



Daniel T Holmes

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Medical Biochemist. Head and Medical Director of Pathology and Laboratory Medicine, Providence Health, Vancouver, BC. Interested in Clinical Endocrinology, Clinical Mass Spectrometry and Data Science in application to Laboratory Medicine.

Education

University of Toronto

BSc (Hons), CHEMICAL PHYSICS

Toronto, Canada

1990–1994

University of British Columbia

MD

Vancouver, Canada

2001

University of British Columbia

RESIDENCY, MEDICAL BIOCHEMISTRY

Vancouver, Canada

2006

Professional Experience

- Apr 2020–Present: Head and Medical Director, Department of Pathology and Laboratory Medicine, Providence Healthcare
- Apr 2017–Apr 2020: Assistant Head, Department of Pathology and Laboratory Medicine, Providence Healthcare
- Sep 2008–Mar 2020: Medical Leader, Clinical Chemistry, Department of Pathology and Laboratory Medicine, Providence Healthcare
- Jul 2006–Present: Medical Biochemist, Department of Pathology and Laboratory Medicine, Providence Healthcare
- Sep 1997–May 2006: Ran large private tutoring company (“Dan The Tutor”) at the University of British Columbia focusing on exam preparation for Calculus 1–3, 100-level Physics, 100-level Chemistry and Organic Chemistry.

Teaching Experience

- UBC Medical Undergraduate
 - 2003: FMED 427, Ovarian Pathology
 - 2003: FMED 427, Pathology of Uterus and Fallopian Tubes
 - 2003–2015: FMED 425, Intracellular Lipid Metabolism
 - 2004–2015: FMED 425, Lipid Lowering Therapies
 - 2008–2015: FMED 425, Lipoprotein Metabolism
 - 2006–2015: Week Chair of Lipid Week
 - 2006, 2008–2021: Problem Based Learning Tutor: Endocrine Block
- UBC Pathology Graduate Studies
 - 2005: PATH 500A, Extracellular Lipid Metabolism
- UBC Bachelor of Medical Laboratory Sciences
 - 2007–2021: PATH 407, Carbon Monoxide, Cyanide and Pesticide Poisoning
 - 2004–2010: PATH 406, Biochemical Investigation of Hypertension
 - 2004–2021: PATH 406, Biochemical Markers of Cardiac Injury
 - 2004–2021: PATH 406, Biochemistry of the Pituitary-Gonadal Axis
- UBC PharmD Program
 - 2006: PATH 548: Lipid Lowering Therapies
 - 2007–2018: PATH 548, Investigation of Hepatocellular Injury
- General Pathology and Medical Biochemistry Residency Training Program
 - 2005–2015: Markers of Hepatic Injury
 - 2005–2015: Biochemistry of the Pituitary-Gonadal Axis
 - 2005–2015: Extracellular Lipid Metabolism

Professional Affiliations

- Canadian Association of Medical Biochemists
- Canadian Society of Clinical Chemists
- American Association of Clinical Chemists
- Royal College of Physicians and Surgeons of Canada
- Doctors of BC
- BC Association of Laboratory Physicians
- Christian Medical and Dental Society
- Member of the Canadian Registry of Hippocratic Physicians

Committees

- 2016–present: Clinical Systems Transformation (Cerner Implementation) Laboratory Physician Champion
- 2018–present: Medical Lead: PHSA Provincial Clinical Chemistry Request for Proposal
- 2016–present: IFCC Committee for the Standardization of Measurement of Insulin and C-Peptide
- 2018, 2022: American Association for Clinical Chemistry Annual Meeting Organizing Committee
- 2014–2022: Mass Spectrometry & Applications to the Clinical Laboratory Scientific Committee Member
- 2020: Mass Spectrometry & Applications to the Clinical Laboratory Scientific Committee, Chair
- 2016–present: Member of the BC Guidelines and Protocols Committee (“GPAC”) and acted as medical lead on the following documents
 - Hormone Testing – Indications and Appropriate Use
 - Testosterone Testing
 - Vitamin D Testing
 - Thyroid Function Testing
- 2018: Chair of the Endocrine Division, American Association for Clinical Chemistry
- 2016–present: Royal College of Physicians and Surgeons Medical Biochemistry Examination Committee
- 2015–2019: Providence Health, Council for Excellence
- 2010–2015: UBC Clinical Faculty Affairs Committee
- 2010–2019: UBC Clinical Faculty Promotions Committee
- 2008–2018: Supervisor, UBC Pathology Summer Research Program
- 2006–2018: RCPSC Medical Biochemistry Residency Training Committee
- 2013–2014: National Guidelines Committee for the Diagnosis of Testosterone Deficiency
- 2021 Ad Hoc National Committee for incorporation of Artificial Intelligence and Machine Learning into the Royal College Pathology and Laboratory Medicine Fellowship programs

