Court File No. 98-CV-141369 CP00

ONTARIO
SUPERIOR COURT OF JUSTICE

B E T W E E N:

DIANNA LOUISE PARSONS, MICHAEL HERBERT CRUICKSHANKS, DAVID TULL, MARTIN HENRY GRIFFEN, ANNA KARDISH, ELSIE KOTYK, Executrix of the Estate of Harry Kotyk, deceased and ELSIE KOTYK, personally

Plaintiffs

and

THE CANADIAN RED CROSS SOCIETY, HER MAJESTY THE QUEEN IN RIGHT OF ONTARIO and THE ATTORNEY GENERAL OF CANADA

Defendants

and

HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF ALBERTA
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF SASKATCHEWAN,
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF MANITOBA,
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THE GOVERNMENT OF THE NORTHWEST TERRITORIES,
THE GOVERNMENT OF NUNAVUT and THE GOVERNMENT OF THE YUKON TERRITORY

Intervenors

Proceeding under the *Class Proceedings Act, 1992*

Court File No. 98-CV-146405

B E T W E E N:

JAMES KREPPNER, BARRY ISAAC, NORMAN LANDRY, as Executor of the Estate of the late SERGE LANDRY, PETER FELSING, DONALD MILLIGAN, ALLAN GRUHLKE, JIM LOVE and PAULINE FOURNIER as Executrix of the Estate of the late PIERRE FOURNIER

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Proceeding under the *Class Proceedings Act, 1992*

MOTION RECORD
(VOL. 1 OF 2)

March 16, 2015

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Monitor for the court in this action

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TAB 1

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Proceeding under the *Class Proceedings Act, 1992*

NOTICE OF MOTION

The Joint Committee will make a motion before Justice Paul Perell on June 22-23, 2015 at 10:00 a.m., or as soon after that time as the motion can be heard, at 393 University Avenue, Toronto, Ontario.

PROPOSED METHOD OF HEARING: The motion is to be heard orally.

THE MOTION IS FOR:

1. An order that the Reports listed below be filed with the Court pursuant to the provisions of Clause 10.01(1)(i) of the January 1, 1986-July 1, 1990 Hepatitis C Settlement Agreement (the "**Settlement Agreement**"):

   (a) "Estimating the Prognosis of Canadians Infected with the Hepatitis C Virus Through the Blood Supply, 1986-1990", The Fifth Revision of Hepatitis C Prognostic Model Based on the Post-Transfusion Hepatitis C Compensation Claimant Cohort, September, 2014, prepared by Murray Krahn, Wendong Chen, Qilong Yi and William Wong (the "**Medical Model Report**");

(b) Actuarial Report to the Joint Committee Assessing the Financial Sufficiency of the 1986-1990 Hepatitis C Trust as at December 31, 2013, by Eckler Ltd. (Richard Border and Wendy Harrison) (the "**Eckler Actuarial Report**"); and

(c) Report of the Joint Committee Relating to Financial Sufficiency of the 1986-1990 Hepatitis C Trust as at December 31, 2013 (the "**Joint Committee Sufficiency Report**").

2. An order that as at December 31, 2013, the Trust Fund is financially sufficient and that, after taking into account an allocation of assets necessary to protect the class members from future major adverse experience, the Trust assets exceed the liabilities by $236,341,000.

3. Directions regarding further court hearings to consider:

(a) whether the restrictions pertaining to income loss claims ought to be removed or changed;

(b) whether any portion of the money and other assets that are held by the Trustee pursuant to the Settlement Agreement are actuarially unallocated within the meaning of paragraph 9(b) of the order of the Ontario Superior Court of Justice dated October 22, 1999 (the "**Settlement Approval Order**")

(c) an order or orders pursuant to paragraphs 9(b) and 9(c) of the Settlement Approval Order.

4. An order that the orders in paragraphs 1 and 2 above shall not be effective unless and until parallel orders are approved by the Superior Court of Québec and the Supreme Court of British Columbia.

5. Such further and other relief as counsel may request and this Honourable Court may permit.

THE GROUNDS for the motion are:

1. The Joint Committee is charged with oversight of the Settlement Agreement, including the Transfused HCV Plan, the Hemophiliac HCV Plan and the Trust Fund.

2. Article 10.01(1)(i) of the Settlement Agreement provides, in effect, that the Joint Committee apply on June 30, 2002 and every three years thereafter, to the Courts for an assessment by the Courts of the financial sufficiency of the Trust Fund. Article 10.01(1)(i) reads as follows:

> on application of any Party or the Joint Committee made within 180 days after (i) 31 December 2001 and (ii) each third anniversary of such date, and on application of the Joint committee or any Class Action Counsel or the Fund Counsel made at any time, assess the financial sufficiency of the Trust Fund and determine, among other things, (A) whether the restrictions on payments of amount in full in the Plans should be varied or removed in whole or in part, and (B) whether the terms of the Plans should be amended due to a financial insufficiency or anticipated financial insufficiency of the Trust Fund;

3. A financial sufficiency review was triggered on December 31, 2013 (the "**2013 Financial Sufficiency Review**"). The Settlement Agreement calls for the application to be made within 180 days of the triggering date. By order dated February 18, 2015, this Court extended the deadline for making this application to March 16, 2015.

4. As it has done on prior financial sufficiency reviews, for the 2013 Financial Sufficiency Review, the Joint Committee:

   (a) facilitated the transfer of non-identifying cohort information and claims data, which the Joint Committee reconciled, from the Administrator to the medical model working group ("**MMWG**") and the actuaries engaged in this review;

(b) retained the MMWG led by Dr. Murray Krahn of the University of Toronto to build and refine an epidemiological model predicting the health outcomes of class members over time using the above-noted information and data and to prepare the Medical Model Report;

(c) sought the advice of a hepatologist, Dr. Vince Bain on this sufficiency review, who has provided evidence describing Hepatitis C Virus ("HCV") disease progression, the current state of the art in HCV treatment, and health outcomes of patients who clear the virus after treatment.

(d) retained the actuarial firm Eckler Ltd. to complete an actuarial assessment of the assets and liabilities as at December 31, 2013 having regard for the Medical Model Report and to prepare the Eckler Actuarial Report; and

(e) prepared the Joint Committee Sufficiency Report, summarizing its input into assumptions on which the Eckler Actuarial Report is based, providing a reconciliation and summing of the benefits paid under the Settlement Agreement and the Plans, highlighting issues under certain provisions of the Plans that are of significance, and describing the HIV Program under the Settlement Agreement.

5. As at December 31, 2013, $774,705,000 in benefits had been paid to class members under the terms of the Settlement Agreement and the Plans. As of the same date, the assets of the Trust were $1,190,199,000, comprised of invested assets and the Provincial/Territorial Notional Assets.

6. The Eckler Actuarial Report opines that, as at December 31, 2013, the assets of the Trust Fund are sufficient to meet liabilities and that, after taking into account an allocation of assets necessary to protect the class members from future major adverse experience (the "**buffer**"), the Trust assets exceed the liabilities by $236,341,000.

7. Although the actuarial models employed by Eckler Ltd. and the actuaries retained by the federal government, Morneau Shepell Inc. are different, it is the Joint

Committee's understanding that the differences in their respective results on the 2013 Financial Sufficiency Review are very small and that both conclude that the assets exceed the liabilities, that a buffer is appropriate, and that after taking the buffer into account, the assets still exceed liabilities.

8. The medical and actuarial evidence support a finding that the Trust Fund is financially sufficient as at December 31, 2013.

9. Such further and other grounds as counsel may advise and this Honourable Court may permit.

THE FOLLOWING DOCUMENTARY EVIDENCE will be used at the hearing of the motion:

1. Report of the Joint Committee Relating to Financial Sufficiency of the 1986-1990 Hepatitis C Trust as at December 31, 2013.
2. Affidavit of Murray Krahn sworn March 16, 2015 appending the Medical Model Report.
3. Affidavit of Richard Border sworn March 11, 2015 appending the Eckler Actuarial Report.
4. Affidavit of Vince Bain sworn March 11, 2015.
5. The Settlement Agreement and the orders of the Courts approving it.
6. Such further and other evidence as counsel may provide and this Honourable Court may permit.

March 16, 2015

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ONTARIO
SUPERIOR COURT OF JUSTICE

PROCEEDINGS COMMENCED AT TORONTO

NOTICE OF MOTION

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TAB 2

REPORT OF THE JOINT COMMITTEE

RELATING TO

FINANCIAL SUFFICIENCY

OF THE 1986-1990 HEPATITIS C TRUST

AS AT DECEMBER 31, 2013

Submitted: March 16, 2015

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1. INTRODUCTION

1. The courts in British Columbia, Ontario and Quebec (Courts) approved The 1986-1990 Hepatitis C Settlement Agreement (Settlement Agreement) in the fall of 1999.[1] They determined on that occasion that while the liabilities under the Settlement Agreement exceeded the settlement amount, the settlement nonetheless was within the envelope of reasonableness.

2. The Settlement Agreement requires that a triennial financial sufficiency assessment be undertaken. At least every third year the Courts must assess whether the assets of the Trust exceed its liabilities and thus determine whether the Trust Fund is financially sufficient in accordance with section 10.01(1)(i) of the Settlement Agreement. The current financial sufficiency assessment was triggered on December 31, 2013.

3. There have been four such triennial financial sufficiency assessments to date (triggered on December 31 of each of 2001, 2004, 2007 and 2010).

4. The Courts have made an order of financial sufficiency on the occasion of each prior triennial financial sufficiency assessment. To date, the Courts have not declared any portion of the money or other assets that are held by the Trustee pursuant to the Settlement Agreement to be actuarially unallocated nor have they exercised their discretion to allocate such funds as is provided for in the orders approving the Settlement Agreement issued in 1999.[2]

2. APPROACH TO ASSESSMENT

5. Section 9.01 of the Settlement Agreement provides for the establishment of a Joint Committee to undertake specified duties as well as duties that the Courts direct. Pursuant to appointments made by the Courts in 1999, 2002 and 2011, the current appointees to the Joint Committee are J. J. Camp, Q.C., Kathryn Podrebarac, Michel Savonitto and Harvey T. Strosberg, Q.C.

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[1] British Columbia Supreme Court Order made October 28, 1999, Ontario Superior Court Order made October 22, 1999, Quebec Superior Court Order made November 19, 1999.

[2] British Columbia Supreme Court Order made October 28, 1999, clause 5(b), Ontario Superior Court Order made October 22, 1999, clause 9(b), Quebec Superior Court Order made November 19, 1999, Schedule F.

6. Section 10.01(1)(i) provides that the Courts will assess the financial sufficiency of the Trust Fund on application of the Joint Committee or any Party to the Settlement Agreement made within 180 days of each third assessment anniversary date.

7. Each prior sufficiency assessment application has happened on the application of the Joint Committee. The record filed by the Joint Committee on each prior assessment included a medical modeling report, an actuarial report from Eckler Ltd. and its predecessors (Eckler) and a report from the Joint Committee providing the assumptions required to calculate the liabilities. Affidavits from medical experts and others have also often formed part of the record filed by the Joint Committee. For several of the most recent sufficiency assessments, the Federal Government has also engaged actuarial experts, Morneau Shepell Inc. and its predecessors (Morneau).

8. The evidentiary record to be filed by the Joint Committee for this financial sufficiency assessement includes a medical model and report, medical evidence, an actuarial report and this report.

9. The Joint Committee report, the medical model and report and the actuarial report are all significantly based on data pertaining to the claims under the Settlement Agreement provided by the Administrator.

10. The Joint Committee provided the non-identifying cohort information and claims data obtained from the Administrator to Eckler, Morneau, the Provincial and Territorial Governments and the medical model working group. This data is the source for a significant number of the assumptions required to complete the financial sufficiency assessment. As such the Joint Committee reviewed the data sets for accuracy, consistency and conformity to the Plans. The inconsistencies and issues with the data that were identified by the Joint Committee and those that were raised by Eckler and/or Morneau were reviewed with the Administrator and resolved in each instance. The Joint Committee catalogued the issues and their solutions and reported to the actuaries on a go forward basis while this aspect of the work was being conducted.

11. What follows is the Joint Committee's report to the Courts pursuant to section 10.01(1)(i) of the Settlement Agreement for the purposes of the financial sufficiency assessment triggered at December 31, 2013.

12. This report summarizes the input the Joint Committee had into the assumptions made by Eckler, provides a summing and reconciliation of benefits paid under the provisions of the Settlement Agreement and the Plans, highlights issues under certain provisions of the Plans that are of significance, and describes the HIV Program under the Settlement Agreement

3. IMPORTANT CONSIDERATIONS FOR ASSESSMENT OF FINANCIAL SUFFICENCY

THE MEDICAL MODEL

13. On settlement approval and for each financial sufficiency assessment conducted under the Settlement Agreement, Dr. Murray Krahn of the University of Toronto has convened a medical model working group (MMWG) of epidemiologists, physicians and statisticians to build (and then refine) an epidemiological model predicting the health outcomes of the class members over time.

14. Advances in treatment in recent years mean that most persons infected with hepatitis C virus (HCV) can receive treatment that is highly effective with fewer side effects than the treatments previously available. These treatment developments were expected to have a significant effect on the medical model and the actuarial outcome. A major aspect of the work to be done to update the medical model would be to incorporate the rapidly changing state of the art in treatment of HCV.

15. Two strategies were developed in this regard: firstly, to request the Administrator to survey claimants who had been treated to determine the antiviral regimen they had been treated with and whether the treatment had been successful (ie. whether they had attained a sustained viral response (SVR) or cure); and, secondly, to have the MMWG survey HCV treating physicians as to treatment patterns presently and anticipated on the horizon.

THE ACTUARIAL PROCESS FOR THE 2013 FINANCIAL SUFFICIENCY ASSESSMENT

16. On the 2010 financial sufficiency assessment (and to a certain extent on the 2007 financial sufficiency assessment), there were differences between the actuaries which were not well understood. The cumulative quantum of these differences on the 2010 assessment was approximately $200 million. These differences are described in the document previously provided to the Courts appended as Appendix A to this report entitled Joint Summary of the Joint Committee and Canada.

17. At the outset of the 2013 assessment, the Joint Committee and the Federal Government agreed on a process to try to eliminate differences between the actuarial reports that were based on technical actuarial modelling not relating to differences in actuarial approach, philosophy or assumptions. The goal was that any differences in outcome would be understood and explainable. For this purpose, Eckler and Morneau were instructed to communicate with each other about their actuarial models, their understanding of the data and medical model and their results as they went. They were encouraged to eliminate technical and modelling outcome differences but to not compromise their independence. They also communicated with the MMWG on the development of the medical model and the medical model report.

THE NOTIONAL ASSETS

18. Although section 10.01(1)(i) directs the assessment of the Trust Fund (the assets held by the Trustee), the actuarial assessment includes consideration of the Trust as a whole. The Trust includes, in addition to the invested assets contributed by the Federal Government, the notional assets[3] which are the obligations of the Provincial and Territorial Governments to pay their 3/11ths share of liabilities as they arise subject to the maximum possible payout. The Joint Committee instructed Eckler to value both the invested assets and the notional assets because the projected liabilities include the obligations of all governments.

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[3] Approximately $162,152,000 at December 31, 2013.

ESTIMATING FINAL COHORT SIZE

19. The size of the cohort of primarily infected persons who would make a timely claim and ultimately be approved for payment under the Transfused HCV Plan and the Hemophiliac HCV Plan (Plans) has been a critical factor in assessing sufficiency from the beginning. A number of considerations come into play in this determination.

20. At the time of the approvals of the Settlement Agreement, the maximum size of the primarily infected hemophiliac cohort entitled to make a claim and ultimately be approved under the Hemophiliac HCV Plan was thought to be essentially known based on the available medical evidence. The criterion for approval of an infected hemophiliac person under the Hemophiliac HCV Plan is satisfied simply by proof of receipt of blood in the period January 1, 1986 to June 30, 1990. Because virtually all of the potential hemophiliac class members who received blood were identified with a hemophiliac treatment centre, the potential maximum cohort of infected hemophiliac persons was estimated at 1645 persons (355 of whom died prior to January 1, 1999).

21. However, at the time of the approvals, the maximum size of the primarily infected transfused cohort entitled to make a claim and ultimately be approved under the Transfused HCV Plan was not known. The criterion for approval of infected persons under the Transfused HCV Plan is proof that they were infected with HCV for the first time by blood received in the class period. Only some of the Provinces and Territories took the step of looking back and identifying those persons who were transfused with blood in the relevant period and encouraging them to be tested. Moreover, because infected persons would not necessarily experience significant symptoms for many years or even decades, a significant percentage of the cohort were yet to be diagnosed. Based upon epidemiological estimates and medical modeling, the maximum cohort of infected transfused persons was first estimated at 8,180 (76 of whom died as a result of HCV prior to January 1, 1999).

22. Over time, the actual claims experience under the Plans has played an increasingly valuable role in estimating the cohort of claimants who will make a timely claim and ultimately be approved under the Plans. The cohort estimates developed on the various prior sufficiency assessments have taken into consideration the number of claims made and approved, the number

of claims made that were in process, the number of claims made which were not being actively pursued and were therefore archived by the administrator, the rate at which claims were made over years and month to month, and the denial rate for claims made. These factors must still be considered because a portion of the cohort is still unknown but, because the first claims deadline has now passed, the uncertainty surrounding cohort size is a much less significant factor today than in prior years.

HEALTH CANADA DENIALS

23. There is a category of denials called Health Canada Negative denials (HCN denials) which, on occasion, occur subsequent to a transfused claim having been approved in the first instance. The court approved traceback protocol (the process by which it is determined if a transfused claimant's infection with HCV was as a result of receipt of blood from an HCV positive donor during the class period) provides that a transfused primarily infected claimant who has an inconclusive traceback after six months is approved under the Transfused HCV Plan subject to future disqualification should the ongoing Health Canada traceback subsequently produce evidence that the claimant was not infected by blood for the first time in the class period. In the event of an HCN denial, the claimant receives no further compensation but is not required to repay any benefits received between initial approval and HCN denial (section 7.05).

24. To date, 99 persons approved and paid compensation have received an HCN denial and are no longer eligible for compensation. A further 8 persons approved but not yet paid compensation at the time their ineligible status became known have been denied compensation based on an HCN denial. Accordingly, the cohort of known transfused primarily infected persons has been reduced by 107 to account for the HCN denials.

THE PASSING OF THE FIRST CLAIM DEADLINE

25. The Plans provide that claims be made before a first claims deadline of June 30, 2010, subject to certain listed exceptions (sections 3.07 Hemophiliac HCV Plan and 3.08 Transfused HCV Plan).

26. Subsequent to the 2010 sufficiency assessment, the Courts approved two protocols which govern the making of claims post June 30, 2010 under these exceptions (CAP1 and CAP2)[4]. By December 31, 2013, 65 persons had claimed under CAP1 and 9 persons had claimed under CAP2. In addition, 60 further claims have been received under these CAPs since this financial sufficiency assessment was triggered.

THE KNOWN COHORTS

27. The approved transfused infected cohort as at December 31, 2013 is 3,924. It is comprised of 3,740 claimants who are alive or who died after January 1, 1999 and 184 claimants who died before January 1, 1999.

28. The approved hemophiliac infected cohort as at December 31, 2013 is 1,359. It is comprised of 1,058 claimants who are alive or who died after January 1, 1999 and 301 claimants who died before January 1, 1999.

THE UNKNOWN COHORT

29. There is still an unknown cohort component which must be accounted for in any financial sufficiency assessment. It is comprised of those claimants whose claims are in process and therefore may or may not go on to become approved and those claimants who have not yet come forward to make a claim under the Plans. The Joint Committee has directed Eckler to estimate the unknown cohort taking into account only those claims which are in process and those claims which will come forward under CAP1 or CAP2 discussed in paragraph 26 above.

30. Subsequent to the 2010 sufficiency assessment, the Courts heard applications brought by Class Counsel to approve a third protocol permitting claims to be made after the June 30, 2010 first claims deadline (CAP3) in those cases where the administrator was satisfied with the reason provided for the claim not having been submitted prior to the deadline. The British Columbia application was dismissed. The Ontario application was approved contingent upon there being a

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[4] Recent HCV Diagnosis Exception to the June 30, 2010 First Claims Deadline Protocol (CAP1) and Issuance of Initial Claims Packages after the June 30, 2010 First Claims Deadline Protocol (CAP2), as amended October 2014.

future declaration of actuarially unallocated assets. The Quebec application was dismissed as premature.

31. Because the decisions of the Courts were not without material differences as required by section 10.01(2) of the Settlement Agreement, the proposed CAP3 did not take effect. The Joint Committee believes that these decisions did not foreclose a renewed request for approval of a late claims protocol in the event the Courts make a declaration identifying actuarially unallocated assets. Accordingly, the Joint Committee instructed Eckler to provide a separate sensitivity analysis for this eventuality.

32. The administrator has recorded 151 infected persons and 76 family members seeking to make claims subsequent to June 30, 2010, who are not covered by the exceptions in CAP1 or CAP2 whose claims could be considered when and if the Courts are satisfied that there are actuarially unallocated assets and if the Courts permit a late claims protocol.

REQUIRED CAPITAL

33. With the main window for new claimants to come forward closed as at June 30, 2010, the Joint Committee sought Eckler's advice on the amount of additional assets in excess of projected liabilities which are required to ensure the soundness of the Plans' operation and to protect the class members against the risk that the medical modelling projections, the data analysis and/or assumptions, and/or the actuarial projections under-estimate the liabilities or overestimate the assets. Eckler has applied established actuarial principles to calculate the amount of assets over and above those necessary to meet the liabilities which are needed to protect the class members from future major adverse experience or catastrophe.

4. PAYMENTS MADE UNDER THE PLANS – 2011 TO 2013

34. The Settlement Agreement provides for a variety of compensation payments responsive to claims made by the class members under the following three compensation plans:

(a) the Transfused HCV Plan;

(b) the Hemophiliac HCV Plan; and

(c) the HIV Secondarily Infected Program (HIV Program) discussed in section 7 below.

35. The Plans provide for compensation to be paid to approved HCV claimants for a variety of losses. The types and amounts of the losses to be paid to claimants are in large measure tied to their progression through the disease levels over time. Many of the compensation amounts are indexed by inflation for each year.

36. The Plans, in the first instance, provided for limitations or holdbacks on certain payments pending periodic reassessment of the Courts and a decision to amend or remove the limitations (section 7.03). Section 10.01(1)(i) of the Settlement Agreement requires the Courts to consider whether any of the restrictions or holdbacks on payments in the Plans should be removed in whole or in part. The extent to which these limitations or holdbacks have been amended or removed is discussed in the paragraphs that follow.

37. As part of the process of analyzing and verifying the claims data, the Joint Committee has summed and reconciled the claims payment data for 2011 to 2013 under the various payment provisions of the Plans.

38. The results of this analysis are set out in paragraphs 39 to 67.

FIXED PAYMENTS – SECTION 4.01 OF THE PLAN

39. The Plans provide that approved infected claimants who are alive and the estates of persons who died after January 1, 1999 (DA9s) without collecting payments prior to their death receive the fixed payments available for their current disease levels and all lower disease levels. The fixed payments made in 2011 to 2013 for the various disease levels were as follows:

TRANSFUSED HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	Total Paid 2011-2013
4.01(1)(a) Level 1 Fixed Payment	$10,000	(64) $826,535.42	(19) $249,023.12	(43) $573,490.57	$1,649,049.11
4.01(1)(b) Level 2 Fixed Payment	$20,000	(45) $1,172,469.62	(18) $471,833.10	(74) $986,937.26	$2,631,239.98
4.01(1)(b) Level 2 Holdback	$5,000	Nil	Nil	Nil	Nil

4.01(1)(c) Level 3 Fixed Payment	$30,000	(38) $1,491,075.69	(31) $1,218,902.33	(45) $1,800,494.10	$4,510,472.12
4.01(1)(d) Level 5 Fixed Payment	$65,000	(29) $2,485,126.20	(14) $1,192,689.40	(20) $1,733,809.00	$5,411,624.60
4.01(1)(e) Level 6 Fixed Payment	$100,000	(24) $3,186,059.25	(13) $1,703,841.88	(11) $1,467,069.12	$6,356,970.25

HEMOPHILIAC HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	TOTAL Paid 2011-2013
4.01(1)(a) Level 1 Fixed Payment	$10,000	(4) $50,976.96	(1) $13,106.48	(1) $13,336.99	$77,420.43
4.01(1)(b) Level 2 Fixed Payment	$20,000	(2) $50,976.94	(1) $26,212.95	(1) $26,673.98	$103,863.87
4.01(1)(b) Level 2 Holdback	$5,000	Nil	Nil	Nil	Nil
4.01(1)(c) Level 3 Fixed Payment	$30,000	(5) $191,163.55	(3) $117,958.29	(4) $160,043.92	$469,165.76
4.01(1)(d) Level 5 Fixed Payment	$65,000	(9) $745,537.86	(4) $340,768.40	(5) $433,452.25	$1,519,758.51
4.01(1)(e) Level 6 Fixed Payment	$100,000	(7) $892,096.59	(6) $786,388.56	(4) $533,479.68	$2,211,964.83

40. Initially, $5,000 of the $20,000 disease level 2 fixed payment (1999 dollars) was deferred as a result of one of the limitations or holdbacks imposed by the Plans. Following the 2001 sufficiency assessment the limitation on the level 2 payment was removed by the Courts and the holdback which had accrued was paid out to claimants approved to that point with interest. Thereafter, new claims approved at disease level 2 were paid the fixed payment in full.

LEVEL 3 LOSS OF INCOME SERVICES IN LIEU OF LEVEL 3 FIXED PAYMENT AND LOSS OF INCOME/SERVICES – SECTIONS 4.01(3), 4.02, 40.03 OF THE PLAN

41. The Plans provide that approved infected claimants at disease level 3 who are alive and the estates of DA9s with unpaid pre-death losses may elect to waive the $30,000 fixed payment (1999 dollars), provided the infected person is at least 80% disabled, and claim instead their net after-tax loss of income or for their loss of services experienced in the home.

42. The Plans also provide that approved infected claimants at disease level 4 or above who are alive and the estates of DA9s with unpaid pre-death losses may claim compensation for their net after-tax loss of income or for their loss of services experienced in the home.

43. Eckler requested that the Joint Committee provide certain income and service loss calculations from the claims data. The calculations provided are as follows:

The claims experience shows that:

(a) 38% (350 claimants/898 claimants) of levels 3 to 6 alive or DA9 primarily infected claimants who were paid loss of income/services on average received 4.95 years of payments (1,735 years/350 claimants) within the 10 year period from their date of transfusion or receipt of blood products (for DA9 claimants up to their year of death);

(b) 71.93% (646 claimants/898 claimants) of levels 3 to 6 alive and DA9 primarily infected claimants who took loss of income/services were paid on average 5.91 years (3,820 years/646 claimants) of past loss of income/services payments where past loss of income/services means the years preceding a claimant's approval year (for DA9 claimants up to their year of death);

(c) the average number of years of past loss of support/services paid for transfused primarily infected DB9 deaths caused by HCV is 7.94 years (683 years/86 claimants) (where past loss means from the year of death to the year preceding the approval year); and

(d) the average number of years of past loss of support/services paid for hemophiliac primarily infected DB9 deaths caused by HCV is 9.02 years (740 years/82 claimants) (where past loss means from the year of death to the year preceding the approval year).

44. Claimants entitled to loss of income or loss of services payments have been paid from the beginning of the year of disability to December 31, 2012. The losses for these types of claims are paid one year in arrears because income tax information is required to process entitlement.

45. The payments made for loss of income and loss of services in 2011 to 2013 (for years 2010 to 2012) were as follows:

TRANSFUSED HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	Total Paid 2011-2013
4.01(3)/4.02 Loss of Income	Based on prior earned income	(67) $3,319,728.17	(69) $2,807,732.66	(70) $3,002,437.88	$9,129,898.71
4.01(3)/4.03 Loss of Services	$12/hour up to $240/week	(179) $3,976,365.52	(182) $5,289,620.92	(185) $4,268,156.57	$13,534,143.01

HEMOPHILIAC HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	TOTAL Paid 2011-2013
4.01(3)/4.02 Loss of Income	Based on prior earned income	(47) $3,263,961.91	(43) $3,390,686.28	(45) $3,637,546.05	$10,292,194.24
4.01(3)/4.03(2) Loss of Services	$12/hour up to $240/week	(112) $2,175,562.99	(107) $1,753,208.17	(108) $1,921,041.64	$5,849,812.80

46. Until 2004, as a result of the required limitations or holdbacks, the Plans paid only 70% of loss of income based on pre-claim gross income of up to $75,000 (1999 dollars). For approved loss of income claims before 2004, 30% of the loss and any loss based on pre-claim gross income above the $75,000 maximum accrued to the claimant pending a decision by the Courts that these limitations be amended or removed.

47. In 2004, the 70% limitation on payment of loss of income claims was removed and the limitation on pre-claim gross income was increased to a maximum of $300,000 (1999 dollars). All accrued loss of income payments triggered by eliminating the 70% payment restriction on income loss and by raising the $75,000 limitation to $300,000 were paid out with interest. Thereafter, approved loss of income claimants were paid 100% of their loss of income based upon a calculation which permitted pre-claim gross income of up to $300,000.

48. In 2008, the Courts raised the limitation on pre-claim gross income which could be used in the calculation of a loss of income claim to a maximum of $2.3 million (1999 dollars) with the proviso that any claim calculated on pre-claim gross income in excess of $300,000 (1999 dollars) required express approval from the Court with jurisdiction prior to its payment.

49. The Courts have approved ongoing payment for 4 claimants with loss of income claims based on pre-claim gross income in excess of $300,000 (including prior year and ongoing

claims). One such claim ended in 2005, the second ended after the 2010 payment, and the other two claims are ongoing to 2024 and 2034,[5] respectively.

COSTS OF CARE – SECTION 4.04 OF THE PLANS

50. The Plans provide that approved infected claimants at disease level 6 who are alive and the estates of level 6 DA9s with unpaid pre-death losses are entitled to claim up to $50,000 (1999 dollars) per year for costs of care, including services provided by family members that are not already compensated under the loss of services provisions.

51. At the beginning of 2010, the standard operating procedure for claiming costs of care was modified by the Courts to improve the administrative process and to increase rates payable for certain services.

52. The payments made for costs of care in 2011 to 2013 were as follows:

TRANSFUSED HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	Total Paid 2011-2013
4.04 Costs of Care	Up to $50,000	(35) $910,575.48	(30) $1,119,560.90	(35) $1,806,961.29	$3,837,097.67

HEMOPHILIAC HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	TOTAL Paid 2011-2013
4.04 Costs of Care	Up to $50,000	(21) $593,140.27	(20) $705,490.52	(18) $732,463.08	$2,031,093.87

COMPENSABLE HCV DRUG THERAPY – SECTION 4.05 OF THE PLANS

53. The Plans and the Court approved protocol for compensable HCV drug therapy provide for a payment of $1,000 per month (1999 dollars) for each month an approved infected claimant at disease levels 3 to 6 underwent a treatment regimen that included either interferon or ribavirin or both or a DA9 claimant at those levels underwent such treatment prior to his or her death. The payments made for compensable HCV drug therapy in 2011 to 2013 were as follows:

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[5] The loss of income payments to these claimants were $1,497,000 (2012) and $290,447 (2013), respectively (despite a high pre-claim net income, the later claimant remains in the work force to this point and has a correspondingly high post-claim net income offset).

TRANSFUSED HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	Total Paid 2011-2013
4.05 HCV Compensable Drug Therapy	$1,000/month	(52) $526,335.46	(41) $398,437.60	(68) $688,189.20	$1,612,962.26

HEMOPHILIAC HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (indexed)	Paid 2013 (Indexed)	TOTAL Paid 2011-2013
4.05 HCV Compensable Drug Therapy	$1,000/month	(14) $175,869.96	(16) $162,520.60	(30) $385,439.30	$723,829.86

54. These monthly payments are provided to people who undergo these treatments to compensate for the adverse side effects generally associated with interferon and/or ribavirin (and/or such other treatments as may be approved by the Courts). As is more fully explained in the medical evidence, medical modeling and actuarial reports, several new drugs with varying regimens and varying levels of side effects have recently become available for treatment of the HCV virus. In some cases, these treatments do not include interferon or ribavirin and so do not qualify for the compensable HCV drug therapy payment unless the Courts make orders that they be added to the list of eligible treatments. Applications have not yet been made to the Courts seeking coverage for any of the new treatments as Compensable HCV drug therapy pending more complete medical information. Accordingly, the impact of these new treatment regimens on payments under this head of compensation is not yet clear.

UNINSURED TREATMENT AND MEDICATION – SECTION 4.06 OF THE PLANS

55. The Plans (section 1.01 definition and section 4.06) reimburse the cost of uninsured generally accepted treatment and medication expenses incurred in the treatment or management of HCV for approved infected claimants who are alive and the estates of DA9s with unpaid pre-death expenses. These claims may include the HCV drug therapy regimens and many other medications and treatments. The payments made for uninsured treatment and medication in 2011 to 2013 were as follows:

TRANSFUSED HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	Total Paid 2011-2013
4.06 Uninsured Treatment & Medication	Reimbursed expenses	(97) $188,335.04	(87) $354,754.20	(99) $376,152.96	$919,242.20

HEMOPHILIAC HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	TOTAL Paid 2011-2013
4.06 Uninsured Treatment & Medication	Reimbursed expenses	(53) $206,236.31	(51) $290,825.48	(64) $294,289.09	$791,350.88

56. The cost of reimbursing uninsured treatment and medication expenses may fluctuate significantly in the future as several factors impact future costs. As outlined more fully in the medical evidence and actuarial reports, the cost of the new drug therapy treatments which have recently become available are significant and the amounts and the timing of coverage by provincial and/or private drug plans cannot be predicted. It is predicted that the number of persons eligible to take the new treatments will increase which will increase the outlay under these provisions of the Plans in the near future. The cost of medications developed in the future for the treatment of HCV and/or newly diagnosed HCV related diseases and/or conditions is another unknown. However, if the new drug therapy treatment regimens prove to be successful, as predicted, the number of class members who attain a sustained viral response (considered as cured) will be high and their future treatment needs and these future payments under the Plans will be eliminated or reduced.

OUT-OF-POCKET EXPENSES – SECION 4.07 OF THE PLANS

57. The Plans provide for reimbursement at all disease levels for uninsured out-of-pocket expenses incurred as a result of HCV infection to approved infected claimants who are alive and to the estates of DA9 infected claimants with unpaid pre-death expenses. The payments made for out-of-pocket expenses in 2011 to 2013 were as follows:

TRANSFUSED HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	Total Paid 2011-2013
4.07 Out-of-Pockets	Reimbursed expenses	(168) $271,018.99	(149) $221,372.41	(158) $313,582.99	$805,974.39

HEMOPHILIAC HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	Total Paid 2011-2013
4.07 Out-of-Pockets	Reimbursed expenses	(90) $203,264.81	(99) $164,206.47	(98) $184,049.47	$551,520.75

58. The court approved protocol for uninsured out-of-pocket expenses was modified by the Courts at the beginning of 2011 to make claiming for out-of-pocket expenses simpler for claimants.

59. Although the medical evidence is that follow up care is needed for some persons who attain a sustained viral response following treatment, the new drug therapy treatment regimens will also have a favourable impact on these future out-of-pocket cost provisions over the long term.

HIV SECONDARILY INFECTED - SECTIONS 4.08 OF THE TRANSFUSED HCV PLAN OR 4.08(1) OF THE HEMOPHILIAC HCV PLAN AND 5.01(3) AND 5.02(2) OF THE PLANS

60. As has been previously noted, the Settlement Agreement establishes the HIV Program to provide compensation to persons secondarily infected with HIV. The HIV Program provides for an unindexed lump sum payment of $240,000 to approved claimants.

61. The Plans also provide for the payment of provable benefits above the threshold of $240,000 (not indexed) to HCV infected persons who are also HIV secondarily infected persons eligible for compensation under the HIV Program. Similar provisions apply to claims by the estates, dependants and family members of such co-infected claimants. There have been no payments made under these provisions to date.

DEATH CLAIMS FOR PERSON WHO DIED PRIOR TO JANUARY 1, 1999 (DB9s) – SECTIONS 5.01, 6.01 AND 6.02 OF THE PLANS

62. The Plans provide, with one exception discussed in paragraphs 66 and 67 below, that HCV must have caused the death of an HCV infected claimant who died prior to January 1, 1999 (DB9) in order for benefits to be payable. In all issues of causation under the Settlement Agreement and the Plans, the Joint Committee has instructed Eckler that the legal definition of

causation which was the law at the time the Settlement Agreement was negotiated and approved, that is material contribution, is the standard that the Administrator uses.

63. The estate, the family members and dependants of an approved DB9 whose death was caused by HCV may either claim:

(a) uninsured funeral expenses of up to $5,000 (1999 dollars), an estate payment of $50,000 (1999 dollars), amounts for loss of support/services for dependants during the deceased's life expectancy, and fixed amounts for loss of guidance, care and companionship for the family members (the $50,000 Option); or

(b) uninsured funeral expenses of up to $5,000 (1999 dollars) and a one-time all inclusive payment of $120,000 (1999 dollars) to be divided among them in settlement of all claims (the $120,000 Option).

64. The payments made relating to these DB9 claims in 2011 to 2013 were as follows:

TRANSFUSED HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	Total Paid 2011-2013
5.01(1) DB9 Funeral	Up to $5,000	(5) $21,699.06	Nil	Nil	$21,699.06
5.01(1) DB9 $50,000 Option	$50,000	(2) $127,442.38	Nil	(1) $66,684.96	$194,127.34
5.01(2) DB9 $120,000 Option	$120,000	(2) $305,861.81	Nil	Nil	$305,861.81
6.01(1) DB9 - Loss of Support	Based on prior earned income	(15) $599,162.04	(12) $260,379.81	(11) $231,270.94	$1,090,812.80
6.01(2) DB9 – Loss of Services	$12/hr up to $240/week	(44) $897,857.09	(44) $812,665.15	(37) $870,250.28	$2,580,772.52
6.02(a) DB9 FM- Spouse	$25,000	(2) $63,721.18	Nil	(1) $33,342.48	$97,063.66
6.02(b) DB9 FM-Child < 21	$15,000	Nil	Nil	Nil	Nil
6.02(c), (d), (e) DB9 FM-Child >21, Sibling, Parent	$5,000	(6) $38,232.72	(5) $32,766.20	(2) $13,337.00	$84,335.92
6.02(f), (g) DB9 FM – Grandparent, Grandchild	$500	(4) $2,548.84	(17) $11,140.44	(1) $666.85	$14,356.13

HEMOPHILIAC HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	TOTAL Paid 2011-2013
5.01(1) DB9 Funeral	Up to $5,000	Nil	Nil	Nil	Nil
5.01(1) DB9 $50,000 Option	$50,000	Nil	Nil	Nil	Nil
5.01(2) DB9 $120,000 Option	$120,000	Nil	Nil	Nil	Nil
6.01(1) DB9 - Loss of Support	Based on prior earned income	(25) $425,257.46	(39) $992,197.88	(26) $405,226.35	$1,822,681.69

6.01(2) DB9 – Loss of Services	$12/hr up to $240/week	(61) $726,856.26	(52) $662,496.32	(51) $668,862.24	$2,058,214.82
6.02(a) DB9 - FM- Spouse	$25,000	Nil	Nil	(1) $33,342.48	$33,342.48
6.02(b) DB9 - FM-Child < 21	$15,000	Nil	Nil	Nil	Nil
6.02(c), (d), (e) DB9 – FM - Child >21, Sibling, Parent	$5,000	Nil	Nil	Nil	Nil
6.02(f), (g) DB9 - FM – Grandparent or Grandchild	$500	Nil	Nil	Nil	Nil

DEATH CLAIMS FOR PERSONS WHO DIED AFTER JANUARY 1, 1999 (DA9s) – SECTIONS 5.02, 6.01 AND 6.02 OF THE PLANS

65. The Plans provide that the estate of a DA9 may claim all unpaid compensation which the deceased could have claimed prior to death. In addition, if the death was caused by HCV, the estate may claim for uninsured funeral expenses of up to $5,000 (1999 dollars), the dependants may claim for loss of support/services during the deceased's life expectancy, and the family members may claim fixed amounts for loss of guidance, care and companionship. The payments made relating to these DA9 claims in 2011 to 2013 were as follows:

TRANSFUSED HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	Total Paid 2011-2013
5.02(1) DA9 Funeral	Up to $5,000	(29) $118,044.99	(15) $55,787.88	(13) $64,181.45	$238,014.32
6.0191) DA9 – Loss of Support	Based on prior earned income	(24) $431,870.31	(31) $842,053.04	(23) $490,664.80	$1,764,588.15
6.01(2) DA9 – Loss of Services	$12/hr up to $240/week	(177) $2,404,822.15	(168) $2,630,889.70	(161) $2,388,490.27	$7,424,202.12
6.02(a) DA9 FM-Spouse	$25,000	(18) $573,490.62	(12) $393,194.28	(10) $333,424.80	$1,300,109.70
6.02(b) DA9 FM-Child<21	$15,000	(2) $38,232.72	(2) $39,319.42	Nil	$77,552.14
6.02(c),(d),(e) DA9 FM-Child>21, Sibling, Parent	$5,000	(111) $707,201.04	(80) $524,259.20	(8) $533,480.00	$1,764,940.24
6.02(f),(g) DA9 FM-Grandparent, Grandchild	$500	(95) $60,534.95	(60) $38,663.88	(74) $49,346.90	$148,545.73

HEMOPHILIAC HCV PLAN

Type of Payment	1999 Amount	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	TOTAL Paid 2011-2013
5.02(1) DA9 Funeral	Up to $5,000	(4) $18,614.33	(7) $36,845.91	(6) $34,388.61	$89,848.85
6.0191) DA9 – Loss of Support	Based on prior earned	(41) $1,666,324.30	(22) $375,679.25	(35) $913,512.49	$2,955,516.04

	income				
6.01(2) DA9 – Loss of Services	$12/hr up to $240/week	(64) $874,331.85	(58) $662,862.59	(65) $757,433.79	$2,294,628.23
6.02(a) DA9 FM – Spouse	$25,000	(4) $127,442.36	(4) $131,064.76	(5) $166,712.40	$425,219.52
6.02(b) DA9 FM – Child < 21	$15,000	(10) $19,116.36	(4) $78,638.84	(4) $80,021.96	$177,777.16
6.02(c),(d),(e) DA9 FM – Child >21, Sibling, Parent	$5,000	(30) $203,907.84	(46) $301,449.04	(31) $206,723.50	$712,080.38
6.02(f),(g) DA9 FM –Grandparent or Grandchild	$500	(20) $13,381.41	(30) $19,659.60	(8) $5,334.80	$38,375.81

CO-INFECTED ELECTIONS – SECTIONS 4.08(2) AND 5.01(4) OF THE HEMOPHILIAC HCV PLAN

66. The Hemophiliac HCV Plan provides a compensation scheme that is identical to the Transfused HCV Plan in most respects and, in addition, provides that:

(a) alive primarily infected claimants also infected with HIV may elect a $50,000 (1999 dollars) payment in satisfaction of all claims including those of family members and dependants; or

(b) the estate, family members and dependants of primarily infected DB9s also infected with HIV may elect a $72,000 (1999 dollars) payment to be divided among them in satisfaction of all claims without proof of HCV as the cause of death.

