequency and style of HSS's approaches to engaging with their fellow: some met often and regularly, others met at specific intervals and others encouraged their fellow to identify when support and guidance were needed.

The challenges

Most of the panelists and survey respondents felt things were working well and identified few challenges. Some HSSs said that, in the future, they would not accept any post-doctoral fellow for less than two years. A number of HSSs said they would work harder at start-up, beginning with a careful three-way planning session involving the fellow and the AS to

agree on project deliverables and role expectations right away; paying more attention to the availability of space and resources; and introducing the fellow early on to the organization's executive team. Several HSSs admitted that they had not devoted sufficient time to their mentorship role because of a demanding schedule or done enough to integrate the fellow into the ongoing activities of their organizations. Others, particularly those more junior in their organizations, acknowledged that they had not done enough to secure buy-in from their organization's top leadership to the embedded fellow and his or her project. Several HSSs and ASs noted that their fellow's project had run into unexpected roadblocks and that they should have done a better job to help develop mitigation plans and alternative projects.

Collaboration between health system and academic supervisors

Many of the HSSs stated that developing new contacts in the academic world was a key benefit of the fellowship program. Some indicated that they had not devoted sufficient time to interacting with their AS or HSS counterpart and would have liked to hold more frequent three-way meetings.

Benefits for health system supervisors and their organizations

The HSSs emphasized the positive impacts of the mentorship experience on themselves and on their organizations. The main personal benefits included expanded linkages to academic partners, development of mentorship skills and learning more about the core competencies and supports available within their organizations for cultivating the competencies. At the organizational level, many HSSs noted that their organizations had gained capacity in the analysis and evaluation of programs and policies that they would not otherwise have had. Collaboration with skilled academic trainees and their supervisors provided valuable learnings to the organization through studies, reports, conference papers and publications with enhanced credibility for policy recommendations and/or advocacy positions. Several respondents observed that the highly visible activities with their fellow and the fellow's project(s) sent a message to the organization about the importance of research and academic partnerships. One participant noted that the involvement of a number of senior leaders with the fellow and his or her research made for a shared focus among them that had previously been limited or absent. Another observed that involvement with the fellow's high-quality work allowed him or her to make an enhanced contribution to population health and to the quality of the provincial health system.

The fellows' experience

Table 2 illustrates that fellows identified mentorship from both supervisors as very important to their professional growth and reported, on average, high satisfaction with the quality of the mentorship they received. However, a small number of fellows ($n = 3$) reported mediocre to low satisfaction (a rating of 3 or lower on the 5-point scale), which signals the need at the program level to understand the factors underlying the rating. An area for improvement

appears to be in fostering meaningful team-based co-mentorship given that a small subset of respondents (n = 4/38) reported that they had not experienced co-mentorship from their HSS and AS. Similarly, other embedded research training programs have found that some of their trainees had suboptimal mentorship experiences and learned through program exit interviews that challenges can arise when the trainee perceives that the mentor is not available enough, does not understand his or her role as a mentor or does not engage the trainee in team meetings and when the embedded project is not a priority for the organization (Hamelin and Paradis 2018).

TABLE 2. Fellows' assessments of their mentorship experience

Fellows' assessments of mentorship	n	Mean rating (SD)
1- and 2-year fellows: Rate the importance of the following enablers to your competency development (scale: 1 [low]–5 [high])		
The mentorship and support for professional growth that I received from my health system supervisor	38	4.35 (0.98)
The mentorship and support for professional growth that I received from my academic supervisor	38	4.24 (0.95)
Co-mentorship (team-based approach) from my health system and academic supervisors	38	4.12* (1.19)
1-year fellows only: Co-mentorship and supervision from health system and academic leaders to enhance career preparedness are a core element of the HSI Fellowship program. Rate your satisfaction with the following (scale: 1 [low]–5 [high]):		
The mentorship and support for professional growth that I received from my academic supervisor	19	4.63 (0.83)
My supervisor's interests in and support for my career pursuits	19	4.58 (0.84)
The supervision, guidance and feedback in relation to my academic research from my academic supervisor	19	4.47 (0.70)
The mentorship and support for professional growth that I received from my health system supervisor	19	4.42 (0.90)
The people and networks my supervisors exposed me to	19	4.42 (0.69)
The efforts my health system supervisor took to integrate me into the organization	19	4.37 (0.89)
The supervision, guidance and feedback in relation to my embedded program of work from my health system supervisor	19	4.37 (1.01)
Opportunities to participate in projects beyond what was proposed in my fellowship application	19	4.32 (0.82)
The resources (e.g., equipment, data, people) that my partner organization made available to support me and my program of work	19	4.16 (1.01)