Career Achievements

- Initiated the now-internationally recognized St. Paul’s Hospital Clinical Mass Spectrometry program which is one of the most sophisticated hospital-based clinical mass spectrometry program in North America.
 - the only laboratory in Canada performing thyroglobulin by SISCAPA-LC-MS/MS, able to overcome negative interferences caused by thyroglobulin autoantibodies in patients with papillary and follicular thyroid carcinoma.
 - the only laboratory in the world routinely performing immunoglobulin G subclasses by LC-MS/MS which overcomes analytical interferences seen in IgG4 related disease.
 - the first laboratory in Canada to perform aldosterone and plasma renin activity by LC-MS/MS and reference lab for a major vendor’s automated immunoassay analyzer.
 - the only laboratory in Canada to perform 1,25 dihydroxyvitamin D by LC-MS/MS and reference lab for a major vendor’s automated immunoassay analyzer.
 - BC’s sole provider of azole antifungal therapeutic drug monitoring (voriconazole, posaconazole, itraconazole)
 - the only laboratory in Canada capable of quantitation of synthetic insulin analogues for investigation of forensic cases, accidental overdoses and intentional insulin misuse.
 - the only laboratory in Canada measuring infliximab by LC-MS/MS.
 - Other assays routinely performed: Vitamin D, high sensitivity testosterone, androstenedione, 17-hydroxyprogesterone, plasma and urine cortisol.
- Recruited 2 nationally prominent Medical Biochemists and 2 nationally prominent Clinical Chemists to the

Providence Health Clinical Chemistry Team.

- Acted as the medical lead for a multi-year Province-Wide Clinical Chemistry core and immunoassay analyzer procurement. Working with technical, administrative, supply chain and financial representatives throughout BC, negotiated savings of \$4M annually in Vancouver Coastal Health and Providence Health alone.
- Acted as the medical laboratory physician champion of the CST Cerner implementation, reviewing and modifying hundreds of clinical order sets, rectifying errors and inconsistencies in test selection, and creating rules for several thousand tests to define allowable period between repeat analyses.
- Began tenure as Head of Department at Providence Health on 01-Apr-2020 and therefore led the department through the COVID response; personally co-wrote all software for COVID data automation in our laboratory with Dr. Mahdi Mobini, PhD.

Software Authorship

- St. Paul's Hospital outpatient requisition scanning software
 - Scans, finds patient identifiers, converts requisitions to PDF and stores by date and patient identifier, performs optical character recognition
 - Allows storing and recovery of standing order requisitions
- Q-See
 - Recovers QC data from Sunquest Laboratory Information System and stores in SQL server on an hourly basis
 - Serves up QC data for review using R Shiny application containerized using Docker
 - Co-authored with Dr. Mahdi Mobini, PhD and Dr. Samuel Chorlton, MD
- Yoyo Monitor
 - Provides real time dashboard feedback to St. Paul's Hospital and Mount Saint Joseph Hospital core laboratory staff on the pending specimen log for samples of urgent and stat priority.
 - Allows rapid identification of samples requiring urgent attention.
- Providence Health COVID Data Automation and Sample Pooling Software
 - Wrote and/or oversaw automation scripts in Linux bash, R language and R Shiny to connect 3 Hamilton robotic liquid handlers, 4 RNA extractors and 4 thermal cyclers and 2 Linux servers.
 - Software tracks samples between instruments whether analyzed in singleton or pools
 - GUI allows sample review before release to laboratory information system using flat files
 - Ended the practice of results reporting using manual transcription
- Mass Spectrometry Data Automation
 - Wrote software to connect Hamilton robotic liquid handlers to SCIEX mass spectrometers
 - Software pre-processes results for laboratory information system, handling results above and below the analytical measuring range, truncating decimals, adding interpretive comments.
 - Passes results to the laboratory information system using flat files.
- Providence Health/Vancouver Coastal COVID Laboratory Dashboard
 - Updates every 30 mins to give testing numbers, (neg/pos) and smoothed rates
 - <https://covid19.providencehealthcare.org/daily/>
- cp-R software for method comparison of biochemical tests
 - open source software written in PyQt4, python and R
 - performs ordinary least squares, Deming or Passing Bablok regression
 - <https://sourceforge.net/projects/cprchempath/>
 - Over 3000 downloads from 81 countries