67. The payments made for co-infected elections in 2011 to 2013 were as follows:

HEMOPHILIAC HCV PLAN

Type of Payment	1999 Amounts	Paid 2011 (Indexed)	Paid 2012 (Indexed)	Paid 2013 (Indexed)	TOTAL Paid 2011-2013
4.08(2) Alive HIV Co-Infected Option	$50,000	(1) $63,721.19	Nil	(2) $133,369.92	$197,091.11
5.01(4) DB9 HIV Co-infected Option	$72,000	(1) $91,758.49	Nil	Nil	$91,758.49

5. RECONCILIATION OF PAYMENTS MADE UNDER THE PLANS THROUGH 2013

68. As part of the process of testing and analyzing the claims data, the Joint Committee has also reconciled the payments made under each provision of the Plans as at the trigger date for

each triennial sufficiency assessment throughout the claims administration to December 31, 2013. These reconciliations were provided to the actuaries for their use in the financial sufficiency assessment. The reconciliations are appended as Appendix B.

6. DEVELOPING ASSUMPTIONS FOR FEES AND EXPENSES RELATING TO THE PLANS

69. On previous triennial sufficiency assessments, the assumptions relating to the fees and expenses payable for the ongoing operations and administration under the Plans have been calculated for a fixed number of years and then reduced to zero. This somewhat abrupt notional cessation of administrative costs was assumed because expenses have a progressively smaller present value, due to discounting, as one moves further out along the time horizon.

70. For the 2013 sufficiency assessment, the Joint Committee conferred with Eckler on whether this methodology sufficiently accounted for further expenses under the Plans given the overriding approach that the Plans will continue as a going-concern until all benefits due to claimants have been paid. As a result, Eckler has developed the expense assumptions for the 2013 sufficiency assessment by projecting them out over the life of the going-concern payments but reducing the expenses going forward in proportion to the projected number of claimants alive at these future dates.

71. In order to project these expenses, the Joint Committee provided Eckler with information on past expenses and current service provider budgets in the near term and consulted with them on anticipated expenses in future years.

7. HIV PROGRAM AND RELATED ASSUMPTIONS

72. The HIV Program established under the Settlement Agreement provides for:

(a) payment of up to 240 payments of $240,000 (not indexed) to approved persons secondarily infected with HIV; and

(b) payment of administrative expenses of up to $2 million dollars.

The HIV Program has no claims deadline.

73. A total of 89 claims have been paid under the HIV Program, two of which have been paid since the 2010 sufficiency assessment.

74. Seven claims are currently registered under the HIV Program, including three claims which have been in process for a number of years and three registrants who have not submitted their completed claims package.

75. A separate budget for expenses relating to the HIV Program is no longer maintained. Any costs associated with administering the HIV Program are covered by the expenses budgeted for the Plans.

76. For the 2013 financial sufficiency assessment, the Joint Committee instructed Eckler to assume:

(a) five additional HIV Program payments, each in the amount of $240,000, occurring every third year starting in 2014; and

(b) that no additional administrative expenses will be paid relating to the HIV Program.

8. OUTCOME OF THE 2013 FINANCIAL SUFFICIENCY ASSESSMENT

77. Although the Eckler actuarial model and the Morneau actuarial model are different in structure and in approach, the actuaries have agreed on the development of the major assumptions and used the same medical model. The Joint Committee understands the differences in results of the actuarial models are very small and that both conclude that the assets exceed the liabilities, that a buffer is appropriate, and that after the buffer the assets still exceed the liabilities.

APPENDIX A

1986-1990 HEPATITIS C SETTLEMENT AGREEMENT

2010 FINANCIAL SUFFICIENCY REVIEW

JOINT SUMMARY OF THE JOINT COMMITTEE AND CANADA

1. Section 10.01(1)(i) of the 1986-1990 Hepatitis C Settlement Agreement (the "Agreement") requires that an application be made every three years to assess the financial sufficiency of the Trust Fund.

2. To date, in each of the preceding triennial fund sufficiency hearings, the Courts have issued orders that the Trust Fund is financially sufficient.

3. The assets and liabilities pertaining to the Agreement were assessed by actuaries for the Joint Committee (by Eckler Ltd.) and for Canada (by Morneau Shepell) as at December 31, 2010.

4. Originally, the parties anticipated that an application would be made to the Courts in 2012 to ascertain the range of any surplus that could be allocated pursuant to the provisions of the orders issued by the Courts at the time the original settlement terms were approved by the Courts.

5. Several issues have arisen which makes the identification of a any surplus for allocation problematic. Some of these larger issues are as follows:

   (a) the difference between the medical model's treatment of HCV death causation and the administrative treatment of that issue. This issue ("Excess HCV Death Causation") over the probable lifetime of the Plans has a probable adverse impact on the Trust Fund by increasing liabilities by $91 million (Eckler Ltd.) to $133 million (Morneau Shepell);

   (b) subsequent to the Eckler Report and during the preparation of the Morneau Report, protocols were proposed pertaining class members who first attempted to make claims after the June 30, 2010 first claims deadline (loosely described as "Late Claims"). Two of these protocols were approved by the Courts without any objection by the FPT Governments and the third of these protocols will be the subject of an application to the Courts. The liabilities associated with these three protocols have been actuarially assessed by Eckler Ltd. at $90 million;

   (c) in the last several months new drugs are entering the field of HCV treatment and the first indications are that these drugs could have a very powerful curative effect for those HCV sufferers who are medically eligible to be prescribed them. These drugs are expensive (approximately $45,000 for a regimen of three months treatment) but if a substantial number of Class Members are cured, these drugs could have a very significant impact of reducing future liabilities. At

the same time, costs related to compensation of uninsured medication will increase to the extent the drugs are not covered by the provincial drug plans;

(d) there are different approaches to incorporating disease progression into the actuarial models employed by Eckler Ltd. and Morneau Shepell. The difference between the approaches is in the range of $25 million to $125 million;

(e) there are substantial differences of opinion between Eckler Ltd. and Morneau Shepell pertaining to margins for adverse deviation and provisions for adverse deviation ("MfAd" and "PfAD"). The difference in liabilities between these approaches is cumulatively in excess of $100 million; and

(f) there are substantial differences of opinion between Eckler Ltd. and Morneau Shepell pertaining to the approach to calculating a buffer and the quantum of the buffer before any suplus can be identified for allocation. These differences in buffer assessment and calculation are approximately $70-$85 million, subject to the resolution of the Late Claims issue.

6. It is proposed by the Joint Committee and Canada that these differences be ironed out as much as possible by the parties and their respective actuaries before any application is brought to identify any surplus available for allocation and before any application is brought to allocate any surplus. At this time, the parties propose to obtain the same order that the Courts have issued to date, namely, that the Trust Fund is financially sufficient.

APPENDIX B
RECONCILIATION OF PAYMENTS UNDER THE 1986-1990 TRANSFUSED HCV PLAN 2000 - 2013

Type of Payment	1999 Amount	Paid 2000-2010	Paid 2011	Paid 2012	Paid 2013	Total Paid 2011-2013	Total Paid 2000-2013
4.01(1)(a) Level 1 Fixed Payment	$10,000	$39,813,122.07[1]	$826,535.42	$249,023.12	$573,490.57	$1,649,049.11	$41,462,171.18
4.01(1)(b) Level 2 Fixed Payment[2]	$15,000/$20,000	$55,173,442.91	$1,172,469.62	$471,833.10	$986,937.26	$2,631,239.98	$57,804,682.89
4.01(1)(b) Level 2 Holdback[3]	$5,000	$10,685,054.70	Nil	Nil	Nil	Nil	$10,685,054.70
4.01(1)(c) Level 3 Fixed Payment	$30,000	$56,182,436.97	$1,491,075.69	$1,218,902.33	$1,800,494.10	$4,510,472.12	$60,692,909.09
4.01(1)(d) Level 5 Fixed Payment	$65,000	$46,601,787.28	$2,485,126.20	$1,192,689.40	$1,733,809.00	$5,411,624.60	$52,013,411.88
4.01(1)(e) Level 6 Fixed Payment	$100,000	$46,060,311.71	$3,186,059.25	$1,703,841.88	$1,467,069.12	$6,356,970.25	$52,417,281.96
4.02 Loss of Income[4]	N/A	$37,852,663.93	$3,319,728.17	$2,807,732.66	$3,002,437.88	$9,129,898.71	$46,982,562.64
4.03 Loss of Services[5]	$12/hour to $240/week	$49,237,672.56	$3,976,365.52	$5,289,620.92	$4,268,156.57	$13,534,143.01	$62,771,815.57
4.04 Cost of Care	$50,000	$9,857,619.57	$910,575.48	$1,119,560.90	$1,806,961.29	$3,837,097.67	$13,694,717.24
4.05 HCV Drug Therapy per month	$1,000	$11,248,982.92	$526,335.46	$398,437.60	$688,189.20	$1,612,962.26	$12,861,945.18
4.06 Uninsured Treatment & Medication	N/A	$3,438,314.35	$188,335.04	$354,754.20	$376,152.96	$919,242.20	$4,357,556.55
4.07 Out of Pockets	N/A	$3,883,179.14	$271,018.99	$221,372.41	$313,582.99	$805,974.39	$4,689,153.53
5.01(1) DB9 Funeral	$5,000	$549,864.92	$21,699.06	Nil	Nil	$21,699.06	$571,563.98
5.01(1) DB9 Estate	$50,000	$4,999,897.03	$127,442.38	Nil	$66,684.96	$194,127.34	$5,194,024.37
5.01(2) DB9 Option	$120,000	$11,544,957.72[6]	$305,861.81	Nil	Nil	$305,861.81	$11,850,819.53
5.02(1) DA9 Funeral	$5,000	$1,454,806.95	$118,044.99	$55,787.88	$64,181.45	$238,014.32	$1,692,821.27
6.01(1) Loss of Support[7]	N/A	$9,131,721.28	$1,031,032.35	$1,102,432.86	$721,935.74	$2,855,400.95	$11,987,122.23
6.01(2) Loss of Services[7]	$12/hour to $240/week	$29,565,064.61	$3,302,679.24	$3,443,554, 85	$3,258,740.55	$10,004,974.64	$39,570,039.25
6.02(a) DB9 FM- Spouse	$25,000	$2,374,307.16	$63,721.18	Nil	$33,342.48	$97,063.66	$2,471,370.82
6.02(b) DB9 FM-Child < 21	$15,000	$512,582.85	Nil	Nil	Nil	Nil	$512,582.85
6.02(c), (d), (e) DB9 FM- Child >21, Sibling, Parent	$5,000	$2,427,399.00	$38,232.72	$32,766.20	$13,337.00	$84,335.92	$2,511,734.92
6.02(f), (g) DB9 FM – Grandparent, Grandchild	$500	$181,494.55	$2,548.84	$11,140.44	$666.85	$14,356.13	$195,850.68
6.02(a) DA9 FM-Spouse	$25,000	$7,437,111.75	$573,490.62	$393,194.28	$333,424.80	$1,300,109.70	$8,737,221.45
6.02(b) DA9 FM-Child<21	$15,000	$761,168.00	$38,232.72	$39,319.42	Nil	$77,552.14	$838,720.14
6.02(c),(d),(e) DA9 FM-Child>21, Sibling, Parent	$5,000	$10,517,272.52[8]	$707,201.04	$524,259.20	$533,480.00	$1,764,940.24	$12,282,212.76
6.02(f),(g) DA9 FM-Grandparent, Grandchild	$500	$886,500.22	$60,534.95	$38,663.88	$49,346.90	$148,545.73	$1,035,045.95
Total Paid		**$452,378,736.67[9]**	**$24,744,346.74**	**$20,668,887.53**	**$22,092,421.67**	**$67,505,655.94**	**$519,884,392.61**

Subtotal Reconciliation	**$519,884,392.61**	
Less	**1,918,048.75**	**(Adjustments and credits for other provincial HCV programs)**
Total Reconciliation	**$517,966,343.86[10]**	

[1] A payment of $10,904.06 originally shown as made in 2003 was not actually paid until 2011 (Claim No. 170).

[2] Level 2 Fixed Payments were $15,000 until approximately September 2002 when the Courts ordered the Level 2 Holdback removed and the Fixed Payments increased to $20,000.

[3] The Level 2 Holdback (plus interest) was paid to those persons who had received a Level 2 Fixed Payment while the Holdback was in place.

[4] Loss of Income payments under this provision are for alive HCV Infected Persons and for the Estates of HCV Infected Persons who died after January 1, 1999 ("DA9s") where a loss of income incurred prior to death had not already been paid to the HCV Infected Person. Loss of Income payments have been made covering income losses to December 31, 2012. The 2013 payments will be calculated when the claimants provide their 2013 income tax information to the Administrator. These payments also include a Loss of Income payment in the amount of $55,677.26 mistakenly made in 2002 to the Estate of an HCV Infected Person who died before January 1, 1999 ("DB9") (Claim No.1200332). The Fund was repaid for the payment made in error. Because Dependants of DB9s are entitled to claim Loss of Support provided the death was caused by HCV and because the Loss of Income/Loss of Support software computes a Loss of Income for the actual year of death and thereafter converts to a Loss of Support claim for subsequent years, these payments include Loss of Income payments to Estates of DB9s for the year of death in the amount of $474,365.63 including holdbacks where appropriate (Claim Nos.136, 224, 246, 1157, 3007, 13000, 15245, 1000101, 1000125, 1000621, 1200081, 1200299, 1200332, 1400153, 1400453, 1401009, 1401534, 1402675).

[5] Loss of Services payments under this provision are for alive HCV Infected Persons and for the Estates of DA9s where a loss of services was incurred prior to death. Loss of Services payments have been made to December 31, 2012. The 2013 payments are currently being assessed. These payments also include Loss of Services payments in the amount of $419,610.99 mistakenly made to the Estates of DB9s in the years 2001 and 2002 (Claim Nos.941, 1354, 1000377, 1000575, 1200062, 1200332, 1401370, 1401567, 1401772). The Fund was repaid for these payments made in error.

[6] These payments include $128,745.39 paid to a Sibling in 2002 although not properly coded (Claim No. 5129) and payments of $260,898.98 to Family Members although coded as Estate files (Claim Nos. 1400325, 1401625, 1402447, 1402608, 1402644).

[7] Loss of Support/Services payments under these provisions are for Dependants who have suffered a Loss of Support/Services following the death of an HCV Infected Person (either DB9 or DA9) provided the death was caused by HCV. Payments have been made to December 31, 2012. The 2013 payments are currently being assessed.

[8] A payment of $6,267.84 originally shown as made in 2010 was not actually paid until 2011 (Claim No. 19290).

[9] This total has been adjusted to reflect the timing of the payments discussed in footnotes 1 and 8.

[10] This payment reconciliation equals the adjusted totals calculated from the Access and Excel databases provided by the Administrator as at December 31, 2013.

RECONCILIATION OF PAYMENTS UNDER THE 1986 – 1990 HEMOPHILIAC HCV PLAN 2000 - 2013

Type of Payment	1999 Amount	Paid 2000-2010	Paid 2011	Paid 2012	Paid 2013	TOTAL Paid 2011-2013	TOTAL Paid 2000-2013
4.01(1)(a) Level 1 Fixed Payment	$10,000	$10,817,576.87	$50,976.96	$13,106.48	$13,336.99	$77,420.43	$10,894,997.30
4.01(1)(b) Level 2 Fixed Payment[1]	$15,000 /$20,000	$14,761,073.21	$50,976.94	$26,212.95	$26,673.98	$103,863.87	$14,864,937.08
4.01(1)(b) Level 2 Holdback[2]	$5,000	$4,200,786.80	Nil	Nil	Nil	Nil	$4,200,786.80
4.01(1)(c) Level 3 Fixed Payment	$30,000	$21,064,307.16	$191,163.55	$117,958.29	$160,043.92	$469,165.76	$21,533,472.92
4.01(1)(d) Level 5 Fixed Payment	$65,000	$17,257,324.94	$745,537.86	$340,768.40	$433,452.25	$1,519,758.51	$18,777,083.45
4.01(1)(e) Level 6 Fixed Payment	$100,000	$14,731,971.37	$892,096.59	$786,388.56	$533,479.68	$2,211,964.83	$16,943,936.20
4.02 Loss of Income[3]	N/A	$30,692,216.18	$3,263,961.91	$3,390,686.28	$3,637,546.05	$10,292,194.24	$40,984,410.42
4.03(2) Loss of Services[4]	$12/ hour to $240/week	$24,581,712.18	$2,175,562.99	$1,753,208.17	$1,921,041.64	$5,849,812.80	$30,431,524.98
4.04(a) Cost of Care	$50,000	$2,882,269.17	$593,140.27	$705,490.52	$732,463.08	$2,031,093.87	$4,913,363.04
4.05 HCV Drug Therapy per month	$1,000	$4,684,380.14	$175,869.96	$162,520.60	$385,439.30	$723,829.86	$5,408,210.00
4.06 Uninsured Treatment and Medication	N/A	$2,255,818.43	$206,236.31	$290,825.48	$294,289.09	$791,350.88	$3,047,169.31
4.07 Out of Pockets	N/A	$2,657,634.00	$203,264.81	$164,206.47	$184,049.47	$551,520.75	$3,209,154.75
4.08(2) Alive HIV Co-Infected Option[5]	$50,000	$2,085,299.18	$63,721.19	Nil	$133,369.92	$197,091.11	$2,282,390.29
5.01(1) DB9 Funeral	$5,000	$509,878.37	Nil	Nil	Nil	Nil	$509,878.37
5.01(1) DB9 Estate	$50,000	$4,584,482.63	Nil	Nil	Nil	Nil	$4,584,482.63
5.01(2) DB9 Option	$120,000	$10,383,551.41[6]	Nil	Nil	Nil	Nil	$10,383,551.41
5.01(4) DB9 HIV Co-infected option	$72,000	$10,329,680.60[7]	$91,758.49	Nil	Nil	$91,758.49	$10,421,439.09
5.02(1) DA9 Funeral	$5,000	$439,987.03	$18,614.33	$36,845.91	$34,388.61	$89,848.85	$529,835.88
6.01(1) Loss of Support[8]	N/A	$14,794,972.22	$2,091,581.76	$1,367,877.13	$1,318,738.84	$4,778,197.73	$19,573,169.95
6.01(2) Loss of Services[8]	$12/hour to $240/week	$14,679,525.76	$1,601,188.11	$1,325,358.91	$1,426,296.03	$4,352,843.05	$19,032,368.81
6.02(a) DB9 - FM- Spouse	$25,000	2,273,680.68	Nil	Nil	$33,342.48	$33,342.48	$2,307,023.16
6.02(b) DB9 - FM-Child < 21	$15,000	$1,592,830.74	Nil	Nil	Nil	Nil	$1,592,830.74
6.02(c), (d), (e) DB9 - FM-Child >21, Sibling, Parent	$5,000	$1,881,333.01	Nil	Nil	Nil	Nil	$1,881,333.01
6.02(f), (g) DB9 - FM – Grandparent or Grandchild	$500	$22,849.58	Nil	Nil	Nil	Nil	$22,849.58
6.02(a) DA9 – FM – Spouse	$25,000	$1,946,446.18	$127,442.36	$131,064.76	$166,712.40[9]	$425,219.52[9]	$2,371,665.70
6.02(b) DA9 – FM – Child < 21	$15,000	$657,001.98	$19,116.36	$78,638.84	$80,021.96	$177,777.16	$834,779.14
6.02(c),(d),(e) DA9 – FM – Child >21, Sibling, Parent	$5,000	$2,466,007.67	$203,907.84	$301,449.04	$206,723.50	$712,080.38	$3,178,088.05
6.02(f),(g) DA9 – FM Grandparent or Grandchild	$500	$67,494.73	$13,381.41	$19,659.60	$5,334.80	$38,375.81	$105,870.54
Total Paid		**$219,302,092.22**	**$12,779,500.00**	**$11,012,266.39**	**$11,726,743.99**	**$35,518,510.38**	**$254,820,602.60**

Subtotal Reconciliation	**$254,820,602.60**	
Less	**1,157,116.99**	**(Adjustments and credits for other provincial HCV programs)**
Total Reconciliation	**$253,663,485.61[10]**	

[1] Level 2 Fixed Payments were $15,000 until approximately September 2002 when the Courts ordered the Holdback removed and the Fixed Payment increased to $20,000.

[2] The Level 2 Holdback (plus interest) was paid to those persons who had received a Level 2 Fixed Payment while the Holdback was in place.

[3] Loss of Income payments under this provision are for alive HCV Infected Persons and the Estates of HCV Infected Persons who died after January 1, 1999 ("DA9s") where a loss of income incurred prior to death had not already been paid to the HCV Infected Person. Loss of Income payments have been made covering income losses to December 31, 2012. The 2013 payments will be calculated when the claimants provide their 2013 income tax information to the Administrator. Because Dependants of DB9s are entitled to claim Loss of Support provided the death was caused by HCV and because the Loss of Income/Loss of Support software computes a Loss of Income for the actual year of death and thereafter converts the claim to a Loss of Support claim, these payments include Loss of Income payments to Estates of DB9s for the year of death in the amount of $171,664.01 including holdback where appropriate (Claim Nos. 30, 423, 3567, 3677, 5243, 5789, 12180, 1100471, 1100589 and 1100756).

[4] Loss of Services payments under this provision are for alive HCV Infected Persons and the Estates of DA9s where a loss of services was incurred prior to death. Loss of Services payments have been made to December 31, 2012. The 2013 payments are currently being assessed. These payments also include Loss of Services payments in the amount of $312,580.26 mistakenly made to the Estates of DB9s in the years 2001 and 2002 (Claim Nos. 53, 1456, 3920, 4618, 1100139, 1100183, 1100447, 1402726). The Fund was repaid for these payments made in error.

[5] Some HCV Infected Persons did not wish to make an HIV Co-infected election right away. Claimants approved at Level 1 or 2 were paid the Fixed Payment amounts for those levels while they considered the HIV Co-Infected election. If a claimant later made this election, the claimant was paid the difference between the Fixed Payments already received and the $50,000 (indexed) payment available under the HIV Co-Infected Option.

[6] These payments include $229,132.84 coded as Estate payments but paid to Family Members (Claim Nos. 1100345, 1100543, 1100664, 1400511).

[7] These payments include $339,940.94 coded as Estate payments but paid to Family Members (Claim Nos. 432, 2123, 2164, 2252, 2813, 1100378, 1100438, 1100528, 1100757).

[8] Loss of Support/Services payments under these provisions are for Dependants who have suffered a Loss of Support/Services following the death of an HCV Infected Person (either DB9 or DA9) provided the death was caused by HCV. Payments have been made to December 31, 2012. The 2013 payments are currently being assessed.

[9] These payments include $33,342.48 paid to a Spouse in 2013 although not properly coded (Claim No. 20711).

[10] This payment reconciliation equals the adjusted totals calculated from the Access and the Excel databases provided by the Administrator as at December 31, 2013.

TAB 3

Court File No. 98-CV-141369 CP00

ONTARIO
SUPERIOR COURT OF JUSTICE

B E T W E E N:

DIANNA LOUISE PARSONS, MICHAEL HERBERT CRUICKSHANKS, DAVID TULL, MARTIN HENRY GRIFFEN, ANNA KARDISH, ELSIE KOTYK, Executrix of the Estate of Harry Kotyk, deceased and ELSIE KOTYK, personally

Plaintiffs

and

THE CANADIAN RED CROSS SOCIETY, HER MAJESTY THE QUEEN IN RIGHT OF ONTARIO and THE ATTORNEY GENERAL OF CANADA

Defendants

and

HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF ALBERTA
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF SASKATCHEWAN,
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF MANITOBA,
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF NEW BRUNSWICK
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF PRINCE EDWARD ISLAND,
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF NOVA SCOTIA
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF NEWFOUNDLAND,
THE GOVERNMENT OF THE NORTHWEST TERRITORIES,
THE GOVERNMENT OF NUNAVUT and THE GOVERNMENT OF THE YUKON TERRITORY

Intervenors

Proceeding under the *Class Proceedings Act, 1992*

Court File No. 98-CV-146405

B E T W E E N:

JAMES KREPPNER, BARRY ISAAC, NORMAN LANDRY, as Executor of the Estate of the late SERGE LANDRY, PETER FELSING, DONALD MILLIGAN, ALLAN GRUHLKE, JIM LOVE and PAULINE FOURNIER as Executrix of the Estate of the late PIERRE FOURNIER

Plaintiffs

and

THE CANADIAN RED CROSS SOCIETY, THE ATTORNEY GENERAL OF CANADA and HER MAJESTY THE QUEEN IN RIGHT OF ONTARIO

Defendants

and

HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF ALBERTA,
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF SASKATCHEWAN,
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF MANITOBA,
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF NEW BRUNSWICK,
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF PRINCE EDWARD ISLAND
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF NOVA SCOTIA
HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF NEWFOUNDLAND,
THE GOVERNMENT OF THE NORTHWEST TERRITORIES,
THE GOVERNMENT OF NUNAVUT AND THE GOVERNMENT OF THE YUKON TERRITORY

Intervenors

Proceeding under the *Class Proceedings Act, 1992*

AFFIDAVIT OF MURRAY KRAHN
(sworn March 16, 2015)

I, Murray Krahn, MD MSc FRCPC, of the Department of Medicine and Faculty of Pharmacy, University of Toronto, located at The Toronto General Hospital, EN14-207, 200 Elizabeth Street, Toronto, Ontario, M5G 2C4, Canada, MAKE OATH AND SAY:

1. I am Director of the Toronto Health Economics and Technology Assessment Collaborative of the Department of Medicine and Faculty of Pharmacy of the University of Toronto.

2. I am also the senior member of what is known as the medical model working group ("**MMWG**"). While the composition of the MMWG has changed over time, I have been involved since its inception in 2002. The MMWG has provided medical modeling expert advice and reports to the Joint Committee of the 1986-1990 Hepatitis Settlement Agreement for the purposes of the triennial fund sufficiency reviews under that settlement agreement. For the most recent financial sufficiency review triggered at December 31, 2013, the MMWG prepared a report entitled "Estimating the Prognosis of Canadians Infected with the Hepatitis C Virus Through The Blood Supply, 1986-1990 - The Fifth Revision of Hepatitis C Prognostic Model Based on the Post-Transfusion Hepatitis C Compensation Claimant Cohort". A copy of that report is attached as Exhibit "A".

3. The other members of the MMWG who participated in the preparation of this report are Dr. Wendong Chen of the Toronto Health Economics and Technology Assessment Collaborative of the Department of Medicine and Faculty of Pharmacy of the University of Toronto, Dr. Qilong Yi of Canadian Blood Services and the University of Ottawa Faculty of Medicine, Epidemiology and Community Medicine and Dr. William Wong of the Toronto Health Economics and Technology Assessment Collaborative of the Department of Medicine and Faculty of Pharmacy of the University of Toronto. Dr. Wendong Chen did significant portions of the data review, medical literature review and rewriting of the report for this revision. Dr. Yi did significant portions of the data analysis and review. I oversaw the MMWG and reviewed the report before it was issued.

4. I certify that the members of the MMWG are aware that our duties are:

(a) to provide opinion evidence that is fair, objective and non-partisan and related only to matters within our area of expertise; and

(b) to assist the courts and provide such additional assistance as the courts may reasonably require to determine a matter in issue.

5. Members of the MMWG are aware that the foregoing duties prevail over any obligation we may owe to any party on whose behalf we are engaged and we are aware that we are not to be advocates for any party. I confirm that the report conforms with the above-noted duties. I further confirm that if called upon to give oral or written testimony, I or the other members of the MMWG will give such testimony in conformity with these duties.

6. My curriculum vitae is attached as Exhibit "B". The curricula vitae of Drs. Chen, Yi and Wong are attached, respectively, as Exhibits "C", "D" and "E".

SWORN BEFORE ME at the City of Toronto, in the Province of Ontario, on March 16, 2015.

Commissioner for Taking Affidavits

Murray Krahn

This is Exhibit "A" referred to in the
Affidavit of Murray Krahn
sworn before me,
this 16th day of March, 2015

A COMMISSIONER FOR TAKING AFFIDAVITS

Estimating the Prognosis of Canadians Infected With the Hepatitis C Virus through the Blood Supply, 1986-1990

The Fifth Revision of Hepatitis C Prognostic Model Based on the Post-Transfusion Hepatitis C Compensation Claimant Cohort

September 2014

Wendong Chen MD PhD
Qilong Yi MD MSc PhD
William Wong PhD
Murray Krahn MD MSc FRCPC

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List of Abbreviations

AE, adverse event

CASL, Canadian Association for the Study of the Liver

CHC, chronic hepatitis C

CI, confidence interval

HCC, hepatocellular carcinoma

HCV, hepatitis C virus

HIV, human immunodeficiency virus

MMLE, Markov maximum likelihood estimation

PEG-IFN, pegylated interferon

RBV, ribavirin

RNA, ribonucleic acid

RR, risk ratio/relative risk

SD, standard deviation

SE, standard error

SVC, spontaneous viral clearance

SVR, sustained viral response

US FDA, United States Food and Drug Administration

MMWG, medical model working group

Executive Summary

The hepatitis C virus (HCV) is one of the most common causes of liver disease in Canada. Prior to the availability of serologic testing for the presence of hepatitis C in 1990, blood transfusion and the use of blood products were the main sources of HCV infection. Between 1986 and 1990, surrogate marker testing was employed to screen blood donors in the United States to prevent the transmission of viral hepatitis in the general population. However, this practice was not conducted in Canada and as a result many Canadians likely acquired HCV through blood transfusion or blood products during this timeframe. On March 27, 1998 Canadian federal, provincial, and territorial governments announced an offer of financial assistance to individuals who acquired HCV through the blood system between January 1, 1986 and July 1, 1990. In 1999, court orders in British Columbia, Ontario and Québec were obtained approving a settlement agreement which established a compensation fund of approximately $1.1 billion for those Canadians who acquired HCV through blood transfusion or blood products between January 1, 1986 and July 1, 1990.

In order to assist with planning for future compensation, a working group was formed in November of 1998 to provide the best possible estimates for the prognosis of transfusion-acquired HCV claimants who met compensation requirements. A Markov state-transition model, developed to simulate the long-term liver-related health outcomes of compensation claimants, provided data needed for an actuarial model used in future compensation fund estimations. The compensation agreement between governments and plaintiffs requires fund estimates to be reviewed every three years as the accuracy of previous predictions may be substantially affected by newly approved compensation claimants, new antiviral treatments, and updates in the natural

history of HCV. The original HCV prognostic model which simulated approved compensation claimants has undergone a total of five subsequent revisions including the current iteration documented in this current report. The first revision was conducted in 2002 by a working group consisting of five members (Murray Krahn, Jenny Heathcote, Linda Scully, Peter Wang, and Qilong Yi). That revision explicitly linked compensation levels with the stage of liver fibrosis in 2,466 approved compensation claimants. The second revision was conducted in 2005 and one new member (Morris Sherman) was added to the working group. The second revision utilized Markov maximum likelihood estimation (MMLE) to determine stage-specific transition probabilities that were applied to the HCV prognostic model to predict liver-related complications and mortality in 4,530 approved claimants. Also included in the second revision of the HCV prognostic model was a survey of treatment patterns in Canadian hepatologists. That survey incorporated treatment data related to use of the combination of pegylated interferon (PEG-IFN) and ribavirin (RBV) therapy which has since replaced conventional interferon-based therapies. The third revision was conducted in 2007 by a working group consisting of three members (Murray Krahn, Qilong Yi, and Hla-Hla Thein). That revision primarily updated baseline information of 5,004 approved compensation claimants and included a more comprehensive meta-analysis to estimate stage-specific transition probabilities. The fourth revision was conducted in 2010 by the same working group as the third revision. That revision maintained the same objectives as before and modified the model structure to include information regarding the transition from hepatocellular carcinoma (HCC) to liver transplantation as well as adopting treatment patterns derived from the claimant cohort.

Since the fourth revision, several new and highly effective antiviral regimens have been developed, some of which are currently available in Canada. Because the new antiviral regimens provide a cure rate of between 70% and 90%, treatment patterns are expected to change substantially and will likely have a significant impact on the prognosis of compensation claimants. Thus, the fifth revision of the HCV prognostic model was requested and a working group consisting of four members (Wendong Chen, Qilong Yi, William Wong, and Murray Krahn) was established in the fall of 2013 to undertake the current revision. The current revision incorporates the result of an on-line survey study of physicians treating HCV patients in Ontario to estimate future treatment patterns with new antiviral regimens, maximizes the use of claimant cohort data to estimate model variables, and revises model predictions for the surviving compensation claimants as of August 31, 2013.

According to the collected claims data as of August 31, 2013, 3,832 surviving compensation claimants, including 884 hemophilics and 2,948 non-hemophilics, were identified to create the claimant cohort for model simulations. The treatment pattern survey attempted to elicit choices for existing standard antiviral therapy, PEG-IFN/RBV, as well as three new types of antiviral regimens (PEG-IFN/RBV-based triple therapy with boceprevir, telaprevir, or faldaprevir; sofosbuvir-based doublets with daclatasvir, ledipasvir or simeprevir; and three direct-acting antiviral regimens plus RBV) in claimants stratified by their status of previous treatment and human immunodeficiency virus (HIV) co-infection. Systematic reviews of randomized clinical trials assessing the three new antiviral regimens were conducted to estimate their treatment efficacy and safety that are needed when developing treatment pattern survey and revising HCV prognostic model. The 1986-1990 HCV Claim Center also conducted a survey of previously

treated claimants to estimate sustained viral response (SVR), the indicator for viral clearance, after previous treatments in current surviving claimants. In order to further improve internal validity of model variables, the current revision has used claims data as the primary data source to estimate the initial distribution of fibrosis stages, natural history of HCV, and non-liver-related mortality for the revised HCV prognostic model. The revised HCV prognostic model has been validated by comparing predicted and observed cumulative rates of liver-related complications and mortality from 2003 to 2013 in treatment-naïve non-hemophilic claimants (decompensated cirrhosis: 6.1% vs. 7.4%; HCC: 1.9% vs. 1.8%; liver transplantation: 0.7% vs. 0.7%; liver-related mortality: 4.1% vs. 7.4%).

By running 50,000 iterations in the revised HCV prognostic model to simulate surviving claimants as of August 31, 2013, the cumulative rates of decompensated cirrhosis, HCC, liver transplantation, and liver-related mortality in the surviving claimants by 2070 are predicted to be 12.1%, 4.3%, 0.9%, and 14.7%, respectively. Further comparisons of model outputs for claimants stratified by their hemophilic status predict that hemophilic claimants will have doubled cumulative rates of liver-related complications (decompensated cirrhosis: 20.7% vs. 9.5%; HCC: 7.3% vs. 3.4%) and mortality (24.9% vs. 11.6%) by 2070 when compared with non-hemophilic claimants. Because the new antiviral regimens are likely to cure most claimants, the long-term prognosis of claimants would be mainly determined by the initial proportions of cirrhosis and liver-related complications. The model outputs of claimants stratified by age strata predict that hemophilic claimants under the age of 80 years will have doubled lifetime cumulative rates of liver-related complications and mortality mainly due to higher initial proportions of cirrhosis.

The current revision has performed sensitivity analyses to assess the impact of major revisions on model predictions. The updated treatment patterns in the current revision are found to reduce cumulative rates of liver-related complications and mortality by half in non-hemophilic claimants when compared to the treatment patterns applied in the fourth revision that was conducted in 2010. Except that the updated lifetime risk of liver transplantation is substantially reduced (0.9% vs. 3.2%), the updated model predictions are not sensitive to changing data source used to estimate model variables for the prognosis of cirrhosis and non-liver-related mortality. Finally, the impact on overall uncertainty associated with model variables on model outputs are explored using two-order Monte Carlo simulation approach and presented with the 95% confidence intervals of their cumulative rates of liver-related complications in 2070 (decompensated cirrhosis: 8.7% to 15.5%; HCC: 3.1% to 5.5%) and mortality (11.0% to 18.4%).

1. Background

HCV is identified as one of the most common causes of liver disease in Canada. Recent studies suggest that the prevalence of HCV infection in the Canadian population is about 0.8 % with an estimated 250,000 to 300,000 Canadians living with HCV.[1-3] Blood transfusion and blood products were the main sources of HCV infection prior to 1990 when serological testing methods came into use for HCV screening in blood donors.[4] Surrogate marker testing was employed to screen blood donors in the United States to reduce the risk of non-A non-B viral hepatitis in the general population from 1986 to 1990 before HCV was discovered.[5] However, surrogate marker testing was not employed in most Canadian jurisdictions[6] and as a result many individuals in Canada likely acquired HCV via blood transfusion or blood products during this four-year period.

On March 27, 1998, federal, provincial, and territorial governments announced an offer of financial assistance to individuals who acquired HCV either directly or indirectly through the blood system between January 1, 1986 and July 1, 1990. Up to $1.1 billion was to be made available to compensate individuals which included hemophilics, secondarily infected HCV claimants, those with HIV who became co-infected with HCV, as well as any others with an HCV infection acquired through blood transfusion during the period in question. In order to settle on an appropriate compensation scheme, the federal and provincial governments as well as the claimants reviewed a number of models of the natural history of HCV. Because of disagreement regarding the natural history of this disease, the Canadian Association for the Study of the Liver (CASL), an impartial body with no stake in the outcome of compensation negotiations, was approached by both stakeholders to produce the best available model simulating the natural history of HCV. In November of 1998, CASL met with individuals with

expertise in hepatitis C epidemiology, hepatitis C clinical care, and decision modeling to assist in the construction of a prognostic model for HCV. These meetings led to the formation of an ad-hoc working group comprised of Drs. Murray Krahn, Jenny Heathcote, Linda Scully, Leonard Seeff and John Wong. This working group evaluated and accepted the structural validity of a simplified version of the Bennet/Wong Markov chain model.[7,8] The working group reviewed each parameter in the model and updated several key parameters, including the excess mortality rate and the incidence rates of cirrhosis, HCC and decompensated cirrhosis, by systematic review of relevant literature. Confidence intervals (CI) and/or plausible ranges were also estimated for key model parameters. With this revised model, the cumulative probability of acquiring cirrhosis, decompensated liver disease, and liver-related death were predicted using baseline characteristics of compensation claimants. For the transfusion cohort as a whole, the 20-year and lifetime cumulative probability of developing liver cirrhosis was 13.4% and 24.9%, respectively. Similarly, the 20-year and cumulative lifetime probability of dying from HCV-related liver disease was 2.5% and 12.3%, respectively. However, the rapid development of HCV treatment options coupled with accumulated clinical information on the natural history of HCV within the compensation cohort have led to a clear demonstration for the need to regularly revise model predictions of long-term prognosis in approved compensation claimants. Doing so will ensure the sufficiency of compensation funds in the future. As well, the compensation agreement between governments and plaintiffs calls for an estimate of the sufficiency of the fund every three years. Four revisions have been conducted thus far (in 2002, 2005, 2007, and 2010) by taking into account the updates on treatment patterns and the natural history of HCV in the approved compensation claimants.