*Four of 38 respondents indicated "N/A: did not experience co-mentorship."

The fellows' qualitative responses about the most valuable aspect of the mentorship they received suggest that they value the efforts their HSSs took to meaningfully integrate them within the organization, include them in team meetings, provide them with exposure to executive management and support and encourage their professional development. Regarding

advice to future supervisors, fellows recommended meeting early on as a team with the fellow to jointly agree upon project scope and deliverables and having frequent meetings and open communication thereafter.

Discussion

Given the strong focus on the comments of five HSSs and reliance on the responses of our heterogeneous cohort of fellows and supervisors, this summary should be treated as emerging evidence whose generalizability to other programs remains to be tested. What it does suggest are the following key points:

- The dual mentorship approach has demonstrated positive impacts for fellows, supervisors and partner organizations.
- The HSSs play a role not only in guiding the practical work of the fellow on a project or projects linked to the objectives of the organization but also in mentoring the fellow for future career preparedness, helping to foster the fellow's enriched core competency development and assessing the fellow's progress in developing and utilizing the enriched core competencies. The HSS's assessment of the fellow's enriched core competency development is a natural component of a relationship that is partly one of employer to employee, partly one of supervisor to trainee, but mainly one of mentor to mentee. This ongoing interaction is primarily intended to benefit the fellow's development but also contributes to the success of the embedded project and the advancement of the health system organization's impact goal. Some HSSs reported that their relationship with the fellow has also benefited their learning and growth as a mentor. Future research should examine whether this ongoing interaction helps the organization develop a learning health system approach and culture.
- In the future, the value and impact for the AS and the university should also be assessed. Additionally, efforts to strengthen the collaboration between the HSS and AS in support of the fellow may generate added value for all involved. Providing mentorship guidance to fellows and supervisors at the beginning of the fellowship and creating routine opportunities (e.g., online webinars) to share tips and pool experiences may also be helpful. Other studies have identified the provision of formal mentorship training as an important contributor to a positive trainee experience (Hamelin and Paradis 2018; Keyser et al. 2008; Pfund et al. 2014).
- The HSSs developed a range of innovative approaches to managing the opportunities and challenges of this new embedded fellowship program. Variation in mentorship strategies, in the ways that individual projects were launched and implemented within organizations and in the methods used to integrate the fellows into the partner organizations' structures and activities is likely due to the individual styles and preferences of the supervisors and fellows and reflective of the variation in organizational norms and

processes of the heterogeneous partner organizations. Future evaluations could help characterize whether and how these approaches and contextual differences impact the fellowship experience.

- There appears to be a strong consensus among this first cohort of HSSs that the HSI Fellowship program provides good value for their money and time as well as a substantial number of personal and organizational benefits. Many HSSs reported having acquired new linkages to the academic world and enhanced mentorship skills. Many also reported that the presence of a fellow provided missing skills to their organization and an opportunity to advance their organization's mandate through research and evaluation.
- The inaugural cohort of fellows appears very satisfied with the program, particularly with the mentorship provided by both supervisors, although some reported lower satisfaction with the level of interaction between the two supervisors. There may be a need to develop supportive program-level guidelines and resources to foster collaborative co-mentorship approaches.