Software Languages

- R language: base R, tidyverse, RMarkdown, R Shiny
- Experienced Linux bash, Linux server networking and heterogeneous networking of Linux and Windows
- Markdown, LaTeX
- Basic Python, SQL
- Expect language for shell based robotic process automation
- Autohotkey for Windows-based robotic process automation

Software Skills

- Static report creation using base R, LaTeX, or RMarkdown from:
 - Excel/csv
 - SQL
 - Spark
- Interactive dashboard creation using:
 - Flexdashboard
 - R Shiny and Shiny Server
- Data automation and data cleansing using:
 - Linux bash
 - R language
- Basic robotic process automation

Awards

- Co-applicant on a Genome BC Genomics and Health: Personalized Medicine Program Grant. Biomarkers in Transplantation 3 (BiT3) Study. Funded at \$2,572,918.
- Co-Applicant on a Genome BC Applied Genomic Consortium Grant for the Development of Novel Biomarker Blood Tests for COPD (December 2012). Funded at \$7M
- Co-applicant Canadian Institutes of Health Research (2007): “Trace element status in chronic hemodialysis patients” Amount awarded (September 2007) \$992,811; Term: Five years
- Canadian Society for Clinical Chemistry Award for Research Excellence 2017

Presentations

- *Doing more with R: Create your own Automated Reports and Dashboards*, AACC Annual Meeting (**Invited**), 26-Sep-2021
- *Case Studies in Emerging Technologies in Pediatric Laboratory Medicine*, AACC Annual Meeting, 27-Sep-2021
- *Mind the App: Application Development as a Solution to Unmet Needs in Laboratory Workflows*, AACC Annual Meeting, 30-Sep-2021
- *Development of Automated Reports in Laboratory Medicine with R*, AACC Annual Meeting (**Invited**), 12-Dec-2021
- *Breaking up with Excel, An Introduction to the R Statistical Programming Language*, MSACL annual scientific meeting (**Invited**), 2014–2022, twice annually in Palm Springs, USA and Salzburg Austria
- *Applications of the R Language to Laboratory Medicine*, SIBioC 2020, the Italian Society of Clinical Chemistry (**Invited**), 06-Oct-2020
- *Which Diagnostic Tests are Underutilized or Overutilized*, Langley Memorial Hospital Grand Rounds, 22-Sep-2020
- *Using R to Produce Clinical Reports in the Patient Record*, R Medicine Conference, 29-Aug-2020 (**Invited**)
- *Analytics in the Clinical Laboratory with R: An Expert Panel*, AACC Webinar, 20-Aug-2020 (**Invited**)
- *Challenges in IGF1 Testing and Reporting*, Canadian Society of Endocrinology Annual Meeting, Winnipeg, 03-Oct-2019 (**Invited**)
- *Getting Started with R for Laboratory Medicine*, AACC Annual Meeting, Anaheim CA, 03-Aug-2019 (**Invited**)
- *Reproducible Research and Manuscript Preparation Using R and the Bookdown Package*, AACC Annual Meeting, Anaheim CA, 06-Aug-2019 (**Invited**)
- *Developing Appropriate Suspicion about Endocrine Lab Results*, Association des Médecins Endocrinologues du Québec, Quebec QC, 25-May-2019 (**Invited**)
- *I can A1c clearly now: analytical variability in A1c measurement*. Diabetes Directors Seminar, Vancouver BC, 11-May-2019 (**Invited**)
- *Mass Spectrometry for Protein Analytes*, Endocrinology Grand Rounds, University of Calgary, Calgary AB, 08-May-2019 (**Invited**)

- *In Tests We Trust, but Should We?* Best Medicine Science Conference, Vancouver, BC, 03-May-2019 (**Invited**)
- *Murder and Munchausen's: Investigation in spontaneous hypoglycemia using LC-MS/MS*, Laboratory Medicine Congress & Exhibition, Korean Society for Clinical Chemistry, Seoul Korea, 31-Oct-2018 (**Invited**)
- *Thyroglobulin by tandem mass spectrometry: How to do it. When you need it*, Laboratory Medicine Congress & Exhibition, Korean Society for Clinical Chemistry, Seoul Korea, 31-Oct-2018 (**Invited**)
- *Protein mass spectrometry in routine clinical care—a year's experience with immunoglobulin subclasses and thyroglobulin* Clinical Mass Spectrometry Conference (CMSC), Beijing China 30-Apr-2018 (**Invited**)
- *Data Mining Routine Results for Reference Intervals: Common Errors and Modern Techniques*. Mass Spectrometry, MSACL.org Palm Springs USA, 25-Jan-2018 (**Invited**)
- *Endocrine Applications requiring high sensitivity: performance of the new SCIEX CitrineTM Mass Spectrometry System for measuring Thyroglobulin and 1,25 dihydroxyvitamin D* MSACL.org, Palm Springs USA, 24-Jan-2018
- *The Future of Clinical Mass Spectrometry Panel Discussion* MSACL.org Palm Springs USA, 23-Jan-2018
- *The Case Against Direct-to-Consumer Laboratory Testing* St. Paul's Hospital CME Conference, Vancouver, BC, 24-Nov-2017 (**Invited**)
- *How and When to Order TSH, Estradiol and Testosterone* St. Paul's CME Hospital Conference, Vancouver, BC, 24-Nov-2017 (**Invited**)
- *Test utilization monitoring - a strategy using open source tools* Clinical Biochemistry Conference, Kuwait City, Kuwait, 04-Nov-2017 (**Invited**)
- *How to determine with age dependent reference intervals: a survey of good and bad Ideas* Clinical Biochemistry Conference, Kuwait City, Kuwait, 04-Nov-2017 (**Invited**)
- *Investigation of Adult Hypoglycemia: for a laboratory perspective strategy* Clinical Biochemistry Conference, Kuwait City, Kuwait, 05-Nov-2017 (**Invited**)
- *Application of mass spectrometry in therapeutic drug monitoring* Clinical Biochemistry Conference, Kuwait City, Kuwait, 05-Nov-2017 (**Invited**)
- *Data Automation and Informatics with R: Application Showcase* AACCC Annual Meeting, San Diego CA, 03-Aug-2017 (**Invited**)
- *Debate: The Case Against Direct to Consumer Testing* Euro Med Lab, Athens Greece, 14-Jun-2017 (**Invited**)
- *Laboratory Conundrums* Canadian Pediatric Endocrine Group, Vancouver, BC, 14-Feb-2017 (**Invited**)
- *Solutions in Search of a Problem? Making Assays Matter for Patients* MSACL.org, Palm Springs, 25-Jan-2017 (**Invited**)
- *Interferences in commercial immunoassays for aldosterone: the case for mass spectrometry* Asia Pacific Federation of Clinical Biochemistry Conference, Taipei Taiwan, 26-Nov-2016 (**Invited**)
- *Are we shooting arrows where there is no target?* Endocrine Days Conference, Vancouver, BC, 21-Oct-2016 (**Invited**)
- *What's new in Thyroid Cancer? Ions. Thyroglobulin by Tandem Mass Spectrometry* BC Head and Neck Tumour Group, Vancouver, BC, 12-Oct-2016 (**Invited**)
- *Modern methods for measuring IGFI*, Endocrine Grand Rounds, McGill University, Montreal QC, 06-Oct-2016 (**Invited**)
- *Saline Suppression Testing and CYP 24A1 deficiency*, Endocrine/Medical Biochemistry Journal Club, McGill University, Montreal QC, 06-Oct-2016 (**Invited**)
- *Varying Those Vexing Voltages: Compound Specific Tuning*, MSACL.org, Salzburg Austria, 14-Sep-2016 (**Invited**)
- *Investigation of Insulin-Mediated Hypoglycemia in the Living and the Dead: The Role of LC-MS/MS* MSACL.org, Salzburg Austria, 15-Sep-2016 (**Invited Keynote Address**)