The first revision was conducted in 2002 by a working group consisting of three members from the original research team (Drs. Jenny Heathcote, Linda Scully and Murray Krahn) along with two new members, Dr. Peter Wang (Epidemiology) and Dr. Qilong Yi (Biostatistics). This revision modified the original prognostic model as a fibrosis stage-based Markov model and updated transition probabilities between fibrosis stages using literature-based evidence. This updated Markov model was used to predict the long-term prognosis of compensation claimants over their remaining lifetimes in accordance with HCV severity levels as stipulated in the compensation package.

The second revision of the HCV prognostic model was conducted in 2005. This revision included an updated literature review which was used to estimate transition probabilities and integrated the most updated claims data at that time for model predictions. The third revision was conducted in 2007 and retained the objectives of the second revision along with a fine-tuning of methodology in order to obtain more accurate predictions. The working group conducting the third revision included two members from previous revisions (Drs. Murray Krahn and Qilong Yi) and one new member, Dr. Hla-Hla Thein, who joined the team as a consultant and modeling expert. The fourth revision was conducted by the same working members as in the 2007 revision. This revision categorized claimants into different disease stages based on clinical symptoms and results from laboratory tests. As well, the fourth revision added the transition from HCC to liver transplantation and incorporated treatment pattern data derived from the claimant cohort. The antiviral therapy employed in the fourth revision was the combination of PEG-IFN and RBV. This treatment combination was recommended by clinical practice guidelines at the time of revision.[9]

A number of significant advances have been made for treating CHC since the fourth revision. Boceprevir and telaprevir, two molecules which inhibit HCV replication through binding to active sites of HCV non-structural protein,[10,11] were approved by Health Canada in 2011. These two agents increased SVR rate at 24 weeks, the indicator of a clinical cure for HCV,[12] to over 50% when combined with PEG-IFN/RBV in both treatment-naïve[13,14] or previously treated patients[15,16] with viral genotype 1, the most prevalent genotype (about 70%) in Canadian patients with CHC.[17] In December 2013, Health Canada approved two additional antiviral agents, simeprevir (NS3/4A protease inhibitor) [18] and sofosbuvir (the nucleotide analog NS5B polymerase inhibitor).[19] The combination of these two antiviral agents may provide a cure for more than 90% of treatment-naïve or previously treated viral genotype 1 patients. In addition, this regimen has a much better safety profile and only needs 12 weeks treatment time,[20] while PEG-IFN/RBV usually requires 48 weeks for treatment and causes a series of side effects decreasing treatment compliance. Several other protease inhibitors have been also evaluated by phase II or III trials and they are expected to be launched in Canada within the next year or two. For example, current phase II studies have demonstrated that faldaprevir, a potent, once-daily, HCV NS3/4A protein inhibitor, could produce a doubling of antiviral response when combined with PEG-IFN/RBV in treatment-naïve patients.[21] Sofosbuvir-based doublets with ledipasvir (an inhibitor of the hepatitis C virus HCV NS5A protein) [22,23] or daclatasvir (HCV NS5A replication complex inhibitor) [24] could provide a cure for nearly all treatment-naïve or previously treated viral genotype 1 patients within 12 weeks. The combination of the protease inhibitor ABT-450 with ritonavir (ABT-450/r), the NS5A inhibitor ombitasvir, and the nucleoside polymerase

inhibitor dasabuvir, which are direct-acting antiviral agents known as "3D", could cure 96% of treatment-naïve or previously treated viral genotype 1 patients when combined with RBV.[25]

The emergence of highly effective and safe antiviral regimens is expected to have a profound impact on treatment patterns in patients with CHC, potentially resulting in an end to the era of interferon-based treatment for CHC.[26] Even though the abovementioned new antiviral regimens are extremely costly, the reimbursement policy for this compensation claimant cohort could accelerate the uptake of these regimens, dramatically improving the long-term prognosis of current surviving claimants chronically infected with HCV. Thus, a fifth revision of the HCV prognostic model has been requested to estimate future treatment patterns affected by newly launched and upcoming antiviral regimens and revise model outputs of current surviving claimants accordingly. Additionally, previous revisions of the HCV prognostic model were mainly based on literature-derived model variables because the claimant cohort had a relatively small sample size and limited follow-up time. In order to further improve internal validity of model predictions, the current revision has taken the claims data as its data source to estimate model variables for fibrosis progression, prognosis of cirrhosis, and non-liver-related mortality for the purpose of further improving accuracy of model predictions. A working group consisting of two members (Drs. Murray Krahn and Qilong Yi) from previous working groups along with two new members (Drs. Wendong Chen and William Wong) was created to undertake the fifth revision of the HCV prognostic model and model outputs of current surviving compensation claimants as of August 31, 2013. Dr. Wendong Chen has developed the revision plan, led the revision, and prepared this report.

2. Revisions on HCV prognostic model

2.1. Revisions on model structure

The HCV prognostic model used in the fourth revision has been modified to meet the objectives of the current revision. The HCV prognostic model in the current revision remains as a fibrosis stage-based Markov model. The health states in this model include fibrosis stages classified as 0 to 4 (F_0 to F_4), liver-related complications (decompensated cirrhosis, HCC, liver transplantation, and post-transplant), and death that is further classified as liver-related death and non-liver-related death. Liver-related death is defined as death with prior occurrence of any liver-related complications. The current revision also allows fibrosis to progress in one direction ($F_0 \rightarrow F_1 \rightarrow F_2 \rightarrow F_3 \rightarrow F_4$). However, the fibrosis stages prior to compensated cirrhosis are assumed to stop progression once viral clearance is achieved through spontaneous viral clearance (SVC) or SVR after antiviral therapy. Because compensated cirrhosis still progresses to decompensated cirrhosis or HCC at a lower rate even after successful antiviral therapy,[27] the current revision adds the transitions from compensated cirrhosis with viral clearance to decompensated cirrhosis and HCC in the HCV prognostic model. The current revision also keeps the assumptions made in the fourth revision regarding the rare incidences of HCC and SVC associated with fibrosis stages prior to F_4 in the model. A simplified representation of the structure of the revised HCV prognostic model in the current revision is illustrated in *Figure 1*. Potential transitions associated with each health state in the model are also depicted in *Figures 2 to 10*. The current revision used TREEAGE PRO 2013 to construct the HCV prognostic model and run microsimulation analyses to generate model outputs predicting long-term prognosis of surviving compensated claimants.

2.2. Revisions on model variables

The model variables in the HCV prognostic model include initial distribution of health states, updated treatment patterns, treatment efficacy of antiviral regimens, fibrosis progression, prognosis of cirrhosis, and non-liver-related mortality. Because hemophilic claimants are substantially different from non-hemophilic claimants in age, gender, and comorbidities that can strongly affect disease prognosis, the current revision estimates model variables according to the hemophilic status of claimants in order to generate model outputs for hemophilic and non-hemophilic claimants separately.

2.2.1. Initial distribution of health states

The 1986-1990 Hepatitis C Claims Center provided claims data for 5,368 approved claimants as of August 31, 2013. When compared to the approved claimants (n=5,225) in the last revision performed in 2010, the current claimant cohort includes 143 newly approved claimants. The proportion of hemophilia in the approved 5,368 claimants is 25.1%. The hemophilic claimants differ from non-hemophilic claimants regarding the distributions of male gender (88.4% vs. 52.6%, $p<0.001$) and HIV co-infection (30.6% vs. 3.1%, $p<0.001$). Similar differences in male gender and HIV co-infection between hemophilics and non-hemophilics are also observed in the 3,832 surviving compensation claimants (884 hemophilics and 2,948 non-hemophilics). Additionally, surviving hemophilics are about 12 years younger than surviving non-hemophilics (mean age: 49.7 years vs. 61.8 years, $p<0.001$). Unadjusted comparisons of baseline demographic and clinical characteristics between hemophilic and non-hemophilic claimants are summarized in *Table 1*.

According to the collected treatment records of compensation claimants, about a quarter of compensation claimants (n=1,342) were treated previously. Because the previously treated claimants are not followed up for their treatment outcomes, the claims center has conducted a telephone survey to trace the treatment outcomes in those previously treated claimants. Based on the surveyed claimants giving the information on the outcomes of previous antiviral treatments, 273 out of 454 (60%) surveyed claimants achieved SVR after previous antiviral treatments. Non-hemophilic claimants experienced a better treatment response than hemophilic claimants (SVR rate: 61.6% vs. 46.6%, p=0.001) even though the viral genotype distributions in the two groups were highly comparable. The surveyed claimants have similar baseline characteristics as the entire cohort of surviving claimants. For example, the surveyed hemophilic claimants are also associated with much higher proportions of male, HIV co-infection, and advanced disease stages than the surveyed non-hemophilic claimants (*Table 2.1*). These differences explain the poorer treatment response associated with the surveyed hemophilic claimants.[28,29,30] The comparisons of the baseline characteristics between surveyed hemophilic and non-hemophilic claimants in treatment responders and non-responders (*Table 2.2 and 2.3*) further suggest that the younger age and higher proportions of male and HIV co-infection associated with surveyed hemophilics are not affected by treatment response. However, the proportion of advanced compensation level is significantly higher in the surveyed hemophilic claimants with SVR (7.3% vs. 1.4%, p=0.032). Given that treatment outcomes are not tracked in the claim cohort data, the patterns of baseline characteristics found in the surveyed claimants stratified by SVR status and hemophilic status are used to estimate initial distribution of compensation levels in previously treated claimants. The initial distribution of compensation levels in the treatment-naïve claimants stratified by the status of hemophilia and HIV co-infection is then estimated directly from claims data (*Table 3*).

Because the HCV prognostic model is a fibrosis stage-based state transition (i.e. Markov) model, the initial distribution of compensation levels derived from the current claimant cohort are further converted to the initial distribution of fibrosis stages using the established matching relationship between compensation levels and fibrosis stages in previous revisions. The matching principles are stated below.

- Compensation level 1: F_0 with negative HCV RNA;
- Compensation Level 2: F_0 with positive HCV RNA;
- Compensation level 3: F_1 or F_2 indicating non-bridging fibrosis;
- Compensation level 4: F_3 indicating bridging fibrosis;
- Compensation level 5: F_4 with compensated cirrhosis;
- Compensation level 6: F_4 with decompensated cirrhosis, HCC, and/or post-transplant.

Because only 19.6% of approved claimants had a documented liver biopsy to confirm their compensation level, assessing liver disease severity using compensation level alone could introduce significant uncertainty regarding the true initial distribution of fibrosis stages in the current surviving claimants. Thus, the current revision continues to use the propensity score matching method[31,32] developed in the fourth revision to estimate fibrosis stage distribution in the claimants without liver biopsy. This method includes the following steps.

Step 1. A multiple logistic regression analysis is performed using biopsy status as the dependent variable and age, gender, previous treatment, hemophilic status, and HIV status as independent variables. Claimants with decompensated cirrhosis or HCC are excluded for propensity score matching as the diagnoses of these two complications are

usually based on symptoms and imaging. Claimants with compensation level 1 are also excluded because individuals with a negative HCV RNA status typically do not have hepatic fibrosis. Thus, this multiple logistic regression analysis only includes claimants with compensation levels of 2 through 5.

Step 2. The formula derived in *Step 1* is used to calculate a propensity score. This score is defined as the predicted probability of receiving a liver biopsy for each included claimant. The derived formula is as follows:

Log [p/(1-p)] = a + age*b1 + gender*b2 + previous treatment*b3 + hemophiliacs status*b4 + HIV status*b5;

p is the probability of receiving liver biopsy;

a is the intercept parameter in the multiple logistic regression analysis;

b1....b5 are the coefficients associated with independent variables in the multiple logistic regression analysis.

Step 3. Claimants are stratified on the basis of propensity scores of <0.4 and > 0.4. In each group, we assume that claimants without liver biopsy have the same distribution of fibrosis stage as the claimants who received a liver biopsy if they have the same compensation level.

The current revision has used this method to estimate the initial distribution of fibrosis stages in the surviving hemophilic claimants and non-hemophilic claimants, respectively. The adjusted initial proportions of F_0 with negative HCV RNA, F_0 with positive HCV RNA, F_1/F_2, F_3, compensated cirrhosis, decompensated cirrhosis, HCC, and post-transplant in current surviving hemophilic claimants are 15.8%, 20.3%, 17.8%, 23.3%, 18.1%, 2.9%, 1.3%, and 0.6%,

respectively (*Table 4.1*). The adjusted initial proportions of F_0 with negative HCV RNA, F_0 with positive HCV RNA, F_1/F_2, F_3, compensated cirrhosis, decompensated cirrhosis, HCC, and post-transplant were 17.5%, 33.3%, 26.9%, 10.7%, 8.6%, 1.7%, 0.5%, and 0.7%, respectively (*Table 4.2*).

2.2.2 Efficacies of new antiviral regimens

The medical model working group (MMWG) on the current revision has searched the websites of Health Canada and the United States Food and Drug Administration (US FDA) for newly approved antiviral agents since 2010. As of January 31, 2014, the approved new antiviral agents in both Canada and the United States include boceprevir,[33,34] telaprevir,[35,36] sofosbuvir,[37,38] and simeprevir.[39,40] The MMWG on the current revision has also reviewed the results of recently completed phase III trials evaluating new antiviral regimens for CHC and consulted the hepatologists at the University Health Network (Drs. Jordan Feld, David Wong, and Morris Sherman) for their opinions on any new antiviral agents that could be available to Canadian patients in the next two years. Based on the identified clinical evidence, expert opinions, and discussions among the members of working group, the updated treatment patterns in the current revision have taken into account four antiviral regimens, including current standard treatment with PEG-IFN/RBV; PEG-IFN/RBV-based triple therapy with boceprevir, telaprevir, or faldaprevir; sofosbuvir-based doublets with simeprevir, daclatasvir, or ledipasvir; and 3D regimen plus RBV, in the updated treatment patterns over the next five years in compensation claimants. Thus, the current revision has conducted a systematic review to estimate treatment efficacy and safety of the four selected antiviral regimens that are included in the treatment preference survey study and the revised HCV prognostic model.

The current revision has searched the common medical databases (MEDLINE, EMBASE, Web of Science, and The Cochrane Library) and proceedings of the annual conferences of the American Association of Study Liver Diseases (AASLD) and the European Association for the Study of the Liver (EASL), the two major international organizations for viral hepatitis, for any published randomized trials assessing the selected new antiviral regimens since 2010. Single-arm meta-analysis method is used to estimate overall SVR and adverse event (AE)-related treatment discontinuation rates associated with the four selected antiviral regimens for patients stratified by their status of previous treatment and HIV co-infection, the two factors having strong impact on treatment efficacy, treatment tolerance, and treatment decision making.

- *PEG-IFN/RBV and PEG-IFN/RBV-based triple therapy*

The current revision has identified 35 trials comparing PEG/RBV-based triple therapy with boceprevir (9 trials), telaprevir (22 trials), or faldaprevir (4 trials) against 24 or 48-week PEG-IFN/RBV.

  - *Treatment-naïve patients without HIV co-infection:* Of the 35 identified trials, 23 trials assessed PEG-IFN/RBV-based triple therapy in treatment-naïve patients without HIV co-infection (5 trials for boceprevir,[41-45] 15 trials for telaprevir,[46-60] and 3 trials for faldaprevir[61-63]). The patients in these 23 trials had an average age of 48 years (n=1,218, 95% CI 46 to 50 years), 57.5% of patients were male (n=5,204, 95% CI 53.7% to 61.2%), 98.3% of patients had viral genotype 1 (n=5,870, 95% CI 96.9% to 99.1%), 84.3% of patients (n=4,967, 95% CI 80.3% to 87.6%) had mild fibrosis (F_0 to F_2), and 13.9% of patients (n=5,523, 95% CI 10.9% to 17.6%) had advanced fibrosis (F_3 or F_4). The pooled estimates of SVR and AE-related treatment discontinuation rates associated with

PEG/RBV-based triple therapy were 70.0% (n=7,149, 95% CI 67.0% to 72.8%) and 12.7% (n=4,072, 95% CI 10.3% to15.4%), respectively. The pooled estimates of SVR and AE-related treatment discontinuation rates associated with PEG-IFN/RBV doublet were 45.5% (n=2,041, 95% CI 43.3% to 47.8%) and 8.7% (n=981, 95% CI 7% to 10.9%), respectively.

- *Treatment-naïve patients with HIV co-infection:* Of the identified 35 trials, three trials compared PEG-IFN/RBV-based triple therapy (1 trial for boceprevir [64] and 2 trials for telaprevir[65,66]) versus PEG-IFN/RBV in treatment-naïve patients with HIV co-infection. Two trials which were comprised of 71 patients with reported patient baseline characteristics, including age (mean 42 years) and proportions of male (73.1%, 95% CI 61.5% to 82.1%), viral genotype 1 (97.8%, 95% CI 87.3% to 99.7%), and mild fibrosis stage (84.7%, 95% CI 74.3% to 91.4%). The pooled estimates of SVR and AE-related treatment discontinuation rates associated with PEG-IFN/RBV-based triple therapy were 73.5% (n=171, 95% CI 64.4% to 80.9%) and 20.0% (n=64, 95% CI 11.9% to 31.6%). The pooled estimate of SVR rate associated with PEG-IFN/RBV was 37.1% (n=62, 95% CI 26% to 49.8%). These three trials did not report AE-related treatment discontinuation rate associated with PEG-IFN/RBV. Thus, the current revision has assumed that HIV co-infection has the similar impact on AE-related treatment discontinuation associated with PEG-IFN/RBV and PEG-IFN/RBV-based triple therapy. The AE-related treatment discontinuation rate associated with PEG-IFN/RBV in treatment-naïve patients with HIV co-infection is estimated by multiplying the relative risk (RR) of AE-related treatment discontinuation associated with HIV co-infection for PEG-IFN/RBV-based triple therapy

by the AE-related treatment discontinuation rate associated with PEG-IFN/RBV in treatment-naïve patients without HIV co-infection.

- *Previously treated patients without HIV co-infection:* Of the identified 35 trials, 9 trials compared PEG-IFN/RBV-based triple therapy (4 trials for boceprevir,[67-70] 5 trials for telaprevir,[71-75] and 1 trial for faldaprevir[76]) against PEG-IFN/RBV in previously treated patients without HIV co-infection. The average age of patients in these 9 trials was 50 years (n=333, 95% CI 49 to 51 years), 66.8% of patients were male (n=2,980, 95% CI 64.4% to 69.2%), 97.0% of patients had viral genotype 1 (n=2,980, 95% CI 95.0% to 98.2%), and 74.0% of patients had mild fibrosis (n=1,048, 95% CI 68.7% to 78.6%). The pooled estimate of SVR and AE-related treatment discontinuation rates associated with PEG-IFN/RBV-based triple therapy in these patients were 53.8% (n=2,377, 95% CI 45.2% to 62.3%) and 16.6% (n=1,773, 95% CI 11.1% to 24.2%), respectively. Of these 9 trials, five trials reported the rates of SVR (n=382, 37.4%, 95% CI 32.2% to 42.8%) and AE-related treatment discontinuation (n=233, 10.1%, 6.8% to 14.7%) rates associated with PEG-IFN/RBV.

- *Previously treated patients with HIV co-infection:* One trial[77] compared PEG-IFN/RBV/telaprevir triple therapy against PEG-IFN/RBV in 31 previously treated patients with HIV co-infection. The average age of these patients was 50 years. The proportions of male, viral genotype 1, and mild fibrosis in these 31 patients were 88.9%, 97.0%, and 90.6%, respectively. The reported SVR rate associated with PEG-IFN/RBV-based triple therapy was 73.8% (95% CI 55.6% to 86.4%). This trial only included 8

patients receiving PEG-IFN/RBV and this sample size was too small to have enough power for reliable estimation. Additionally, the SVR rate in these 8 patients was 50%, which was higher than the SVR rate in treatment-naïve patients. This finding was against many other trials reporting less treatment response associated with HIV co-infection. Thus, the current revision disregards the reported SVR rate associated with PEG-IFN/RBV in this trial but assumes that HIV has the same impact on treatment efficacies of PEG-IFN/RBV and PEG-IFN/RBV-based triple therapy. The RR of SVR associated with HIV co-infection in patients receiving PEG-IFN/RBV-based triple therapy is multiplied by the estimated SVR rate associated with PEG-IFN/RBV in previously treated patients without HIV to estimate SVR rate associated with PEG-IFN/RBV in previously treated patients with HIV co-infection. This trial did not report AE-related treatment discontinuation rates associated with the two antiviral regimens either and the current revision assumes that their AE-related treatment discontinuation rates remained the same as what were reported in previously treated patients without HIV co-infection.

- *Sofosbuvir-based doublets*

The current revision has identified three trials assessing sofosbuvir-based doublets with simeprevir,[78] ledipasvir,[79] or daclatasvir [80] in treatment-naïve or previously treated patients without HIV co-infection.

- *Treatment-naïve patients without HIV co-infection:* One trial reported on 100 patients with an average age of 54 years and a male gender proportion of 52.7%. The proportions of viral genotype 1 and advanced fibrosis stage among studied patients were 97.4% (n=139, 95% CI 92.9% to 99.1%) and 20.4% (n=130, 95% CI 12.9% to 30.8%),

respectively. The pooled rates of SVR and AE-related treatment discontinuation associated with sofosbuvir-based doublets in these patients were 94.6% (n=139, 88.5% to 97.6%) and 2.2% (n=100, 0.6% to 8.4%), respectively.

- *Previously treated patients without HIV co-infection:* One trial reported on 21 patients with an average age of 59 years and a male gender proportion of 61.9%. The proportions of viral genotype 1 and advanced fibrosis stage among studied patients were 97.1% (n=50, 95% CI 87.0% to 99.4%) and 14.3% (n=21, 95% CI 4.7% to 36.2%), respectively. The pooled rates of SVR and AE-related treatment discontinuation associated with sofosbuvir-based doublets in these patients were 95.4% (n=69, 86.6% to 98.5%) and 2.2% (n=100, 0.6% to 8.4%), respectively.

- *3D regimen plus RBV*

Two phase III trials assessed treatment efficacy and safety associated with 3D regimen plus RBV in treatment-naïve (SAPPHIRE-I) [25] and previously treated patients (SAPPHIRE-II),[81] respectively. The 3D regimen consists of a boosted protease inhibitor ABT-450/ritonavir, NS5A inhibitor ABT-267, and non-nucleoside polymerase inhibitor ABT-333. In the SAPPHIRE-I trial, 473 previously untreated adult, non-cirrhotic, and viral genotype 1 patients received 12 weeks of 3D regimen plus RBV treatment. The reported SVR and AE-related treatment discontinuation rates associated with 3D regimen plus RBV in these treatment-naïve patients were 96.2% and 0.6%, respectively. In the SAPPHIRE-II trial, 297 previously treated adult, non-cirrhotic, and viral genotype 1 patients received 12 weeks of 3D regimen plus RBV treatment. The reported SVR and AE-related treatment discontinuation rates in these previously treated patients were 96.3% and 1%, respectively.

The current revision has not identified any specific trials that evaluated sofosbuvir-based doublets and 3D regimen plus RBV in patients with HIV co-infection. Based on the recommendations from clinical experts and the working group, HIV co-infection was assumed to have the same impact on SVR and AE-related treatment discontinuation associated with the four selected antiviral regimens when estimating the rates of SVR and AE-related treatment discontinuation associated with sofosbuvir-based doublet and 3D regimen plus RBV in patients with HIV co-infection. The estimated SVR and AE-related treatment discontinuation rates associated with the four selected antiviral regimens are summarized in *Table 5.1 and 5.2, respectively*.

2.2.3. Predicting treatment patterns over the next five years

Physicians are expecting significant change of treatment patterns for CHC because of those highly effective and safe new antiviral regimens. In order to estimate treatment patterns in surviving claimants over the next five years, the current revision has conducted an on-line survey study to measure physician's preferences for treating current surviving claimants with the four selected antiviral regimens discussed in the section of 2.2.2. This survey study invited physicians treating HCV in Ontario to review summarized baseline characteristics of surviving claimants eligible for treatment *(Table 6.1)* and the summarized SVR and AE-related treatment discontinuation rates associated with selected antiviral regimens (*Table 5.1 and 5.2*) and then indicate their likelihood of treating compensation claimants in a 0-100 scale and their treatment choices from the four selected antiviral regimens. This survey study received ethics approval

from the University of Toronto in January 2014 (PROTOCOL REFERENCE #29616) and the survey contents are attached as *Appendix I* of this report.

This survey study contacted approximately 100 Ontario physicians drawn from directories posted by the Canadian Liver Foundation[82] for physicians treating HCV across Canada. 14 physicians gave their written consents to participate in this on-line survey. The likelihoods of treating treatment-naïve and previously treated claimants without HIV co-infection in these 14 physicians were highly comparable (87.5% vs. 91.0%). However, their preferences to treat treatment-naïve and previously treated claimants with HIV co-infection were reduced to 65.8% and 61.7%, respectively. None of these 14 physicians selected PEG-IFN/RBV to treat any types of claimants and small proportions of the surveyed physicians selected PEG-IFN/RBV-based triple therapy to treat claimants (7.1% to 14.3%). When treating naïve claimants without HIV co-infection, sofosbuvir-based doublets were associated with a higher rate of selection than 3D regimen plus RBV (50% vs. 35.7%). However, 3D regimen plus RBV had a higher rate of selection than sofosbuvir-based doublets when treating treatment-naïve claimants with HIV co-infection (66.7% vs. 25%) and previously treated claimants, irrespective of their status of HIV co-infection (without HIV co-infection: 57.1% vs. 35.7%; with HIV co-infection: 83.4% vs. 8.3%) . The results of this survey study are summarized in *Table 6.2.*

2.2.4. Stage-specific fibrosis progression

Previous revisions explicitly described the MMLE method to estimate specific fibrosis stage transition rates using claims data of non-hemophilic claimants without HIV co-infection.[83] The current revision has used the same method to estimate stage-specific fibrosis progression using

updated claims data for non-hemophilic claimants without HIV co-infection. The first blood transfusion date and the latest compensation level associated with non-hemophilic claimants are used to estimate HCV infection time. A Markov model is constructed to simulate fibrosis progression starting from F_0 with an initial set of annual stage-specific fibrosis transition probabilities (0.1 for all transitions between consecutive fibrosis stages). The Markov model is run with iterations and modifications on each stage-specific annual transition probability until the squared residual sum, which indicates the difference between the predicted and observed fibrosis stage distributions, is less than 0.000001. Because the number of non-hemophilic claimants without HIV co-infection in the current revision only increases slightly to 3863 from 3839 in the last revision, the estimates of annual stage-specific transition probabilities in these two revisions are highly comparable. Calibration is also performed to further improve matching between predicted and observed fibrosis stage distributions at the time of claim in the non-hemophilic claimants without HIV co-infection. Similar to what was estimated in the fourth revision, the calibrated annual fibrosis transition probability from F_0 to F_1 is still less than half of annual transition probabilities for fibrosis progression above F_1 in the current revision. The uncalibrated and calibrated annual stage-specific fibrosis transition probabilities in the current revision and the fourth revision are summarized in *Table 7*.

2.2.5. Prognosis of cirrhosis in compensation claimants

In order to further improve internal validity of model outputs, the current revision has used claims data directly to estimate the rates at which decompensated cirrhosis, HCC, liver transplant, and liver-related mortality occurred in claimants with a diagnosis of compensated cirrhosis. This

is another major change from the fourth and previous revisions which mainly relied on literature based estimates.

- *Annual risk of developing decompensated cirrhosis:* 98 non-HIV and treatment naïve claimants were identified and retrospectively followed up from their first diagnosis of compensated cirrhosis to August 31, 2013. The claimants were censored when HCC, decompensated cirrhosis, liver transplant, or death occurred prior to the end of follow-up. 64 claimants developed decompensated cirrhosis over an average follow-up time of 13.1 years. The estimate of annual transition probability of developing decompensated cirrhosis in these claimants was 0.078 (95% CI 0.073 to 0.083).
- *Annual risk of developing HCC:* 98 non-HIV and treatment-naïve claimants were identified and retrospectively followed up from their first diagnosis of decompensated cirrhosis to August 31, 2013. The claimants were censored when HCC, decompensated cirrhosis, liver transplant, or death occurred prior to the end of follow-up. HCC developed in 28 claimants over an average follow-up time of 13.1 years. The estimated annual transition probability of developing HCC in these claimants was 0.025 (95% CI 0.024 to 0.027). Because the risk of developing HCC associated with compensated cirrhosis and decompensated cirrhosis was considered comparable, this estimate on the risk of HCC associated with decompensated cirrhosis was also applied to compensation claimants with compensated cirrhosis in the model.
- *Annual risk of liver transplantation:* 515 claimants with decompensated cirrhosis and/or HCC were identified and retrospectively followed up from their first decompensated cirrhosis or HCC diagnosis to August 31, 2013. 21 claimants were reported to have liver transplantation over an average follow-up time of 10.3 years. The estimate of annual

probability of receiving liver transplantation in these claimants was 0.004 (95% CI 0.0039 to 0.0042).

- *Annual risk of mortality associated with decompensated cirrhosis:* 414 claimants with a diagnosis of decompensated cirrhosis only were identified and retrospectively followed up from their first decompensated cirrhosis diagnosis to August 31, 2013 for any death records. A total of 343 deaths were recorded over an average follow-up period of 10.7 years. The estimate of annual risk of mortality associated with decompensated cirrhosis in these claimants was 0.152 (95% CI 0.146 to 0.158).
- *Annual risk of mortality associated with HCC:* 130 claimants with HCC were identified and retrospectively followed up for any death records after their first HCC diagnosis. A total of 110 deaths were reported in these claimants over an average time of 9.3 years. The estimate of annual risk of mortality associated with HCC in these claimants was 0.182 (95% CI 0.169 to 0.198).
- *Risk of first-year mortality after liver transplantation:* 58 claimants receiving liver transplantation were identified and retrospectively followed up for one year after the reported liver transplantation. A total of 5 deaths were recorded during this period. The estimate of the first-year mortality after liver transplantation in these claimants was 0.086 (95% CI 0.037 to 0.186).
- *Annual risk of mortality associated with post-transplantation*: 53 claimants survived for more than one year after liver transplantation. A total of 24 deaths were recorded in these claimants over an average follow-up time of 15.1 years. The estimate of annual risk of mortality associated with post-transplant in these claimants was 0.039 (95% CI 0.036 to 0.043).

Most claims data-based estimates for the prognosis of cirrhosis are comparable with literature derived estimates except that the annual mortality risk associated with HCC (0.182 vs. 0.35) and first-year mortality associated with liver transplantation (0.086 vs. 0.146) in the compensation claimants were about half of literature-based estimates in the fourth revision. Additionally, the assumed risk of liver transplantation associated with liver-related complications in the fourth revision is 25 times of that observed in the claimants (0.1 vs. 0.004). Thus, using estimates based on claims data in the HCV prognostic model is expected to generate more accurate model outputs than using estimates derived or assumed in the fourth revision. The estimates of the prognosis of cirrhosis derived from claims data and the fourth revision are summarized in *Table 8.*

2.2.6. Non-liver-related mortality

The current revision classifies mortality as liver-related mortality and non-liver-related mortality in order to differentiate death causes in simulated claimants. Liver-related mortality is defined as the death associated with any liver-related complications, such as decompensated cirrhosis, HCC, liver transplantation, or post-transplant. Non-liver-related mortality is defined as the death occurs prior to the diagnosis of any liver-related complications. Thus, non-liver-related mortality is applied to the claimants who have viral clearance due to SVC or successful antiviral therapy and also applied to uncured claimants without developed compensated cirrhosis and/or HCC in the HCV prognostic model. Previous revisions directly used Canada life tables as the source for non-liver-related mortality in the compensation claimants because the health problems which required blood transfusion so long ago in compensation claimants were unlikely to still have a meaningful impact on life expectancy and because current care has made virus-free hemophilics

almost have the same life expectancy as general population. However, these two hypotheses have never been tested before using claims data. Thus, the current revision has estimated the following annual risks of non-liver-related mortality from a group of surviving non-HIV claimants with a compensation level below 6 as of January 1, 2003 to test the two hypotheses through the comparisons with the 2009 to 2011 Canada life tables (*Table 9.1*) .[84]

- *Annual risk of non-liver-related mortality in hemophilic claimants:* 728 hemophilic claimants (589 males and 139 females) met the inclusion criteria for the analysis. These claimants were stratified by the defined age strata (every 10 years from age 20 years to 70 years or above) and gender. A total of 24 non-liver-related deaths (19 males and 5 females) were recorded in these claimants over the 10-year follow-up from 2003 to 2013. The estimated annual risks of non-liver-related mortality associated with the six age stratas increased from 0 to 0.017 in male hemophilics and from 0 to 0.0127 in female hemophilics. When compared with the Canada life tables stratified by age and gender, male hemophilics have comparable annual risk of non-liver-related mortality with general male Canadians except those at age 30 to 39 who have doubled annual non-liver-related mortality rate (0.0029 vs. 0.0001). When compared to general female Canadians, the female hemophilics at ages 40 to 49 (0.0032 vs. 0.0013) and 50 to 59 (0.0062 vs. 0.0031) have doubled annual risk of non-liver-related mortality. However, the sample size of female hemophilics in each age stratum ranged from 10 to 39, which were unlikely to have enough power to generate a reliable estimate from a statistical perspective. Thus, the current revision has used annual non-liver-related mortality rates derived from male hemophilic claimants under the age of 70 years and the female Canada life table to simulate non-liver-related mortality for hemophilics in the HCV prognostic model. Additionally, the Canada life table for males has been used in the model to

simulate non-liver-related mortality in male hemophilics at ages 70 or above due to the lack of claims data for accurate estimations. The estimated annual risks of non-liver-related mortality for hemophilic claimants are summarized in *Table 9.2.*

- *Annual risk of non-liver-related mortality in non-hemophilic claimants:* 2,877 non-hemophilic claimants (1,407 males and 1,470 females) met the inclusion criteria for the analysis of their annual non-liver-related mortality rates. These claimants were further stratified by the defined age strata and gender for a retrospective 10-year follow-up from 2003 to 2013 to identify non-liver-related deaths. A total of 185 non-liver-related deaths (124 males and 61 females) were identified and included for the survival analyses in non-hemophilics. Similar to the mortality patterns in the Canadian general population, non-hemophilic claimants with older age and male gender had higher non-liver-related mortality. The annual risk of non-liver-related mortality associated with the six age strata increased from 0.0017 to 0.015 in male non-hemophilics and from 0 to 0.01 in female non-hemophilics. However, male non-hemophilics persistently had substantially higher annual non-liver-related morality rates than general Canadians with male gender (ages 20 to 29: 0.0017 vs. 0.0007; ages 30 to 39: 0.0023 vs. 0.0010; ages 40 to 49: 0.0063 vs. 0.0019; ages 50 to 59: 0.0079 vs. 0.0048) until their ages reached to 60 years. Female non-hemophilics at ages 30 to 59 also had higher annual non-liver-related mortality rates than general Canadians with female gender (ages 30 to 39: 0.0013 vs. 0.0006; ages 40 to 49: 0.0019 vs. 0.0013; ages 50 to 59: 0.0049 vs. 0.0031). The identified differences in annual non-liver-related mortality between non-hemophilics and general Canadians are considered substantial. Thus, the current revision has applied the estimated annual non-liver-related mortality rates from both male and female non-hemophilic claimants under the age of 70 years for model simulation. The

Canada life tables are only used to simulate non-liver-related mortality in non-hemophilic claimants with ages above 70 years because the claims data are unlikely to give reliable estimations for age 70 to 79, 80 to 89, and 90 or above in the HCV prognostic model. The estimated annual non-liver-related mortality rates derived from male and female non-hemophilic claimants are summarized in *Table 9.3*.

2.2.7. Model estimates from the fourth revision

Even though the current revision aims to further improve accuracy of model outputs by maximizing the use of claims data to estimate model variables, there are still some model variables that can't be derived from claims data due to small sample size and missing information. Thus, the current revision continues to use the following estimates derived from the literature review in the fourth revision.

- *Impact of HIV on disease progression:* About a quarter of surviving claimants with hemophilia have an HIV co-infection that has been proven to accelerate disease progression,[85] reduce treatment response to antiviral therapy,[86] and increase non-liver-related mortality.[87] The impact of HIV on the treatment efficacies of the selected four antiviral regimens in the updated treatment patterns has been described in Section 2.2.2. Because nearly all claimants with HIV co-infection have hemophilia and the onset of HCV in hemophilic claimants was difficult to determine the MMLE method can't be used to estimate stage-specific fibrosis progression rates in these claimants with HIV co-infection. The fourth revision[88] conducted a systematic review to estimate the RR (2.12, 95% CI 1.52 to 2.97) of cirrhosis associated with HIV co-infection by comparing 2,636 HIV/HCV co-infection patients with 4,970 HCV mono-infection patients identified from 27 HCV natural

history studies. The fourth revision multiplied this RR by the annual stage-specific fibrosis progression rates in claimants without HIV co-infection to simulate the fibrosis progression in claimants with HIV co-infection. The current revision continues to use this solution to simulate fibrosis progression and also prognosis of cirrhosis in the current surviving claimants with HIV co-infection in the model.

- *Impact of HIV on non-liver-related mortality:* the current revision is able to retrospectively follow 238 claimants with HIV co-infection for 10 years, from 2003 to 2013, to estimate annual non-liver-related mortality rates by age strata and gender. The male claimants in three age strata, ages 20 to 29, 30 to 39, and 40 to 49, have a sample size above 50 and the estimated annual mortality rates from these claimants are higher than hemophilic claimants without HIV co-infection as expected (ages 20 to 29: 0.0083 vs. 0; ages 30 to 39: 0.0036 vs. 0.0029; ages 40 to 49: 0.0051 vs. 0.0022) (*Table 10*). Thus, the estimated non-liver-related mortality rates from these three age strata are considered reliable and used in the model to simulate non-liver-related mortality for male HIV-infected claimants with ages 20 to 50 years. However, the current revision has to simulate non-liver-related morality in other claimants with HIV co-infection using the estimated excess mortality associated with HIV (RR 6.24) from a meta-analysis comparing 5,168 HIV negative hemophilics with 2,979 HIV positive hemophilics for all-cause mortality in the fourth revision.[88]
- *SVC in patients with CHC*: A number of studies investigating the natural history of CHC have reported occurrence of SVC in patients with CHC.[89] The fourth revision identified 21 published studies reporting SVC in patients with CHC. The weighted mean SVC rate in these 21 studies was 0.020 (95% CI, 0.013-0.027). The fourth revision further pooled the estimated SVC rates from the literature and the observed SVC rate in the compensation claimants to

estimate the annual incidence rate of SVC (0.017, 95% CI 0.011 to 0.022) for the HCV prognostic model. Additionally, the fourth revision suggested that the chance of SVC would be reduced in advanced fibrosis stage. Thus, the current revision follows the suggestions made in the fourth revision by applying 0.017 as the annual SVC rate associated with F_0 and F_1, 0.01 as the annual SVC rate associated with F_2, and 0.005 as the annual SVC rate associated with F_3 in the HCV prognostic model.

- *Risk of HCC associated with fibrosis stage prior to cirrhosis:* The fourth revision applied a small annual incidence rate of HCC to non-cirrhotic claimants because HCC was found to develop at an average annual rate of 2.1% in non-cirrhotic patients in Japan[90]. Because Japanese have the highest incidence rate in HCC in the world and the compensation claimants differ from Japanese patients in ethnicity and viral transmission route, the fourth revision adopted the assumption made on this variable in the 1998 model which applied 0.0001 as the annual HCC rate associated with moderate fibrosis and zero for mild fibrosis. The fourth revision converted these rates by assuming that F_0 was comparable with mild fibrosis and F_1 to F_2 were comparable with moderate fibrosis. The fourth revision further assumed the annual rate of HCC associated with F_3 stage as 0.001 because advanced fibrosis stage was expected to have a higher risk of HCC. Thus, the current revision has adopted the same estimates used in the fourth revision for the risk of HCC associated with non-cirrhotic claimants.