The HSI Fellowship aims to train a new cadre of PhD graduates with the skills, experience and relationships to drive evidence-informed health system improvement. Although the evaluations of the HSI Fellowship program and its mentorship component are strongly positive, future work should focus on improving and strengthening the relationships among the HSS and the AS, between supervisors and fellows, between the fellows themselves by way of peer mentorship and alumni mentorship opportunities and perhaps even between different types of mentors, in line with emerging evidence in support of mentorship "boards" and similar team mentorship ideas (Claman 2010; Halvorson et al. 2015). Ellen and Brown (2016) suggest that game theory insights emphasize the importance of trusted relationships to effective knowledge transfer.

Conclusion

The results reported in this study suggest that the HSI Fellowship has demonstrated success for both fellows and supervisors. It is important to note, however, that comments both critical and constructive tend to focus on the opportunity for fellows and supervisors to develop a relationship. Hopes for longer fellowships and praise for the networks of contacts brought by the program suggest that future iterations should focus on the nature, sustainability and intensity of relationships as key determinants to the success of the program and, ultimately, to the creation of a learning health system.

Acknowledgements

This study reflects the views of five HSI Fellowship health system supervisors, but the authors would like to acknowledge and thank all of the health system and academic supervisors and the fellows involved in the program.

Correspondence may be directed to: Stephen Bornstein, PhD; e-mail: sbornste@mun.ca.

References

Allen, T.D., L.T. Eby, M.L. Poteet, E. Lentz and L. Lima. 2004. "Career Benefits Associated with Mentoring for Protégés: A Meta-Analysis." *Journal of Applied Psychology* 89(1): 127–36.

Canadian Health Services and Policy Research Alliance, Training Modernization Working Group (CHSPRA TMWG). 2015a. *Challenges, Opportunities, and Future Directions for Health Services and Policy Research Training in Canada: A White Paper*. Ottawa, ON: Canadian Institutes of Health Research. Retrieved January 6, 2019. <https://docs.wixstatic.com/ugd/5adc92_1718e4da4dca480f8a8b475e20178f7e.pdf>.

Canadian Health Services and Policy Research Alliance, Training Modernization Working Group (CHSPRA TMWG). 2015b. *Modernizing Health Services and Policy Research Training: A Pan-Canadian Strategy*. Ottawa, ON: Canadian Institutes of Health Research. Retrieved January 6, 2019. <https://docs.wixstatic.com/ugd/5adc92_4b4c942ad5294494899538927034 73cc.pdf>.

Canadian Institutes of Health Research (CIHR). 2017. Fellowships: Health System Impact Fellowships. Retrieved January 6, 2019. <https://www.researchnet-recherchenet.ca/rnr16/vwOpprtntyDtls.do?prog=2630&view=currentOpps&type=EXACT&resultCount=25&sort=program&next=1&all=1&masterList=true>.

Claman, P. 2010, October 20. "Forget Mentors: Employ a Personal Board of Directors. *Harvard Business Review*. Retrieved January 11, 2019. <https://hbr.org/2010/10/forget-mentors-employ-a-person>.

Eby, L.T., T.D. Allen, S.C. Evans, T.W.H. Ng and D.L. DuBois. 2008. "Does Mentoring Matter? A Multidisciplinary Meta-Analysis Comparing Mentored and Non-Mentored Individuals." *Journal of Vocational Behaviour* 72(2): 254–67. doi:10.1016/j.jvb.2007.04.005.

Ellen, M. and A. Brown. 2016. "Transferring Research from Researchers to Knowledge Users: The Importance of Relationships and Getting Them Right." *Journal of Health Services Research & Policy* 21(2): 134–36. doi:10.1177/1355819615602030.

Ellen, M.E., J.N. Lavis, M. Ouimet, J. Grimshaw and P.-O. Bédard. 2011. "Determining Research Knowledge Infrastructure for Healthcare Systems: A Qualitative Study." *Implementation Science* 6: 60. doi:10.1186/1748-5908-6-60.

Eller, L.S., E.L. Lev and A. Feurer. 2014. "Key Components of an Effective Mentoring Relationship: A Qualitative Study." *Nurse Education Today* 34(5): 815–20. doi:10.1016/j.nedt.2013.07.020.