- *Automation of the Clinical Mass Spectrometry Workflows*, Cherry Blossom Automation Conference, Seoul Korea, 21-Apr-2016 (**Invited Keynote Address**)
- *Application of Mass Spectrometry to the Screening and Diagnosis of Primary Aldosteronism*, Severance Hospital Laboratory Medicine Rounds, Seoul Korea, 20-Apr-2016. (**Invited**)
- *Don't Manually Transcribe Your Results: The Poor Person's Guide to LC-MS/MS LIS Interfacing with R*, MSACL.org Palm Springs USA, 25-Feb-2016
- *Setting Your Mass Spec Team up for Success*, MSAC.org Palm Springs USA, 24-Feb-2016.
- *Laboratory Investigation of Spontaneous Hypoglycemia*, Mayo Clinic, Rochester MN, 30-Sep-2015 (**Invited**)
- *Best Practices and Current Applications of Clinical Mass Spectrometry*, AACC Mass Spectrometry Meeting, Chicago IL, 01-Oct-2015.
- *I think therefore I R, an introduction to the R statistical programming language for Clinical Laboratorians*, AACC Annual Meeting Jul 7, 2015
- *Little Steps with Big Data*, AACC Annual Meeting, Philadelphia, PA, 5-Jul-2015
- *Detecting and Managing Interferences and Contamination in Mass Spectrometric Analysis*, AACC National Webinar, 21-May-2015 (**Invited**)
- *AACC/MSACL: Best Practices and Current Applications—Delivering accurate steroid results with LC-MS/MS: How owning an expensive bicycle does not make you a good cyclist* October 2014, (**Invited**)
- *Detection of Allenic Norleucine, a Nephrotoxic Amino Acid from Amanita Smithiana and Related Mushrooms* MSACL.org Salzburg, Sep 2014
- *Medical Biochemistry in the CKD patient* Canadian Society for Nephrology, Vancouver, BC, 23-Apr-2014 (**Invited**)
- *Three Years Experience in Screening and Diagnosis of Primary Aldosteronism by LC-MS/MS*, MSACL.org, San Diego CA, 26-Feb-2014
- *Rethinking Santa's Appearance. Laboratory Diagnosis of Cushing's Syndrome*, Canadian Society for Clinical Chemists National Webinar, 12-Dec-2013
- *Analytical Considerations and Diagnostic Approaches to Addison's Disease and Cushing's Syndrome*, AACC Annual Meeting, Houston TX 31-Jul-2013.
- *Laboratory Medicine Statistics: A Hands-on Interactive Session with Real Data*, AACC Annual Meeting, Houston TX, 29-Jul-2013
- *Introduction to the R Statistical Computing Language*, Canadian Society for Clinical Chemists National Webinar, 10-Jan-2013 (**Invited**)
- *Bay Area Chapter of the American Association of Clinical Chemistry: Investigation of Primary Aldosteronism*, San Francisco, CA 18-Oct-2012 (**Invited**)
- *Plasma Renin Activity: An Achievable Venture in Proteomic Translation*, BC Proteomics Network Annual Meeting, 20-Feb-2012 (**Invited**)
- *Laboratory Investigation of Primary Aldosteronism*, Canadian Society for Clinical Chemists National Webinar, 12-Jan-2012 (**Invited**)
- *Unusual Causes of an Elevated Osmolal Gap: How to be Circumspect with Serum and Solvents*, Internal Medicine Grand Rounds, St. Paul's Hospital, Vancouver, BC, 01-Dec-2011
- *Hold the Sun: Appropriate Vitamin D Testing and Treatment*, St. Paul's CME Hospital Conference, Vancouver, BC, 17-Nov-2011 (**Invited**)
- *But I didn't Inhale: Urine Drug Screen Pearls*, St. Paul's CME Hospital Conference, Vancouver, BC, 17-Nov-2011 (**Invited**) *Adrenal Hypertension: Laboratory Diagnostic Challenges**, Canadian Association of Medical Biochemists Annual Meeting, Quebec QC, 13-Oct-2011 (**Invited**)
- *The Use and Interpretation of Biochemical Testing for the Investigation of Adrenal Hypertension: Primary Aldosteronism. Laboratory Roll in Diagnosis*, AACC Annual Meeting, Atlanta, GA, Jul-2011

- *Practical translational proteomics: Angiotensin I and II by immuno-MALDI MS* Annual Symposium of the BC Proteomics Network, Vancouver, BC, 25-Sep-2010
- *PROOF Centre 2nd Annual Meeting: Biomarker Solutions for Personalized Medicine. “The Clinical Laboratory Approach” for assay validation*, Vancouver, BC, 26-May-2009
- *HbA1c: Emergence as a Diagnostic Tool for Diabetes Mellitus*, Diabetes Directors Seminar, Vancouver, BC, 21-May-2010 (**Invited**)
- *Parathyroid Hormone: everything that you did not need to know for the exam*, BC Endocrine Days, Vancouver, BC, 01-Oct-2010 (**Invited**)
- *Vitamin D Analysis: Perspectives from the Laboratory*, BC Endocrine Days, Vancouver, BC, 01-Oct-2010 (**Invited**)
- *What’s new in the literature: Effect of Aging on A1c levels in Individual without Diabetes*, Diabetes Directors Seminar, Vancouver, BC, 25-May-2009 (**Invited**)
- *What’s new in the literature: Effect of Aging on A1c levels in Individual without Diabetes*, BC Endocrine Days, Vancouver, BC, 03-Oct-2008 (**Invited**)
- *Primary Aldosteronism, Diagnostic Update*, Internal Medicine Grand Rounds, St. Paul’s Hospital, Vancouver, BC, 11-Dec-2007, (**Invited**)
- *Moles/Litre: Not the number of burrowing rodents that fit in a milk carton. Understanding the Technical aspects of Osmolality*, Nephrology Rounds, St Paul’s Hospital, Vancouver, BC, 30-Aug-2007
- *Research in Progress Rounds: The Effect of Analytical Variation on Calculated Laboratory Measures*, iCapture Centre Research in Progress Rounds, Vancouver, BC, 05-Feb-2007
- *A Critical Look at eGFR*, Diabetes Directors Seminar, Vancouver, BC, 17-May-2007 (**Invited**)
- *Unusual Lipidology Cases*, BC Childrens’ Hospital Pathology Rounds, Vancouver, BC, 31-Oct-2006

Peer Reviewed Publications

1. Holmes, D. T., Mobini, M., & McCudden, C. R. (2021). Reproducible manuscript preparation with RMarkdown application to JMSACL and other Elsevier Journals. *Journal of Mass Spectrometry and Advances in the Clinical Lab*, 22, 8–16. <https://doi.org/10.1016/j.jmsacl.2021.09.002>
2. Kline, G. A., Symonds, C. J., & Holmes, D. T. (2021). *Intranasal corticosteroids may have systemic absorption and potential impact upon cortisol measures.*
3. Grober, E. D., Krakowsky, Y., Khera, M., Holmes, D. T., Lee, J. C., Grantmyre, J. E., Patel, P., Bebb, R. A., Fitzpatrick, R., Campbell, J. D., Carrier, S., & Morgentaler, A. (2021). Canadian Urological Association guideline on testosterone deficiency in men: Evidence-based Q&A. *Canadian Urological Association Journal*, 15(5), E234–E243. <https://doi.org/10.5489/cuaj.7252>
4. Holmes, D. T., Romney, M. G., Angel, P., & DeMarco, M. L. (2020). Proteomic applications in pathology and laboratory medicine: Present state and future prospects. *Clinical Biochemistry*, 82, 12–20. <https://doi.org/10.1016/j.clinbiochem.2020.05.007>
5. Mak, N. T. J. J., Li, J., Vasilyeva, E., Hiebert, J., Guo, M., Lustig, D., Holmes, D., & Wiseman, S. M. (2020). Intraoperative parathyroid hormone measurement during parathyroidectomy for treatment of primary hyperparathyroidism: When should you end the operation? *The American Journal of Surgery*, 219(5), 785–789. <https://doi.org/10.1016/j.amjsurg.2020.02.049>
6. Holmes, D. T. (2020). Self-Ordering Laboratory Testing: Limitations When a Physician Is not Part of the Model. *Clinics in Laboratory Medicine*, 40(1), 37–49. <https://doi.org/10.1016/j.cll.2019.11.002>
7. McCormack, J. P., & Holmes, D. T. (2020). Your results may vary: The imprecision of medical measurements. *BMJ*, 368, m149. <https://doi.org/10.1136/bmj.m149>
8. Holmes, D. T. (2019). A brief update on mass spectrometry applications to routine clinical endocrinology. *Clinical Mass Spectrometry*, 13, 18–20. <https://doi.org/10.1016/j.clinms.2019.05.006>

9. Kline, G. A., Darras, P., Leung, A. A., So, B., Chin, A., & Holmes, D. T. (2019). Surprisingly low aldosterone levels in peripheral veins following intravenous sedation during adrenal vein sampling: Implications for the concept of nonsuppressibility in primary aldosteronism. *Journal of Hypertension*, 37(3), 596–602. <https://doi.org/10.1097/HJH.0000000000001905>
10. Holmes, D. T., & Buhr, K. A. (2019). Widespread Incorrect Implementation of the Hoffmann Method, the Correct Approach, and Modern Alternatives. *American Journal of Clinical Pathology*, 151(3), 328–336. <https://doi.org/10.1093/ajcp/aqy149>
11. French, D., Drees, J., Stone, J. A., Holmes, D. T., & Gugten, J. G. van der. (2019). Comparison of four clinically validated testosterone LC-MS/MS assays: Harmonization is an attainable goal. *Clinical Mass Spectrometry*, 11, 12–20. <https://doi.org/10.1016/j.clinms.2018.11.005>
12. Khan, W., Van Der Gugten, G., & Holmes, D. T. (2019). Thyrotoxicosis due to 1000-fold error in compounded liothyronine: A case elucidated by mass spectrometry. *Clinical Mass Spectrometry*, 11, 8–11. <https://doi.org/https://doi.org/10.1016/j.clinms.2018.11.003>
13. Humphries, K. H., Gao, M., Lee, M. K., Izadnegahdar, M., Holmes, D. T., Scheuermeyer, F. X., Mackay, M., Mattman, A., & Grafstein, E. (2018). Sex Differences in Cardiac Troponin Testing in Patients Presenting to the Emergency Department with Chest Pain. *Journal of Women's Health*, 27(11), 1327–1334. <https://doi.org/10.1089/jwh.2017.6812>
14. Tonelli, M., Wiebe, N., Bello, A., Field, C. J., Gill, J. S., Hemmelgarn, B. R., Holmes, D. T., Jindal, K., Klarenbach, S. W., Manns, B. J., Thadhani, R., & Kinniburgh, D. (2018). Concentrations of Trace Elements and Clinical Outcomes in Hemodialysis Patients: A Prospective Cohort Study. *Clinical Journal of the American Society of Nephrology*, 13(6), 907–915. <https://doi.org/10.2215/CJN.11451017>
15. Gugten, G. van der, DeMarco, M. L., Chen, L. Y. C., Chin, A., Carruthers, M., Holmes, D. T., & Mattman, A. (2018). Resolution of Spurious Immunonephelometric IgG Subclass Measurement Discrepancies by LC-MS/MS. *Clinical Chemistry*, 64(4), 735–742. <https://doi.org/10.1373/clinchem.2017.282319>
16. Winston-McPherson, G. N., Samraj, A. N., Poster, K., Yamaguchi, D., Dickerson, J. A., Drees, J. C., Holmes, D. T., & Greene, D. N. (2018). Performance characteristics of the Beckman Coulter UniCel DxI 800 TSH (3rd IS) assay. *Clinica Chimica Acta*, 478, 90–100. <https://doi.org/10.1016/j.cca.2017.12.029>
17. Humphries, K. H., Lee, M. K., Izadnegahdar, M., Gao, M., Holmes, D. T., Scheuermeyer, F. X., Mackay, M., Mattman, A., & Grafstein, E. (2018). Sex Differences in Diagnoses, Treatment, and Outcomes for Emergency Department Patients With Chest Pain and Elevated Cardiac Troponin. *Academic Emergency Medicine*, 25(4), 413–424. <https://doi.org/10.1111/acem.13371>
18. Carter, R. L. R., Talbot, K., Hur, W. S., Meixner, S. C., Van Der Gugten, J. G., Holmes, D. T., Côté, H. C. F., Kastrup, C. J., Smith, T. W., Lee, A. Y. Y., & Prydzial, E. L. G. (2018). Rivaroxaban and apixaban induce clotting factor Xa fibrinolytic activity. *Journal of Thrombosis and Haemostasis*, 16(11), 2276–2288. <https://doi.org/10.1111/jth.14281>
19. Bahar, B., Tuncel, A. F., Holmes, E. W., & Holmes, D. T. (2017). An interactive website for analytical method comparison and bias estimation. *Clinical Biochemistry*, 50(18), 1025–1029. <https://doi.org/10.1016/j.clinbiochem.2017.08.008>
20. Kline, G., & Holmes, D. T. (2017). Adrenal venous sampling for primary aldosteronism: Laboratory medicine best practice. *Journal of Clinical Pathology*, 70(11), 911–916. <https://doi.org/10.1136/jclinpath-2017-204423>
21. Tonelli, M., Wiebe, N., Bello, A., Field, C. J., Gill, J. S., Hemmelgarn, B. R., Holmes, D. T., Jindal, K., Klarenbach, S. W., Manns, B. J., Thadhani, R., & Kinniburgh, D. (2017). Concentrations of Trace Elements in Hemodialysis Patients: A Prospective Cohort Study. *American Journal of Kidney Diseases*, 70(5), 696–704. <https://doi.org/10.1053/j.ajkd.2017.06.029>
22. Newby, B., & Holmes, D. T. (2017). Effect of Tubing Flush or Preconditioning on Available Insulin Concentration for IV Infusion: A Pilot Project. *Canadian Journal of Hospital Pharmacy*, 70(4). <https://doi.org/10.4212/cjhp.v70i4.1685>

23. Saeedi, R., Mojebi-Mogharar, A., Sandhu, S. K., Dubland, J. A., Ford, J.-A., Yousefi, M., Pudek, M., Holmes, D. T., Erb, S. R., Kwan, W. C. P., Kendler, D. L., & Yoshida, E. M. (2017). [Http://www.scielo.org.mx/scielo.php?script=sci_abstract&pid=S1665-26812017000200207&lng=es&nrm=iso&tlng=en](http://www.scielo.org.mx/scielo.php?script=sci_abstract&pid=S1665-26812017000200207&lng=es&nrm=iso&tlng=en). *Annals of Hepatology*, 16(2), 207–214. <https://doi.org/10.5604/16652681.1231577>
24. Kline, G. A., & Holmes, D. T. (2017). De-evolution of diagnostic testing for adrenal insufficiency. *The Lancet Diabetes & Endocrinology*, 5(2), 88–90. [https://doi.org/10.1016/S2213-8587\(16\)30145-0](https://doi.org/10.1016/S2213-8587(16)30145-0)
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Book Chapters

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3. Holmes, D. T. (2020). Statistical methods in laboratory medicine. In M. Marzinke & W. Clarke (Eds.), *Contemporary practice in clinical chemistry* (4th ed.). Elsevier.
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Letters to the Editor

1. Kline, G. A., Symonds, C. J., & Holmes, D. T. (2021). Systemic absorption of intranasal corticosteroids may occur and can potentially affect the hypothalamic–pituitary–adrenal axis. *CMAJ*, 193(12), E426–E426. <https://doi.org/10.1503/cmaj.78162>
2. Mattman, A., Chen, L. Y. C., Gugten, G. van der, Chin, A., Carruthers, M., DeMarco, M. L., & Holmes, D. T. (2020). In IgG4 related disease, elevated IgG2 is an artifact not a biomarker. *Seminars in Arthritis and Rheumatism*, 50(2), e8. <https://doi.org/10.1016/j.semarthrit.2019.08.002>
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4. Katayev, A., Fleming, J. K., Holmes, D. T., & Buhr, K. A. (2019). Widespread implementation of the hoffmann method: A second opinion. *American Journal of Clinical Pathology*, 152(1), 116–117.
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6. Lin, D. C., Raizman, J. E., Holmes, D. T., Don-Wauchope, A. C., & Yip, P. M. (2017). Evaluation of a chemiluminescent immunoassay for urinary aldosterone on the DiaSorin LIAISON automated platform against RIA and LC-MS/MS. *Clinical Chemistry and Laboratory Medicine (CCLM)*, 55(8), e181–e183. <https://doi.org/10.1515/cclm-2016-0841>
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Personal Interests

- Distance running: former national level XC and middle distance track athlete
- Cycling: Zwift enthusiast
- Canoeing: Algonquin Park and Bowron Lake Provincial Park fan
- Flyfishing: I enjoy freshwater and saltwater flyfishing
- Faith: I lead a Bible study fellowship group for Iranian immigrants to Canada
- Family: Married with 4 Children aged 8–20 y