2.3. Model assumptions

Assumptions are often made in model studies due to simplifying model structure or the lack of evidence. The current revision has made the following assumptions with respect to model structure and variables:

- *Initial distribution of fibrosis stages:* Because the latest compensation level determinations were unlikely to be made exactly as of August 31, 2013, the current revision has assumed that the latest claimed compensation levels remained unchanged in order to estimate the initial distribution of fibrosis stages in the simulated claimants. Additionally, the matching relationship between compensation level and fibrosis stage does not differentiate F_1 and F_2 in claimants with a compensation level of 3. The current revision has assumed that F_1 stage and F_2 stage are evenly distributed when estimating the initial distribution of fibrosis stages. Finally, the current revision has assumed that the estimated treatment outcomes of previous treatment in surveyed claimants are applicable to all previously treated claimants when estimating initial proportions of claimants with viral clearance and claimants who failed with previous treatments.
- *Natural history of CHC:* Most assumptions made by the fourth revision for fibrosis progression were retained in the current revision. For example, the HCV prognostic model only allowed fibrosis to progress in one direction. As well, fibrosis progression was assumed to stop when SVC or SVR was achieved in claimants with a fibrosis stage prior to compensated cirrhosis. Because HCC and decompensated cirrhosis were still observed in cirrhotic patients who had underwent successful antiviral treatment,[91] the current revision has assumed that successful antiviral therapy would reduce the risk of developing decompensated cirrhosis or HCC by half in cirrhotic claimants. Additionally, the current revision has assumed that CHC wouldn't affect mortality in claimants without any liver-related

complications to reflect the fact that liver-related death typically occurs following the development of liver-related complications.[92] Finally, the liver-related mortality, defined as the mortality associated with decompensated cirrhosis, HCC, and post-transplant, was fixed value and could be lower than non-liver-related mortality when claimants reached old age associated with high non-liver-related mortality. Thus, the model in the current revision would replace liver-related mortality with non-liver-related mortality once age-specific non-liver-related mortality excessed liver-related mortality in claimants with decompensated cirrhosis, HCC, or post-transplant.

- *Treatment patterns:* The current revision has utilized treatment preference data from the surveyed physicians to simulate future treatment patterns over the next five years in claimants chronically infected with HCV. Because the updated treatment patterns have high treatment rate and the new antiviral treatments are highly effective, the current revision has assumed no repeated treatment in the simulated claimants. Additionally, the claimants with developed liver-related complications are assumed not to receive antiviral treatments because SVR has limited impact on the prognosis of liver-related complications.[93]

2.4. Model validation

Different from the fourth revision which compared predicted and observed initial distribution of disease stages in the simulated claimants for model validation, the current revision has validated the revised HCV prognostic model by comparing predicted and observed prognosis of non-hemophilic claimants over a 10-year period from 2003 to 2013. This approach first created the validation cohort by including non-hemophilic claimants who were alive in 2003, had no HIV co-infection, and were treatment naïve. The initial distribution of fibrosis stages in this validation

cohort was estimated through the propensity score method described in the Section of 2.2.1. The revised HCV prognostic model was applied with the estimated initial distribution of disease stages in the validation cohort and model estimates for non-hemophilics to generate model outputs within 10-year time horizon. The predicted and observed cumulative rates of liver-related complications (decompensated cirrhosis: 6.1% vs. 7.4%; HCC: 1.9% vs. 1.8%; 0.7% vs. 0.7%) and all-cause mortality (10.6% vs. 11.9%) in the validation cohort are highly comparable. However, some discrepancies have been observed between the predicted and observed cumulative rates of liver-related mortality (5.5% vs. 7.4%) and non-liver-related mortality (9.0% vs. 4.5%) during 10-year follow-up. Further comparing the predicted and observed proportions of disease stages in the surviving non-hemophilics in 2013 has shown highly comparable proportions of F_0 with negative HCV RNA (25.1% vs. 24.8%), compensated cirrhosis (6.3% vs. 3.8%), decompensated cirrhosis (2.2% vs. 1.5%), HCC (0.9% vs. 0.4%), and post-transplant (0.5% vs. 0.5%). The predicted and observed outcomes in this validation cohort are summarized in *Table 11.*

3. Model predictions for current surviving compensation claimants

The current revision has used the revised HCV prognostic model to create two working models, one for hemophilic claimants and the other for non-hemophilic claimants, by applying the initial distributions of health states in surviving hemophilic and non-hemophilic claimants as of August 31, 2013. The model variables used in the two working models are summarized in *Table 12.* The two working models filled with baseline values of model variables were run with 50,000 iterations to simulate transitions between health states in surviving hemophilic and non-

hemophilic claimants within a time horizon of 57 years from 2013 to 2070. The generated model outputs from the two working models are further analysed for the following model predictions.

3.1. Model predictions for the entire claimant cohort

The proportion of hemophilia in the surviving claimants as of August 31, 2013 has been used to weight the model outputs of hemophilic and non-hemophilic claimants when predicting long-term prognosis of the entire cohort of surviving claimants as of August 31, 2013. The sum of the weighted model outputs from the two working models is used to calculate cumulative rates of liver-related complications and mortality and proportions of disease stages in surviving claimants every 10 years starting from 2020. The cumulative rates of decompensated cirrhosis (from 3.3% to 12.1%), HCC (from 0.7% to 4.3%), and liver-related mortality (0% to 14.7%) in the simulated claimants are predicted to increase persistently from 2013 to 2070. Because the applied treatments in the model can cure most claimants and fibrosis stages prior to cirrhosis are expected to remain unchanged in cured claimants, the predicted proportions of non-cirrhotic stages in surviving claimants only increase slightly. However, the proportion of compensated cirrhosis in surviving claimants is predicted to decrease from 10.8% in 2013 to 1.4% because cured cirrhosis still progresses to decompensated cirrhosis and HCC in the model. Even though liver-related complications are usually associated with high mortality, the continuous progression of cured and uncured compensated cirrhosis can cause newly developed liver-related complications and slow down the declining proportions of liver-related complications in surviving claimants. The model outputs of the entire cohort of surviving claimants are summarized by the defined calendar years in *Table 13.1.*

3.2. Comparing hemophilics versus non-hemophilics for model outputs

Hemophilic claimants are expected to have poorer long-term prognosis than non-hemophilic claimants because the higher prevalence of advanced fibrosis stage, HIV co-infection, and male gender in hemophilic claimants can reduce treatment response and accelerate disease progression. The current revision has compared the model outputs of hemophilic and non-hemophilic claimants and further confirmed this hypothesis. By 2070, hemophilic claimants are predicted to have doubled cumulative rates of decompensated cirrhosis (20.7% vs. 9.5%), HCC (7.3% vs. 3.4%), and liver-related mortality (24.9% vs. 11.6%) when compared to non-hemophilic claimants. Because hemophilic claimants have much higher initial proportion of compensated cirrhosis than non-hemophilic claimants (18.1% vs. 8.6%), the predicted proportions of decompensated cirrhosis and HCC in surviving hemophilics remained two times higher than what are predicted in surviving non-hemophilic claimants until 2040 when the differences in the predicted proportion of compensated cirrhosis between surviving hemophilics and non-hemophilics start to decrease substantially due to the lack of progression from cured claimants with less advanced fibrosis stage. Additionally, the low liver transplantation rate applied in the HCV prognostic model has made the predicted cumulative rates of liver transplantation in hemophilics and non-hemophilics highly comparable but very small (1.0% vs. 0.9%). The model outputs of hemophilic and non-hemophilic claimants are summarized by the selected calendar years in *Table 13.2.*

4. Model outputs stratified by age

In order to help with future planning of compensation funds for current surviving claimants, the current revision has stratified surviving claimants by age strata starting at 20 years with 10-year

interval until 90 years or above for the comparisons of model outputs between hemophilic and non-hemophilic claimants.

4.1. Ages 20 to 29

In this age stratum, hemophilic claimants have a much higher initial proportion of cirrhosis than non-hemophilic claimants (16.8% vs. 9.9%). Thus, these hemophilic claimants are expected to have higher risks of developing liver-related complications and mortality. Additionally, the long life expectancy associated with this age stratum can further increase the occurrences of liver-related complications and mortality. Based on the model outputs by 2070 for these claimants, the predicted cumulative rates of decompensated cirrhosis (18.8% vs. 12.4%), HCC (6.7% vs. 4.9%), and liver-related mortality (23.5% vs. 15.5%) associated with hemophilics are 1.367 to 1.516 times what are predicted in non-hemophilics. The future proportion of compensated cirrhosis in surviving hemophilics is predicted to decline faster than that in non-hemophilics until the calendar year of 2040 when the two predicted proportions become comparable (5.7% vs. 4.3%). Thus, hemophilics and non-hemophilics will also have comparable proportions of liver-related complications after the calendar year of 2040 (decompensated cirrhosis: 0.7 to 2.9% vs. 0.7 to 1.6%; HCC: 0.3 to 1.0% vs. 0.3 to 0.7%; post-transplant: 0.2 to 0.4% vs. 0.3%). The model outputs of hemophilic and non-hemophilic claimants in this age stratum are summarized in *Table 14.1.*

4.2. Ages 30 to 39

Hemophilic claimants in this age stratum continue to have an almost doubled initial proportion of cirrhosis (17% vs. 9.7%) than non-hemophilics. Because this age stratum is associated with

shorter life expectancy than ages 20 to 29, the disease progression time will be shorter and the developments of liver-related complications and mortality in these claimants are also reduced slightly, irrespective of their hemophilic status. Thus, the predicted cumulative rates of decompensated cirrhosis (18.2% vs. 11.3%), HCC (6.1% vs. 4.5%), and liver-related mortality (22.5% vs. 14.4%) in 2070 in hemophilics are 1.356 to1.611 times what are predicted in non-hemophilics. The proportion of compensated cirrhosis in hemophilics is predicted to decline faster than that in non-hemophilics until the calendar year of 2050 when the two predicted proportions are comparable (3.7% vs. 3.1%). Thus, the proportions of liver-related complications in surviving hemophilics and non-hemophilics are predicted to be highly comparable after the calendar year of 2050 (decompensated cirrhosis: 1.3 to 1.8% vs. 1.1% to 1.8%; HCC: 0.6% vs. 0.4 to 0.5%; post-transplant: 0.3% vs. 0.2 to 0.3%). The model outputs for hemophilic and non-hemophilic claimants in this age stratum are summarized in *Table 14.2.*

4.3. Ages 40 to 49

This age stratum is associated with a higher initial proportion of cirrhosis than ages 30 to 39, irrespective of claimant's hemophilic status. Additionally, the initial proportions of decompensated cirrhosis in hemophilic and non-hemophilic claimants in this age stratum have increased to 4.1% and 1.6%, respectively. Even though this age stratum is associated with shorter life expectancy, the high initial proportions of advanced disease stages in these claimants are likely to drive up future occurrences of liver-related complications and mortality. Since the initial proportion of cirrhosis in hemophilics is still two times higher than that in non-hemophilics in this age stratum (23.2% vs. 12.1%), the predicted cumulative rates of decompensated cirrhosis (23.1% vs. 12.9%), HCC (8.3% vs. 5.0%), and liver-related mortality (28.2% vs. 16.5%) by 2070

in hemophilics continue to be substantially higher than what are predicted in non-hemophilics. The proportions of cirrhosis in surviving hemophilics and non-hemophilics are predicted to decline to comparable levels (4.6% vs. 3.2%) in the calendar year of 2050. Surviving hemophilics and non-hemophilics are predicted to have comparable proportions of liver-related complications after the calendar year of 2050 (decompensated cirrhosis: 2.6 to 3.4% vs. 1.6 to 1.9%; HCC: 0.8 to 1.8% vs. 0.7 to 1.4%; post-transplant: 0.5 to 0.8% vs. 0.5 to 0.7%). The model outputs of hemophilic and non-hemophilic claimants in this age stratum are summarized in *Table 14.3.*

4.4. Ages 50 to 59

The initial proportions of cirrhosis (24.9% vs. 12.7%) and liver-related complications (decompensated cirrhosis: 4.8% vs. 2.8%; HCC: 1.9% vs. 0.9%) continue to increase in both hemophilic and non-hemophilic claimants in this age stratum. The shorter life expectancy of claimants in this age stratum begins to demonstrate strong impact on the disease prognosis as the predicted cumulative rates of decompensated cirrhosis, HCC, and liver-related mortality associated with this age stratum start to fall. However, the nearly doubled initial proportions of liver-related complications associated with hemophilics continue to make the predicted cumulative rates of decompensated cirrhosis (22.4% vs. 12.3%), HCC (8.5% vs. 4.3%), and liver-related mortality (27.1% vs. 15.3%) in hemophilics 1.771 to 1.977 times of what are predicted in non-hemophilics in 2070. However, hemophilics are predicted to have lower cumulative rates of liver transplantation than non-hemophilics (0.5% vs. 1.2%) due to substantially higher initial proportion of liver transplantation in non-hemophilics (0.9% vs. 0%). Our model predictions also indicate that no claimants will survive to 2070, irrespective of

hemophilic status. The proportions of compensated cirrhosis in surviving hemophilics and non-hemophilics are predicted to decline to a comparable level in 2060. Therefore, hemophilics are predicted to have persistently higher proportions of decompensated cirrhosis (4.3 to 6.2% vs. 2.2 to 2.9%) and HCC (1.7 to 4.9% vs. 0.7 to 2.5%) than non-hemophilics from 2020 to 2060. The model outputs of hemophilic and non-hemophilic claimants in this age stratum are summarized in *Table 14.4*.

4.5. Ages 60 to 69

Hemophilic and non-hemophilic claimants in this age stratum have the highest initial proportions of cirrhosis (30.8% vs. 14.5%), decompensated cirrhosis (10.2% vs. 4.2%), HCC (0.9% vs. 1.0%), and post-transplant (2.8% vs. 1.4%) in the entire claimant cohort. Even though the short life expectancy associated with this age stratum means no claimants will survive to 2060, the high initial proportions of advanced disease stages are expected to drive the cumulative rates of liver-related complications and mortality to the highest in both hemophilic and non-hemophilic claimants. When compared with non-hemophilics in this age stratum, hemophilics continue to have doubled initial proportions of cirrhosis and liver-related complications. Consequently, hemophilics are also predicted to have nearly doubled lifetime cumulative rates of decompensated cirrhosis (24.2% vs. 12.0%), HCC (6.8% vs. 4.3%), liver transplantation (3.4% vs. 1.7%), and liver-related mortality (28.1% vs. 14.5%) relative to non-hemophilics. Additionally, the much higher initial proportions of cirrhosis and liver-related complications in hemophilics are likely to make hemophilics to have sustainably higher proportions of liver-related complications than non-hemophilics over their survival time (decompensated cirrhosis: 6.8 to 7.8% vs. 2.6 to 5.3%; HCC: 2.3 to 4.6% vs. 1.0 to 2.4%; post-transplant: 2.7 to 4.1% vs.

1.3 to 2.0%). The model outputs of hemophilics and non-hemophilics in this age stratum are summarized in *Table 14.5*.

4.6. Ages 70 to 79

The initial disease stages associated with hemophilics are far more advanced than the initial stages associated with non-hemophilics in this age stratum (cirrhosis: 27.1% vs. 7.8%; decompensated cirrhosis: 12.2% vs. 5.1%; HCC: 6.1% vs. 0.7%, liver transplantation: 2% vs. 0.5%). However, the life expectancy associated with this age stratum is much reduced and no claimants in this age stratum will survive to 2050. Thus, further disease progression beyond 2050 will be stopped accordingly and the lifetime cumulative rates of liver-related complications and mortality in both hemophilic and non-hemophilic claimants are predicted to drop substantially. However, the predicted lifetime cumulative rates of decompensated cirrhosis (18.8% vs. 8.9%), HCC (9.1% vs. 2.6%), liver transplantation (2.5% vs. 0.7%), and liver-related mortality (20.8% vs. 10.1%) in hemophilics continue to be much higher that what are predicted in non-hemophilics. The higher initial proportions of compensated cirrhosis and decompensated cirrhosis associated with hemophilics also make the predicted proportions of liver-related complications in surviving hemophilics sustainably higher than what are predicted in non-hemophilics over their survival time (decompensated cirrhosis: 5.7 to 8.8% vs. 3.1 to 4.3%; HCC: 3.5 to 5.0% vs. 1.1 to 2.0%; post-transplant: 2.3 to 3.0% vs. 0.5 to 0.9%). The model outputs of hemophilic and non-hemophilic claimants in this age strata are summarized in *Table 14.6*.

4.7. Ages 80 to 89

The initial proportions of cirrhosis (7.7% vs. 8.9%) and decompensated cirrhosis (4.2% vs. 3.1%) in hemophilics in this age stratum substantially drop to be comparable with the initial proportions of the two advanced disease stages in non-hemophilics. Thus, the two types of claimants are expected to have similar long-term prognosis in their short life expectancy. Both hemophilics and non-hemophilics in this age stratum are predicted to have no survivors by 2040. Hemophilics and non-hemophilics are predicted to have comparable lifetime cumulative risks of liver-related complications (decompensated cirrhosis: 5.2% vs. 4.7%; HCC: 0.8% vs. 1.6%; liver transplantation: 0.1% vs. 0.4%) and mortality (5.5% vs. 5.2%) and also have comparable proportions of liver-related complications (decompensated cirrhosis: 4.5 to 4.9% vs. 2.5 to 3.0%; HCC: 0.8 to 1.9% vs. 1.1 to 2.1%; post-transplant: 0.1 to 0.4% vs. 0.3 to 0.4%) over their survival time. The model outputs of hemophilic and non-hemophilic claimants in this age stratum are summarized in *Table 14.7.*

4.8. Age strata of 90 years and above

Both hemophilics and non-hemophilics in this age stratum have further dropping but more comparable initial proportion of cirrhosis (4.3% vs. 4.5%). Within the much shortened life expectancy associated with this age stratum, both hemophilics and non-hemophilics are predicted to have very few occurrences of liver-related complications (decompensated cirrhosis: 0.5% vs. 1.8%; HCC: 0.2% vs. 0.6%; liver transplantation: 0% vs. 0.5%) and mortality (0.6% vs. 1.9%) by 2030 when no more claimants are predicted to survive. Thus, hemophilics and non-hemophilics also have highly comparable but extremely low proportions of liver-related complications (decompensated cirrhosis: 1.1% vs. 1.2%; HCC: 0.4% vs. 0.7%; post-transplant: 0%

vs. 0.5%) in 2020, the only defined calendar year with surviving claimants. The model outputs of hemophilics and non-hemophilics in this age stratum are summarized in *Table 14.8.*

5. Comparing model outputs of the current revision and the fourth revision

In order to demonstrate impact of updated treatment pattern and model variables on the long-term prognosis of current surviving claimants, we have compared the model outputs of the current revision and the fourth revision in the defined calendar years from 2020 to 2070. Because claimants only receive PEG-IFN/RBV combination treatment in the fourth revision, about of half of claimants are expected to fail with this treatment and continue to progress to more advanced disease stage. Thus, the predicted cumulative rates of liver-related complications and mortality in the fourth revision increase much faster than what are predicted in the current revision which mainly uses sofosbuvir-based doublet and 3D regimen plus RBV treatments, which can cure most claimants and substantially improve the long-term prognosis of compensation claimants. For example, the cumulative rate of cirrhosis in the fourth revision are predicted to increase from 24.3% in 2020 to 38.5% in 2060 (absolute difference: 14.2%) while the current revision predicts an increase of 2.9% (from 16.9% to 19.8%) for the cumulative rate of cirrhosis during the same period. Similar trends are also found in the comparisons of cumulative rates of HCC, liver transplantation, and liver-related mortality predicted by the fourth revision and the current revision. By 2060, the predicted cumulative rates of cirrhosis (38.5% vs. 19.8%), HCC (10.5% vs. 4.3%), and liver-related mortality (24.0% vs. 14.4%) in the fourth revision are nearly two times what are predicted in the current revision. Because the fourth revision assumed a much higher annual risk of liver-transplantation than the current revision (0.1 vs. 0.0004), the predicted cumulative rate of liver transplantation in the fourth revision in 2060 is 4.7 times the prediction

in the current revision (4.2% vs. 0.9%). Less effective antiviral therapy used in the fourth revision also affects the distribution of disease stages in surviving claimants over their survival time. Different from the relatively stable proportion of cirrhosis from 2020 to 2060 in the fourth revision (11.6% to 16.2%), the predicted proportion of cirrhosis in the current revision declines gradually (9.7% to 2.1%) due to the lack of new progressions from less advanced fibrosis stage. Thus, the fourth revision has persistently higher proportions of decompensated cirrhosis (2.9 to 4.3% vs. 1.5 to 3.2%) and HCC (1 to 1.5% vs. 0.7 to 1.1%) than the current revision over time from 2020 to 2060. The assumed higher annual risk of liver transplantation in the fourth revision could further drive up the predicted proportion of post-transplant in the fourth revision (1.5 to 4.1% vs. 0.5 to 0.7%). The model outputs of the fourth revision and the current revision are summarized in *Table 15*.

6. Sensitivity analyses

The substantial differences in model outputs of the current revision and the fourth revision have suggested that the model outputs of compensation claimants could be highly sensitive to the updates made in the current revision. When compared with the fourth revision, the current revision has updated treatment patterns using new antiviral regimens over the next five years and model estimates for the prognosis of cirrhosis and non-liver-related mortality using claims data. Thus, we have performed the following sensitivity analyses to assess the impact of the main updates on model outputs of current surviving non-hemophilic claimants.

6.1. Data sources of estimates for the prognosis of cirrhosis: Literature review vs. Claims data

The estimates for the prognosis of cirrhosis in the fourth revision were derived from literature review of studies including HCV patients irrespective of viral transmission route. Thus, the literature-based estimates are expected to have better external validity but poorer internal validity as the compensation claimants acquired HCV only through blood transfusion or blood products. The current claims data contain over 5,000 approved claimants and a large number of claimants have been followed up for 16 years since the compensation cohort was created in 1998. Thus, the claims data are believed to have enough sample size and follow-up time to estimate their own prognosis of cirrhosis and improve internal validity of model outputs. We have compared literature-derived estimates in the fourth revision and estimates based on claims data for the prognosis of cirrhosis (*Table 16.1.*). The annual risk of mortality associated with HCC in compensation claimants is about half of the estimate derived from literature (0.182 vs. 0.35). The first-year mortality rate after liver transplantation in compensation claimants is also much lower than what has been reported from literature (0.086 vs. 0.146). The fourth revision made an assumption on the chance of liver transplantation associated with decompensated cirrhosis or HCC due to the lack of literature. However, this assumed estimate is 4.7 times of the rate of liver transplantation (0.1 vs. 0.004) truly observed in compensation claimants. Thus, the estimates derived from claims data are expected to reduce the occurrences of liver-related mortality and liver transplantation. Comparing model outputs based on the two difference data sources has confirmed substantially higher cumulative rate of liver transplantation associated with claims data in 2070 (3.2% vs. 0.9%). However, the estimates based on claims data are unable to reduce liver-related mortality likely due to very low occurrences of HCC. Thus, the model outputs based on these two data sources are highly comparable except more occurrences of liver transplantation due to the assumption made in the fourth revision. The model outputs of non-hemophilics using

estimates derived from literature or claims data for the prognosis of cirrhosis are summarized in *Table 16.2.*

6.2. Non-liver-related mortality: claim cohort vs. 2009 to 2011 Canada life tables

The current revision updated non-liver-related mortality by using claims data for the same purpose of improving the accuracy of model outputs because the comorbidities associated with blood transfusion or blood products could substantially reduce the life expectancy of compensation claimants. We have used the claims data to estimate annual risk of non-liver-related mortality in non-HIV claimants stratified by age, gender, and hemophilic status and compared them with the 2009 to 2011 Canada age- and gender-specific life tables (*Table 17.1*). The comparisons have demonstrated that annual non-liver-related mortality rates associated with both hemophilics (male: 0.00290) and non-hemophilics (male: 0.00233; female: 0.00133) at ages 30 to 39 were nearly two times of the annual mortality rates in general Canadians (male: 0.00111; female: 0.00058) within the same age range. Annual non-liver-related mortality rates associated with male non-hemophilics in ages 40 to 49 (0.00632) and ages 50 to 59 (0.00794) were 3.3 times and 1.6 times of the annual mortality rates for male Canadians in the same age strata (ages 40 to 49: 0.00240; ages 50 to 59: 0.00619). Thus, we have also performed the sensitivity analysis to compare model outputs based on different data sources for non-liver-related mortality, claims data vs. Canada life tables, for any meaningful changes. However, the model outputs are not sensitive to the identified differences in non-liver-related mortality between claimants and general Canadians as the generated model outputs are almost identical. The comparisons observed almost identical model predictions on cumulative rates of liver-related complications and proportions of disease stages in the selected calendar years from 2020 to 2070. Even though

the relative differences in annual non-liver-related mortality rates between some compensation claimants and general Canadians look large, the absolute differences in annual non-liver-related mortality rates between them are too small to cause any obvious changes of model outputs. The model outputs based on annual non-liver-related mortality rates derived from claims data and the Canada life tables for non-hemophilics are summarized in *Table 17.2*.

6.3. Treatment patterns: current revision vs. the fourth revision

Updating treatment patterns with information from new antiviral regimens served as the major revision of the HCV prognostic model in this report. In order to demonstrate the impact of updated treatment patterns on model predictions, we have compared the model outputs of non-hemophilic claimants using treatment patterns estimated in the fourth revision and the current revision for the HCV prognostic model. The treatment patterns estimated in the two revisions are different in both treatment rate and treatment efficacy. The overall treatment rate in the fourth revision was 43.6%, which is about half of the treatment rate derived from the treatment preference survey study in the current revision. PEG-IFN/RBV was the only antiviral regimen used in the fourth revision and the treatment efficacy of this antiviral regimen was only about half of sofosbuvir-based doublets or 3D regimen plus RBV, the two antiviral regimens functioned as the primary methods of treatment in the current revision of the model. The substantially increased treatment rate and treatment efficacy of antiviral regimens associated with the updated treatment patterns in the current revision were expected to provide a cure for most claimants with CHC and significantly improve long-term prognosis of compensation claimants. Comparing the model outputs based on the two treatment patterns demonstrates that the predicted cumulative rates of decompensated cirrhosis (9.5% vs. 19.7%), HCC (3.4% vs.

8.3%), and liver-related mortality (11.6% vs. 24.9%) associated with the updated treatment patterns in the current revision were less than half of the predictions associated with previous treatment patterns used in the fourth revision. Because the treatment patterns in the fourth revision are expected to cure about one-quarter of surviving claimants and uncured claimants will continue the progression to advanced disease stage, the predicted proportion of compensated cirrhosis associated with treatment patterns in the current revision declines much faster than the prediction associated with previous treatment patterns in the fourth revision. Consequently, the proportions of decompensated cirrhosis (5.9 to 6.7% vs. 0.8 to 2.1%), HCC (2.4 to 3.3% vs. 0.4 to 0.9%), and post-transplant (0.8 to 1.3% vs. 0.4 to 0.7%) in non-hemophilic claimants receiving treatment patterns used in the fourth revision are predicted to be persistently higher than the predictions associated with current treatment patterns over their future survival time. The model outputs based on the two treatment patterns for surviving non-hemophilic claimants are summarized in *Table 18*.

7. Overall uncertainty associated with model predictions

The estimates of model variables are associated with more or less uncertainty that can cause model outputs to vary. Uncertainty associated with model variables is usually indicated by 95% CI, which can be used to construct the distributions of model variables. When exploring over uncertainty associated with model outputs, the mean values of the model variables in the disease prognostic model are replaced with the constructed distributions of model variables to calculate 95% CI of model outputs.

The current revision used the abovementioned method to estimate uncertainty associated with the long-term prognosis of surviving compensation claimants as of August 31, 2013. Because the model variables in the HCV prognostic model are probability/proportion variables that are usually associated with beta distribution, we have constructed the distributions of model variables using their 95% CIs and the assumption of beta distribution. After replacing the baseline values of model variables with the constructed model distributions in the HCV prognostic model, two-order Monte Carlo simulation analysis with 1000 trials for the first order and 50,000 trials for the second order was performed to generate 1000 model outputs for surviving hemophilic and non-hemophilic claimants, respectively. In order to estimate 95% CI of model outputs for the entire claimant cohort, the initial proportion of hemophilia in the surviving claimants (23.1%) has been used to determine the number of model outputs randomly selected from the 1000 model outputs for hemophilics and non-hemophilics. Thus, 231 randomly selected model outputs for hemophilics and 769 randomly selected model outputs for non-hemophilics were pooled to create 1000 model outputs representing the distribution of model outputs for the entire claimant cohort. Based on these 1000 model outputs, the estimated 95% CIs of cumulative decompensated cirrhosis, HCC, and liver-related mortality rates by 2070 were 8.7 to 15.5%, 3.1 to 5.5%, and 11.0 to 18.4%, respectively. The 95% CIs of cumulative rates of liver-related complications and mortality in the selected calendar years are summarized in *Table 19.*

8. Implications of current revision on future indirect costs to claimants

The current revision has predicted that the future treatment patterns over the next five years could cure most claimants and substantially reduce liver-related complications, which are usually associated with significant consumptions of health resources and also indirect costs related to

patient time, caregiver time, and out-of-pocket costs. According to a large survey study measuring 738 outpatients living in the metropolitan area of Vancouver, British Columbia, the annual patient time costs, caregiver time costs, and out-of-pocket costs associated with viral clearance were $281, $31, and $427, respectively. These costs associated with viral clearance were substantially lower than the costs associated with non-cirrhotic patients and further lower when compared to those costs associated with cirrhosis.[94] ENREF 1This study also reported the lowest unemployment rate associated with viral clearance. Thus, successful treatment in a high proportion of HCV infected individuals, as is forecast by this model, may substantially reduce societal costs due to morbidity-related work loss, and may substantially reduce out of pocket expenses associated with ongoing HCV infection.

The economic impact of model outputs on compensation claimants is an important consideration for compensation budget planning as most claimants would get rid of the virus and their compensation needs would be substantially reduced. If future estimations on indirect costs to compensation claimants are needed, this Canadian survey study can be used as the source for the reference of indirect costs needed in the HCV prognostic model. For example, the health states used to summarize the annual patient time costs, caregiver time costs, and out-of-pocket time costs in this survey study could be easily matched with the health states in the HCV prognostic model. The reported annual indirect costs associated with the classified health states (*Table 20*) could be directly applied to the HCV prognostic model except treatment costs, which was based on interferon-based treatment. The new treatments are believed to be associated with much less treatment costs (not including drug costs) than interferon-based treatment because the treatment time of new treatments will be reduced to 12 weeks, which is a quarter of treatment time often

needed for interferon-based treatments. Additionally, the interferon-free treatments will cause much less toxicity and reduce indirect costs associated with AE management. Because this survey study also performed multiple regression analyses to assess the relationship between patient baseline characteristics and annual patient and caregiver time costs and out-of-pocket costs (*Table 21*), the reported coefficients associated with patient demographics, virus clearance, and disease stages can be used to construct a formula to predict indirect costs associated with claimants during each model cycle. The same adjustment for indirect costs associated with treatment is also needed in this method in order to reflect the reduced treatment time and toxicity associated with new antiviral regimens used in the current revision.

9. Discussion

The emergence of highly effective antiviral regimens for CHC is expected to substantially alter current treatment patterns as well as significantly improve the long-term prognosis of patients with CHC. Thus, the current revision has primarily focused on updating treatment patterns with new antiviral regimens and revising model predictions for current surviving compensation claimants due to the changed treatment patterns. The current revision has conducted a survey to measure a physician's likelihood of treating claimants and their preferences on treatment options that include current standard treatment and also three new antiviral regimens that will be ready for Canadian patients within two years. The survey results based on data from 14 physicians suggest that they are willing to treat most claimants using the most recently developed antiviral regimens, sofosbuvir-based doublets and 3D antivirals, likely because they can provide a cure for nearly all patients and their expensive costs can be compensated.

When compared with the fourth revision that was conducted in 2010, the current revision predicts that the lifetime cumulative rates of liver-related complications and mortality can be reduced by half mainly due to greatly improved treatment rates and treatment efficacy associated with new treatments. Separate model predictions for claimants stratified by hemophilic status have further confirmed much poorer prognosis associated with hemophilic claimants mainly because of more advanced disease stages and a much higher prevalence of HIV co-infection in hemophilics. When compared with non-hemophilic claimants, hemophilic claimants are predicted to have doubled lifetime cumulative rates of decompensated cirrhosis, HCC, and liver-related mortality. Further comparisons of model outputs between hemophilics and non-hemophilics stratified by age suggest that the higher initial proportion of cirrhosis in hemophilics is the main factor driving up the occurrences of liver-related complications and mortality. Even though the new treatments can cure most claimants, the cured claimants with developed cirrhosis still have a certain risk of progressing to more advanced stages and continue to increase the risks of liver-related complications and mortality.

The MMWG on the current revision has taken several steps to improve the accuracy of model outputs. First, the current revision includes a survey of previously treated claimants to determine their treatment outcomes that have significant impact on long-term prognosis and also treatment pattern. The overall SVR rate among surveyed claimants was 57.8%, which was highly consistent with the reported SVR rate associated with previous standard antiviral therapy using the combination of PEG-IFN and RBV. We believe that treatment outcome patterns in these surveyed claimants are highly valid when used to estimate the initial proportions of treatment responders and non-responders needed by the HCV prognostic model. Second, the current

revision has fully taken into account the possible impact of HIV co-infection and previous treatment on physician treatment preference[95,96] when conducting the treatment pattern survey study. Additionally, the surveyed physicians were asked to give their treatment preferences according to the summarized baseline characteristics of current surviving claimants chronically infected with HCV. Because previous revisions used the treatment patterns data derived from published survey studies for general patients with HCV, the estimated treatment patterns specifically for claimants stratified by the status of HIV co-infection and previous treatment should have much improved internal validity when simulating the same type of claimants in the model. For example, the results of this survey study indicate that over 90% of the surveyed physicians are willing to treat claimants with new treatments which are highly effective and also highly expensive. We believe that this treatment rate will substantially drop if these new treatments cannot be reimbursed. Finally, the current revision has tried to further improve the accuracy of model outputs by estimating model variables using claims data. Previous revisions mainly estimated model variables from literature or assumptions. When compared with model variables for the prognosis of cirrhosis in the fourth revision, the estimates of some model variables derived from claims data were much lower. For example, the assumed annual risk of receiving liver transplantation in the fourth revision is 25 times of the estimate derived from claims data. Using this assumed estimate would increase lifetime cumulative liver transplantation rate by 356% from 0.9% to 3.2% in surviving non-hemophilic claimants. Because liver transplantation increases costs tremendously to both patients and health care system, the revised prediction of the rate of liver transplantation in the future is expected to have significant impact on future compensation budget planning.

The previous revision validated the natural history model through the comparisons of predicted and observed initial distribution of disease stages in the simulated claimants. In contrast, the current revision compared predicted and observed liver-related complications and mortality by following a group of non-hemophilic claimants for 10 years. The predicted and observed liver-related complications are well matched. However, the predicted cumulative liver-related mortality rate was lower than what was observed whereas the predicted non-liver-related mortality was much higher than what was observed. We suspect that recorded liver-related complications present in the claim cohort may be less advanced due to treatment received via the compensation program. The risk of liver-related mortality among the claimant cohort is likely to be less than predicted by the literature because the cohort has received treatment under the compensation plan that those in other studies did not get (presumably due to cost issues). However, the impact of this bias on model predictions should be significantly minimized because the updated treatment patterns are expected to cure the majority of claimants with CHC and the occurrences of liver-related complications will be substantially reduced. Because claims involving deaths not caused by HCV would not be eligible to receive compensation, non-liver-related mortality in compensation claimants may not be fully recorded. The missing information on non-liver-related mortality could make the predicted non-liver-related mortality higher than the recorded non-liver-related mortality in compensation claimants. Because the two types of bias associated with mortality can be neutralized by each other, the predicted and observed all-cause mortalities are comparable. Thus, we believe that the HCV prognostic model used in the current revision is valid and able to generate reliable model predictions on the long-term prognosis of current surviving compensation claimants.

The current revision has also performed sensitivity analysis to assess the changes of model outputs associated with the major revisions made in the HCV prognostic model. The major revisions include the updated treatment patterns with new antiviral regimens and using claims data to estimate model variables for the prognosis of cirrhosis and non-liver-related mortality. These sensitivity analyses have not detected any meaningful changes of model outputs when changing the data sources for the estimations on the prognosis of cirrhosis and non-liver-related mortality. The insensitivity of model outputs to estimates derived from claims data for the prognosis of cirrhosis can be explained by the updated treatment patterns that will cure most of patients and substantially reduce the risk of cirrhosis in the compensation claimants. Thus, the impact of the changes of model variables for the prognosis of cirrhosis is unlikely to be demonstrated in a small number of cirrhotic claimants. Another sensitivity analysis observed almost identical model outputs based on non-liver-related mortality derived from claims data and the latest Canada life tables. Even though the non-liver-related mortality associated with some compensation claimants has been confirmed to be relatively larger than general population, the absolute differences in non-liver-related mortality between them are too small to cause any obvious changes of model outputs. The final sensitivity analysis compared the model outputs based on previous treatment patterns used in the fourth revision and the updated treatment pattern in the current revision. Similar to the comparisons of model outputs in the fourth revision and the current revision, the model predictions on the lifetime risks of liver-related complications and mortality are decreased by half when the updated treatment patterns in the current revision are used. Thus, these performed sensitivity analyses have confirmed that the predicted improvements of long-term prognosis in the current surviving claimants are solely driven by the

updated treatment patterns that will cure over 80% of surviving claimants with HCV over the next five years.

The current revision also has several limitations that may affect model predictions. The efficacy of antiviral regimens represented in the treatment pattern data are based on randomized clinical trials identified via a comprehensive search of main medical databases as well as proceedings from top liver-related conferences. However, the identified clinical trials are unable to provide all estimates needed in the model. For example, we have to assume that HIV co-infection has the same impact on SVR rates associated with new antiviral regimens as that found in traditional PEG-IFN/RBV treatment due to the lack of trials assessing new antiviral treatments in patients with HIV co-infection. Additionally, the reported treatment efficacies associated with these new antiviral regimens are determined based on SVR at 12 weeks, which is only half the time conventionally used to assess SVR following treatment. Even though both Health Canada and US FDA accept SVR at 12 weeks as the main outcome measure to assess treatment efficacies of new antivirals, there is no clinical evidence confirming that SVR at 12 weeks represents a clinical cure. Thus, current model predictions may require further adjustment if SVR rates associated with new antiviral regimens change appreciably given longer follow-up. Finally, the current revision doesn't take into account the prognosis of small number of claimants (33 claimants, 0.86% of total surviving claimants as of August 31, 2013) who were categorized into compensation level 6 because of liver-unrelated complications, such as lymphoma (8 claimants), cryoglobulinemia (14 claimants), and glomerulonephritis (11 claimants). Because cryoglobulinemia and glomerulonephritis can be substantially improved after eradication of HCV,[97] the new treatment patterns could make their impact on model prediction totally ignorable.

Also, more and more convincing evidence suggest that successful antiviral therapy improves cure rate of HCV-related lymphoma.[98] We believe that this small group of patients only have modest effects on the future mortality of the compensation cohort.

In summary, the HCV prognostic model has been revised by including future treatment pattern data which takes into account new antiviral regimens that are likely to be available in Canada within the next two years. The much improved treatment rate and cure rate associated with sofosbuvir-based doublets and 3D antiviral regimen plus RBV would reduce the lifetime risks of liver-related complications and mortality by half in current surviving hemophilic and non-hemophilic claimants. Additionally, hemophilic claimants are predicted to continue to have a worse prognosis than non-hemophilic claimants likely due to a higher initial proportion of cirrhosis and HIV co-infection. Thus, future compensation funds are definitely needed to be adjusted by taking into account the changes of treatment patterns, expected reductions of liver-related complications and mortality, and reduced indirect costs to claimants due to substantially improved cure rate.

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11. Tables

Table 1. Baseline clinical and serological features of post-transfusion claimant cohort as of August 31, 2013: comparisons between hemophilics and non-hemophilics.

	Total	Hemophilics		non-Hemophilics		Statistical test	
Characteristics	N=5368	N=1345		N=4023			
	N	N	%*	N	%*	Chi	P
Sex							
Male	3303	1189	88.4	2114	52.5	547.423	*<0.001*
Female	2061	155	11.5	1906	47.4	547.815	*<0.001*
Missing	4	1	0.1	3	0.1	0.000	0.998

Survival status as of August 31, 2013							
Alive	3832	884	65.7	2948	73.3	27.789	***<0.001***
Dead	1536	461	34.3	1075	26.7	27.789	***<0.001***
Compensation level based on biopsy							
Yes	1053	232	17.3	821	20.4	6.378	***0.012***
No	4315	1113	82.7	3202	79.6	6.378	***0.012***
Level of compensation							
Level 1	872	155	11.5	717	17.8	29.390	***<0.001***
Level 2	1442	211	15.7	1231	30.6	114.078	***<0.001***
Level 3	1322	347	25.8	975	24.2	1.328	0.249
Level 4	292	84	6.3	208	5.2	2.265	0.132
Level 5	361	112	8.3	249	6.2	7.344	***0.007***
Level 6	610	148	11.0	462	11.5	0.231	0.631
Missing	469	288	21.4	181	4.5	361.636	***<0.001***
HCV therapy							
Yes	1342	378	28.1	964	24.0	9.223	***0.002***
No	4026	967	71.9	3059	76.0	9.223	***0.002***
HIV Positive							
Yes	537	412	30.6	125	3.1	848.248	***<0.001***
No	4339	847	63.0	3492	86.8	369.331	***<0.001***
Indeterminate	38	3	0.2	35	0.9	6.002	***0.014***
Missing	454	83	6.2	371	9.2	12.119	***0.001***
Age at first blood transfusion (yr)							
0-9	286	0	0.0	286	7.1	0.078	0.780
10-19	252	0	0.0	252	6.3	0.068	0.794
20-29	694	1	0.1	693	17.2	4.687	***0.030***
30-39	747	0	0.0	747	18.6	0.234	0.629
40-49	596	0	0.0	596	14.8	0.178	0.673
50-59	590	0	0.0	590	14.7	0.176	0.675
60-69	571	0	0.0	571	14.2	0.169	0.681
70+	203	0	0.0	203	5.1	0.054	0.816
Missing	7	0	0.0	7	0.2	0.002	0.966
Year at first blood transfusion							
<1986	567	0	0.0	567	14.1	0.168	0.682
1986	793	1	0.1	792	19.7	3.977	***0.046***
1987	805	0	0.0	805	20.0	0.256	0.613
1988	737	0	0.0	737	18.3	0.230	0.632
1989	751	0	0.0	751	18. 7	0.235	0.628
1990	292	0	0.0	292	7.3	0.080	0.777
Missing	1	0	0.0	1	0.0	0.000	0.987

Number of transfusions, 1986-1990							
1	1385	1	0.1	1384	34.4	1.850	0.174
2	348	0	0.0	348	8.7	0.097	0.756
3	183	0	0.0	183	4.6	0.049	0.825
4	272	0	0.0	272	6.8	0.074	0.786
5	100	0	0.0	100	2.5	0.026	0.872
>5	1653	0	0.0	1653	41.1	0.721	0.396
Missing	5	0	0.0	5	0.1	0.001	0.972
Among alive cohort	N=3832	N=884		N=2948			
HIV Positive							
Yes	326	227	25.7	99	3.4	435.296	***<0.001***
No	3160	595	67.3	2565	87.0	182.516	***<0.001***
Indeterminate	24	2	0.2	22	0.8	2.955	0.086
Missing	322	60	6.8	262	8.9	3.897	***0.048***
Sex							
Male	2173	749	84.7	1424	48.3	367.526	***<0.001***
Female	1655	134	15.2	1521	51.6	367.967	***<0.001***
Current age, mean (SD) years	5362	883	49.7 (13.7)	2944	61.8 (18.5)	17.970	***<0.001***

*Percentages were calculated based on available observations excluding missing and unknown categories.
HCV, hepatitis C virus; RNA, ribonucleic acid; SD, standard deviation.

Table 2.1. Baseline characteristics and SVR among previously treated compensation claimants.

Hemophilic status	Hemophilics		Non-hemophilics		P value
Sample size	118		354		
Demography	N	Mean±SD/%	N	Mean±SD/%	
Age (years)	118	51.3±10.7	354	57.0±13.7	***<0.001***
Male gender (%)	103	87.3	176	49.72	***<0.001***
Viral genotype (%)					
1a	34	28.8	95	26.8	0.721
1b	13	11.0	28	7.9	0.345

2 or 3	21	17.8	58	16.4	0.776
others	3	2.5	4	1.1	0.374
Unknown	47	39.8	169	47.7	0.165
Compensation level (%)					
2	21	17.8	42	11.9	0.118
3	41	34.8	196	55.4	***<0.001***
4	18	15.3	41	11.6	0.335
5	23	19.5	43	12.2	0.065
6	8	6.8	12	3.4	0.119
Unknown	7	5.9	20	5.7	1.000
HIV co-infection (%)	24	20.3	5	1.4	***<0.001***
Treatment outcome					
SVR (%)	55	46.6	218	61.6	***0.001***

SVR, sustained viral response; SD, standard deviation; HIV, human immunodeficiency virus

Table 2.2. Characteristics of surveyed compensation claimants with successful antiviral treatment (SVR).

Hemophilic status	Hemophilics		Non-hemophilics		P value
Sample size	55		218		
Demography	N	Mean±SD/%	N	Mean±SD/%	
Age (years)	55	50.0±11.2	218	56.1±14.0	***0.003***
Male gender (%)	49	89.1	109	50.0	***<0.001***
Viral genotype (%)					
1a	8	14.6	58	26.6	0.077

1b	7	12.7	12	5.5	0.075
2 or 3	13	23.6	40	18.4	0.445
others	2	3.6	3	1.4	0.265
Unknown	25	45.5	105	48.2	0.764
Compensation level (%)					
2	8	14.6	24	11.0	0.484
3	24	43.6	137	62.8	***0.014***
4	10	18.2	29	13.3	0.389
5	6	10.9	15	6.9	0.393
6	4	7.3	3	1.4	***0.032***
Unknown	3	5.5	10	4.6	0.729
HIV co-infection (%)	8	14.6	2	0.9	***<0.001***

Table 2.3. Characteristics of surveyed compensation claimants with unsuccessful antiviral treatment (no SVR).

Hemophilic status	Hemophilics		Non-hemophilics		P value
Sample size	62		119		
Demography	N	Mean±SD/%	N	Mean±SD/%	
Age (years)	62	52.5±10.2	119	58.4±13.1	***0.002***
Male gender (%)	53	85.5	60	50.4	***<0.001***
Vrial genotype (%)					
1a	26	41.9	35	29.4	0.1
1b	6	9.7	15	12.6	0.632

2 or 3	8	12.9	18	15.1	0.824
others	1	1.6	1	0.8	1
Unknown	21	33.9	50	42.0	0.337
Compensation level (%)					
2	12	19.4	17	14.3	0.398
3	17	27.4	48	40.3	0.103
4	8	12.9	11	9.2	0.453
5	17	27.4	25	21.0	0.357
6	4	6.5	8	6.7	1
Unknown	4	6.5	10	8.4	0.774
HIV co-infection (%)	16	25.8	2	1.7	***<0.001***

Table 3. Initial distribution of disease stages in the surviving compensation claimants stratified by their hemophilic status.

Hemophilic status			Hemophilics			Non-hemophilics		
Disease stage			Distribution (%)	initial age (years)	Male proportion (%)	Distribution (%)	initial age (years)	Male proportion (%)
SVC (level 1)			21.8	47.8	84.5	28.4	64.5	39.0
Responders to previous treatment	without HIV	level 2	2.7	41.4	89.3	2.0	59.8	46.0
		level 3	5.7	47.2	84.6	11.8	51.8	49.8
		level 4	3.5	49.0	83.2	2.4	59.7	41.2
		level 5	1.5	54.8	100.0	1.2	64.8	59.8
		missing	1.7	60.0	100.0	0.2	70.7	66.5
	with HIV	level 2	0.5	74.4	100.0	NA	NA	NA

		level 3	2.4	43.5	100.0	0.2	46.7	0.0
		level 4	0.0	NA	NA	NA	NA	NA
		level 5	0.3	49.0	100.0	NA	NA	NA
		missing	0.0	NA	NA	NA	NA	NA
Non-responders to previous treatment	Without HIV	level 2	2.8	50.1	68.6	1.4	63.6	64.8
		level 3	4.4	53.3	80.0	4.2	57.2	46.3
		level 4	1.6	52.1	100.0	0.9	61.8	55.1
		level 5	4.0	50.9	77.8	2.1	52.3	43.6
		missing	0.0	NA	NA	NA	NA	NA
		decompensated cirrhosis	0.9	48.9	100.0	0.6	57.2	72.8
		HCC	0.3	56.4	100.0	0.2	54.1	100.0
		post-transplant	0.0	NA	NA	0.1	64.4	0.0
	With HIV	level 2	1.1	63.3	100.0	NA	NA	NA
		level 3	1.5	50.2	100.0	NA	NA	NA
		level 4	0.9	45.6	100.0	NA	NA	NA
		level 5	1.2	54.8	100.0	NA	NA	NA
		missing	0.0	NA	NA	NA	NA	NA
		decompensated cirrhosis	0.5	36.5	100.0	NA	NA	NA
		HCC	0.0	NA	NA	NA	NA	NA
		post-transplant	0.0	NA	NA	NA	NA	NA
Treatment-naïve	without HIV	level 2	13.2	45.5	85.5	27.5	65.2	48.1
		level 3	10.0	59.0	73.9	11.7	60.4	47.1
		level 4	3.3	55.1	86.2	1.4	64.4	45.3
		level 5	1.6	50.9	85.7	2.0	71.1	53.4
		missing	0.1	79.1	100.0	NA	NA	NA
		decompensated cirrhosis	0.7	57.4	66.7	0.9	70.3	46.4
		HCC	0.3	52.8	100.0	0.2	72.5	60.0
		post-transplant	0.3	71.1	100.0	0.2	64.4	60.0
	with HIV	level 2	5.4	48.7	97.9	0.0	54.4	0.0
		level 3	3.8	44.2	100.0	NA	NA	NA
		level 4	0.6	46.0	100.0	0.0	50.9	100.0
		level 5	1.4	45.0	100.0	NA	NA	NA
		missing	0.1	71.5	100.0	NA	NA	NA
		decompensated cirrhosis	0.1	44.1	100.0	NA	NA	NA
		HCC	0.0	NA	NA	NA	NA	NA
		post-transplant	0.1	42.3	100.0	NA	NA	NA

SVC, spontaneous viral clearance; HIV, human immunodeficiency virus

Table 4.1. Estimated initial distribution of disease stages in surviving hemophilic claimants as of August 31, 2013.

Age strata	20 to 29		30 to 39		40 to 49		50 to 59		60 to 69		70 to 79		80 to 89		90 or above		All age	
Sample size	22		192		265		206		107		49		24		7		872	
Disease stage	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
F0, HCV RNA-	6	27.3	51	26.6	40	15.1	21	10.2	10	9.3	7	14.3	3	12.5	0	0.0	138	15.8
F0, HCV RNA+	4	18.2	38	19.8	48	18.1	39	18.9	14	13.1	12	24.5	16	66.7	6	85.7	177	20.3
F1/2	3.6	16.4	30.5	15.9	50.1	18.9	41	19.9	21.7	20.3	7.2	14.7	1.2	5.0	0.3	4.3	156	17.8
F3	4.7	21.4	39.7	20.7	65.3	24.6	53.5	26.0	28.3	26.4	9.4	19.2	1.6	6.7	0.4	5.7	203	23.3
F4, compensated cirrhosis	3.7	16.8	30.8	16.0	50.6	19.1	41.5	20.1	22	20.6	7.3	14.9	1.2	5.0	0.3	4.3	157	18.1
F4, decompensated cirrhosis	0	0.0	2	1.0	7	2.6	6	2.9	7	6.5	2	4.1	1	4.2	0	0.0	25	2.9
HCC	0	0.0	0	0.0	3	1.1	4	1.9	1	0.9	3	6.1	0	0.0	0	0.0	11	1.3
Post-transplant	0	0.0	0	0.0	1	0.4	0	0.0	3	2.8	1	2.0	0	0.0	0	0.0	5	0.6

Table 4.2. Estimated initial distribution of disease stages in surviving non-hemophilic claimants as of August 31, 2013.

Age strata	20 to 29		30 to 39		40 to 49		50 to 59		60 to 69		70 to 79		80 to 89		90 or above		All age	
Sample size	196		112		397		693		494		409		354		227		2882	
Disease stage	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
F0, HCV RNA-	31	15.8	23	20.5	71	17.9	128	18.5	77	15.6	70	17.1	67	18.9	38	16.7	505	17.5
F0, HCV RNA+	69	35.2	35	31.3	97	24.4	179	25.8	123	24.9	146	35.7	165	46.6	146	64.3	960	33.3
F1/2	54.7	27.9	30.8	27.5	129.8	32.7	213.6	30.8	158.9	32.2	100.1	24.5	64.6	18.2	23.3	10.3	775	26.9
F3	21.8	11.1	12.3	11.0	51.7	13.0	85.1	12.3	63.3	12.8	39.9	9.8	25.8	7.3	9.3	4.1	309	10.7
F4, compensated cirrhosis	17.5	8.9	9.9	8.8	41.5	10.5	68.3	9.9	50.8	10.3	32	7.8	20.6	5.8	7.4	3.3	248	8.6
F4, decompensated cirrhosis	1	0.5	1	0.9	3	0.8	11	1.6	9	1.8	16	3.9	7	2.0	1	0.4	49	1.7
HCC	0	0.0	0	0.0	1	0.3	2	0.3	5	1.0	3	0.7	3	0.8	1	0.4	15	0.5
Post-transplant	1	0.5	0	0.0	2	0.5	6	0.9	7	1.4	2	0.5	1	0.3	1	0.4	20	0.7

Table 5.1. Summary of synthesized SVR rates associated with selected four antiviral regimens in patients with CHC stratified by previous treatment status and HIV co-infection status.

Treatment regimen	Treatment duration	Treatment-naïve without HIV		Treatment-naïve with HIV		Previously treated without HIV		Previously treated with HIV	
		SVR	95% CI	SVR	95% CI	SVR	95% CI	SVR	95% CI
PEG-IFN/RBV	24 to 48 weeks	0.455	0.433 to 0.478	0.371	0.260 to 0.498	0.374	0.323 to 0.428	0.305	0.263 to 0.349
PEG-IFN/RBV-based triple therapy	24 to 48 weeks	0.7	0.670 to 0.728	0.735	0.644 to 0.809	0.538	0.452 to 0.623	0.538	0.452 to 0.623
Sofosbuvir-based doublet	12 weeks	0.946	0.885 to 0.976	0.802	0.751 to 0.828	0.954	0.866 to 0.985	0.809	0.734 to 0.783
3D regimen plus RBV	12 weeks	0.962	0.944 to 0.975	0.816	0.800 to 0.826	0.963	0.938 to 0.977	0.817	0.795 to 0.829

Table 5.2. Summary of synthesized AE-related treatment discontinuation rates associated with selected four antiviral regimens in patients with CHC stratified by previous treatment status and HIV co-infection status.

Anregimen	Treatment duration	Treatment-naïve without HIV		Treatment-naïve with HIV		Previously treated without HIV		Previously treated with HIV	
		Treatment discontinuation	95% CI	Treatment discontinuation	95% CI	Treatment discontinuation	95% CI	Treatment discontinuation	95% CI
PEG-IFN/RBV	24 to 48 weeks	0.1	0.05 to 0.16	0.18	0.02 to 0.33	0.131	0.07 to 0.21	0.236	0.126 to 0.378
PEG-IFN/RBV-based triple therapy	24 to 48 weeks	0.127	0.103 to 0.154	0.2	0.119 to 0.316	0.166	0.111 to 0.242	0.261	0.175 to 0.381
Sofosbuvir-based doublet	12 weeks	0.022	0.006 to 0.084	0.0396	0.011 to 0.151	0.022	0.006 to 0.084	0.0396	0.011 to 0.151
3D regimen plus RBV	12 weeks	0.006	0.001 to 0.018	0.0108	0.002 to 0.032	0.01	0.002 to 0.029	0.018	0.004 to 0.052

Table 6.1. Summary of baseline characteristics associated with surviving compensation claimants with ongoing CHC stratified by previous treatment status and HIV co-infection status.

Type of claimants	Treatment naïve without HIV	Treatment naïve without HIV	Previously treated without HIV	Previously treated with HIV
Age (years)	62.8 ± 20.2	47.6 ± 11.2	54.3 ± 14.0	50.2 ± 8.2
Male gender	53.3%	96.3%	58.0%	93.3%
Duration of HCV infection (years)	26.7 ± 4.8	25.0 ± 1.0	26.4 ± 5.2	26.0 ± 1.7
Hemophilics	16.2%	97.3%	27.3%	93.0%
Previous blood transfusion	81.9%	2.8%	71.4%	7.0%
Distribution of fibrosis stage				
F0	63.5%	39.4%	0.0%	0.0%
F1/F2	27.8%	39.4%	71.0%	53.5%
F3	3.8%	5.5%	15.2%	16.3%
F4	4.9%	15.6%	13.8%	30.2%
Distribution of viral genotype				
1	74.4%	75.0%	74.4%	75.0%
2 or 3	24.4%	16.7%	24.4%	16.7%
4, 5 or 6	1.2%	8.3%	1.3%	8.3%

Table 6.2. Summary of the treatment pattern based on 14 surveyed physicians for surviving compensation claimants with ongoing CHC over the next five years.

Treatment patterns	Treatment rate (%)		Treatment options							
			PEG/RBV		PEG/RBV-based triple therapy		Sofosbuvir-based doublet		3D regimen plus RBV	
Type of claimant	Baseline	95% CI	N	%	N	%	N	%	N	%
Treatment-naïve without HIV	87.5	79.2 to 95.8	0	0	2	14.3	7	50	5	35.7
Treatment-naïve with HIV	65.8	42.3 to 89.3	0	0	1	8.3	3	25	8	66.7
Previously treated without HIV	91.0	86.0 to 96.1	0	0	1	7.1	5	35.7	8	57.1
Previously treated with HIV	61.7	39.5 to 84.0	0	0	1	8.3	1	8.3	10	83.4

Table 7. Uncalibrated and calibrated annual stage-specific fibrosis transition probabilities derived from non-hemophilic claimants using MMLE method in the fourth and fifth revisions.

Revision version	Fibrosis transition	F0 to F1		F1 to F2		F2 to F3		F3 to F4	
		Baseline	95% CI	Baseline	95% CI	Baseline	95% CI	Baseline	95% CI
The fourth revision (2010)	Uncalibrated	0.029	0.025,0.032	0.118	0.080,0.145	0.137	0.079,0.175	0.103	0.042,0.130
	Calibrated	0.057	0.051,0.084	0.145	0.082,0.153	0.15	0.130,0.202	0.12	0.133,0.253
The fifth revision (2014)	Uncalibrated	0.038	0.033,0.044	0.101	0.074,0.128	0.133	0.084,0.182	0.114	0.063,0.166
	Calibrated	0.054	0.046,0.062	0.12	0.088,0.152	0.135	0.085,0.185	0.138	0.076,0.200

Table 8. Prognosis of cirrhosis derived from approved compensation claimants for the current revision and derived from literature in the fourth revision.

Transition between health states	Sample size	Cumulative events	Follow-up time (years)		Annual transition probability (fifth revision)		Annual transition probability (fourth revision)	
			Baseline	95% CI	Baseline	95% CI	Baseline	95% CI
Compensated cirrhosis to decompensated cirrhosis	98	64	13.05	12.22, 13.89	0.078	0.073,0.083	0.065	0.033,0.092
Compensated cirrhosis to HCC	98	28	13.05	12.22, 13.89	0.025	0.024,0.027	0.033	0.024,0.046
Decompensated cirrhosis to death	414	343	10.72	10.26, 11.19	0.152	0.146,0.158	0.186	0.137,0.250
HCC to death	130	110	9.32	8.50, 10.13	0.182	0.169,0.198	0.35	0.316,0.699
Decompensated cirrhosis or HCC to liver transplantation	515	21	10.29	9.87, 10.71	0.004	0.0039,0.0042	0.1	0.050,0.180
Mortality after liver transplantation (first year)	58	5			0.086	0.037,0.186	0.146	0.127,0.210
Mortality after liver transplantation (subsequent year)	53	24	15.06	13.73, 16.39	0.039	0.036,0.043	0.044	0.035,0.053

Table 9.1. Canadian age- and sex-related life table, 2009 to 2011.

Age	Male	Female	Age	Male	Female
1 year	0.0003	0.00021	56 years	0.00533	0.00336
2 years	0.00022	0.00016	57 years	0.00586	0.00368
3 years	0.00017	0.00013	58 years	0.00645	0.00403
4 years	0.00013	0.0001	59 years	0.00709	0.00442
5 years	0.00011	0.00009	60 years	0.0078	0.00485
6 years	0.0001	0.00008	61 years	0.00859	0.00533
7 years	0.00009	0.00007	62 years	0.00945	0.00586
8 years	0.00008	0.00007	63 years	0.0104	0.00645
9 years	0.00008	0.00007	64 years	0.01145	0.0071
10 years	0.00009	0.00008	65 years	0.0126	0.00782
11 years	0.0001	0.00008	66 years	0.01387	0.00862
12 years	0.00012	0.00009	67 years	0.01528	0.00951
13 years	0.00015	0.00011	68 years	0.01682	0.01051
14 years	0.0002	0.00014	69 years	0.01852	0.01161
15 years	0.00028	0.00018	70 years	0.0204	0.01284
16 years	0.00039	0.00022	71 years	0.02247	0.0142
17 years	0.00051	0.00026	72 years	0.02475	0.01573
18 years	0.00059	0.00028	73 years	0.02726	0.01743
19 years	0.00066	0.00029	74 years	0.03004	0.01934
20 years	0.00071	0.0003	75 years	0.0331	0.02146
21 years	0.00075	0.0003	76 years	0.03647	0.02384
22 years	0.00076	0.00031	77 years	0.04019	0.02649
23 years	0.00076	0.00031	78 years	0.0443	0.02947
24 years	0.00074	0.0003	79 years	0.04883	0.0328
25 years	0.00071	0.0003	80 years	0.05383	0.03654
26 years	0.0007	0.0003	81 years	0.05935	0.04074
27 years	0.00069	0.00031	82 years	0.06543	0.04545
28 years	0.0007	0.00032	83 years	0.07215	0.05074
29 years	0.00071	0.00034	84 years	0.07957	0.05669
30 years	0.00074	0.00037	85 years	0.08776	0.06338
31 years	0.00078	0.0004	86 years	0.0968	0.07091
32 years	0.00082	0.00043	87 years	0.10678	0.0794
33 years	0.00086	0.00047	88 years	0.1178	0.08897
34 years	0.00091	0.00051	89 years	0.12997	0.09977
35 years	0.00096	0.00056	90 years	0.14341	0.11196
36 years	0.00102	0.0006	91 years	0.15794	0.12542
37 years	0.00108	0.00066	92 years	0.17326	0.13991
38 years	0.00115	0.00071	93 years	0.18931	0.15541
39 years	0.00123	0.00077	94 years	0.20604	0.1719
40 years	0.00132	0.00084	95 years	0.21839	0.18849
41 years	0.00142	0.00092	96 years	0.23536	0.20653
42 years	0.00153	0.001	97 years	0.2529	0.22549
43 years	0.00165	0.00109	98 years	0.27092	0.24526
44 years	0.00179	0.00118	99 years	0.28933	0.26571
45 years	0.00194	0.00129	100 years	0.30802	0.28671
46 years	0.00211	0.0014	101 years	0.32687	0.3081
47 years	0.00229	0.00153	102 years	0.34576	0.3297
48 years	0.00251	0.00166	103 years	0.36457	0.35132
49 years	0.00275	0.00181	104 years	0.38319	0.3728
50 years	0.00301	0.00197	105 years	0.40149	0.39395
51 years	0.00331	0.00215	106 years	0.41937	0.41461
52 years	0.00364	0.00235	107 years	0.43673	0.43462
53 years	0.00401	0.00257	108 years	0.4535	0.45386
54 years	0.00441	0.0028	109 years	0.4696	0.47222
55 years	0.00484	0.00307	110 years and over	1	1

Table 9.2. Annual risk of non-liver-related mortality based on the 10-year follow-up (2003 to 2013) of hemophilic claimants stratified by age strata and gender.

Gender	Males			Females		
Age strata	Sample size	Non-liver-related death	Annual non-liver-related mortality rate	Sample size	Non-liver-related death	Annual non-liver-related mortality rate
20 to 29	139	0	0.0000	14	0	0.0000
30 to 39	170	5	0.0029	39	0	0.0000
40 to 49	133	3	0.0022	31	1	0.0032
50 to 59	70	3	0.0046	32	2	0.0062
60 to 69	49	4	0.0093	13	1	0.0078
70+	28	4	0.0170	10	1	0.0127

Table 9.3. Annual risk of non-liver-related mortality based on the 10-year follow-up (2003 to 2013) of non-hemophilic claimants stratified by age strata and gender.

Gender	Male			Female		
Age strata	Sample size	Non-liver-related death	Annual non-liver-related mortality rate	Sample size	Non-liver-related death	Annual non-liver-related mortality rate
20 to 29	59	1	0.0017	53	0	0.0000
30 to 39	217	5	0.0023	227	3	0.0013
40 to 49	293	18	0.0063	428	8	0.0019
50 to 59	248	19	0.0079	273	13	0.0049
60 to 69	238	30	0.0134	217	11	0.0052
70+	352	51	0.0155	272	26	0.0100

Table 10. Annual risk of non-liver-related mortality based on the 10-year follow-up (2003 to 2013) of claimants with HIV co-infection stratified by age strata and gender.

Gender	Male			Female		
Age strata	Sample size	Non-liver-related death	Annual non-liver-related mortality rate	Sample size	Non-liver-related death	Annual non-liver-related mortality rate
20 to 29	52	4	0.0083	0	0	-
30 to 39	89	3	0.0036	4	0	-
40 to 49	63	3	0.0051	3	0	-
50 to 59	18	0	-	0	0	-
60 to 69	3	0	-	1	0	-
70+	1	1	1	1	0	-

Table 11. Model predicted and observed prognosis of non-hemophilic claimants over 10-year follow-up from 2003 to 2013.

Outcome measure	2003 (observed)	2013 (observed)	2013 (predicted)
Cumulative rate (%)			
Cirrhosis	10.4	12.1	13.6
Decompensated cirrhosis	2.9	7.4	6.1
Liver transplantation	0.6	0.7	0.7
HCC	0.4	1.8	1.9
Liver-related mortality	0	7.4	4.1
Non-liver-related mortality	0	4.5	6.5
Proportion of disease stage among surviving claimants (%)			
F_0 with HCV RNA-	23.1	24.8	25.1
F_0 with HCV RNA+	46.9	46.7	29.3
F_1	6.8	10.2	19.7
F_2	6.8	10	9.1
F_3	5.9	2.2	7
Compensated cirrhosis	7.5	3.8	6.3
Decompensated cirrhosis	1.9	1.5	2.2
Post-transplant	0.6	0.5	0.5
HCC	0.4	0.4	0.9

Table 12. Summary of model variables applied to the HCV prognostic model in the current revision.

Model variables	Baseline value	Lower limit of 95% CI	Upper limit of 95% CI	Data source
Prevalence of hemophilia in the survival claim cohort on August 31, 2014	0.231			Table 1
Initial distribution of disease stage in survival hemophilia claimants				
F0 with HCV RNA-	0.158			Table 4.1
F0 with HCV RNA+	0.203			Table 4.1
F1/2	0.178			Table 4.1
F3	0.233			Table 4.1
F4, compensated cirrhosis	0.181			Table 4.1
F4, decompensated cirrhosis	0.029			Table 4.1
HCC	0.013			Table 4.1
Post-transplant	0.006			Table 4.1
Initial distribution of disease stage in survival non-hemophilia claimants				
F0 with HCV RNA-	0.175			Table 4.2
F0 with HCV RNA+	0.333			Table 4.2
F1/2	0.269			Table 4.2
F3	0.107			Table 4.2

F4 (compensated cirrhosis)	0.086			Table 4.2
Decompensated cirrhosis	0.017			Table 4.2
HCC	0.005			Table 4.2
Post-transplant	0.007			Table 4.2
Natural history of CHC				
Annual incidence rate of SVC for F0 and F1	0.017	0.011	0.022	The fourth revision report
Annual incidence rate of SVC for F2	0.01			The fourth revision report
Annual incidence rate of SVC for F3	0.005			The fourth revision report
Annual transition from F0 to F1	0.054	0.046	0.062	Table 7
Annual transition from F1 to F2	0.12	0.088	0.152	Table 7
Annual transition from F2 to F3	0.135	0.085	0.185	Table 7
Annual transition from F3 to F4	0.138	0.076	0.200	Table 7
Annual transition between fibrosis stages in treatment naïve or previously treated claimants with SVR	0			Model assumption
Annual risk of decompensated cirrhosis associated with compensated cirrhosis	0.078	0.073	0.083	Table 8
Annual risk of decompensated cirrhosis associated with compensated cirrhosis after successful antiviral treatment	0.039			Model assumption
Annual risk of HCC associated with F1 to F2	0.0001			The fourth revision report
Annual risk of HCC associated with F3	0.001			The fourth revision report
Annual risk of HCC associated with compensated cirrhosis	0.025	0.024	0.027	Table 8
Annual risk of mortality associated with decompensated cirrhosis	0.152	0.146	0.158	Table 8
Annual risk of mortality associated with HCC	0.182	0.169	0.198	Table 8
Annual risk of liver transplantation associated with decompensated cirrhosis or HCC	0.004	0.004	0.004	Table 8
Risk of mortality in the first year after liver transplantation	0.086	0.037	0.186	Table 8
Annual risk of mortality in subsequent years after liver transplantation	0.039	0.036	0.043	Table 8
Proportion of previous treatments in hemophilic claimants	0.38			Claims data
Proportion of previous treatments in non-hemophilic claimants	0.29			Claims data
SVR rate of previous antiviral treatment in hemophilic claimants	0.466			Table 2.1
SVR rate of previous antiviral treatment in non-hemophilic claimants	0.616			Table 2.1
Treatment pattern				
Treatment rate in treatment-naïve claimants without HIV	0.875	0.792	0.958	Table 6.3
Treatment rate in treatment-naïve claimants with HIV	0.658	0.423	0.893	Table 6.3
Treatment rate in previously treated claimants without HIV	0.91	0.86	0.961	Table 6.3
Treatment rate in previously treated claimants with HIV	0.617	0.395	0.84	Table 6.3
Distribution of antiviral regimens used in treatment-naïve claimants without HIV				
PEG-IFN/RBV	0			Table 6.3
PEG-IFN/RBV-based triple therapy	0.143			Table 6.3
Sofosbuvir-based doublet	0.5			Table 6.3
3D regimen plus RBV	0.357			Table 6.3
Distribution of antiviral regimens used in treatment-naïve claimants with HIV				

PEG-IFN/RBV	0			Table 6.3
PEG-IFN/RBV-based triple therapy	0.083			Table 6.3
Sofosbuvir-based doublet	0.250			Table 6.3
3D regimen plus RBV	0.667			Table 6.3
Distribution of antiviral regimens used in previously treated claimants without HIV				
PEG-IFN/RBV	0			Table 6.3
PEG-IFN/RBV-based triple therapy	0.071			Table 6.3
Sofosbuvir-based doublet	0.357			Table 6.3
3D regimen plus RBV	0.571			Table 6.3
Distribution of antiviral regimens used in previously treated claimants with HIV				
PEG-IFN/RBV	0			Table 6.3
PEG-IFN/RBV-based triple therapy	0.083			Table 6.3
Sofosbuvir-based doublet	0.083			Table 6.3
3D regimen plus RBV	0.834			Table 6.3
Treatment efficacy of antiviral regiments in treatment-naïve patients without HIV				
PEG-IFN/RBV	0.455	0.433	0.478	Table 6.1
PEG-IFN/RBV-based triple therapy	0.7	0.67	0.728	Table 6.1
Sofosbuvir-based doublet	0.946	0.885	0.976	Table 6.1
3D regimen plus RBV	0.962	0.944	0.975	Table 6.1
Treatment efficacy of antiviral regiments in treatment-naïve patients with HIV				
PEG-IFN/RBV	0.371	0.26	0.498	Table 6.1
PEG-IFN/RBV-based triple therapy	0.735	0.644	0.809	Table 6.1
Sofosbuvir-based doublet	0.802	0.751	0.828	Table 6.1
3D regimen plus RBV	0.816	0.8	0.826	Table 6.1
Treatment efficacy of antiviral regiments in previously treated patients without HIV				
PEG-IFN/RBV	0.374	0.323	0.428	Table 6.1
PEG-IFN/RBV-based triple therapy	0.538	0.452	0.623	Table 6.1
Sofosbuvir-based doublet	0.954	0.866	0.985	Table 6.1
3D regimen plus RBV	0.963	0.938	0.977	Table 6.1
Treatment efficacy of antiviral regiments in previously treated patients with HIV				
PEG-IFN/RBV	0.305	0.263	0.349	Table 6.1
PEG-IFN/RBV-based triple therapy	0.538	0.452	0.623	Table 6.1
Sofosbuvir-based doublet	0.809	0.734	0.783	Table 6.1
3D regimen plus RBV	0.817	0.795	0.829	Table 6.1
Annual risk of non-liver-related mortality in male hemophilics				
20 to 29	Canadian life table			Table 9.1
30 to 39	0.003			Table 9.2
40 to 49	0.002			Table 9.2
50 to 59	0.005			Table 9.2
60 to 69	0.009			Table 9.2
70+	Canadian life table			Table 9.1

Annual risk of non-liver-related mortality in female hemophilics				
20 to 29	Canadian life table			Table 9.1
30 to 39	Canadian life table			Table 9.1
40 to 49	Canadian life table			Table 9.1
50 to 59	Canadian life table			Table 9.1
60 to 69	Canadian life table			Table 9.1
70+	Canadian life table			Table 9.1
Annual risk of non-liver-related mortality in male non-hemophilics				
20 to 29	0.002			Table 9.3
30 to 39	0.002			Table 9.3
40 to 49	0.006			Table 9.3
50 to 59	0.008			Table 9.3
60 to 69	0.013			Table 9.3
70+	Canadian life table			Table 9.1
Annual risk of non-liver-related mortality in female non-hemophilics				
20 to 29	Canadian life table			Table 9.1
30 to 39	0.001			Table 9.3
40 to 49	0.002			Table 9.3
50 to 59	0.005			Table 9.3
60 to 69	0.005			Table 9.3
70+	Canadian life table			Table 9.1
Annual risk of non-liver-related mortality in male claimants with HIV co-infection				
20 to 29	0.0083			Table 10
30 to 39	0.0036			Table 10
40 to 49	0.0051			Table 10
RR of fibrosis progression associated with HIV co-infection	2.122	1.518	2.967	The fourth revision report
Excess mortality associated with HIV co-infection	6.24	5.43	7.18	The fourth revision report

Table 13.1. Model outputs by calendar year: All surviving claimants as of August 31, 2013.

Calendar year	2013	2020	2030	2040	2050	2060	2070

Cumulative proportion (%)*							
Cirrhosis	14.1	16.9	18.3	19.3	19.7	19.8	19.9
Decompensated cirrhosis	3.3	6.5	9.5	11.0	11.8	12.0	12.1
HCC	0.7	1.8	3.1	3.8	4.1	4.3	4.3
Liver transplantation	0.7	0.7	0.8	0.9	0.9	0.9	0.9
Non-liver-related mortality	0.0	14.9	32.6	48.5	63.5	75.1	81.2
Liver-related mortality	0.0	3.3	8.5	11.7	13.5	14.4	14.7
All-cause mortality	0.0	18.3	41.1	60.4	77.1	89.4	95.8
Sex distribution (%)							
Female	59.3	44.6	46.6	48.1	47.9	46.2	44.2
Age distribution (%)							
<30 yr	5.7						
30- yr	8.0	6.9					
40- yr	17.8	8.9	8.9				
50- yr	23.8	19.9	10.5	12.3			
60- yr	16.4	27.4	23.8	13.3	19.3		
70- yr	12.1	17.9	32.1	29.4	18.7	36.6	
80- yr	10.1	11.6	17.3	33.5	35.5	26.8	62.4
95- yr	6.1	7.5	7.3	11.4	26.5	36.5	37.6
Stage distribution (%)†							
F_0 with HCV RNA-	17.1	20.2	25.6	30.3	34.1	37.3	40.8
F_0 with HCV RNA+	30.3	25.1	20.7	18.0	15.7	13.6	10.8
F_1	12.4	13.8	14.1	14.0	14.4	14.7	15.2
F_2	12.4	12.7	13.4	13.6	13.9	14.2	14.5
F_3	13.6	13.6	14.6	15.2	15.3	15.3	15.6
Compensated cirrhosis	10.8	9.7	7.0	5.0	3.3	2.1	1.4
Decompensated cirrhosis	2.0	3.2	2.7	2.2	2.0	1.5	0.9
Post-transplant	0.7	0.7	0.7	0.6	0.6	0.5	0.4
HCC	0.7	1.1	1.1	1.0	0.8	0.7	0.5

*Proportion computed with reference to the number of patients who were alive in year 2013.
†Proportion computed with reference to the number of patients who were alive in predicted year (e.g. 2020, 2030, ...).
Stage distribution of the living patients in year 2013 is taken from the post-transfusion claimant cohort data with the adjustment for non-biopsy.

Table 13.2. Model outputs by calendar year: Hemophilics vs. Non-hemophilics.

Hemophilic status	Hemophilics							Non-hemophilics						
Calendar year	2013	2020	2030	2040	2050	2060	2070	2013	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*														
Cirrhosis	22.9	27.7	29.8	30.7	31.1	31.2	31.2	11.5	13.6	14.9	15.9	16.3	16.4	16.5
Decompensated cirrhosis	4.8	11.0	16.6	19.2	20.3	20.6	20.7	2.9	5.2	7.3	8.5	9.2	9.4	9.5
HCC	1.3	3.3	5.4	6.6	7.0	7.2	7.3	0.5	1.4	2.4	2.9	3.2	3.4	3.4
Liver transplantation	0.6	0.7	0.8	1.0	1.0	1.0	1.0	0.7	0.7	0.8	0.9	0.9	0.9	0.9
Non-liver-related mortality		8.3	20.4	34.4	49.4	62.6	71.4		16.9	36.3	52.8	67.8	78.8	84.1
Liver-related mortality		5.5	14.9	20.5	23.2	24.5	24.9		2.7	6.6	9.1	10.6	11.3	11.6
All-cause mortality		13.8	35.2	54.9	72.6	87.1	96.3		19.6	42.9	62.0	78.5	90.1	95.6
Sex distribution (%)														
Female	84.8	15.8	16.3	16.2	16.0	16.2	14.4	51.6	53.3	55.7	57.7	57.5	55.2	53.2
Age distribution (%)														
<30 yr	2.5							6.6						
30- yr	21.7	2.7						3.9	8.1					
40- yr	31.0	23.3	3.1					13.8	4.5	10.7				
50- yr	23.5	32.3	26.2	3.8				23.9	16.2	5.8	14.8			
60- yr	12.3	24.2	35.1	31.4	5.4			17.6	28.3	20.4	7.9	23.5		
70- yr	5.6	11.9	24.0	39.1	40.9	9.2		14.1	19.7	34.6	26.5	12.0	44.8	
80- yr	2.7	4.2	9.5	20.4	41.2	54.9	20.1	12.3	13.8	19.6	37.5	33.8	18.4	75.1
95- yr	0.8	1.4	2.2	5.3	12.6	35.9	79.9	7.7	9.3	8.9	13.2	30.7	36.7	24.9
Stage distribution (%)†														
F_0 with HCV RNA-	15.8	18.9	23.8	28.0	31.1	33.7	34.8	17.5	20.6	26.2	31.0	35.0	38.4	42.6
F_0 with HCV RNA+	20.3	16.3	14.1	12.7	11.4	9.8	9.3	33.3	27.8	22.7	19.6	17.0	14.8	11.2
F_1	8.9	10.0	10.5	11.1	11.7	12.3	13.4	13.5	14.9	15.2	14.9	15.2	15.4	15.7
F_2	8.9	9.2	10.0	10.5	10.6	10.9	9.9	13.5	13.7	14.4	14.5	14.9	15.2	15.9
F_3	23.3	21.7	23.6	25.3	26.5	27.4	28.5	10.7	11.2	11.9	12.2	11.9	11.7	11.7
Cirrhosis	18.1	15.8	10.5	6.8	4.3	2.6	1.9	8.6	7.9	6.0	4.5	3.0	1.9	1.3
Decompensated cirrhosis	2.9	5.7	4.9	3.5	2.6	1.8	1.2	1.7	2.4	2.1	1.8	1.8	1.4	0.8
Post-transplant	0.6	0.6	0.6	0.7	0.7	0.7	0.4	0.7	0.7	0.7	0.6	0.6	0.5	0.4
HCC	1.3	1.9	1.8	1.5	1.1	0.9	0.7	0.5	0.8	0.9	0.8	0.7	0.6	0.4

*Proportion computed with reference to the number of patients who were alive in year 2013.
†Proportion computed with reference to the number of patients who were alive in predicted year (e.g. 2020, 2030, ...).
Stage distribution of the living patients in year 2013 is taken from the post-transfusion claimant cohort data with the adjustment for non-biopsy.

Table 14.1. Model outputs for claimants with ages 20 to 29.

Hemophilic status	Hemophilics							Non-hemophilics						
Calendar year	2013	2020	2030	2040	2050	2060	2070	2013	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*														
Cirrhosis	16.8	21.2	23.7	25.0	25.6	25.9	26.0	9.9	12.0	14.0	15.6	16.7	17.4	17.7
Decompensated cirrhosis		5.9	12.3	15.7	17.4	18.4	18.8	1.0	3.5	6.6	9.0	10.7	11.8	12.4
HCC		1.8	4.0	5.3	6.1	6.5	6.7	0	0.9	2.2	3.3	4.1	4.6	4.9
Liver transplantation		0.1	0.2	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.8	0.8
Non-liver-related mortality		0.9	5.6	9.4	15.4	24.7	42.8		0.7	2.8	6.6	11.9	19.1	36.3
Liver-related mortality		2.6	10.7	16.8	20.4	22.4	23.5		1.6	5.7	9.5	12.3	14.2	15.5
All-cause mortality		3.6	16.3	26.2	35.8	47.1	66.3		2.3	8.5	16.1	24.2	33.4	51.8
Alive	100	96.4	83.7	73.8	64.2	52.9	33.7	100	97.7	91.5	83.9	75.8	66.6	48.2
Stage distribution (%)†														
F_0 with HCV RNA-	27.3	29.4	34.3	38.9	42.5	44.7	46.5	15.8	19.5	25.0	29.8	34.1	37.6	40.9
F_0 with HCV RNA+	18.2	14.2	11.9	10.3	8.8	7.7	6.6	35.2	28.8	23.6	19.9	16.9	14.5	12.1
F_1	8.2	9.0	9.3	9.7	10.1	10.3	10.3	14.0	15.2	15.5	15.8	15.9	16.2	16.4
F_2	8.2	8.4	8.9	9.1	9.3	9.6	9.9	14.0	14.2	14.7	15.0	15.2	15.3	15.4
F_3	21.4	19.9	21.0	22.2	23.1	23.7	23.9	11.1	11.8	12.3	12.6	12.6	12.6	12.5
Compensated cirrhosis	16.8	14.1	9.1	5.7	3.6	2.3	1.5	8.9	7.8	5.8	4.3	3.0	2.0	1.3
Decompensated cirrhosis		3.8	4.1	2.9	1.7	1.0	0.7	0.5	1.9	1.9	1.6	1.3	1.0	0.7
Post-transplant		0.0	0.2	0.3	0.4	0.3	0.2	0.5	0.4	0.3	0.3	0.3	0.3	0.3
HCC		1.2	1.3	1.0	0.6	0.5	0.3	0	0.6	0.8	0.7	0.5	0.4	0.3

*Proportion computed with reference to the number of patients who were alive in year 2013.

†Proportion computed with reference to the number of patients who were alive in predicted year (e.g. 2020, 2030, ...).

Stage distribution of the living patients in year 2013 is taken from the post-transfusion claimant cohort data with the adjustment for non-biopsy.

Table 14.2. Model outputs for claimants with ages 30 to 39.

Hemophilic status	Hemophilics							Non-hemophilics						
Calendar year	2013	2020	2030	2040	2050	2060	2070	2013	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*														
Cirrhosis	17	21.2	23.5	24.7	25.3	25.6	25.6	9.7	11.7	13.7	15.2	16.3	16.7	16.9
Decompensated cirrhosis	1	6.7	12.5	15.7	17.3	18.0	18.2	0.9	3.2	6.3	8.6	10.1	11.0	11.3
HCC		1.7	3.7	4.9	5.6	6.0	6.1	0.0	1.0	2.2	3.1	3.8	4.3	4.5
Liver transplantation		0.1	0.2	0.4	0.4	0.5	0.5	0.0	0.0	0.1	0.2	0.3	0.3	0.3
Non-liver-related mortality		3.4	7.6	14.1	24.2	43.1	64.5	0.0	1.5	5.5	11.2	18.9	36.2	64.7
Liver-related mortality		3.1	11.0	16.6	19.9	21.6	22.5	0.0	1.7	5.6	9.0	11.7	13.5	14.4
All-cause mortality		6.5	18.6	30.7	44.1	64.7	87.0	0.0	3.2	11.1	20.3	30.6	49.7	79.1
Alive	100	93.5	81.4	69.3	55.9	35.3	13.1	100	96.8	88.9	79.7	69.4	50.3	20.9
Stage distribution (%)†														
F_0 with HCV RNA-	26.6	29.2	34.4	39.0	42.3	44.2	46.5	20.5	23.7	28.8	33.5	37.5	40.7	43.7
F_0 with HCV RNA+	19.8	15.7	13.1	11.4	10.1	8.9	7.4	31.3	25.6	20.9	17.5	14.8	12.6	10.5
F_1	7.9	9.1	9.3	9.5	9.9	9.9	9.7	13.8	14.7	14.8	15.0	15.3	15.6	15.5
F_2	7.9	8.1	8.6	8.8	9.0	9.2	9.1	13.8	14.2	14.7	14.8	15.0	15.0	14.7
F_3	20.7	19.2	20.4	21.6	22.4	23.1	23.6	11.0	11.6	12.0	12.3	12.2	12.4	12.4
Compensated cirrhosis	16	13.5	8.7	5.6	3.7	2.4	1.5	8.8	7.8	5.9	4.4	3.1	2.0	1.2
Decompensated cirrhosis	1	4.2	4.0	2.9	1.8	1.4	1.3	0.9	1.8	1.9	1.7	1.3	1.1	1.1
Post-transplant	0	0.1	0.2	0.3	0.3	0.3	0.3	0.0	0.0	0.1	0.2	0.2	0.2	0.3
HCC	0	1.0	1.3	0.9	0.6	0.6	0.6	0.0	0.6	0.7	0.7	0.5	0.4	0.5

*Proportion computed with reference to the number of patients who were alive in year 2013.

†Proportion computed with reference to the number of patients who were alive in predicted year (e.g. 2020, 2030, ...).

Stage distribution of the living patients in year 2013 is taken from the post-transfusion claimant cohort data with the adjustment for non-biopsy.

Table 14.3. Model outputs for claimants with ages 40 to 49.

Hemophilic status	Hemophilics							Non-hemophilics						
Calendar year	2013	2020	2030	2040	2050	2060	2070	2013	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*														
Cirrhosis	23.2	28.6	31.3	32.4	32.9	33.0	33.0	12.1	14.7	16.9	18.4	19.2	19.5	19.5
Decompensated cirrhosis	4.1	11.0	17.8	21.2	22.6	23.1	23.1	1.6	4.5	8.2	10.8	12.2	12.8	12.9
HCC	1.1	3.3	5.9	7.4	8.1	8.3	8.3	0.3	1.4	2.9	3.9	4.6	4.9	5.0
Liver transplantation	0.4	0.5	0.8	0.9	1.0	1.0	1.0	0.5	0.6	0.7	0.7	0.8	0.8	0.8
Non-liver-related mortality		3.0	10.0	20.1	38.3	59.2	70.7	0.0	2.7	8.3	15.7	33.6	62.2	81.4
Liver-related mortality		5.4	15.8	22.4	26.0	27.7	28.2	0.0	2.1	7.1	11.3	14.2	15.8	16.5
All-cause mortality		8.4	25.8	42.5	64.3	86.9	98.9	0.0	4.8	15.4	26.9	47.8	78.0	97.9
Alive	100	91.6	74.2	57.5	35.7	13.1	1.1	100	95.2	84.6	73.1	52.2	22.0	2.1
Stage distribution (%)†														
F_0 with HCV RNA-	15.1	18.0	22.6	26.5	29.4	31.7	33.9	17.9	20.6	25.1	29.1	32.4	34.9	33.9
F_0 with HCV RNA+	18.1	14.7	12.8	11.5	10.4	9.2	6.3	24.4	20.3	16.7	14.1	11.9	10.1	9.1
F_1	9.5	10.3	10.9	11.5	11.7	12.0	11.2	16.3	16.1	16.6	16.9	17.5	18.0	18.9
F_2	9.5	9.9	10.6	11.1	11.6	11.5	11.9	16.3	16.3	16.7	17.2	17.4	17.3	17.9
F_3	24.6	22.6	24.4	26.4	27.7	28.6	28.5	13.0	13.7	14.3	14.5	14.7	14.9	15.1
Compensated cirrhosis	19.1	16.7	11.2	7.2	4.6	2.8	2.3	10.5	9.4	6.8	4.8	3.2	2.0	1.1
Decompensated cirrhosis	2.6	5.6	5.0	3.8	2.8	2.6	3.4	0.8	2.3	2.5	2.1	1.7	1.6	1.9
Post-transplant	0.4	0.4	0.6	0.6	0.7	0.8	0.5	0.5	0.5	0.4	0.4	0.5	0.6	0.7
HCC	1.1	1.9	1.8	1.4	1.1	0.8	1.8	0.3	0.8	0.9	0.8	0.7	0.7	1.4

*Proportion computed with reference to the number of patients who were alive in year 2013.
†Proportion computed with reference to the number of patients who were alive in predicted year (e.g. 2020, 2030, ...).
Stage distribution of the living patients in year 2013 is taken from the post-transfusion claimant cohort data with the adjustment for non-biopsy.

Table 14.4. Model outputs for claimants with ages 50 to 59.

Hemophilic status	Hemophilics							Non-hemophilics						
Calendar year	2013	2020	2030	2040	2050	2060	2070	2013	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*														
Cirrhosis	24.9	31.0	33.5	34.3	34.6	34.6	34.6	12.7	15.2	17.2	18.5	19.1	19.2	19.2
Decompensated cirrhosis	4.8	12.0	18.6	21.3	22.3	22.4	22.4	2.8	5.6	9.0	11.1	12.1	12.3	12.3
HCC	1.9	4.3	6.7	7.9	8.4	8.5	8.5	0.3	1.3	2.8	3.7	4.2	4.3	4.3
Liver transplantation	0	0.1	0.3	0.4	0.5	0.5	0.5	0.9	0.9	1.1	1.1	1.2	1.2	1.2
Non-liver-related mortality		6.4	18.9	38.9	60.3	71.9	72.9	0.0	3.9	11.6	30.4	61.3	82.5	84.7
Liver-related mortality		6.4	16.9	23.2	25.9	27.0	27.1	0.0	2.7	7.6	11.6	14.1	15.1	15.3
All-cause mortality		12.8	35.9	62.1	86.3	98.9	100.0	0.0	6.6	19.2	41.9	75.4	97.6	100.0
Alive	100	87.2	64.1	37.9	13.7	1.1	0.0	100	93.4	80.8	58.1	24.6	2.4	0.0
Stage distribution (%)†														
F_0 with HCV RNA-	10.2	12.8	17.0	20.6	23.7	24.0	.	18.5	21.6	26.3	30.1	33.4	34.2	.
F_0 with HCV RNA+	18.9	15.3	13.4	12.2	10.6	9.6	.	25.8	21.7	17.9	15.3	12.9	9.1	.
F_1	10	10.9	11.6	12.0	12.7	10.7	.	15.4	15.4	15.9	16.4	16.9	19.0	.
F_2	10	10.4	11.2	11.8	12.3	11.8	.	15.4	15.4	15.8	16.1	15.8	15.4	.
F_3	26	23.9	26.1	28.1	28.4	29.5	.	12.3	12.9	13.4	13.6	13.7	12.8	.
Compensated cirrhosis	20.1	18.1	12.6	8.5	5.3	3.1	.	9.9	9.0	6.5	4.7	3.2	2.8	.
Decompensated cirrhosis	2.9	6.2	5.8	4.5	4.3	5.6	.	1.6	2.5	2.4	2.2	2.4	2.9	.
Post-transplant	0	0.1	0.3	0.5	0.6	0.7	.	0.9	0.7	0.7	0.8	0.9	1.4	.
HCC	1.9	2.3	2.0	1.7	2.0	4.9	.	0.3	0.7	0.9	0.9	0.8	2.5	.

*Proportion computed with reference to the number of patients who were alive in year 2013.

†Proportion computed with reference to the number of patients who were alive in predicted year (e.g. 2020, 2030, ...).

Stage distribution of the living patients in year 2013 is taken from the post-transfusion claimant cohort data with the adjustment for non-biopsy.

Table 14.5. Model outputs for claimants with ages 60 to 69.

Hemophilic status	Hemophilics							Non-hemophilics						
	2013	2020	2030	2040	2050	2060	2070	2013	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*														
Cirrhosis	30.8	36.8	38.6	39.0	39.1	39.1		14.5	16.9	18.9	19.8	19.9	19.9	
Decompensated cirrhosis	10.2	17.1	22.3	24.0	24.2	24.2		4.2	7.1	10.3	11.7	12.0	12.0	
HCC	0.9	3.5	5.8	6.6	6.7	6.8		1.0	2.1	3.5	4.2	4.3	4.3	
Liver transplantation	2.8	3.0	3.2	3.4	3.4	3.4		1.4	1.5	1.6	1.7	1.7	1.7	
Non-liver-related mortality		10.5	33.6	56.9	70.6	71.9		0.0	6.0	27.4	61.1	83.4	85.5	
Liver-related mortality		8.6	19.8	25.5	27.9	28.1		0.0	3.5	8.9	12.4	14.2	14.5	
All-cause mortality		19.1	53.4	82.4	98.4	100.0		0.0	9.5	36.3	73.5	97.6	100.0	
Alive	100	80.9	46.7	17.6	1.6	0.0		100	90.5	63.7	26.5	2.4	0.0	
Stage distribution (%)†														
F_0 with HCV RNA-	9.3	11.4	14.6	16.9	16.8	.	.	15.6	18.8	23.1	26.5	27.1	.	.
F_0 with HCV RNA+	13.1	11.3	10.2	8.9	8.5	.	.	24.9	20.7	17.4	14.3	12.0	.	.
F_1	10.1	10.1	11.0	11.3	12.6	.	.	16.1	16.2	16.5	16.7	17.1	.	.
F_2	10.1	10.6	11.4	12.4	11.4	.	.	16.1	16.3	16.7	16.4	16.9	.	.
F_3	26.4	24.9	27.1	29.0	29.8	.	.	12.8	13.9	14.3	14.9	14.2	.	.
Compensated cirrhosis	20.6	18.9	13.2	8.2	5.1	.	.	10.3	9.2	6.8	4.7	3.1	.	.
Decompensated cirrhosis	6.5	7.8	6.8	6.9	7.0	.	.	1.8	2.6	2.9	3.3	5.3	.	.
Post-transplant	2.8	2.7	3.1	3.5	4.1	.	.	1.4	1.3	1.3	1.6	2.0	.	.
HCC	0.9	2.3	2.7	2.7	4.6	.	.	1.0	1.0	1.1	1.5	2.4	.	.

*Proportion computed with reference to the number of patients who were alive in year 2013.
†Proportion computed with reference to the number of patients who were alive in predicted year (e.g. 2020, 2030, ...).
Stage distribution of the living patients in year 2013 is taken from the post-transfusion claimant cohort data with the adjustment for non-biopsy.

Table 14.6. Model outputs for claimants with ages 70 to 79.

Hemophilic status	Hemophilics							Non-hemophilics						
Calendar year	2013	2020	2030	2040	2050	2060	2070	2013	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*														
Cirrhosis	27.1	30.4	31.1	31.3	31.3			7.8	14.4	15.3	15.5	15.5		
Decompensated cirrhosis	12.2	16.2	18.5	18.8	18.8			5.1	7.0	8.5	8.8	8.9		
HCC	6.1	7.8	8.9	9.1	9.1			0.7	1.7	2.4	2.6	2.6		
Liver transplant	2	2.3	2.4	2.5	2.5			0.5	0.6	0.6	0.7	0.7		
Non-liver-related death		27.5	60.5	77.7	79.2			0.0	18.6	60.7	87.4	89.9		
Liver-related death		9.4	17.4	20.5	20.8			0.0	4.0	8.0	9.9	10.1		
All cause death		36.9	77.9	98.2	100.0			0.0	22.6	68.6	97.2	100.0		
Alive	100	63.1	22.1	1.8	0.0			100	77.4	31.4	2.8	0.0		
Stage distribution (%)†														
F0 RNA-	14.3	17.6	22.3	26.6	.	.	.	17.1	21.1	26.6	30.4	.		
F0 RNA+	24.5	20.7	17.3	13.5	.	.	.	35.7	30.3	24.6	20.4	.		
Fibrosis 1	7.4	9.1	9.6	10.0	.	.	.	12.2	14.0	14.0	13.4	.		
Fibrosis 2	7.4	8.0	8.5	8.5	.	.	.	12.2	12.8	13.2	13.9	.		
Fibrosis 3	19.2	18.5	20.0	19.5	.	.	.	9.8	10.3	11.1	11.3	.		
Compensated cirrhosis	14.9	13.4	9.0	5.2	.	.	.	7.8	6.9	5.1	3.5	.		
Decompensated cirrhosis	4.1	5.7	6.8	8.8	.	.	.	3.9	3.1	3.3	4.3	.		
Post-transplant	2	2.3	3.0	2.8	.	.	.	0.5	0.5	0.8	0.9	.		
HCC	6.1	4.5	3.5	5.0	.	.	.	0.7	1.1	1.2	2.0	.		

*Proportion computed with reference to the number of patients who were alive in year 2013.
†Proportion computed with reference to the number of patients who were alive in predicted year (e.g. 2020, 2030, ...).
Stage distribution of the living patients in year 2013 is taken from the post-transfusion claimant cohort data with the adjustment for non-biopsy.

Table 14.7. Model outputs for claimants with ages 80 to 89.

Hemophilic status	Hemophilics							Non-hemophilics						
Calendar year	2013	2020	2030	2040	2050	2060	2070	2013	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*														
Cirrhosis	7.7	9.5	9.6	9.7				8.9	9.7	9.9	9.9			
Decompensated cirrhosis	4.2	4.9	5.2	5.2				3.1	4.3	4.7	4.7			
HCC	0	0.5	0.7	0.8				0.8	1.4	1.6	1.6			
Liver transplantation	0	0.1	0.1	0.1				0.3	0.4	0.4	0.4			
Non-liver-related mortality		56.1	91.4	94.5				0.0	45.7	90.5	94.8			
Liver-related mortality		3.0	5.3	5.5				0.0	2.6	5.0	5.2			
All-cause mortality		59.0	96.6	100.0				0.0	48.4	95.5	100.0			
Alive	100	41.0	3.4	0.0				100	51.6	4.5	0.0			
Stage distribution (%)†														
F_0 with HCV RNA-	12.5	18.9	28.3	.	.	.	.	18.9	24.2	31.6	.			
F_0 with HCV RNA+	66.7	54.3	41.9	.	.	.	.	46.6	37.7	29.6	.			
F_1	2.5	7.5	8.3	.	.	.	.	9.1	12.1	12.6	.			
F_2	2.5	3.4	4.4	.	.	.	.	9.1	9.5	10.1	.			
F_3	6.7	6.6	6.4	.	.	.	.	7.3	7.7	7.6	.			
Compensated cirrhosis	5	4.0	3.3	.	.	.	.	5.8	4.7	3.0	.			
Decompensated cirrhosis	4.2	4.5	4.9	.	.	.	.	2.0	2.5	3.0	.			
Post-transplant	0	0.1	0.4	.	.	.	.	0.3	0.4	0.3	.			
HCC	0	0.8	1.9	.	.	.	.	0.8	1.1	2.1	.			

*Proportion computed with reference to the number of patients who were alive in year 2013.
†Proportion computed with reference to the number of patients who were alive in predicted year (e.g. 2020, 2030, ...).
Stage distribution of the living patients in year 2013 is taken from the post-transfusion claimant cohort data with the adjustment for non-biopsy.

Table 14.8. Model outputs for claimants with ages 90 or above.

Hemophilic status	Hemophilics							Non-hemophilics						
Calendar year	2013	2020	2030	2040	2050	2060	2070	2013	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*														
Cirrhosis	4.3	4.5	4.5					4.5	4.9	4.9				
Decompensated cirrhosis	0	0.4	0.5					1.2	1.7	1.8				
HCC	0	0.2	0.2					0.4	0.6	0.6				
Liver transplantation	0	0.0	0.0					0.4	0.5	0.5				
Non-liver-related mortality		86.9	99.4					0.0	80.9	98.1				
Liver-related mortality		0.4	0.6					0.0	1.4	1.9				
All-cause mortality		87.2	100.0					0.0	82.3	100.0				
Alive	100	12.8	0.0					100	17.7	0.0				
Stage distribution (%)†														
F_0 with HCV RNA-	0	8.5	.	.	.	.	.	16.7	23.4	.				
F_0 with HCV RNA+	85.7	69.2	.	.	.	.	.	64.3	51.4	.				
F_1	2.1	8.9	.	.	.	.	.	5.1	9.5	.				
F_2	2.1	3.2	.	.	.	.	.	5.1	5.9	.				
F_3	5.7	5.4	.	.	.	.	.	4.1	4.5	.				
Compensated cirrhosis	4.3	3.3	.	.	.	.	.	3.3	2.8	.				
Decompensated cirrhosis	0	1.1	.					0.4	1.2	.				
Post-transplant	0	0.0	.					0.4	0.5	.				
HCC	0	0.4	.					0.4	0.7	.				

*Proportion computed with reference to the number of patients who were alive in year 2013.

†Proportion computed with reference to the number of patients who were alive in predicted year (e.g. 2020, 2030, ...).

Stage distribution of the living patients in year 2013 is taken from the post-transfusion claimant cohort data with the adjustment for non-biopsy.

Table 15. Comparing model outputs for the fourth (2010) and current (2014) revisions.

Revision version	The fourth revision (2010)					The current revision (2014)				
Calendar year	2020	2030	2040	2050	2060	2020	2030	2040	2050	2060
Cumulative proportion (%)*										
Cirrhosis	24.3	32.2	36.3	37.9	38.5	16.9	18.3	19.3	19.7	19.8
HCC	4	7	9.1	10.1	10.5	1.8	3.1	3.8	4.1	4.3
Liver transplantation	2.9	3.6	3.9	4.1	4.2	0.7	0.8	0.9	0.9	0.9
Non-liver-related mortality	21.9	38.3	52.3	63.4	70.3	14.9	32.6	48.5	63.5	75.1
Liver-related mortality	7	14.6	20	22.8	24	3.3	8.5	11.7	13.5	14.4
All-cause mortality	29	52.9	72.2	86.3	94.3	18.3	41.1	60.4	77.1	89.4
Stage distribution (%)†										
F_0 with HCV RNA-	22.2	27.4	32.6	37.4	42	20.2	25.6	30.3	34.1	37.3
F_0 with HCV RNA+	15.8	8.4	4.5	2.4	1.3	25.1	20.7	18.0	15.7	13.6
F_1	12.2	10.3	9.2	9	8.2	13.8	14.1	14.0	14.4	14.7
F_2	13.2	12.3	11.8	11.8	11.8	12.7	13.4	13.6	13.9	14.2
F_3	16.4	17.1	16.8	16.7	17	13.6	14.6	15.2	15.3	15.3
Compensated cirrhosis	14.1	16.2	16.2	14.1	11.6	9.7	7.0	5.0	3.3	2.1
Decompensated cirrhosis	3.5	4.3	4.1	3.4	2.9	3.2	2.7	2.2	2.0	1.5
Post-transplant	1.5	2.5	3.2	3.9	4.1	0.7	0.7	0.6	0.6	0.5
HCC	1.2	1.5	1.5	1.3	1	1.1	1.1	1.0	0.8	0.7

Table 16.1. Comparing model estimates derived from claims data in the current revision and literature review in the fourth revision.

Data source	Claim cohort data based estimations			Literature based estimations		
Model variables (annual transition probability)	Baseline	95% CI		Baseline	95% CI	
Compensated cirrhosis to decompensated cirrhosis	0.078	0.073	0.083	0.065	0.033	0.092
Compensated cirrhosis to HCC	0.025	0.024	0.027	0.033	0.024	0.046
Decompensated cirrhosis to death	0.152	0.146	0.158	0.186	0.137	0.25
HCC to death	0.182	0.169	0.198	0.35	0.316	0.699
Decompensated cirrhosis or HCC to liver transplantation	0.004	0.004	0.004	0.1	0.05	0.18
First year mortality after liver transplantation	0.086	0.037	0.186	0.146	0.127	0.21
Subsequent year mortality after liver transplantation	0.039	0.036	0.043	0.044	0.035	0.053

Table 16.2. Comparing model outputs for non-hemophilic claimants using model variables derived from different data sources: Literature review vs. Claims data.

Model data source	Literature review							Claims data						
Calendar year	2013	2020	2030	2040	2050	2060	2070	2013	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*														
Cirrhosis	11.5	13.3	14.7	15.5	16.0	16.1	16.2	11.5	13.6	14.9	15.9	16.3	16.4	16.5
Dec. Cirrhosis	2.9	4.7	6.5	7.6	8.1	8.3	8.4	2.9	5.2	7.3	8.5	9.2	9.4	9.5
HCC	0.5	1.6	2.6	3.3	3.6	3.7	3.8	0.5	1.4	2.4	2.9	3.2	3.4	3.4
Liver transplant	0.7	1.5	2.3	2.8	3.1	3.2	3.2	0.7	0.7	0.8	0.9	0.9	0.9	0.9
Non-liver-related mortality		16.8	36.5	53.1	68.3	79.2	84.6		16.9	36.3	52.8	67.8	78.8	84.1
Liver-related mortality		3.1	6.4	8.6	10.0	10.8	11.1		2.7	6.6	9.1	10.6	11.3	11.6
All-cause mortality		19.9	42.9	61.7	78.3	89.9	95.7		19.6	42.9	62.0	78.5	90.1	95.6
Sex distribution (%)														
Female	48.4	53.9	56.6	58.4	58.9	55.9	53.6	51.6	53.3	55.7	57.7	57.5	55.2	53.2
Age distribution (%)														
<30 yr	6.6							6.6						
30- yr	3.9	8.1						3.9	8.1					
40- yr	13.8	4.6	10.7					13.8	4.5	10.7				
50- yr	23.9	16.0	5.9	14.8				23.9	16.2	5.8	14.8			
60- yr	17.6	28.4	20.1	7.9	23.4			17.6	28.3	20.4	7.9	23.5		
70- yr	14.1	19.8	34.8	26.2	12.2	44.7		14.1	19.7	34.6	26.5	12.0	44.8	
80- yr	12.3	13.6	19.7	37.7	33.7	18.9	75.5	12.3	13.8	19.6	37.5	33.8	18.4	75.1
95- yr	7.7	9.6	8.8	13.5	30.7	36.4	24.5	7.7	9.3	8.9	13.2	30.7	36.7	24.9
Stage distribution (%)†														
F_0 with HCV RNA-	17.5	21.2	26.5	31.1	34.8	38.8	42.8	17.5	20.6	26.2	31.0	35.0	38.4	42.6
F_0 with HCV RNA+	33.3	27.8	22.9	19.0	15.7	13.2	11.5	33.3	27.8	22.7	19.6	17.0	14.8	11.2
F_1	13.5	14.9	15.2	15.3	15.6	16.0	15.7	13.5	14.9	15.2	14.9	15.2	15.4	15.7
F_2	13.5	13.7	14.1	14.1	14.4	14.4	13.9	13.5	13.7	14.4	14.5	14.9	15.2	15.9
F_3	10.7	11.4	11.8	12.3	12.4	11.9	12.3	10.7	11.2	11.9	12.2	11.9	11.7	11.7
Compensated cirrhosis	8.6	7.9	6.1	4.5	3.4	2.0	1.3	8.6	7.9	6.0	4.5	3.0	1.9	1.3
Decompensated cirrhosis	1.7	1.4	1.0	0.8	0.8	0.6	0.2	1.7	2.4	2.1	1.8	1.8	1.4	0.8
Post-transplant	0.7	1.3	2.0	2.5	2.7	2.8	2.3	0.7	0.7	0.7	0.6	0.6	0.5	0.4
HCC	0.5	0.5	0.4	0.3	0.2	0.3	0.1	0.5	0.8	0.9	0.8	0.7	0.6	0.4

*Proportion computed with reference to the number of patients who were alive in year 2013.
†Proportion computed with reference to the number of patients who were alive in predicted year (e.g. 2020, 2030, ...).
Stage distribution of the living patients in year 2013 is taken from the post-transfusion claimant cohort data with the adjustment for non-biopsy.

Table 17.1. Estimates of non-liver-related mortality derived from the claimant cohort and the 2009 to 2011 Canada life tables.

Gender	Male			Female	
Age stratum	Hemophilics	Non-hemophilics	Canada life table	Non-hemophilics	Canada life table
20 to 29	0.00000	0.00171	0.00071	0.00000	0.00030
30 to 39	0.00290	0.00233	0.00096	0.00133	0.00056
40 to 49	0.00220	0.00632	0.00194	0.00189	0.00129
50 to 59	0.00464	0.00794	0.00484	0.00487	0.00307
60 to 69	0.00933	0.01338	0.01260	0.00519	0.00782

Table 17.2. Comparing model outputs for non-hemophilic claimants using non-liver-related mortality derived from different data sources: claims data vs. 2009 to 2011 Canada life tables.

Data source	Claims data							2009 to 2011 Canada life tables						
Calendar year	2013	2020	2030	2040	2050	2060	2070	2013	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*														
Cirrhosis	11.5	13.6	14.9	15.9	16.3	16.4	16.5	11.5	13.1	14.5	15.4	15.8	16.0	16.0
Dec. Cirrhosis	2.9	5.2	7.3	8.5	9.2	9.4	9.5	2.9	5.1	7.3	8.6	9.2	9.4	9.5
HCC	0.5	1.4	2.4	2.9	3.2	3.4	3.4	0.5	1.4	2.3	2.9	3.2	3.3	3.4
Liver transplantation	0.7	0.7	0.8	0.9	0.9	0.9	0.9	0.7	0.8	0.8	0.9	0.9	0.9	0.9
Non-liver-related mortality		16.9	36.3	52.8	67.8	78.8	84.1		16.6	35.8	52.3	67.2	78.5	84.1
Liver-related mortality		2.7	6.6	9.1	10.6	11.3	11.6		2.7	6.5	9.1	10.5	11.2	11.5
All-cause mortality		19.6	42.9	62.0	78.5	90.1	95.6		19.2	42.3	61.3	77.8	89.7	95.6
Sex distribution (%)														
Female	51.6	53.3	55.7	57.7	57.5	55.2	53.2	51.6	53.2	55.4	57.1	56.7	53.7	51.2
Age distribution (%)														
<30 yr	6.6		.	.	.	.	.	6.6						
30- yr	3.9	8.1						3.9	8.1	.	.	.	.	.
40- yr	13.8	4.5	10.7	.	.	.	.	13.8	4.6	10.7	.	.	.	.
50- yr	23.9	16.2	5.8	14.8	.	.	.	23.9	16.4	6.1	15.0	.	.	.
60- yr	17.6	28.3	20.4	7.9	23.5	.	.	17.6	28.7	20.9	8.3	24.3	.	.
70- yr	14.1	19.7	34.6	26.5	12.0	44.8	.	14.1	19.3	34.5	26.9	12.4	44.8	.
80- yr	12.3	13.8	19.6	37.5	33.8	18.4	75.1	12.3	13.5	19.4	37.1	33.6	19.1	76.6
95- yr	7.7	9.3	8.9	13.2	30.7	36.7	24.9	7.7	9.3	8.4	12.7	29.8	36.1	23.4
Stage distribution (%)†														
F_0 with HCV RNA-	17.5	20.6	26.2	31.0	35.0	38.4	42.6	17.5	20.7	26.4	31.2	35.1	38.3	40.6
F_0 with HCV RNA+	33.3	27.8	22.7	19.6	17.0	14.8	11.2	33.3	27.8	22.5	19.2	16.4	13.4	11.1
F_1	13.5	14.9	15.2	14.9	15.2	15.4	15.7	13.5	14.8	15.2	15.2	15.8	16.9	18.1
F_2	13.5	13.7	14.4	14.5	14.9	15.2	15.9	13.5	14.0	14.6	14.7	14.9	15.1	14.7
F_3	10.7	11.2	11.9	12.2	11.9	11.7	11.7	10.7	11.3	11.9	12.0	11.9	11.7	12.1
Compensated cirrhosis	8.6	7.9	6.0	4.5	3.0	1.9	1.3	8.6	7.4	5.7	4.2	3.1	2.2	1.5
Decompensated cirrhosis	1.7	2.4	2.1	1.8	1.8	1.4	0.8	1.7	2.5	2.2	2.0	1.6	1.4	1.0
Post-transplant	0.7	0.7	0.7	0.6	0.6	0.5	0.4	0.7	0.7	0.7	0.6	0.5	0.5	0.4
HCC	0.5	0.8	0.9	0.8	0.7	0.6	0.4	0.5	0.8	0.8	0.7	0.6	0.5	0.5

Table 18. Comparing model outputs for non-hemophilic claimants using treatment patterns in the current revision and the fourth revision.

Treatment pattern	The current revision in 2014						The fourth revision in 2010					
Calendar year	2020	2030	2040	2050	2060	2070	2020	2030	2040	2050	2060	2070
Cumulative proportion (%)*												
Cirrhosis	13.6	14.9	15.9	16.3	16.4	16.5	19.1	27.5	32.1	34.1	34.8	35.0
Dec. Cirrhosis	5.2	7.3	8.5	9.2	9.4	9.5	6.9	12.7	16.7	18.7	19.4	19.7
HCC	1.4	2.4	2.9	3.2	3.4	3.4	2.1	4.7	6.7	7.7	8.2	8.3
Liver transplantation	0.7	0.8	0.9	0.9	0.9	0.9	0.8	0.9	1.1	1.2	1.2	1.2
Non-liver-related mortality	16.9	36.3	52.8	67.8	78.8	84.1	16.8	34.9	48.8	60.3	68.1	71.8
Liver-related mortality	2.7	6.6	9.1	10.6	11.3	11.6	3.3	11.0	17.7	22.0	24.1	24.9
All-cause mortality	19.6	42.9	62.0	78.5	90.1	95.6	20.1	45.8	66.5	82.3	92.2	96.7
Sex distribution (%)												
Female	53.3	55.7	57.7	57.5	55.2	53.2	53.9	56.6	58.0	58.4	55.7	53.5
Age distribution (%)												
<30 yr		.	.	.	.	.						
30- yr	8.1						8.3	.	.	.	.	.
40- yr	4.5	10.7	.	.	.	.	4.7	10.8	.	.	.	.
50- yr	16.2	5.8	14.8	.	.	.	16.1	6.0	14.9	.	.	.
60- yr	28.3	20.4	7.9	23.5	.	.	27.8	20.2	8.1	23.5	.	.
70- yr	19.7	34.6	26.5	12.0	44.8	.	19.6	33.9	26.4	12.5	43.4	.
80- yr	13.8	19.6	37.5	33.8	18.4	75.1	13.7	19.5	36.9	33.0	19.2	72.1
95- yr	9.3	8.9	13.2	30.7	36.7	24.9	9.8	9.5	13.7	31.0	37.4	27.9
Stage distribution (%)†												
F_0 with HCV RNA-	20.6	26.2	31.0	35.0	38.4	42.6	20.9	25.8	30.7	34.6	36.8	39.1
F_0 with HCV RNA+	27.8	22.7	19.6	17.0	14.8	11.2	22.2	11.8	6.5	3.4	1.9	0.6
F_1	14.9	15.2	14.9	15.2	15.4	15.7	13.7	12.8	11.1	10.8	10.3	10.7
F_2	13.7	14.4	14.5	14.9	15.2	15.9	13.5	13.3	13.7	13.8	15.2	14.2
F_3	11.2	11.9	12.2	11.9	11.7	11.7	12.1	13.3	13.9	14.8	15.7	17.5
Compensated cirrhosis	7.9	6.0	4.5	3.0	1.9	1.3	11.6	13.9	13.4	11.7	10.1	7.7
Decompensated cirrhosis	2.4	2.1	1.8	1.8	1.4	0.8	3.9	5.9	6.7	6.5	6.0	6.3
Post-transplant	0.7	0.7	0.6	0.6	0.5	0.4	0.6	0.8	1.0	1.1	1.1	1.3
HCC	0.8	0.9	0.8	0.7	0.6	0.4	1.5	2.4	3.1	3.3	2.8	2.6

Table 19. Monte Carlo simulation projecting the 95% CI of the model predictions on cumulative rates of liver-related clinical outcomes.

Calendar year	2020		2030		2040		2050		2060		2070	
Cumulative rates of clinical outcomes (%)	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
Cirrhosis	16.9	14.6 -19.2	18.3	14.7 -21.9	19.3	15.0 -23.6	19.7	14.8 -24.6	19.8	14.6 -25.0	19.9	14.7 -25.1
Decompensated cirrhosis	6.5	5.5 -7.5	9.5	7.5 -11.5	11	8.4 -13.6	11.8	8.6 -15.0	12	8.7 -15.3	12.1	8.7 -15.5
HCC	1.8	1.4 -2.2	3.1	2.3 -3.9	3.8	2.8 -4.8	4.1	2.9 -5.3	4.3	3.1 -5.6	4.3	3.1 -5.5
Liver-related mortality	3.3	2.8 -3.8	8.5	7.0 -10.0	11.7	9.3 -14.1	13.5	10.3 -16.7	14.4	10.8 -18.0	14.7	11.0 -18.4

Table 20. Reported mean cost to HCV patients and their caregivers by disease stage in a recent Canadian survey study.

Disease stage	Patient time costs	Caregiver time costs	Out-of-pocket costs
	Estimate (95% CI)	Estimate (95% CI)	Estimate (95% CI)
Chronic (N = 326)	$1411 ($931–1891)	$60 ($23–98)	$1150 ($615–1686)
Treatment (N = 61)	$1481 ($851–2111)	$152 ($18–285)	$2496 ($677–4316)
Viral clearance (N = 148)	$281 ($175–387)	$31 ($0–72)	$427 ($73–780)
Cirrhosis (N = 135)	$3588 ($1766–5411)	$766 ($173–1359)	$1667 ($766–2568)
HCC (N = 21)	$2739 ($972–4507)	$1050 ($45–2345)	$2837 ($178–5495)
Transplant (N = 47)	$9416 ($2987–15 844)	$2460 ($1–4982)	$2204 ($1103–3305)
Total (N = 738)	$2136 ($1554–2719)	$372 ($174–570)	$1326 ($979–1673)

Table 21. Coefficients associated with patient baseline characteristics for annual patient time and caregiver time costs and out-of-pocket costs in a Canadian HCV survey study.

Predictor	Annual patient and caregiver time cost				Annual out-of-pocket cost			
	Coefficient	SE	t	P-value	Coefficient	SE	t	P-value
(Constant)	5291.14	2329.15	2.27	0.02	1012.71	1217.99	0.83	0.41
Treatment	184.66	1281.15	0.14	0.89	1511.28	669.89	2.26	<0.05
Viral clearance	-893.79	916.62	-98	0.33	-626.31	479.33	-1.31	0.19
Cirrhosis	2758.79	950.32	2.9	0.004	369.4	496.95	0.74	0.46
HCC	1992.02	2234.15	0.89	0.37	1594.62	1168.31	1.36	0.17
Transplantation	10028.23	1449.33	6.92	<0.0001	1013.5	757.9	1.34	0.18
Age	-73.51	40.08	-1.83	0.07	17.58	20.96	0.84	0.4
Gender	394.75	708.36	0.56	0.58	-628.3	370.43	-1.7	0.09
Marital status	363.69	710.33	0.51	0.61	143.24	371.45	0.39	0.7
Education	-198.53	724.06	-0.27	0.78	54.6	378.64	0.14	0.89
Ln income	-188.38	90.88	-2.07	0.04	-121.61	47.53	-2.56	<0.05
ICED	281	325.44	0.86	0.39	1511.28	669.89	0.18	<0.05

ICED, Index of Co-Existent Disease; SE, standard error.

12. Figures.

Figure 1. Simplified Markov model structure for simulating prognosis of HCV in the current revision.

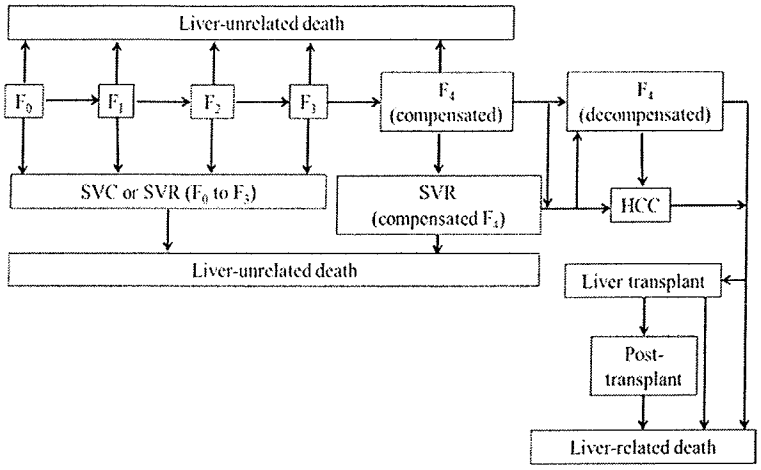


Figure 2. Subtree for health state "Fibrosis stage 0 with negative HCV RNA".

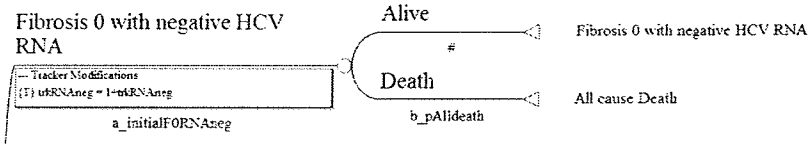


Figure 3. Subtree for health state "Fibrosis stage 0 with positive HCV RNA".

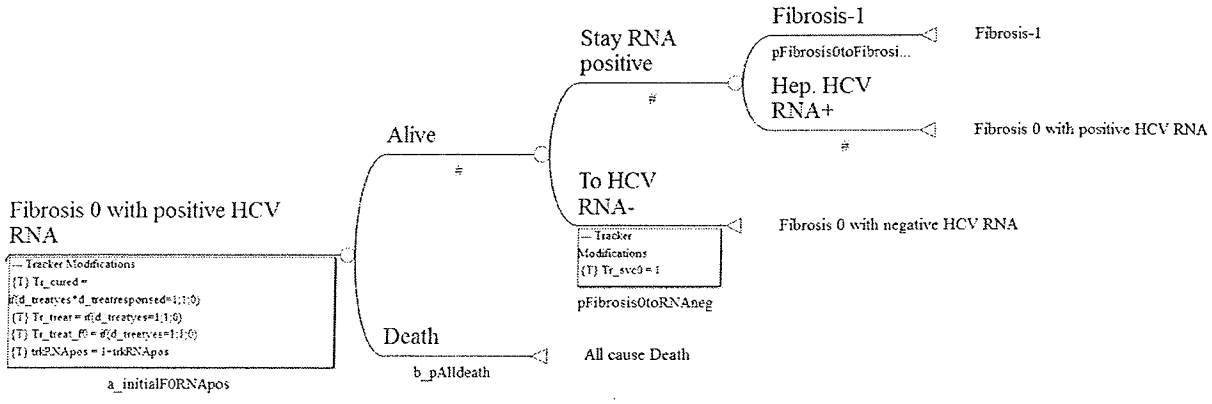


Figure 4. Subtree for health state "Fibrosis stage 1".

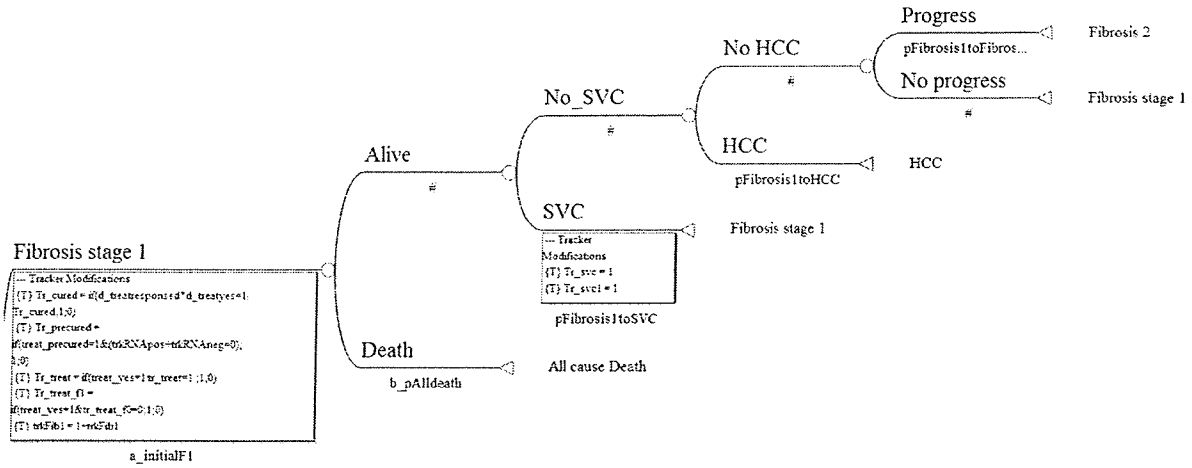


Figure 5. Subtree for health state "Fibrosis stage 2".

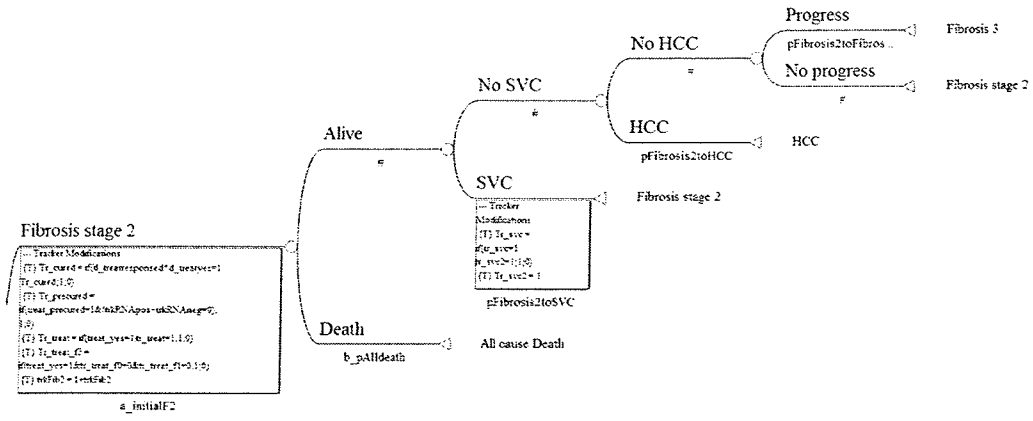


Figure 6. Subtree for health state "Fibrosis stage 3".

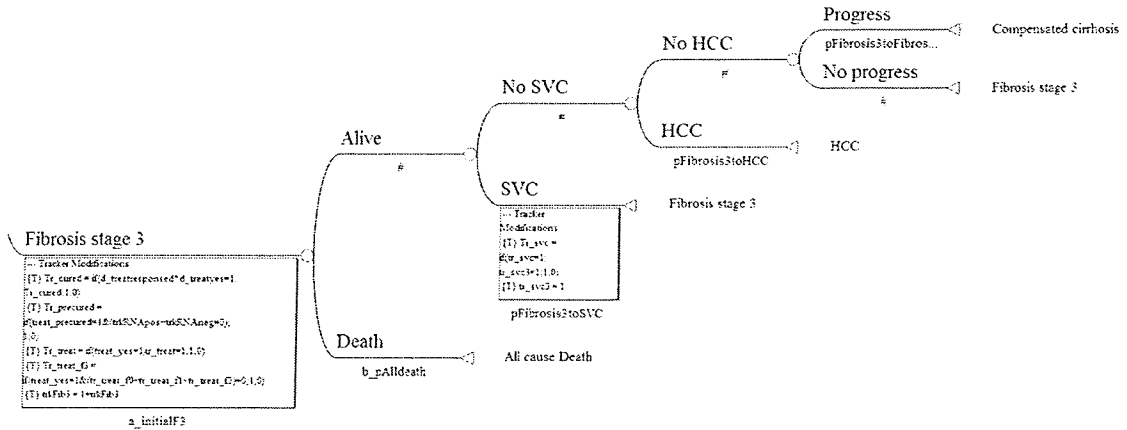


Figure 7. Subtree for health state "Compensated cirrhosis".

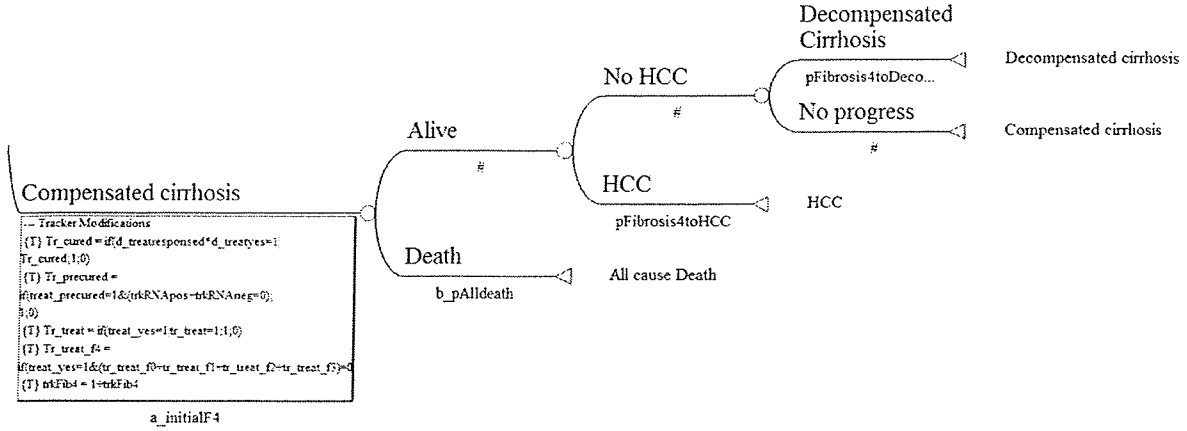


Figure 8. Subtree for health state "Decompensated cirrhosis".

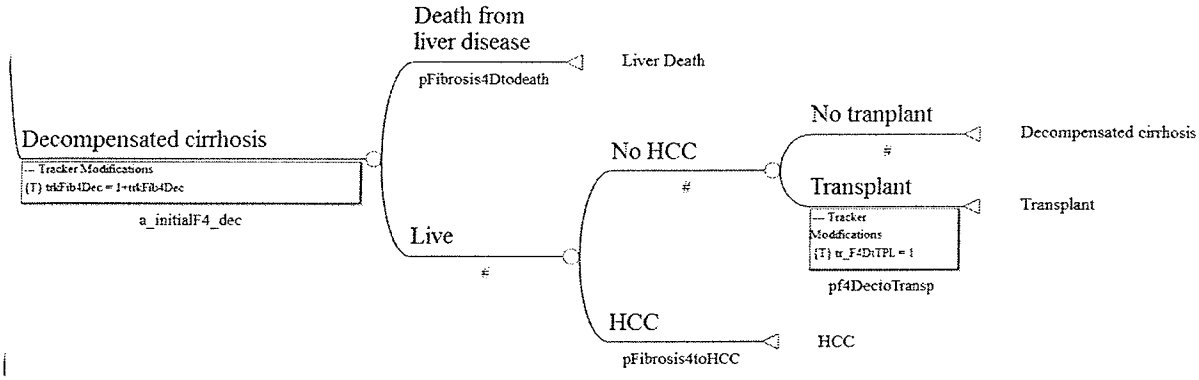


Figure 9. Subtree for health state "HCC".

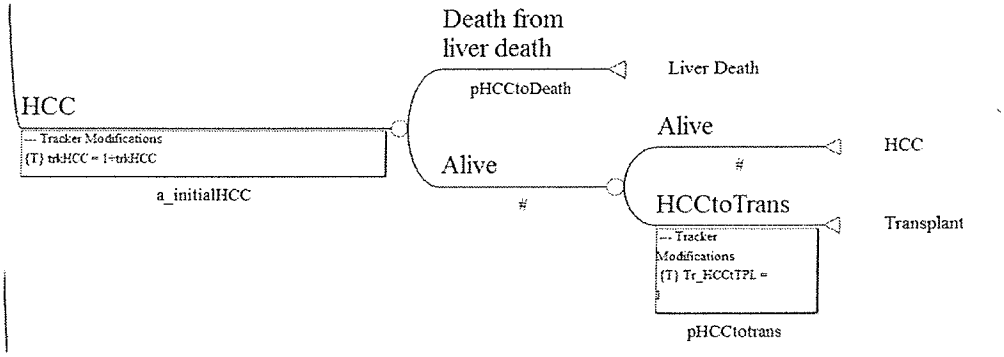
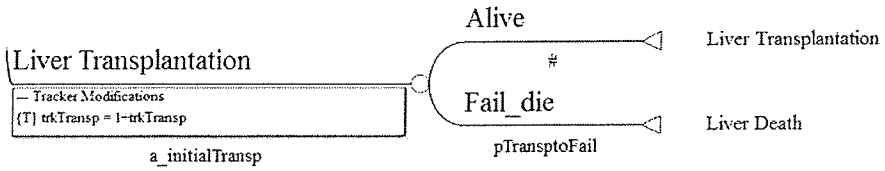


Figure 10. Subtree for health state "Liver transplantation".



Appendix 1. The study ethics approval letter for the fifth revision of HCV prognostic model for 1986-1990 HCV compensation claimants.

UNIVERSITY OF TORONTO

OFFICE OF THE VICE-PRESIDENT RESEARCH AND INNOVATION

PROTOCOL REFERENCE # 29618

January 6, 2014

Dr. Murray Krahn
DEPT OF MEDICINE
FACULTY OF MEDICINE

Dear Dr. Krahn,

Re: Your research protocol entitled, "The fifth revision plan on estimating the prognosis of Canadians infected with the Hepatitis C virus through the blood supply, 1986-1990"

ETHICS APPROVAL	Original Approval Date: January 6, 2014 Expiry Date: January 5, 2015 Continuing Review Level: 1

We are writing to advise you that the Health Sciences Research Ethics Board (REB) has granted approval to the above-named research protocol under the REB's delegated review process. Your protocol has been approved for a period of one year and ongoing research under this protocol must be renewed prior to the expiry date.

Any changes to the approved protocol or consent materials must be reviewed and approved through the amendment process prior to its implementation. Any adverse or unanticipated events in the research should be reported to the Office of Research Ethics as soon as possible.

Please ensure that you submit an Annual Renewal Form or a Study Completion Report 15 to 30 days prior to the expiry date of your current ethics approval. Note that annual renewals for studies cannot be accepted more than 30 days prior to the date of expiry.

If your research is funded by a third party, please contact the assigned Research Funding Officer in Research Services to ensure that your funds are released.

Best wishes for the successful completion of your research.

Yours sincerely,

OFFICE OF RESEARCH ETHICS
McMurrich Building, 12 Queen's Park Crescent West, 2nd Floor, Toronto, ON M5S 1S8 Canada
Tel: +1 416 946-3273 ● Fax: +1 416 946-5763 ● ethics.review@utoronto.ca ● http://www.research.utoronto.ca/for-researchers-administrators/ethics/

Appendix II. The survey package measuring clinical physicians' treatment preferences for survival compensation claimants with CHC.

I. INFORMED CONSENT FORM

I volunteer to participate in a research project conducted by Dr. Murray Krahn from the Toronto Health Economics and Technology Assessment (THETA) Collaborative at the University of Toronto.

I understand that this project is designed to gather information to predict long-term health outcomes in a cohort of patients who have acquired chronic hepatitis C (CHC) through blood transfusion or blood products from 1986 to 1990 in Canada and who are currently qualified to receive compensation for antiviral therapy for CHC-related complications from a trust fund set by the Canadian Federal, Provincial, and Territory governments.

I understand that this survey will assess physician's preferences regarding the use of new antiviral regimens in this CHC compensation cohort.

I understand that my participation in this survey is voluntary and that I may refuse to volunteer, decline to answer any questions and withdraw from the survey at any time without giving any reasons.

I understand that my participation in this survey is unlikely to cause any risks, harm or inconvenience to me or my patients.

I understand that the generated outcomes of this survey will be included in the study final report and might be published in a relevant medical journal.

I understand that my personal information and generated data will be strictly protected in a secured computer and locked in a safe box in the administrative office at THETA.

I understand that all information from this survey will be considered confidential and access to this data will be limited to the principal investigator, study coordinator and data analyst.

I understand that my personal information will be encrypted as codes in the survey and data analysis and the final report and manuscript will not include any identifiable information.

Certificate of consent:

I have read the foregoing information or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print Name of Participant: _____

Signature of Participant: _____

Date (DD/MM/YYYY): _____

Please fax back the signed consent form to 416-946-3719 with attention to Dr. Murray Krahn.

II. CHARACTERISTICS OF SURVEY PATICIPANT

1. **Please provide the following personal information:**

   Birth year: _____Gender: ☐ Male / ☐ Female

2. **Please outline your educational background**

   MD completed year: _____

   Master's degree completed year: _____

   PhD completed year: _____

3. **Please describe your university affiliations**

   Position: _____

   Faculty/Department: _____

   Institution: _____

4. **Please describe your clinical practice**

   Type of clinical setting:

   - ☐ Tertiary care hospital
   - ☐ Community medical center
   - ☐ Ambulatory care (physician's office) not attached to hospital
   - ☐ Other: (please specify) _____

   Clinical specialty:

   - ☐ Hepatology
   - ☐ Gastroenterology
   - ☐ Infectious diseases
   - ☐ Internal medicine
   - ☐ Other: (please specify) _____

   Duration of clinical practice in your current specialty (years): _____

5. **Please provide information regarding chronic hepatitis C patients**

   Monthly number of patient visits for chronic hepatitis C in 2013:_____

Monthly number of patients receiving antiviral therapy for chronic hepatitis C in 2013: _____

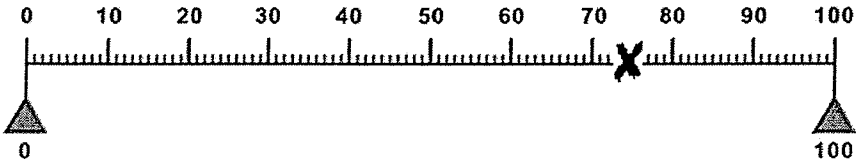
III. INSTRUCTIONS TO COMPLETE THIS SURVEY

This survey aims to understand how patients within the HCV compensation cohort are likely to be treated with antiviral therapy. In formulating your response, please consider how you are likely to treat HCV patients OVER THE NEXT TWO YEARS. We ask you to think ahead, because some of these regimens are not available in every jurisdiction at present. We will be considering the following treatment regimens:

a. Pegylated interferon plus ribavirin (PEG/RBV) (24 to 48 weeks)
b. PEG/RBV-based triple therapy with bocepreivr, telaprevir, or faldaprevir (24 to 48 weeks)
c. PEG-free therapy including the combination of ribavirin and three direct antiviral agents (12 weeks)
d. PEG/RBV-free therapy including sofosbuvir-based doublet with daclatasvir, ledipasvir or simeprevir (12 weeks)

Because HIV co-infection and previous failed antiviral treatment will affect treatment decisions, the CHC compensation cohort will be divided into four subgroups. You will read a brief description of baseline characteristics associated with the subgroup and the estimated clinical efficacy (sustained viral response (SVR)) and treatment discontinuation associated with antiviral regimens for the subgroup.

1. Please mark on the following 0-100 scale to indicate the percentage of patients within this subgroup that would likely be treated within your practice, if antiviral therapy is reimbursed by the compensation trust fund and patient's willingness to be treated is fully taken into account. "100" means you would treat 100% of patients. "0" means you would treat no patients.



2. If you decide to treat this subgroup, please indicate which regimen you are likely to use most frequently in this group: a

a. PEG/RBV
b. PEG/RBV-based triple therapy
c. PEG-free therapy
d. PEG/RBV-free therapy

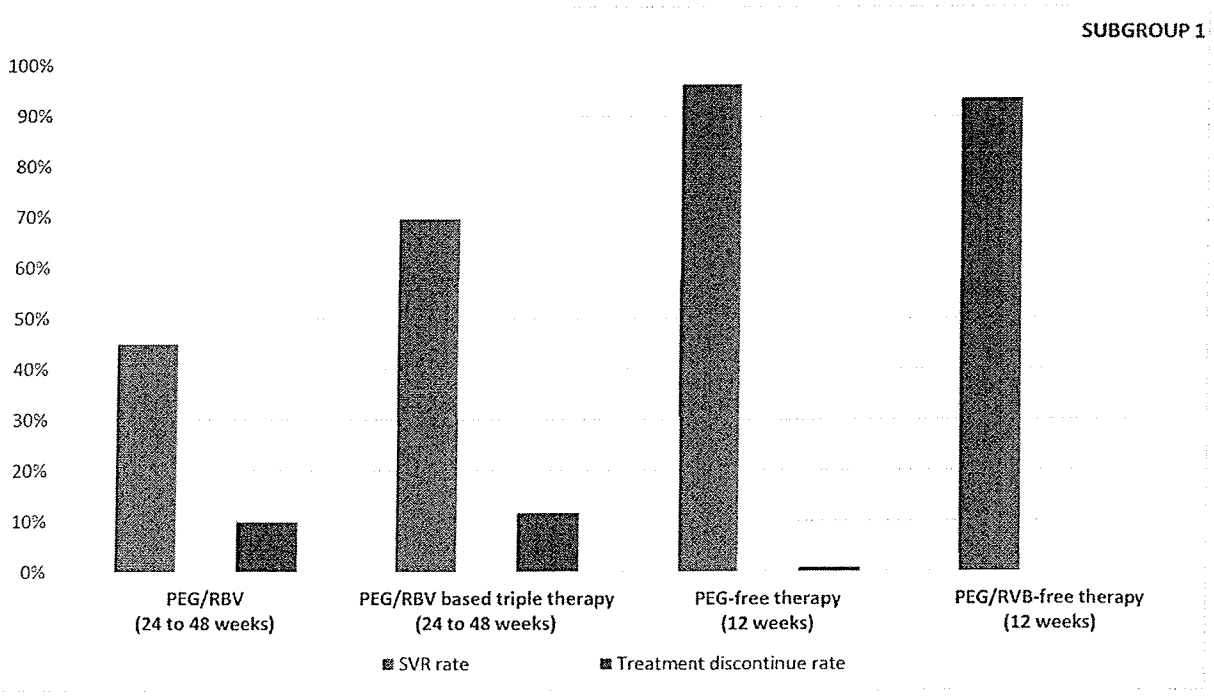
IV. QUESTIONNAIRES FOR THE FOUR PATIENT SUBGROUPS

Patient subgroup 1: Naïve patients without HIV co-infection

1. Baseline characteristics of patient subgroup 1

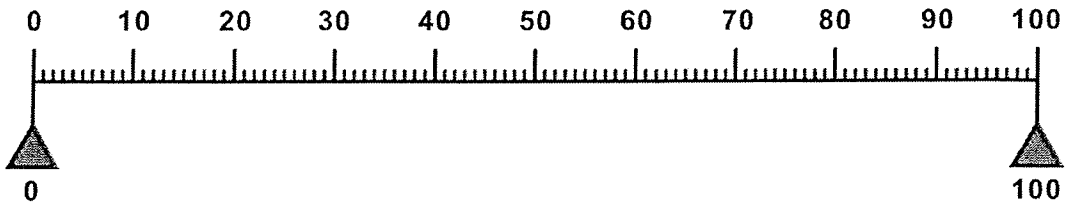
Baseline variable	%/mean ±SD
Age (years)	62.8 ± 20.2
Male gender	53.3%
Duration of HCV infection (years)	26.7 ± 4.8
Hemophilics	16.2%
Previous blood transfusion	81.9%
Distribution of fibrosis stage	
F0	63.5%
F1/F2	27.8%
F3	3.8%
F4	4.9%
Distribution of viral genotype	
1	74.4%
2 or 3	24.4%
4, 5 or 6	1.2%

2. Estimated clinical efficacies and toxicities associated with antiviral regimens in the patient subgroup 1 (naïve patients without HIV co-infection).



3. Survey questions for patient subgroup 1 (naïve patients ***without*** HIV co-infection).

3.1. Please mark on the following 0-100 scale to indicate the percentage of patients within this subgroup (naïve patients ***without*** HIV co-infection) that would likely be treated within your practice, if antiviral therapy is reimbursed by the compensation trust fund and patient's willingness to be treated is fully taken into account. "100" means you would treat 100% of patients. "0" means you would treat no patients.



3.2. If you decide to treat this subgroup (naïve patients ***without*** HIV co-infection), please indicate which regimen you are likely to use most frequently in this group:

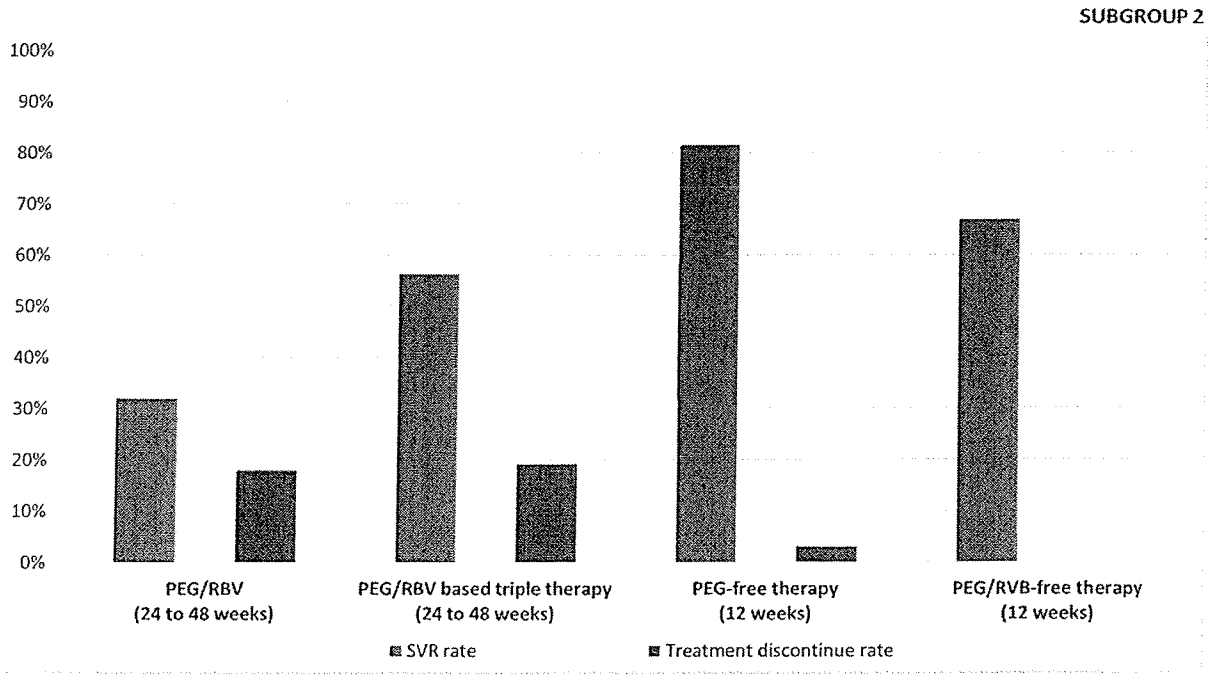
a. PEG/RBV
b. PEG/RBV-based triple therapy
c. PEG-free therapy
d. PEG/RBV-free therapy

Patient subgroup 2: Naïve patients with HIV co-infection

1. Baseline characteristics of patient subgroup 2.

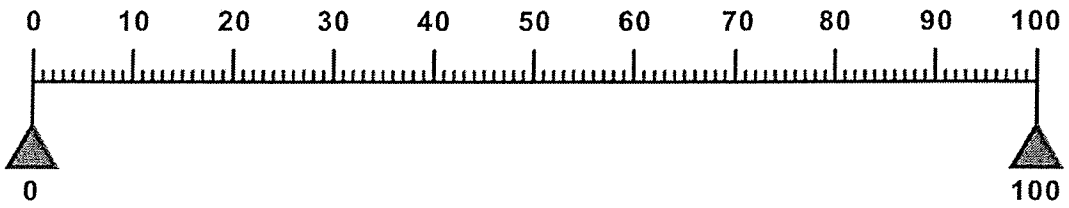
Baseline variable	%/mean ±SD
Age (years)	47.6 ± 11.2
Male gender	96.3%
Duration of HCV infection (years)	25.0 ± 1.0
Hemophilics	97.3%
Previous blood transfusion	2.8%
Distribution of fibrosis stage	
F0	39.4%
F1/F2	39.4%
F3	5.5%
F4	15.6%
Distribution of viral genotype	
1	75.0%
2 or 3	16.7%
4, 5 or 6	8.3%

2. Estimated clinical efficacies and toxicities associated with antiviral regimens in the patient subgroup 2.



3. Survey questions for patient subgroup 2 (naïve patients ***with*** HIV co-infection).

3.1. Please mark on the following 0-100 scale to indicate the percentage of patients within this subgroup (naïve patients ***with*** HIV co-infection) that would likely be treated within your practice, if antiviral therapy is reimbursed by the compensation trust fund and patient's willingness to be treated is fully taken into account. "100" means you would treat 100% of patients. "0" means you would treat no patients.



3.2. If you decide to treat this subgroup (naïve patients ***with*** HIV co-infection), please indicate which regimen you are likely to use most frequently in this group:

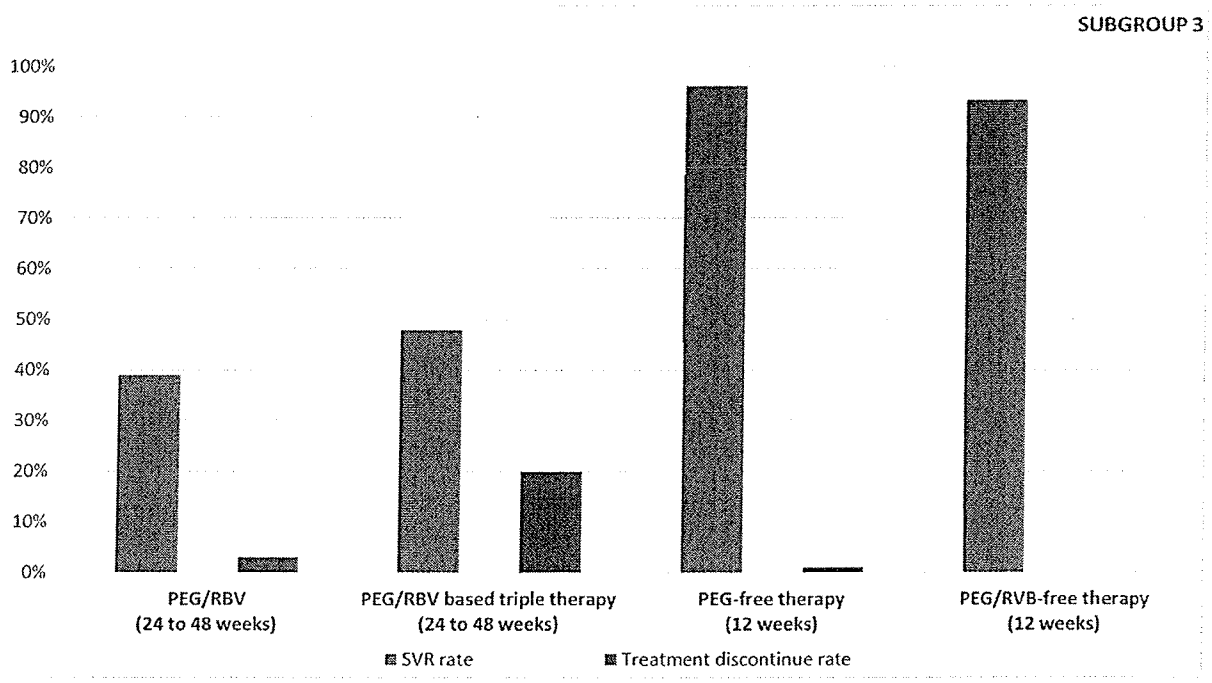
a. PEG/RBV
b. PEG/RBV-based triple therapy
c. PEG-free therapy
d. PEG/RBV-free therapy

Patient subgroup 3: Previously treated patients without HIV co-infection

1. Baseline characteristics of patient subgroup 3.

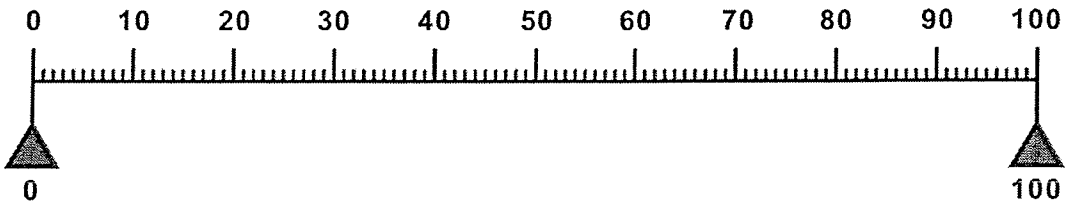
Baseline variable	%/mean ±SD
Age (years)	54.3 ± 14.0
Male gender	58.0%
Duration of HCV infection (years)	26.4 ± 5.2
Hemophilics	27.3%
Previous blood transfusion	71.4%
Distribution of fibrosis stage	
F0	0.0%
F1/F2	71.0%
F3	15.2%
F4	13.8%
Distribution of viral genotype	
1	74.4%
2 or 3	24.4%
4, 5 or 6	1.3%

2. Estimated clinical efficacies and toxicities associated with antiviral regimens in the patient subgroup 3.



3. Survey questions for patient subgroup 3 (previously treated patients ***without*** HIV co-infection)

3.1. Please mark on the following 0-100 scale to indicate the percentage of patients within this subgroup (previously treated patients ***without*** HIV co-infection) that would likely be treated within your practice, if antiviral therapy is reimbursed by the compensation trust fund and patient's willingness to be treated is fully taken into account. "100" means you would treat 100% of patients. "0" means you would treat no patients.



3.2. If you decide to treat this subgroup (previously patients ***without*** HIV co-infection), please indicate which regimen you are likely to use most frequently in this group:

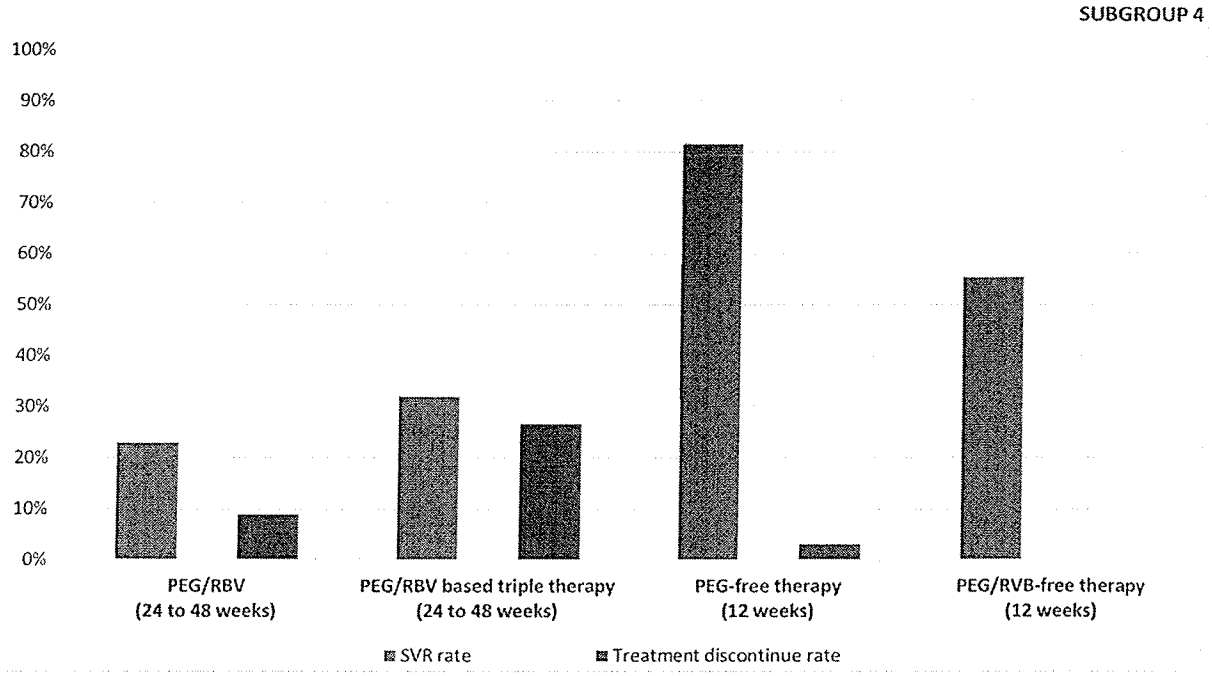
a. PEG/RBV
b. PEG/RBV-based triple therapy
c. PEG-free therapy
d. PEG/RBV-free therapy

Patient subgroup 4: Previously treated patients with HIV co-infection

1. Baseline characteristics of patient subgroup 4.

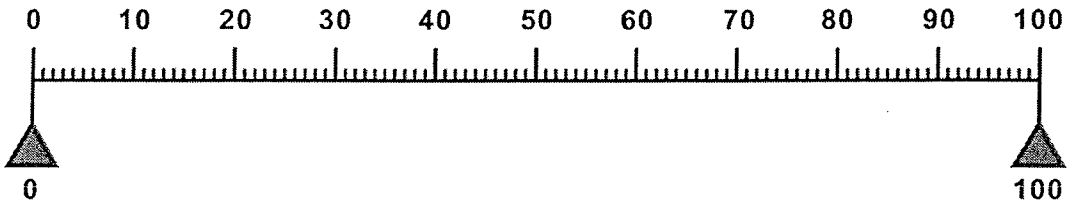
Baseline variable	%/mean ±SD
Age (years)	50.2 ± 8.2
Male gender	93.3%
Duration of HCV infection (years)	26.0 ± 1.7
Hemophilics	93.0%
Previous blood transfusion	7.0%
Distribution of fibrosis stage	
F0	0.0%
F1/F2	53.5%
F3	16.3%
F4	30.2%
Distribution of viral genotype	
1	75.0%
2 or 3	16.7%
4, 5 or 6	8.3%

2. Estimated clinical efficacies and toxicities associated with antiviral regimens in the patient subgroup 4.



3. Survey questions for patient subgroup 4 (previously treated patients ***with*** HIV co-infection)

3.1. Please mark on the following 0-100 scale to indicate the percentage of patients within this subgroup (previously treated patients ***with*** HIV co-infection) that would likely be treated within your practice, if antiviral therapy is reimbursed by the compensation trust fund and patient's willingness to be treated is fully taken into account. "100" means you would treat 100% of patients. "0" means you would treat no patients.



3.2. If you decide to treat this subgroup (previously patients ***with*** HIV co-infection), please indicate which regimen you are likely to use most frequently in this group:

a. PEG/RBV
b. PEG/RBV-based triple therapy
c. PEG-free therapy
d. PEG/RBV-free therapy

Many thanks for completing the survey questions for our study. You can fax back the signed information consent form and completed survey with attention to Dr. Murray Krahn.

Fax number is 416-946-3719.

This is Exhibit "B" referred to in the
Affidavit of Murray Krahn
sworn before me,
this 16th day of March, 2015

A COMMISSIONER FOR TAKING AFFIDAVITS

CURRICULUM VITAE

Dr. Murray D. Krahn

A. DATE OF PREPARATION

January 2015

B. BIOGRAPHICAL INFORMATION

Business Address

Toronto Health Economics & Technology Assessment (THETA) Collaborative
144 College Street, Room 658
Toronto, ON M5S 3M2
Tel: 416-978-6608 Fax: 416-946-3719
E-mail: murray.krahn@theta.utoronto.ca

Degrees/ Education

1992-1993	Research Fellowship Clinical Decision Making, New England Medical Center, Tufts University
1990-1993	Fellowship, General Internal Medicine, University of Toronto
1991	M.Sc. Clinical Epidemiology, McMaster University
1986-1990	Post-graduate training, Internal Medicine, University of Toronto
1982	M.D. University of Manitoba
1978	B.A. Philosophy, University of Winnipeg

Employment

2007 – Present	Director, Toronto Health Economics and Technology Assessment Collaborative (THETA), University of Toronto; Professor, Department of Medicine, Division of General Internal Medicine and Clinical Epidemiology, University of Toronto; Professor, Faculty of Pharmacy, University of Toronto
2001 - 2007	Associate Professor, Department of Medicine, Division of General Internal Medicine and Clinical Epidemiology, University of Toronto
2006 – Present	Adjunct Scientist, Institute for Clinical Evaluative Sciences (ICES) Senior Scientist, Toronto General Research Institute
2005 – Present	F. Norman Hughes Chair in Pharmacoeconomics, Faculty of Pharmacy, University of Toronto
2000 – 2005	Associate Director, Clinical Epidemiology Program, Health Policy, Management and Evaluation, University of Toronto
1995	Scientist, Toronto General Research Institute General Internal Medicine, University Health Network

Honours and Awards

2014	The Dr. Jill M. Sanders Award of Excellence in Health Technology Assessment, CADTH
2009	Senior Researcher Award, Association of Faculties of Pharmacy of Canada
2007	David Sackett Senior Investigator Award, Canadian Society for Internal Medicines
2005	Inaugural holder of the F. Norman Hughes Chair in Pharmacoeconomics, Faculty of Pharmacy

2005	Eugenie Stuart Award for Excellence in Course/Program Development & Coordination, Department of Health Policy, Management, and Evaluation, University of Toronto
2001 – 2007	Investigator Award, Canadian Institutes for Health Research
2004	Wightman Berris Academy Teaching Individual Teaching Award in the Category of "Health Professional Programs"
1996-1998	Arthur Bond Fellowship for Innovative Health Systems Research, Physicians' Services Incorporated Foundation
1992, 1995	Young Investigator of the Year, Society for Medical Decision Making
1990	Henry Christian Memorial Award, American Federation for Clinical Research, Outstanding abstract in Clinical Epidemiology
1990	Residents and Fellows Research awards, Clinical Epidemiology Category, Toronto General Hospital, University Health Network

Professional Affiliations and Activities

2015	Member, JDMI Research Steering Committee
2013	President, Society for Medical Decision Making; Co-Chair, Government Economic Advisory Board Advisory Board Organizing Committee; Chair, Decision Determinants Sub-Committee, Ontario Health Technology Advisory Committee (OHTAC) Co-Chair, Vaccine Pharmacoeconomics Workshop
2012	Public Engagement Sub-Committee, Health Quality Ontario Steering Committee, BRIDGES Governance Comittee
2010	Co-chair, Society for Medical Decision Making annual meeting Member, Ontario Health Technology Advisory Committee Co-chair, Health Technology Assessment Group, Applied Research Center in Cancer Control Mentor, Health Care, Technology, and Place, CIHR STIHR program, University of Toronto
2000 - 2010	Member, Advisory Committee to the Bone and Joint Decade Task Force on Neck Pain and its Associated Disorders
2005	Member, Drug Quality and Therapeutics Committee, Cancer Care Ontario Subcommittee, Ontario Ministry of Health and Long-term Care Chair, Clinical Strategies, Society for Medical Decision Making Annual Meeting, San Francisco
2004-2006	Chair, Membership Committee, Society for Medical Decision Making
2004	Chair, Health Economics Abstract Sessions, Society for Medical Decision Making Annual Meeting, Atlanta Board Member, CIHR/NCIC Canadian Prostate Cancer Research Initiative Editorial Board, Medical Decision Making
2002-2005	Trustee, Board of Directors, Society for Medical Decision Making
2001-2005	Associate Director, Clinical Epidemiology and Health Care Research Programme, Department of Health Administration, University of Toronto
2001-2004	Clinician Scientist Committee, Canadian Institutes for Health Research
2002	Bone and Joint Decade 2000 Task Force on Neck Pain and Associated Disorders
2000	Data Safety and Monitoring Committee; CLIP (Cancer of the liver, Italian Program) trial of alternate screening intervals for hepatocellular carcinoma Clinical Research Programme in Prostate Cancer, University Health Network Faculty Advisory Board, University of Toronto Medical Journal
1998-2010	Chair, working group commissioned by the Federal, Provincial and Territorial Governments of Canada, the Hepatitis C plaintiffs (1986-1999) and the Canadian Association for the Study of the Liver (CASL) to produce a model of the natural history of hepatitis C.
1998 – 2001	Member, Decision Analysis Group, UCLA-Rand Evidence Based Practice Center
1996 - 2000	Member, Scientific Advisory Panel, Canadian Coordinating Office of Health Technology Assessment (CCOHTA)

1996-1998	Member, Executive, Socio-behavioral Cancer Research Network, National Cancer Institute of Canada
1996	Co-chair, Short Courses, Society for Medical Decision Making Annual Meeting
1995-1996	Member, Ontario Ministry of Health Hepatitis B Control Program Committee
1994-1997	Editorial Board, Medical Decision Making
1993-1995	Member, Ontario Ministry of Health Guidelines Panel for Prostate Specific Antigen Utilization

Reviewer:

Dutch HTA Agency (Zorginstituut Nederland)
Canadian Institutes for Health Research
Annals of Internal Medicine,
Journal of the American Medical Association,
Medical Decision Making,
PharmacoEconomics,
ACP Journal Club,
Evidence Based Medicine,
Abstracts of Clinical Care Guidelines,
Pediatrics,
Alberta Heritage Foundation for Medical Research
Michael Smith Foundation
B.C. Lung Association,
Canadian Medical Association Journal
American Journal of Medicine
Quality of Life Research
Value in Health
Canadian Journal of Public Health
Canadian Journal of Respirology
Gastroenterology
Journal of the American Medical Association

Consultant:

Ontario Ministry of Health, Drug Quality and Therapeutics Committee,
New Drug Funding Program, Cancer Care Ontario

University Committees

January 2008	Member, Departmental Promotions Committee, Department of Medicine, University of Toronto
November 2007	Member, Planning Committee for the first GIM Faculty Day, Department of Medicine, University of Toronto
2005	HPME Ontario Research Chairs Search Committee Curriculum Committee, Accreditation Committee, Faculty of Pharmacy
2000-2005	Chair, PhD Admissions Committee, Clinical Epidemiology Program, University of Toronto PhD Committee, Communications Task Force, Curriculum Committees, Department of Health Policy, Management, and Evaluation
1999	Executive Committee, Clinical Epidemiology Program, University of Toronto
1997-2005	M.Sc. Admissions Committee, Clinical Epidemiology Program, University of Toronto
1995-1997	Urban Health Initiatives Committee, University of Toronto

Hospital Committees

1999	Research Director, Division of General Internal Medicine, University Health Network
2005	Postgraduate fellowship committee

C. ACADEMIC HISTORY

Research Interests

My central area of research interest has been the application of decision analysis and economic evaluation to broad questions of health and clinical policy. This methodologic focus has been expressed in a variety of content areas including prostate cancer and viral hepatitis. More recent interests include evaluating the role of disease specific utility assessment, using administrative data to build longitudinal cost models, and evaluating the role of health technology assessment in pharmaceutical reimbursement decisions.

Research Awards (Applied)

1. The Canadian F.I.G.H.T. (Fluorenscence Image-Guided Help in Treating) Breast Cancer Surgical Trial
   Canadian Institutes of Health Research: Transitional Operating Grant

Principal Investigator:	Dacosta R
Co-Investigators	Done S, Easson A, Helyer L, Holloway C, Krahn M, Leong W, McCready D, Meiers P, Mew D, Panzarella T, Rosen C, Simpson J
2015 - 2020	$1,580,000
Major goals of the project:	See title
% of overlap with current application	0%

2. Improving Triage and Infroming Capacity Needs for Patients with Severe Aortic Stenosis undergoing Transcatheter Aortic Valve Implantation (TAVI): A Pan-Canadian Evaluation
   Canadian Instititues of Health Research

Principal Investigator:	Wijeysundera H
Co-Investigators:	Asgar A, Austin P, Bainey K, Berta W, Gagliardi A, Hoch J, Knudtson M, Ko D, Kuluski K, Lauck S, Miller F, Nadeem S, Pelletier M, Piazza N, Potter B, Rodes Cabau J, Tu J, Webb J, Wong W, Wood D
Collaborators:	Booker J, Cohen E, Daneault B, Denereux P, Kass M, Krahn M, Peterson m, Welsh R, Zimmermann R
2015 - 2019	1,462,931
Major goals of the project:	See title
% of overlap with current application	0%

3. The impact of periodontitis on the time to progression to insulin therapy among Canadian First Nations and Inuit with type 2 diabetes managed by oral anti-diabetic medications
   Canadian Diabetes Association 2014 operating grant competition

Principal Investigator:	Azarpazhooh A
Co-Investigators:	Banerji A, **Krahn M,** Lebovic G, Mamdani M, Shah P, Stewart S, Tenenbaum H
2014 – 2016	$152,329
Major goals of the project:	See title
% of overlap with current application	0%

4. Evaluation of Telehomecare for Patients with Congestive Heart Failure or Chronic Obstructive Pulmonary Disease
TVN - Strategic Impact Grant

Principal Investigator:	**Krahn M** and Rac V
Co-Investigators:	Alter D, Schull M, Abrahamyan L, Pechlivanoglou P, Wong W, Shahid N, Sahakyan Y, Fan I
2015 - 2017	$518,972
Major goals of the project:	See title
% of overlap with current application	0%

5. Pan-Canadian Evvironmental Scan of End-of-Life Care Policies and Practices in breast cancer
Breast Cancer Foundation

Principal Investigator:	**Krahn M**
Co-Investigator:	Rac V, Wong W, Pechlivanoglou P, Miller F, Abrahamyan L
2015-2018	$434,882
Major goals of the project:	See title
% of overlap with current application	0%

Research Awards (Granted)
Peer Review

1. Vivia Hemodialysis System
MaRS EXCITE: Baxter Healthcare Corporation

Principal Investigator(s)	**Krahn M**, Rac V
Co-Investigators:	Abrahamyan L, Mitsakakis N
2014-2017	$1, 813,000.12
Major goals of the project:	See title
% of overlap with current application	0%

2. The impact of periodontitis on the time to progression to insulin therapy amony Canadian First Nations and Inuit with type 2 diabetes managed by oral anti-diabetic medications.
Canadian Diabetes Association

Principal Investigator:	Azarpazhooh A
Co-Investigators	**Krahn M**, Banerji A, Lebovic G, Mamdani M, Prakeshkumar S, Stewart S, Tennenbaum H
2014-2016	$152,329
Major goals of the project:	See title
% of overlap with current application	0%

3. Service Models and Cost-effectiveness of Preoperative Care in Ontario
Health Quality Ontario (HQO)

Principal Investigator: Rac V
Co-PI: **Krahn M**
Co-Investigators: Abrahamyan L, Pechlivanoglou P, Mitsakakis N, Carcone S
2014 - 2017 $471,799
Major goals of the project: See title

% of overlap with current application 0%
Grant No. 497336

4. Request for proposal for Evaluation Services - Value Demonstrating Initiative on COPD: Evaluation of Value Demonstrating Initiative on COPD
The Lung Association
Principal Investigator: **Krahn M**
Co-Investigators: Rac V, Abrahamyan L, Pechlivanoglou P, Mitsakakis N
2014-2017 $397,434
Major goals of the project: See title
% of overlap with current application 0%
Grant No. not yet set up

5. Toronto Health Economics and Technology Assessment Collaborative (THETA)
Health Quality Ontario (HQO)
Principal Investigator: **Krahn M**
Co-investigators: Rac V, Pham B, Miller F, Abrahamyan L, Pechlivanoglou P, Carcone S, Bielecki J, Lim M
4/2014 – 3/2017 $4,800,000
Major goals of the project: See title
% of overlap with current application 0%
Grant No. 496569

6. Pathways to Procurement: Processes, Rationales & Options for Investing in Health Technology Innovation
Canadian Institute of Health Research (CIHR)
Principal Investigator: Miller F
Co-Investigators: Lehoux P, **Krahn M**, Peacock S, Rac V, Pham B
2014-2018 $354,718

Major goals of the project: See Title
% of overlap with current application: 0%
Grant No. MOP 133514

7. Using Administrative Health Care Data to Inform Cancer Care Policy in Canada
Canadian Institute of Health Research (CIHR)
Principal Investigator: **Krahn M**
Nominated PI: de Oliveira C
Co-Investigators: Matheson G, Coldman A, Cooper D, Joyce M, Rousseau J, Dragomir E, Earle C, Hoch J, Mittman N, Peacock S, Skedgel C, Turner D

2014-2017	$398,814 (CIHR) $75,000 (MOHLTC - partner)
Major goals of the project:	See Title
% of overlap with current application:	0%

8. Ecologically Optimizing Exercise Maintenance in Men and Women Pos-Cardiac Rehabilitation: A Randomized Controlled Trial of Efficacy with Economics (ECO-PCR)
Heart and Stroke Foundation of Canada

Principal Investigator(s)	Reid R and Grace S
Co-Investigators:	Blanchard C, Chessex C, Harris J, Kingsbury K, Manuel D, Mark A, Mullen K, Pipe A, **Krahn M**
2014 - 2017	$274,825
Major goals of the project	See title
% of overlap with current application	0%

9. Development of a Utility Weighting Function for the Bladder Utility Symptom Scale (BUSS-U)
Canadian Cancer Society Research Institute (CCSRI)

Principal Investigator:	**Krahn M**
Co-Investigators:	Kulkarni G, Alibhai S, Chin J, Chung P, Finelli A, Perlis N, Sridhar S, Tomlinson G, Boehme K, Bremner K
2/2014 – 1/2017	$299,900
Major goals of the project:	See title
% of overlap with current application	0%
Grant No. 702607	

10. Cross sectional and longitudinal measures of quality of life and utility among patients with chronic hepaitis C virus infection
Canadian Institutes of Health Research (CIHR)

Principal Investigator	**Krahn M**
Nominated PI:	Wong W
Co-Investigators:	Krahn M, Bruneau J, Feld J, Feng Z, Lee SS, Mitsakakis N, Myers R, Pechlivanoglous P, Powis J, Rac V
2014 - 2015	$100,000

11. Estimating the Cost of Non-dialysis Health Care Among Dialysis Patients
Ontario Renal Network/Cancer Care Ontario

Principal Investigator:	**Krahn M**
Co-Investigators:	Rac V, de Oliveira C, Mendelssohn D, McFarlane P, Bremner K
11/2013 – 7/2015	$189,952
Major goals of the project:	See title
% of overlap with current application	0%
Grant No. 495837	

12. Evaluation of Telehomecare for Patients with Congestive Heart Failure or Chronic Obstructive Pulmonary Disease

Ministry of Health and Long-Term Care / BRIDGES
Principal Investigator: **Krahn M**
Co-Principal Investigators: Abrahamyan L, Pechlivanoglou P, Mitsakakis N
11/2013 – 12/2017 $436,828
Major goals of the project: See title
% of overlap with current application 0%
Grant No. 470530

13. Clinical and Cost-effectiveness of MedsCheck in Ontario Seniors: A Mixed Methods Study
Canadian Pharmacists Association
Principal Investigator: **Krahn M**
Co-Investigators: Rac V, Pechlivanoglou P, Grootendorst P, Mitsakakis N, Bowen J, Abrahamyan L, Priest S, Mahdi M
9/2013 – 03/2016 $236,626.80
Major goals of the project: See title
% of overlap with current application 0%
Grant No. 495679

14. The mapping of the MFSAF and MPNSAF to the EQ-5D in a representative population of patients living with Myelofibrosis
Sanofi-Aventis Canada Inc.
Principal Investigator: **Krahn M**
Co-Investigators: Mitsakakis N, Bremner K
12/2013 - 12/2014 $80,000
Major goals of the Project: See title
% of overlap with current application 0%
Grant No. 144414

15. Canadian Institutes of Health Research (CIHR) - Transformation of Indigenous Primary Healthcare Delivery (FORGE AHEAD): Community-driven Innovations and Strategic Scale-up Toolkits

Principal Investigator: Harris S.
Co-Investigators: Baxter E, Houle L, Jacobs S, Kandukur K,; Littlechild RW, McComb IK, McDonald HL, Montour D, Morach JE, Nose MA, O'Keefe T, Redmond D, Spade D, Tischer C, Zeiller SD; Barre DE, Bhattacharyya O, Dannenbaum D, Dawson KG, Dyck RF, Episkenew JM, Green ME, Hanley AJ, Lavallee B, Macaulay AC; McComber AM; Parry MJ; Reichert SM; Salsberg JS; Thind A, Tobe SW, Toth EL, Walsh AM; Wortman J, Zwarenstein MF
Collaborators: **Krahn M**, de Oliveira C
2013 – 2018 $500,000 / year ($2,500, 000)
Major goals of the project: See title
% of overlap with 0%

16. Center for the Evaluation of Technological Innovation (CETI)

Canada Foundation for Innovation (CFI)
Principal Investigator: **Krahn M**
Co-Investigators: Miller F, Cadarette S, Wijeysundera H, Hoch J, Grootendorst P, Ungar W, Lemieux-Charles L, Coyte P.
2013-2018 $2,999,834
Major goals of the project: See title
% of overlap with current application 0%
Grant No. NIF 2012 #31001

17. Home Sleep Study with ApneaDX for the diagnosis of obstructive sleep apnea: a pragmatic randomized controlled trial
MaRS Excellence in Clinical Innovation and Technology Evaluation (EXCITE)
Health Quality Ontario (HQO)
Principal Investigator: **Krahn M**
Co-Principal Investigator: Fitzpatrick M
Co-Investigators: Rac V, Pham B, Pechlivanoglou P, Abrahamyan L.
4/2013 – 8/2014 $414,991 (EXCITE)
2014 - 2015 $339,318 (HQO)
Major goals of the project: See title
% of overlap with current application 0%
Grant No. 495183

18. Toronto Health Economics and Technology Assessment Collaborative (THETA)
Health Quality Ontario (HQO)
Principal Investigator: **Krahn M**
Co-investigators: Alibhai S, Bayoumi A, Bauch C, Chaim B, Beyene J, Bremner K, Carcone S, Detsky A, Fowler R, Englesakis M, John-Baptiste A, Einarson T, Hoch J, Chen M, Laporte A, Mittman N, MacKeigan L, Naglie G, Naimark D, Pham B, Sander B, Thein HH, Tomlinson G, Ungar W, Urbach D.
4/2013 – 3/2014 $1,768,656
Major goals of the project: See title
% of overlap with current application 0%
Grant No. 494551

19. Study of Tumour RNA Disruption Assay (RDA) as a predictive tool for response to Neoadjuvant Chemotherapy in Breast Cancer – A prospective Mixed-Methods Study
MaRS Excellence in Clinical Innovation and Technology Evaluation (EXCITE)
Principal Investigator: **Krahn M**
Co-Investigators: Rac V, Pechlivanoglou P, Pham B, Abrahamyan L, Carcone S, Wong J, Mitsakakis N
6/2013 – 6/2015 $1,160,423.60
Major goals of the project: See title
% of overlap with current application 0%

20. An RCT and economic analysis of three exercise delivery methods in men with prostate cancer on ADT
Canadian Institutes of Health Research (CIHR)

Principal Investigator:	Shabbir A
Co-Investigators:	Culos-Reed, S, **Krahn M**, Lukka H, Matthew A, Ritvo P, Sabiston C, Santa Mina D, Segal R, Tomlinson, G, Warde P
10/2013 – 9/2018	$781,091
Major goals of the project:	See title
% of overlap with current application	0%

21. A Phase II RCT and economic analysis of three exercise delivery methods in men with prostate cancer on ADT
Prostate Cancer Canada

Principal Investigator:	Shabbir A
Co-Investigators:	Culos-Reed, S, **Krahn M**, Matthew A, Ritvo P, Sabiston C, Santa Mina D, Segal R, Tomlinson, G, Warde P
7/2013 – 6/2015	$195,796
Major goals of the project:	See title
% of overlap with current application	0%

22. Phase-Specific and Lifetime Medical Costs of Care for Childhood Cancer in British Columbia and Ontario
Canadian Institutes of Health Research (CIHR)

Principal Investigator:	McBride M
Co-PI:	**Krahn M**
Co-Investigators:	de Oliveira C, Greenberg M, Nathan P, Peacock S, Rogers P
2012 – 2015	$377,886
Major goals of the project:	See title
% of overlap with current application	0%

Grant No. 20200

23. Developing and validating the Bladder Utility Symptom Scale (BUSS) - A disease specific utility Instrument For bladder cancer health related quality of life
Canadian Institutes of Health Research

Principal Investigator:	**Krahn M**, Kulkarni G
Co-Investigators:	Finelli A, Alibhai S, Perlis N, Ritvo P
10/2012-9/2015	$278,960
Major goals of the project:	See title
% of overlap with current application	0%

24. Stroke units in Ontario: characteristics and costs associated with effectiveness
Ontario Stroke Network

Principal Investigator:	**Krahn M**
Co-Investigators:	Kapral M, Ieraci L, Rac V,
9/2012-3/2014 :	$100,000
Major goals of the project:	See title
% of overlap with current application	0%
Grant No. OSN 1207-000150	

25. Toronto Health Economics and Technology Assessment Collaborative (THETA)
Health Quality Ontario (HQO)

Principal Investigator:	**Krahn M**
Co-investigators:	Alibhai S, Bayoumi A, Bauch C, Chaim B, Beyene J, Bremner K, Carcone S, Detsky A, Fowler R, Englesakis M, John-Baptiste A, Einarson T, Hoch J, Chen M, Laporte A, Mittman N, MacKeigan L, Naglie G, Naimark D, Pham B, Sander B, Thein HH, Tomlinson G, Ungar W, Urbach D.
2012 - 2013	$1,768,656
Major goals of the project:	See title
% of overlap with current application	0%
Grant No. 492530	

26. A Population-based outcome and economic evaluation of interventions for gastric cancer
Canadian Institutes of Health Research (CIHR)

Principal Investigator:	Coburn N
Co-Investigators:	Johnson A, **Krahn M**, Paszat L, Earle C, Law C, Karanicolas P, Kiss A, Wright F, Dobrow M, Irish J, McLeod R, Mahar A, Brar S, Dixon M
2012 – 2014	$245,200
Major goals of the project:	See title
% of overlap with current application	0%

27. Investigating the process of how expert-consult teams deliver home-based palliative care in two provinces

Canadian Institute of Health Research (CIHR)

Principal Investigator:	Seow H
Co-Investigators:	Austin P, Barbera L, Brazil K, Fainsinger R, Fassbender K, **Krahn M**, Marshall D, Pereira J, Sussman J
10/2011 – 09/2014	$387,917
Major goals of the project:	See title
% of overlap with current application	0%

28. A pharmacoeconomic policy model for hepatitis C: development and applications
Canadian Institute of Health Research (CIHR)

Principal Investigator:	Thein HH
Co-Investigators:	Dore G, Earle C, Feld J, Fisman D, **Krahn M**, Wong WW

10/2011 – 09/2013 $133,475
Major goals of the project: See title
% of overlap with current application 0%

29. Impact of Patterns of Current Care on the Burden of Chronic Hepatitis C In British Columbia, Canada
Canadian Liver Foundation
Principal Investigator: **Krahn M**
Co-Investigators: Chen WD
2011 – 2012 $355,300
Major goals of the project: See title
% of overlap with current application 0%
Grant No. CLF-Krahn Liver Research Trust Fund

30. Specialized Multidisciplinary Community-Based Care for Chronic Wounds Study
Ministry of Health and Long-Term Care (MoHLTC)
Principal Investigator: **Krahn M**
2011 – 2013 $300,100
Major goals of the project: See title
% of overlap with 0%
Grant No. 06403D

31. Heart Failure (Multi-Disciplinary Community Care) Clinics Field Evaluation Research Project
Ministry of Health and Long-Term Care (MoHLTC)
Principal Investigator: **Krahn M**
2010 – 2012 $240,449
Major goals of the project: See title
% of overlap with 0%
Grant No. 06403B

32. Pressure Ulcers Multi-disciplinary Team via Telemedicine (PUMTT)
Ministry of Health and Long-Term Care (MoHLTC)
Principal Investigator: **Krahn M**, Stern A
Co-investigators: Baker R, Levine L, Jeffs L, Harris C, Alibhai S, Woodbury G, Zwarenstein M, Teague L
2010 – 2012 $299,109
Major goals of the project: See title
% of overlap with current application 0%
Grant No. 06403C

33. Pressure Ulcers Multi-disciplinary Team via Telemedicine (PUMTT)
Canadian Patient Safety Institute
Principal Investigator: **Krahn M**, Stern A
Co-Investigators: Baker R, Levine L, Jeffs L, Harris C, Alibhai S, Woodbury G, Zwarenstein M, Teague L
2010 – 2012 $247,683

Major goals of the project: See title
% of overlap with current application: 0%
Grant No. RFA09-1200-ON

34. Pressure Ulcers Multi-disciplinary Team via Telemedicine (PUMTT)
Community Care Access Centre
Principal Investigator: **Krahn M**, Stern A
Co-Investigators: Baker R, Levine L, Jeffs L, Harris C, Alibhai S, Woodbury G, Zwarenstein M, Teague L
2010 – 2012 $45,000
Major goals of the project: See title
% of overlap with current application: 0%

35. The Economic Burden of Patient Safety
Canadian Patient Safety Institute (CPSI)
Principal Investigator: Etchells E
Co-Investigators: Baker M, Shojania K, **Krahn M**, McDonald A, Taggar R, Matlow A, Daneman N
2010 – 2012 $448,550
Major goals of the project: See title
% of overlap with current application: 0%

36. Modeling and economic evaluation of hepatitis C epidemic mitigation strategies in Australia
National Health and Medical Research Council (NHMRC) Project Grant
Principal Investigator: Wilson DP, Thein HH, **Krahn M**
Co-Investigators: Dore G, Maher L, Kaldor J
2010 – 2012 $448,550
Major goals of the project: See title
% of overlap with current application: 0%

37. Evaluation of a model for assessment and treatment of hepatitis C virus among injecting drug users in the opiate pharmacotherapy setting
NHMRC Partnership Projects
Principal Investigator: Dore G, Haber P, Grebely J, Day C, Treloar C, Ryan L, Thein HH
Co-Investigators: Jauncey M, **Krahn M**, Batey R, Loveday S, Bath N
2010 – 2014 $1,495,188
Major goals of the project: See title
% of overlap with current application: 0%

38. Assessing the Impact of Policy Interventions for Problematic Prescription Opioid Use and Related Harms at a Popuulation Level
Canadian Institute of Health Research (CIHR)

Principal Investigator:	Arratoon C, Fischer B, Kendall P, Lynch M, Rehm J
Co-I:	Goldner E, **Krahn M**
2010 – 2011	$200,000
Major goals of the project:	See title
% of overlap with current application	0%

39. Assessing Interventions for Protecting Vulnerable Population during the 2009 H1N1 Pandemic
Canadian Institute of Health Research (CIHR)

Principal Investigator:	Bauch C
Co-PI:	**Krahn M**, Moghadas S
Co-I:	Deeks S, Kwong J, McGeer A, Sander B, Wu J.
2009 – 2010	$99,839
Major goals of the project:	See title
% of overlap with current application	0%

40. Model-based economic evaluation of hepatitis C treatment strategies in individuals co-infected with HIV in Canada
Canadian Institutes of Health Research (CIHR)

Principal Investiagor:	Bauch C and **Krahn M**
Co-Investigators:	Bayoumi A, Klein M, Thein HH, Wilson D
2009 – 2010	$188,120
Major goals of the project:	
% of overlap with current application	

41. Health Care, Technology and Place: A Strategic Training Initiative
Canadian Institutes of Health Research (CIHR)

Principal Investigator:	Coyte P
Co-Investigators:	Andrews G, Baecker R, Bayoumi A, Boydell K, Cameron J, Carter M, Clifford T, Colantonio A, Culyer A, Dunn J, Fernie G, Gignac M, Hoch J, Holmes D, Jadad A, **Krahn M**, Laporte A, Letourneau N, Levin L, Maki B, Mihailidis A, Miller F, Mykhalovskiy E, O'Brien-Pallas L, Rosenberg M, Upshur R.
2009 – 2015	$3,850,220
Major goals of the project:	
% of overlap with current application	
Grant No. TGF - 53911	

42. Phase I of the Evidence on Tap: Expedited Knowledge Synthesis 2009
Canadian Institutes of Health Research (CIHR)

Principal Investigator:	**Krahn M**
Co-Investigators:	Cadarette S, Einarson T, Alibhai S, Pham B, Machado M,

	van der Velde G, Tomlinson G
2009	No monetary involved
Major goals of the project:	
% of overlap with current application	

43. Androgen Deprivation Therapy (ADT) in Ontario: Pattern of Care, Lifetime Costs, Model-based and Real-world cost-effectiveness
Drug Innovation Fund of the Ontario Ministry of Health and Long-Term Care

Principal Investigator:	**Krahn M**
Co-Investigators:	Bell C, Gavura S, Grootendorst P, Hodgson D, Mamdani M, Peacock S, Sawka C, Sullivan T, Trudeau M, Woodward G
2009 –2012	$304,767
Major goals of the project:	
% of overlap with current application	
Grant No. 020200	

44. Canadian Centre for Applied Research in Cancer Control (ARCC): Advancing Health Economics, Services, Policy and Ethics

BC Cancer Agency	
Principal Investigator:	Hoch J, Peacock S
Co-Investigators:	Barbera L, Barer M, Berry S, Brouwers M, Browman G, Culyer T, Dobrow M, Doll R, Elwood M, Evans R, Fassbender K, Gallagher R, Gibson J, Hagen N, Harvey B, Henry D, Hodgson D, **Krahn M**, Lemieux-Charles L, McBride M, Mittman N, O'Reilly S, Ringash J, Sawka C, Sullivan T, Sutcliffe S, Upshur R
7/2009 – 6/2014	$3,600,000
Major goals of the project:	See title
% of overlap with	0%

45. Phase-specific and lifetime costs of cancer in Ontario and British Columbia
Canadian Cancer Society

Principal Investigator:	**Krahn M**
Co-Investigators:	Alibhai S, Barer M, Farahati F, Hoch J, Laporte A, Marchado M, Naglie, G, Paszat L, Peacock S, Tomlinson G
2009 – 2013	$674,546
Major goals of the project:	See title
% of overlap with current application	0%

46. Non-Medical Use of Prescription Opiod analgesics in Canada: Epidemiology, Consequences and Interventions
Canadian Institute for Health Research (CIHR)

Principal Investigator:	Fischer B
Co-Investigators	Barrett S, Bouchard M, Dell C, Fallu J, Goldman H, Goldner E, **Krahn M**, Mugford G, Paterson B, Somers J, Tyndall M

2008 - 2014	$1,249,500
Major goals of the project:	See title
% of overlap with current application	0%

47. Turning for Ulcer Reduction (TURN) Study
Ministry of Health and Long-Term Care (MoHLTC)

Principal Investigator:	**Krahn M**
Co-Investigators:	Stern A, Bergstrom N, Horn S
2008 – 2011	$507,520
Major goals of the project:	See title
% of overlap with current application	0%

Grant No. 06403A

48. Cervical cancer screening in the era of HPV vaccination: using mathematical and economic models to guide screening policy
Canadian Institute for Health Research (CIHR)

Principal Investigator:	Bauch C, Gilca V, **Krahn M**, Mai V, McLachlin C, Pham B
Co-Investigators:	Anonychuk A, Colgan T, Howlett R, John-Baptiste A, Sander B
2008-2010	$195,617
Major goals of the project:	See title
% of overlap with current application	0%

49. Estimating treatment effects for uncommon disease using observational data in a Bayesian context. The warfarin in scleroderma-pulmonary hypertension model
Canadian Institute for Health Research (CIHR)

Principal Investigator:	Feldman B
Co-Investigators:	Granton J, Hawker G, Johnson S, **Krahn M**, Tomlinson G
2008 - 2011	$104,651
Major goals of the project:	See title
% of overlap with current application:	0%

50. Development and implementation of a Type 2 Diploma program for university graduate level students to increase Canadian capacity for assessing and monitoring the use of new and existing health technologies
Canadian Institute for Health Research (CIHR)

Principal Investigator:	Goeree R, **Krahn M**, Lynd L
Co-Investigators	Lemieux-Charles L, Marra C, O'Reilly D, Tarride J, Xie F
2008 - 2009	$5,000

51. Hip Fracture and Quality of Life Pilot Study
Medical Research Foundation

Principal Investigator:	Wang P
Co-Investigators:	Squire D, Mathews M, Buehler S, **Krahn M**, Cheung A
2008 – 2009	$10,000

Major goals of the project:	See title
% of overlap with current application	0%

52. Examining quality of life and health outcomes after hip fracture in urban-rural Newfoundland: A pilot study
NL Medical Research Foundation Internal Competition

Principal Investigator:	Wang P
Co-Investigators	Squire D, Mathews M, Buehler S, **Krahn M**, Cheung A
2008 – 2009	$10,000
Major goals of the project:	See title
% of overlap with current application	0%

53. The Cost-effectiveness of Pandemic influenza Mitigation Strategies using a Stochastic Agent Based Transmission Model
CIHR Pandemic Preparedness Res-Influenza Diagnostics, Transmission Competition

Principal Investigator:	**Krahn M**
Co-Investigators:	Bauch C, Kwong J, McGeer A, Raboud J.
2007 – 2010	$235,273
Major goals of the project:	See title
% of overlap with current application	0%

54. Toronto Health Economics and Technology Assessment Collaborative
Ministry of Health and Long-Term Care

Principal Investigator:	**Krahn M**
Co-Investigators:	Alibhai S, Bayoumi A, Bauch C, Chaim B, Beyene J, Bremner K, Carcone S, Detsky A, Fowler R, Englesakis M, John-Baptiste A, Einarson T, Hoch J, Chen M, Laporte A, Mittman N, MacKeigan L, Naglie G, Naimark D, Pham B, Sander B, Thein HH, Tomlinson G, Ungar W, Urbach D.
2007 –2012	$7,069,092
Major goals of the project:	See title
% of overlap with current application	0%

55. Economic Evaluation of Adjunctive Intravenous Anti-thrombotic and Anti-platelet Agents in Percutaneous Coronary Intervention for Stable Angina
Canadian Institute for Health Research (CIHR)

Principal Investigator:	Wijeysundera H
Co-Investigators:	**Krahn M**
2007 - 2012	$220,000
Major goals of the project:	See title
% of overlap with current application	0%

56. Evaluating the need for and potential design of a no-fault compensation program for immunization related injuries
Canadian Institute for Health Research (CIHR)

Principal Investigator:	Keelan J, Wilson K
Co-Investigators:	Attaran A, Busse J, **Krahn M**, McGeer A, Upshur R
2007 - 2010	$145,274
Major goals of the project:	See title
% of overlap with current application	0%

57. A 2-year follow-up study of the health effects of androgen deprivation therapy in men with non-metastatic Prostate cancer
Canadian Cancer Society

Principal Investigator:	Alibhai S
Co-Investigators:	Naglie G, **Krahn M**, Fleshner N, Duff CS, Tannock I, Tomlinson G, Warde P
2007 – 2010	$338,946
Major goals of the project:	See title
% of overlap with current application	0%

58. Androgen deprivation therapy in prostate cancer patients: patterns of care, lifetime costs, and cost Effectiveness of ADT treatment
Canadian Cancer Society

Principal Investigator:	**Krahn M**
Co-Investigators:	Warde P, Tomlinson G, Naglie G, Alibhai S, Trachtenberg J, Laporte A, Ritvo P, Pham B
2007 – 2010	$326,774
Major goals of the project:	See title
% of overlap with current application	0%

59. A 2-year follow-up study of the health effects of androgen deprivation therapy in men with non-metastatic Prostate cancer
Canadian Institute of Health Research (CIHR)

Principal Investigator:	Alibhai S
Co-Investigators:	Naglie G, **Krahn M**, Fleshner N
2007 – 2010	$360,000
Major goals of the project:	See title
% of overlap with current application	0%

60. Evaluation of Ontario's Universal Influenza Immunization Program
Canadian Institute for Health Research (CIHR)

Principal Investigator:	Guttmann A, **Krahn M**, Kwon J, Marra F, Moran M, Pourbohloul B, Reynolds d, Sander B

Co-Investigators:	Bowles S, Dell S, Garay J, Halperin S, Langley J, McNeil S, Meyers L, Northrup D, Parkin P, Patrick D, Roos L, Ross A, Smith M, Stukel T, Svenson L, To T, Upshur R
2006-2010	$843,609
Major goals of the project:	See title
% of overlap with current application	0%

61. Should Ontario's Universal Influenza Immunization Program be adopted by all Canadian provinces? A Comprehensive approach to the evaluation of influenza management policies and estimation of potential Health effects and costs
University of Toronto Research Program/Health Canada

Principal Investigator:	Raboud J
Co-Investigators:	Sander B, McGeer A, Kwong J, Maetzel A, Manuel D, **Krahn M**, Naglie G
2006 – 2009	$378,007
Major goals of the project:	See title
% of overlap with current application	0%

62. Evaluation of Ontario's Universal Influenza Immunization Program
Canadian Institute of Health Research (CIHR)

Nominated PI:	Manuel DG
Principal Investigator:	**Krahn M**, Guttmann A, Kwong J, Pourbohloul B, Langley JM, Moran MK, Sander B, Reynolds D, Marra F
Co-Investigators:	Stukel T, Smith M, Halperin S, Roos L, Upshur R, Meyers L, Garay J, Patrick D, Svenson L, Dowlatabadi H, Ross A, MacNeil S
2006 – 2009	$1,050,000
Major goals of the project:	See title
% of overlap with current application	0%

63. Population-based estimates of health care cost in persons with hepatitis C
Ministry of Health and Long-Term Care (MoHLTC)

Principal Investigator:	Paterson M
Co-Investigators:	Laupacis A, **Krahn M**
2006 – 2006	$192,140
Major goals of the project:	See title
% of overlap with current application	0%

64. Markov Models for cost effectiveness analysis: A framework for assessing external consistency
Canadian Coordinating Office for Health Technology Assessment (CCOHTA)

Principal Investigator:	**Krahn M**
Co-Investigators:	Pham B, Tricco A, Hoch J, Tomlinson G
2006 – 2007	$41,135.88
Major goals of the	See title

project:
% of overlap with current application 0%

65. Evaluation of a multi-disciplinary approach for the treatment of hepatitis C virus in injection drug users
Canadian Institute of Health Research (CIHR)
Principal Investigator: Conway B and Farley J
Co-Investigators: Fraser C, **Krahn M**, Singer J
2005 – 2008 $462,111
Major goals of the project: See title
% of overlap with current application 0%
Grant No. 135409

66. Population-based estimates of cost and quality of life in community-dwelling HCV patients.
Canadian Institutes of Health Research (CIHR)
Principal Investigator: **Krahn M**
Co-Investigators: Anis A, Heathcote J, Krajden M, Pourbohloul B, Shadmani R, Tomlinson G, Yoshida E
2005 – 2008 $455,262
Major goals of the project: See title
% of overlap with current application 0%

67. Appropriate management of neck pain: Contribution of decision analysis to the development of tre recommendations
Canadian Institute for Health Research (CIHR)
Principal Investigator: Van der Velde G
Co-Investigators: Hogg-Johnson S, **Krahn M**
2005 - 2008 $110,000
Major goals of the project See title
% of overlap with application 0%

68. Longitudinal Canadian Alzheimer's Disease quality of life study
Canadian Institute for Health Research (CIHR)
Principal Investigator: Naglie G
Co-Investigators: Bacher Y, Beattie B, Bergman H, Black S, Borrie M, Byszewski A, Freedn Hogan D, Irvine M, **Krahn M**, MacKnight C, Patterson C, Ritvo P, Strei Tomlinson G
2005 - 2007 $50,000
Major goals of the project See title
% of overlap with application 0%

69. Evaluating the cost effectiveness of a universal hepatitis A vaccination programme: a dynamic perspective
Canadian Institute of Health Research (CIHR) Industry-Partnered Grant (2/3 from GSK, 1/3 from CIHR
Principal Investigator: Bauch C
Co-Investigators **Krahn M**, Duval B, Gilca V

2005 – 2006	$19,865
Major goals of the project:	See title
% of overlap with current application	0%

70. Liquid-Based Techniques for Cervical Cancer Screening
CCOHTA

Principal Investigator:	**Krahn M**
Co-Investigators:	Rosen B, McLachlin M, Sanders B, Grootendorst P, Tomlinson G, Pham B
2005 – 2006	$61,594.55
Major goals of the project:	See title
% of overlap with current application	0%

71. Utility values for health-state outcomes to non-surgical treatments for neck pain
Ministry of Health and Long-Term Care/Ontario Chiropractors Association Research Fund

Principal Investigator:	van der Velde G
Co-Investigators:	Hogg-Johnson S, **Krahn M**, Hurwitz E, Cassidy JD, Llewellyn-Thomas H, Cote P
2005 – 2006	$68,500
Major goals of the project:	See title
% of overlap with current application	0%

72. Health-related quality of life in advanced lung disease and lung transplantation
Physicians Services Incorporated

Principal Investigator:	Singer L
Co-Investigators:	**Krahn M**, Tullis D, