

Kaley (Kaleen) Hayes, PharmD, PhD

Assistant Professor

Department of Health Services, Policy, and Practice
Brown University School of Public Health

Curriculum Vitae

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EDUCATION

PhD, Epidemiology 2021
Specialization: Pharmacoepidemiology
University of Toronto Dalla Lana School of Public Health, Toronto, Ontario, Canada

Doctor of Pharmacy (PharmD), *Summa cum laude* 2017
University of Pittsburgh School of Pharmacy, Pittsburgh, Pennsylvania, USA

AFFILIATIONS

Assistant Professor (Primary) 2021 – Present
Department of Health Services, Policy, and Practice; Brown University, Providence, RI

Adjunct Assistant Professor 2022 – Present
Graduate Department of Pharmaceutical Sciences, University of Toronto, Toronto, Canada

Investigator 2021 – Present
Center for Gerontology and Healthcare Research, Brown University, Providence, RI

LICENSURES AND CERTIFICATIONS

Pharmacist (No. RP451466) 2017 – Present
Pennsylvania State Board of Pharmacy

License to Administer Injectables (No. RPI011390) 2017 – Present
Pennsylvania State Board of Pharmacy

RESEARCH AWARDS

FUNDED FEDERAL GRANTS

R01AG078759 (National Institute on Aging Project Grant) 2022 –2026
Benefits and Harms of Long-term Osteoporosis Pharmacotherapy: Impact of Treatment Length, Type, Switching, and Holidays
PI: Hayes (contact), Cadarette
Total costs: 2,537,664 USD

Canadian Institutes of Health Research Project Grant 2019 – 2021
Comparative benefits and harms of long-term osteoporosis pharmacotherapy
PI: Cadarette (contact), Hayes
Total direct costs: 100,000 CAD

OTHER GRANTS AND RESEARCH AWARDS

International Society for Pharmacoepidemiology Manuscript Grant 2022 – 2023
Use of real-world data to assess the effects of deprescribing medications on clinical outcomes in older adults
PI: Hayes
9,950 USD

Brown University Office of the Vice President of Research Salomon Research Award 2022 – 2023
Leveraging new databases to understand medication use in the post-acute care setting among older adults with hip fracture
PI: Hayes
14,050 USD

Investigator-Initiated Industry Grant (Sponsor: Insight Therapeutics) 2022
iGlarLixi versus Complex Insulin Regimens among Nursing Facility Residents with Type 2 Diabetes
PI: Hayes
50,000 USD

TRAINING AWARDS AND SCHOLARSHIPS

Advancing Geriatrics Infrastructure and Network Growth (AGING) Initiative Multiple Chronic Conditions Scholars (MCCS) Program 2023 – 2024

US Deprescribing Research Network Junior Investigator Intensive Program 2022 – 2023
2000 USD for travel

Canadian Institutes of Health Research Postdoctoral Fellowship 2021
*100,000 CAD (NB: Declined to accept faculty position at Brown University)
Rank: 1st of 98 post-PhD applicants (15 funded)*

American Society of Bone and Mineral Research Young Investigator Travel Grant 2021
500 USD

Canadian Institutes of Health Research Doctoral Research Award 2019 – 2021
*105,000 CAD (90,000 CAD stipend; 15,000 CAD Research Grant; F32 Equivalent)
Rank: 7th of 520 applicants in Health Sciences Research Stream (66 funded)*

International Society for Pharmacoepidemiology Scholarship 2021
300 USD, 2021 Annual Meeting, Online

Canadian Institutes of Health Research Drug Safety and Effectiveness Cross-Disciplinary Training Program Award (DSECT) 2018 – 2019
10,000 CAD; Stream 1 Trainee Stipend

University of Pittsburgh Full Tuition Merit Scholarship 2011 – 2016
94,376 USD

International Society for Pharmacoepidemiology Scholarship 2020
300 USD, 2020 Annual Meeting, Online

Canadian Institutes of Health Research Drug Safety and Effectiveness Cross-Disciplinary Training Program Award (DSECT) 2020
10,000 CAD; Stream 2 Trainee Stipend

Society for Epidemiologic Research Conference Scholarship <i>275 USD; 2021 Annual Meeting, Online</i>	2021
Ontario Drug Policy Research Network Outstanding Applicant Award <i>1,500 CAD</i>	2020
International Society for Pharmacoepidemiology Travel Scholarship <i>1,205 USD; 2019 Annual Meeting, Philadelphia, USA</i>	2019
Canadian Institutes of Health Research Drug Safety and Effectiveness Cross-Disciplinary Training Program (DSECT) Travel Scholarship <i>1,100 CAD; Awarded for visit to McGill University for scholarly collaboration</i>	2018
International Society for Pharmacoepidemiology Travel Scholarship <i>1,655 USD; 2018 Annual Meeting, Prague, Czech Republic</i>	2018
University of Pittsburgh School of Pharmacy APhA-ASP Travel Award <i>1,400 USD</i>	2014, 2015
University of Pittsburgh Provost's Study Abroad Scholarship <i>1,000 USD; International Pharmacy Student Federation Exchange Program</i>	2013
University of Pittsburgh School of Pharmacy Dean's Fund Travel Award <i>500 USD</i>	2016, 2014
South Hills Pitt Club Alumni Undergraduate Scholarship <i>2,000 USD</i>	2011 – 2014
Jeffrey's Drug Store Community Undergraduate Scholarship <i>1,000 USD</i>	2011

HONORS, DISTINCTIONS, AND LEADERSHIP RECOGNITION

Canadian Institutes of Health Research Drug Safety and Effectiveness Cross-Disciplinary Training Program (DSECT) Distinguished Alumni Award	2022
International Society for Pharmacoepidemiology Emerging Leader Award	2022
Canadian Association for Population Therapeutics Top 5 Abstract <i>Time trends among new users of osteoporosis drugs in Ontario, Canada</i>	2018
TEVA Pharmaceuticals Award for Outstanding Research <i>Awarded for PharmD research contributions; 250 USD honorarium</i>	2017
APhA-ASP 2015-2016 National Patient Care Award <i>Directed student chapter and co-authored report which served for evaluation</i>	2017
Rho Chi Chapter of the Year Award <i>Served on executive board and co-authored report which served for evaluation</i>	2017
University of Pittsburgh Student Affairs Program of the Year Award <i>Co-directed HPV Vaccination Education and Research Initiative</i>	2016

PUBLICATIONS

PEER-REVIEWED PUBLISHED MANUSCRIPTS

1. Tadrous M, Graill P, **Hayes KN**, Neville H, Houlihand J, Clement F, Guertin JR, Law M, Gomes T. Canadian Trends in Estimated Pharmaceutical Drug Purchases and Projections, 2023. **Can J Health Technol.** 2022;2(11):1-30. <https://doi.org/10.51731/cjht.2022.512>
2. Zullo AR, Riester M, **Hayes KN**, Munshi M, Berry SD. Comparative Safety of Sulfonylureas among U.S. Nursing Home Residents. **J Am Geriatr Soc.** E-pub ahead of print, Dec 10, 2022. PMID: 36495141.
3. **Hayes KN**, Mor V, Zullo AR. Electronic Health Records to Rapidly Assess Biosimilar Uptake: An Example Using Insulin Glargine in a Large U.S. Nursing Home Cohort. **Front Pharmacol.** 2022; 13:855598. PMID: PMC9114471.
4. Hofmeister M, Sivakumar A, Clement F, **Hayes KN**, Law M, Guertin JR, Neville HL, Tadrous M. Trends in Canadian Prescription Drug Purchasing: 2001-2020. **J Pharm Policy Prac.** 2022;15(20). PMID: PMC8928614.
5. **Hayes KN**, Burden AM, Winter EM, Hauser B. Comment on: Paradoxically protective effect of glucocorticoids on bone mass and fragility fracture in a large cohort: a cross-sectional study. **Rheumatol Adv Prac.** 2022;6(2):rkac010. PMID: PMC9073364.
6. Schneider T, Gomes T, **Hayes KN**, Suda KJ, Tadrous M. Comparisons of Insulin Spending and Price between Canada and the US. **Mayo Clin Proc.** 2022;97(3):573-578. PMID: 35135692.
7. **Hayes KN**, Cheung AM, Brown KA, Kim SA, Juurlink DN, Cadarette SM. Comparative risks of osteoporosis drug holidays following long-term risedronate versus alendronate therapy: a propensity score-matched cohort study. **Ann Intern Med.** 2022;175:335-343. PMID: 35007149.
 - Summary for Patients: Fracture Risk During Osteoporosis Drug Holiday. **Ann Intern Med.** (online only). <https://doi.org/10.7326/P21-0013>.
 - Continuing Medical Education Podcast: Centor RM, **Hayes KN**. Annals On Call - Time for a Bisphosphonate Holiday? **Ann Intern Med.** <https://doi.org/10.7326/A21-0013>.
 - Feature: American College of Physicians (ACP-IM) Internal Medicine Meeting 2022: Recent Articles That Should Influence Practice. Presented April 29, 2022.
8. **Hayes KN**, Baschant U, Hauser B, Burden AM, Winter EM. When to start and stop bone-protecting medication for preventing glucocorticoid induced osteoporosis. **Front Endocrinol.** 2021;12:782118. PMID: PMC8715727.
9. Tadrous M, Shakeri A, **Hayes KN**, Neville H, Houlihand J, Clement F, Guertin JR, Law M, Gomes T. Canadian Trends in Prescription Drug Expenditures and Projections, 2001-2023. **Can J Health Technol.** 2021;1(11):1-24. <https://doi.org/10.51731/cjht.2021.209>
10. **Hayes KN**, Gomes T, Tadrous M. Greater than the sum: applying daily-dose equivalents to antipsychotic prescription claims. **Front Pharmacol.** 2021;12:709349. PMID: PMC8378135.

11. Makari J, Dagenais J, Tadrus M, Jennings S, Rahmann I, **Hayes KN**. Hospital pharmacist discharge care is independently associated with reduced risk of hospital readmissions for patients with chronic obstructive pulmonary disease: a propensity score-matched cohort study. **Can Pharm J**. 2022;155(2):101-106.
12. **Hayes KN**, Winter EM, Cadarette SM, Burden AM. Duration of bisphosphonate drug holidays in osteoporosis patients: a narrative review of the evidence and considerations for decision-making. **J Clin Med**. 2021;10(5):1140. PMID: PMC7963175.
13. **Hayes KN***, Burkard T*, Burden AM, Weiler S, Tadrus M. Global adverse events reported for direct-acting antiviral therapies for the treatment of Hepatitis C: An analysis of the World Health Organization VigiBase. **Eur J Gastro Hep**. 2021;33(1S):e1017-e1021. PMID: PMC8734625. *Contributed equally.
14. Cadarette SM, Maclure M, Delaney JAC, Gagne JJ, Whitaker HJ, **Hayes KN**, Wang SV, Tadrus M, Gagne JJ, Consiglio GP, Hallas J. Control yourself: ISPE-sponsored guidance for the application of self-controlled study designs in pharmacoepidemiology. **Pharmacoepidemiol Drug Saf**. 2021;30(6):671-684. PMID: PMC8251635.
15. **Hayes KN**, Hundal AK, Cadarette SM. Observational study methods used to assess type 2 diabetes pharmacotherapy effects on fracture risk: a scoping review protocol. **JBI Evidence Synthesis**. 2021;19(11):3129-3141. PMID: 34054037.
16. Shakeri A, **Hayes KN**, Gomes T, Tadrus M. Comparison of public and private payments for direct-acting antivirals (DAAs) across Canada. **Can Liv J**. 2021;4(4):429-9.
17. Hundal AK, Watterson TL, **Hayes KN**. Addressing challenges of precepting student pharmacists enrolled in remote research advanced pharmacy practice experiences. **Am J Pharm Educ**. 2021; 85(5):8311. PMID: 34283730.
18. **Hayes KN**, He N, Brown KA, Kim SM, Cheung AM, Juurlink DN, Cadarette SM. Over half of seniors who start oral bisphosphonate therapy are exposed for 3 or more years: novel rolling window approach and patterns of use. **Osteoporos Int**. 2021;32(7):1413-20. PMID: 33415374.
19. **Hayes KN**, Giannakeas V, Wong AKO. Bisphosphonate use is protective of radiographic knee osteoarthritis progression among those with low disease severity and being non-overweight: data from The Osteoarthritis Initiative. **J Bone Miner Res**. 2020;35(12):2318-26. PMID: 33378555.
20. **Hayes KN**, Giannakeas V, Wong AKO. Response to: Challenges to the Possible Use of Bisphosphonates in Early-Stage Osteoarthritis. **J Bone Miner Res**. 2021;36(4):815-816. PMID: 32662919.
21. Kirisci LK, Tarter RE, Vanyukov MM, **Hayes KN**, Reynolds MD. Derivation and assessment of the opioid use disorder severity scale: prediction of health, psychological and social adjustment problems. **Am J Drug Alcohol Abuse**. 2020; 46(6):699-707. PMID: 31967913.
22. **Hayes KN**, Nakhla N, Tadrus M. Further evidence to monitor chronic proton pump inhibitor use. **JAMA Netw Open**. 2019;2(11):e1916184. PMID: 31774516.
23. **Hayes KN**, Pan I, Kunkel AC, McGivney MS, Thorpe CT. Evaluation of targeted HPV vaccination education among undergraduate college students. **J Am Coll Health**. 2019;67(8):781-789. PMID: 30570453.
24. **Hayes KN**, Tadrus M. The Name Game: A call for change of psychopharmacological nomenclature in clinical practice. **BMJ Opinion**. Nov 12, 2019. <https://bit.ly/2NOg5Jt>
25. **Hayes KN**, Ban JK, Athanasiadis G, Burden AM, Cadarette SM. Time-trends in oral bisphosphonate initiation in Ontario, Canada over 20 years reflect drug policy and healthcare delivery changes. **Osteoporos Int**. 2019;30(11):2311-2319. PMID: 31317249.

26. **Hayes KN**, Bastacky M. Essential statistics for pharmacists: guidance on confounders and regression. Continuing education article and assessment. **The Pennsylvania Pharmacist (Journal of the Pennsylvania Pharmacists Association)**. July/August 2019:29. Available at: papharmacists.com/page/CEHomeStudies.
27. Wong L, **Hayes KN**, Cadarette SM. Bad to the bone: how pharmacists can help minimize drug-induced fracture risk. **Pharm Prac + Business**. 2018;5(10):18-23.
28. **Hayes KN**, Meyer SM. Visual arts programs for health sciences students have unrealized potential for interprofessional education. **Health, Interprofessional Practice & Education**. 2018;3(3).

PUBLISHED PEER-REVIEWED ABSTRACTS AND SCIENTIFIC PRESENTATIONS AT MEETINGS

1. **Hayes KN**, Harris DA, Zullo AR, Mor V. COVID-19 booster vaccination by race, ethnicity, and frailty among 11.3 million older adults. [Abstract] Oral presentation, American Geriatrics Society Annual Meeting, May 2023, Long Beach, United States.
2. Harris DA, Zullo AR, Mor V, **Hayes KN**. Comparative safety of BNT162b2 and mRNA-1273 vaccines across frailty subgroups among 6.4 million older adults. [Abstract] Poster presentation, American Geriatrics Society Annual Meeting, May 2023, Long Beach, United States.
3. **Hayes KN**, Zhang T, Berry SD*, Zullo AR*. Benefits and Harms of Standard versus Reduced-Dose Direct Oral Anticoagulants for Frail Older Adults. [Abstract] Poster presentation, U.S. Deprescribing Research Network Annual Meeting, May 2022, Orlando, United States.
*Drs. Berry and Zullo contributed equally.
4. **Hayes KN**, Riester MR, Zhang Y, Beaudoin F, Zullo AR. Administrations of pro re nata (PRN) analgesics among skilled nursing facility residents following a hip fracture. [Abstract] *Pharmacoepidemiol Drug Saf* 2022;31(S2):379. Poster presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management, Aug 2022, Copenhagen, Denmark.
5. Zhang Y, **Hayes KN**, Lee Y, Zullo AR. Trends in COVID-19-related medication use in United States nursing homes. [Abstract] *Pharmacoepidemiol Drug Saf* 2022;31(S2):377. Poster presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management, Aug 2022, Copenhagen, Denmark.
6. Cupp MA, Beaudoin FL, Joshi R, Riester MR, **Hayes KN**, Zullo AR. One-year opioid use following discharge from post-acute care after hip fracture. [Abstract] *Pharmacoepidemiol Drug Saf* 2022;31(S2):297. Poster presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management, Aug 2022, Copenhagen, Denmark.
7. **Hayes KN**, Cupp MA, Commey A, Joshi R, Beaudoin F, Zullo AR. Differences in opioid use after hip fracture by race and post-acute care use among U.S. older adults. [Abstract] *Pharmacoepidemiol Drug Saf* 2022;31(S2):89. Oral presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management, Aug 2022, Copenhagen, Denmark.
8. Shmuel S, Moga D, Niznik JD, Lauffenburger J, Morin L, Gnjjidic D, Li X, **Hayes KN**. Using real-world data and pharmacoepidemiologic methods to advance the science of deprescribing research. [Abstract] Symposium presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management, Aug 2022, Copenhagen, Denmark.

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9. **Hayes KN**, Daiello LA, Zullo AR, Berry SD. Use of large-scale electronic health record data to examine precise antihypertensive medication exposures immediately before a fall among US nursing home residents. [Abstract] *Pharmacoepidemiol Drug Saf* 2022;31(S2):379. Poster presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management, Aug 2022, Copenhagen, Denmark.
 10. **Hayes KN**, Brown KA, Cheung AM, Kim SA, Juurlink DN, Cadarette SM. A shorter drug holiday after 3 or more years of risedronate versus alendronate is important to maintain osteoporotic fracture protection. [Abstract] *JBMR Plus* 2021, in press. Oral presentation, American Society for Bone and Mineral Research Annual Meeting, Oct 2021, online.
 11. **Hayes KN**, Cheung AM, Brown KA, Juurlink D, Cadarette SM. Shorter drug holiday after 3 or more years of risedronate versus alendronate is important to maintain osteoporotic fracture protection. *Pharmacoepidemiol Drug Saf* 2021;29(S2):44. Oral presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management, Aug 2021, online.
 12. Rzepka AM, **Hayes KN**, Konstantelos N, Cadarette SM. Oral bisphosphonate exposure among denosumab users in Ontario, Canada. [Abstract] *Pharmacoepidemiol Drug Saf* 2021;29(S2):232. Poster presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management, Aug 2021, online.
 13. **Hayes KN**, Cheung AM, Brown KA, Juurlink D, Cadarette SM. Fracture risk associated with long-term risedronate versus alendronate therapy during osteoporosis treatment gaps: a propensity-score matched cohort analysis. [Abstract] Poster presentation, Society for Epidemiologic Research Annual Meeting, Jun 2021, online.
 14. **Hayes KN**, He N, Brown K, Cheung AM, Juurlink D, He N, Cadarette SM. Almost half of seniors initiating oral bisphosphonate therapy are exposed for 3 or more years — understanding the benefits and harms of therapy is needed. [Abstract] *Popul Ther Clin Pharmacol*; 2020;27(4)e33-4. Poster presentation, Canadian Association for Population Therapeutics, Oct 2020, online.
 15. **Hayes KN**, He N, Brown K, Cheung AM, Juurlink D, He N, Cadarette SM. Almost half of seniors initiating oral bisphosphonate therapy are exposed for 3 or more years — understanding the benefits and harms of therapy is needed. [Abstract] *Pharmacoepidemiol Drug Saf* 2020; 29(S3):196. Poster presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management, Sept 2020, online.
 16. Konstantelos N, He N, **Hayes KN**, Cadarette SM. Over 2000 seniors initiate second-line osteoporosis pharmacotherapy monthly in Ontario – impact of drug policy change and call for research. [Abstract] *Pharmacoepidemiol Drug Saf* 2020; 29(S3):165-66. Poster presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management, Sept 2020, online.
 17. **Hayes KN**, Giannakeas V, Wong AKO. Effects of bisphosphonate use on knee osteoarthritis progression: an analysis of the Osteoarthritis Initiative study. [Abstract] *Pharmacoepidemiol Drug Saf* 2019;28(S2):S22. Oral presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management, Aug 2019, Philadelphia, United States.
 18. **Hayes KN**, Ban J, Athanasiadis G, Burden AM, Cadarette SM. Time trends among new users of osteoporosis drugs over 20 years. [Abstract] Poster presentation, Ontario Pharmacy Evidence Network Summit, March 2019, Toronto, Canada.

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19. **Hayes KN**, Ban J, Athanasiadis G, Burden AM, Cadarette SM. Time trends among new users of osteoporosis drugs over 20 years in Ontario. [Abstract] Oral presentation, Canadian Association for Population Therapeutics Annual Meeting; Oct 2018, Toronto, Canada. *Winner, Top 5 Abstract.*
 20. **Hayes KN**, Ban J, Athanasiadis G, Burden AM, Cadarette SM. Time trends among new users of osteoporosis drugs over 20 years: considerations for study design. [Abstract] *J Bone Miner Res* 2018;32 (Suppl 1):169. Poster presentation, American Society for Bone and Mineral Research Annual Meeting, Sept 2018, Montréal, Canada.
 21. **Hayes KN**, Ban J, Athanasiadis G, Burden AM, Cadarette SM. Time trends among new users of osteoporosis drugs over 20 years: considerations for pharmacoepidemiologic study design. [Abstract] *Pharmacoepidemiol Drug Saf* 2018;27(S2):S417. Poster presentation, International Conference in Pharmacoepidemiology and Therapeutic Risk Management Annual Meeting, Aug 2018, Prague, Czech Republic.
 22. Cadarette SM, Maclure MM, Delaney JAC, Whithaker HJ, **Hayes KN**, Hallas J. Self-Controlled Crossover Observational Pharmacoepidemiologic (SCOPE) Study Designs. [Abstract] Symposium presentation (Advanced Topics Course), International Society for Pharmacoepidemiology Mid-Year Meeting, Apr 2018, Toronto, Canada.
 23. **Hayes KN**, Albrecht TH, Moore KK, Evancovich AM, Ensor CR, Iasella CJ. Derivation of predictors of clinical effectiveness of colistin for the treatment of serious gram-negative infections. [Abstract] *Pharmacotherapy* 37(6):E50-E50. Poster presentation, American College of Clinical Pharmacy Virtual Poster Symposium, May 2017, Washington, D.C., USA.
 24. **Hayes KN**, Pan I, Thorpe CT. Evaluation of targeted HPV vaccination education among undergraduate college students. [Abstract] Poster presentation, American Public Health Association Annual Meeting, Oct 2016, Denver, USA. *Winner, APHA Outstanding Poster Award.*
 25. **Hayes KN**, Rhodes M. Stakeholder attitudes towards the regulation and distribution of antibiotics in Rosario, Argentina. *J Am Pharm Assoc* 2015;55(2):e152. [Abstract] Poster presentation, American Pharmacists Association Annual Meeting, Mar 2015, San Diego, USA.
 26. **Hayes KN**, Kunkel A, Vacchani M, Thorpe C, Bacci J, McGivney M. Perceptions and attitudes toward HPV vaccination among college students. [Abstract] Poster presentation, Pennsylvania Pharmacists Association Mid-Year Meeting, Feb 2015, Harrisburg, USA.
 27. **Hayes KN**, Policcichio D, Albrecht T, Terreri B. Osterhaus Pharmacy: the power of provider status. [Abstract] Poster presentation, Pennsylvania Pharmacists Association Mid-Year Meeting, Feb 2014, Bedford, USA.

INVITED PRESENTATIONS

1. Tadrous M, **Hayes KN**. Consultation on the Canadian Real-World Evidence Guidance. Dec 2, 2022. *Canadian Association for Drugs and Technologies in Health Webinar in Collaboration with Health Canada (407 stakeholder attendees).*
2. **Hayes KN**. Real-world patterns of long-term bisphosphonate use and comparative fracture risk of osteoporosis drug holidays. Oct 24, 2022. *Australian Institute for Musculoskeletal Science (AIMSS) Annual Research Symposium Keynote Address (50 clinician and researcher attendees).*

3. **Hayes KN.** Comparative risks of osteoporosis drug holidays following long-term risedronate versus alendronate therapy. Jul 27, 2022. *Hebrew SeniorLife Musculoskeletal Group Journal Club Series.* (10 researcher attendees).
4. **Hayes KN.** Evidence to Inform Deprescribing: Real-World Example on Anticoagulants and Protocol for Future Guidelines. Jun 24, 2022. *Australian Deprescribing Network Journal Club Series.* (45 multidisciplinary attendees).
5. **Hayes KN.** The Why's and How's of Professional Websites. Apr 27, 2022. International Society for Pharmacoepidemiology Mid-Year Meeting Course. (80 researcher attendees).
6. **Hayes KN.** Rolling (window) in the deep: methods to measure longitudinal drug exposures in claims data. Apr 14, 2022. *ICES Research Day.* (27 researcher attendees).
7. **Hayes KN.** Comparative Fracture Risk During Osteoporosis Drug Holidays After Long-Term Risedronate Versus Alendronate Therapy. Mar 10, 2022. *UCSD Bone Health Interest Group.* (82 patient attendees).
8. **Hayes KN.** Shorter drug holiday is important to maintain osteoporotic fracture protection during risedronate versus alendronate drug holidays. Feb 8, 2022. *Bone Health Extension for Community Health Outcomes (ECHO) group.* (78 clinician attendees)
9. **Hayes KN.** Understanding patterns and estimating effects of long-term bisphosphonate therapy and drug holidays. Mar 12, 2021. *Presented University of Waterloo School of Pharmacy Research Seminar Series* (52 attendees).
10. **Hayes KN.** Comparative effectiveness of long-term risedronate and alendronate therapy during drug holidays. Nov 23, 2020. *Research in Progress Seminar Presented at the Center for Pharmacoepidemiology Research and Training at the University of Pennsylvania School of Medicine.*
11. **Hayes KN.** Understanding patterns and estimating effects of long-term bisphosphonate therapy. Nov 2, 2020. *Presented to the Division of Pharmacoepidemiology and Pharmacoeconomics at the Brigham and Women's Hospital and Harvard Medical School.*
12. **Hayes KN.** Comparative effectiveness and safety of different sequential osteoporosis treatment regimens. Aug 10, 2020. *Presented to Osteoporosis Canada Pharmacotherapy Working Group.*
13. **Hayes KN.** Long-term oral bisphosphonate therapy patterns: use of healthcare administrative data to study medication utilization. Jul 2, 2020. *Presented to trainees of the Leslie Dan Faculty of Pharmacy Undergraduate Summer Research Program.*
14. **Hayes KN.** Long-term oral bisphosphonate therapy patterns among Ontario seniors, 2000-2016. Jun 22, 2020. *Presented to Osteoporosis Canada Guideline Update Pharmacotherapy Working Group.*
15. Cadarette SM, **Hayes KN.** Real-world experience and skills result from the DSECT Program. May 6, 2020. *Presented to trainees of the CIHR Drug Safety and Effectiveness Cross-Disciplinary Training (DSECT) Program at Annual Symposium.*
16. **Hayes KN.** Understanding patterns and estimating relative effects of long-term bisphosphonate therapy and drug holidays. Mar 20, 2019. *Presented to CIHR Drug Safety and Effectiveness Network at: Annual Objective Structured Knowledge Translation Experience for the CIHR Drug Safety and Effectiveness Cross-Disciplinary Training Program.*

17. **Hayes KN.** Visual arts, the health sciences, and interprofessional development: A literature review and proposal for an interprofessional visual arts elective course for the health sciences. Apr 2, 2017. *Presented to: University of Pittsburgh Working Group on Interprofessional Education, Pittsburgh, United States.*

REPORTS

1. **Hayes KN.** Clinical Guideline Update Literature Review: Comparative effectiveness and safety of different sequential osteoporosis treatment regimens. Aug 10, 2020. *Delivered to the Osteoporosis Canada Guideline Update Pharmacotherapy Working Group.*
2. **Hayes KN, Wong L, Cadarette SM.** Clinical Guideline Update Literature Review: Relative effectiveness and safety of denosumab versus bisphosphonates after long-term bisphosphonate therapy. Apr 15, 2019. *Delivered to the Osteoporosis Canada Guideline Update Pharmacotherapy Working Group.*
3. Moore K, **Hayes KN,** Albrecht T, Anderson J, Terihay W, Bott N, Miller S. Quality Improvement Report: Retrospective analysis of oxycodone 5mg tablet dispenses from Presbyterian Prescription Shop. 2016.

PEER-REVIEW ACTIVITIES

Grant Review

National Institute on Aging Pathway to Independence (K99/R00) Standing Study Section 2022 – Present
PSI Foundation Operating Grants 2022

Manuscript ad hoc Peer Reviewer (Works Reviewed by Year)

<i>NEJM Evidence</i>	2022 (1)
<i>Drugs and Aging</i>	2022 (1)
<i>Osteoporosis International</i>	2022 (1)
<i>Circulation: Cardiovascular Quality & Outcomes</i>	2022 (1)
<i>Frontiers in Pharmacology (Section: Pharmacoepidemiology)</i>	2021 (1), 2022 (3)
<i>Drugs – Real World Outcomes</i>	2021 (2), 2022 (2)
<i>JBI Evidence Synthesis</i>	2021 (3), 2022 (2)
<i>Frontiers in Endocrinology</i>	2021 (2)
<i>Journal of Clinical Medicine</i>	2021 (2), 2022 (3)
<i>Scientific Reports</i>	2021 (1)
<i>Pharmacoepidemiology and Drug Safety</i>	2021 (3), 2022 (1)
<i>Bone</i>	2020 (1), 2021 (2)
<i>Health and Interprofessional Practice</i>	2020 (1), 2021 (1)
<i>PLOS ONE</i>	2020 (1), 2021 (1)
<i>Research in Social and Administrative Pharmacy</i>	2018 (1), 2019 (2),
<i>Therapeutic Advances in Chronic Disease</i>	2020 (4)
	2020 (1)
<i>Canadian Medical Association Journal</i>	2018 (1)

Abstract Reviewer

International Society for Pharmacoepidemiology Annual Meeting 2018 (5), 2022 (38)

PROFESSIONAL SERVICE, COMMITTEES, AND LEADERSHIP

Canadian Agency for Drugs and Technology in Health (CADTH)

Real-World Evidence Guideline Authorship Team 2022 – Present

Osteoporosis Canada

Member, Guideline Update Pharmacotherapy Working Group 2018 – Present

International Society for Pharmacoepidemiology (ISPE)	
<i>Member in Good Standing</i>	2018 – 2021
<i>Moderator, Mid-Year Conference, Online</i>	2021
<i>University of Toronto Chapter President</i>	2019 – 2020
<i>University of Toronto Chapter Vice President</i>	2018 – 2019
<i>University of Toronto Chapter Secretary</i>	2017 – 2018
<i>ISPE Mid-Year Meeting Planning Committee Member</i>	2017 – 2018

Canadian Institutes of Health Research Drug Safety and Effectiveness Cross-Disciplinary Training (DSECT) Program	
<i>Stream 2 Trainee; Secondary Mentor: JM Gamble, PharmD, PhD</i>	2020 – 2021
<i>Stream 1 Trainee; Secondary Mentor: Robert Platt, PhD</i>	2018 – 2019

Ontario Drug Policy Research Network (ODPRN) Training Program	2020
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Ontario College of Pharmacists	
<i>Pharmacist Scope of Practice Implementation Initiative</i>	2018

Public Health Students Association (PHSA), University of Toronto	
<i>International Students' Representative (Inaugural)</i>	2017 – 2018
<i>Epidemiology PhD Student Representative</i>	2017 – 2018

American Society of Health System Pharmacists	
<i>University of Pittsburgh Clinical Skills Competition Winner; National Competitor</i>	2016

TEACHING

COURSES

<u>Brown University:</u>	
Introduction to Pharmacoepidemiology (PHP2440)	2023
<i>Master of Public Health and Public Health Doctoral Programs</i>	
Course Coordinators: Hayes, Zullo	

TEACHING ASSISTANTSHIPS

<u>University of Toronto:</u>	
Critical Appraisal (PHM606)	2019 – 2021
<i>PharmD for Pharmacists Program</i>	(4 semesters)
Course Coordinators: Mina Tadrous, PharmD, PhD, Tara Gomes, PhD	
Preparation for Advanced Pharmacy Practice Experience (PHM330)	2018 – 2020
<i>PharmD Program</i>	(3 semesters)
Course Coordinators: Sandra Mejia, PharmD, Naomi Steenhof, PharmD	
Scientific Overviews in Epidemiology (CHL5418)	2018 – 2020
<i>Master of Public Health in Epidemiology Program</i>	(3 semesters)
Course Instructor: Rebecca Liu, PhD	
Global Pharmaceutical Policy (PHM320/PHC470)	2017 – 2019
<i>PharmD, Pharmaceutical Chemistry, PharmD for Pharmacists Programs</i>	(3 semesters)
Course Instructor: Jillian C. Kohler, PhD	

LECTURES/COURSE SESSIONS TAUGHT

International Society for Pharmacoepidemiology, UofT Chapter

1. Advanced Pharmacoepidemiologic Study Designs 2020
2. Causal Diagrams, Third Variables, and Study Designs 2019

Canadian Institutes of Health Research

Drug Safety and Effectiveness Cross Disciplinary Training Program

3. Introduction to Pharmacoepidemiology (co-instructor: S. Cadarette) 2019

University of Toronto

Preparation for Advanced Pharmacy Practice Experiences (PHM330)

4. Critical Appraisal of a Clinical Trial: Design and Bias 2020
Four online modules: Osteoporosis Background, Validity and Bias, Critical Appraisal of a Trial Example, Calculations and Patient Scenarios

Critical Appraisal (PHM606H)

5. Intention-to-treat analysis (online module) 2019, 2020 (2), 2021
6. Non-inferiority Trials (online module) 2019, 2020 (2), 2021
7. Qualitative Research (online module) 2020 (2), 2021

Scientific Overviews in Epidemiology (CHL5418H)

8. Tutorial: Conducting meta-analysis in Excel and R 2020
9. Tutorial: Applying PRISMA and GRADE to a systematic review 2019
10. Tutorial: Developing the "PICO" for a research question 2019

Introduction to Pharmacoepidemiology (JRH1000)

11. Pharmacology and Epidemiology: Entangled! 2018, 2019
12. Self-Controlled Study Designs 2018

Global Pharmaceutical Policy (PHM320H)

13. Case Study: Trade Related Agreement on International Property Rights 2017, 2018, 2019
14. Preparing for Assessment in Global Pharmaceutical Policy 2019
15. Preparedness for Research and Clinical Experiences Abroad 2019

University of Pittsburgh

Becoming a Leader (PHARM5828)

16. Women in Leadership 2017
17. Leading a Team 2017

Bidwell Training Center

Horticulture Technology/Pharmacy Technician Training Program

18. Medical Marijuana in Pennsylvania: Science, Laws, and Regulations 2017

MENTORSHIP AND SUPERVISORY EXPERIENCE

Supervisor, Senior Data Analyst, Brown University

Michael Adegboye, MPH 2022 – Present

Supervisor, Lead Biostatistician, Brown University

Preeti Chachlani, MSc 2022 – Present

Supervisor, Research Scientist, Brown University

Dan Harris, PhD 2022 – Present

Supervisor, Paid Research Assistantship, Brown University

Yalin Deng, PharmD (Health Services Research PhD student)

2022 – Present

Yifan Zhao (Biostatistics MSc student)

2022 – Present

Alexander Pralea (undergraduate student)

2021 – Present

Advisor, Master of Public Health Thesis, Brown University

Laurel Mangelsdorf (in progress)

2022 – Present

Darlene Tat, PharmD (in progress)

2022 – Present

Abednego Comney, MPH

2021 – 2022

**Co-Supervisor, Faculty of Pharmacy Undergraduate Summer Research Program
University of Toronto**

Trainee: Anisha Hundal

2020

ONLINE RESOURCES AND ARTICLES

1. **Hayes KN.** 11 myths about lupus. *Insider (A Business Insider Publication)*. Nov 27, 2019.
2. **Hayes KN.** 12 facts about poison prevention that could save your life. *Insider (A Business Insider Publication)*. Jan 4, 2019.
3. **Hayes KN.** 19 things you may not know about diabetes. *Insider (A Business Insider Publication)*. Oct 24, 2018.
4. **Hayes KN.** 10 things that can increase your risk for diabetes. *Insider (A Business Insider Publication)*. Oct 23, 2018.
5. **Hayes KN, Praderio C.** 17 things you need to know about your thyroid — because it controls a lot more in your body than you'd think. *Insider (A Business Insider Publication)*. Aug 15, 2018.
6. **Hayes KN.** 8 reasons you should try intermittent fasting – and 8 reasons why you shouldn't. *Insider (A Business Insider Publication)*. Jul 18, 2018.
7. **Hayes KN.** 10 life-saving first aid hacks everyone should know. *Insider (A Business Insider Publication)*. Jul 11, 2018.
8. Basu N, Pan I, **Hayes KN.** The HPV Vaccine: Red Light to Cancer. A toolkit to guide education and discussion about HPV and the HPV vaccine on college campuses. *The University of Pittsburgh School of Pharmacy and Jewish Healthcare Foundation*.