Gagliardi, A.R., F. Webster, L. Perrier, M. Bell and S. Straus. 2014. "Exploring Mentorship as a Strategy to Build Capacity for Knowledge Translation Research and Practice: A Scoping Systematic Review." *Implementation Science* 9: 122. doi:10.1186/s13012-014-0122-z.

Halvorson, M.A., J.W. Finney, X. Bi, N.C. Maisel, K.P. Hayashi, J.C. Weitlauf et al. 2015. "The Changing Faces of Mentorship: Application of a Developmental Network Framework in a Health Services Research Career Development Program." *Clinical and Translational Science* 8(6): 824–29. doi:10.1111/cts.12355.

Hamelin, A.-M. and G. Paradis. 2018. "Population Health Intervention Research Training: The Value of Public Health Internships and Mentorship." *Public Health Reviews* 39(6). doi:10.1186/s40985-018-0084-9.

Keyser, D.J., J.M. Lakoski, S. Lara-Cinisomo, D.J. Schultz, V.L. Williams, D.F. Zellers et al. 2008. "Advancing Institutional Efforts to Support Research Mentorship: A Conceptual Framework and Self-Assessment Tool." *Academic Medicine* 83(3): 217–25. doi:10.1097/ACM.0b13e318163700a.

McMahon, M., S. Bornstein, A. Brown, L.A. Simpson, L. Savitz and R. Tamblyn. 2019. "Training for Health System Improvement: Emerging Lessons from Canadian and US Approaches to Embedded Fellowships." *Healthcare Policy* 15(Special Issue): 34–48. doi:10.12927/hcpap.2019.25981.

Nowell, L., J.M. Norris, K. Mrklas and D.E. White. 2017. "Mixed Methods Systematic Review Exploring Mentorship Outcomes in Nursing Academia." *Journal of Advanced Nursing* 73(3): 527–44. doi:10.1111/jan.13152.

Pfund, C., S.C. House, P. Asquith, M.F. Fleming, K.A. Buhr, E.L. Burnham et al. 2014. "Training Mentors of Clinical and Translational Research Scholars: A Randomized Controlled Trial." *Academic Medicine* 89(5): 774–82. doi:10.1097/ACM.0000000000000218.

Sambunjak, D., S.E. Straus and A. Marusic. 2006. "Mentoring in Academic Medicine: A Systematic Review." *JAMA* 296(9): 1103–15. doi:10.1001/jama.296.9.1103.

Sambunjak, D., S.E. Straus and A. Marusic. 2010. "A Systematic Review of Qualitative Research on the Meaning and Characteristics of Mentoring in Academic Medicine." *Journal of General Internal Medicine* 25(1): 72–78. doi:10.1007/s11606-009-1165-8.

Sherrill, W.W., J. Westerman, R.E. Howell, T.P. Saul and J.M. Lowe. 2012. "Mentoring in Health Services Management: Reflections on an Evolving Training Ground." *The Health Care Manager* 31(1): 44–51. doi:10.1097/HCM.0b013e318242d285.

Tjan, A.K. 2017, February 27. "What the Best Mentors Do." *Harvard Business Review*. Retrieved January 10, 2019. <https://hbr.org/2017/02/what-the-best-mentors-do>.

Tong, C. and K.E. Kram. 2013. "The Efficacy of Mentoring – The Benefits for Mentees, Mentors, and Organizations." In J. Passmore, D. Peterson and T. Freire, eds., *The Wiley-Blackwell Handbook of the Psychology of Coaching and Mentoring* (pp. 217–42). West Sussex, UK: John Wiley & Sons.

Walsh., A.M. and S.C. Borkowski. 1999. "Mentoring in Health Administration: The Critical Link in Executive Development." *Journal of Healthcare Management* 44(4): 269–80; discussion 280–81.

Policy is always in the making. This journal is designed to serve readers from diverse backgrounds including health system managers, practitioners, politicians and their administrators, educators and academics. Our authors come from a broad range of disciplines including social sciences, humanities, ethics, law, management sciences and knowledge translation. They want good policy – a foundation for best practices.

www.healthcarepolicy.net

This issue of *Healthcare Policy* | *Politiques de Santé*
was made possible through the support of: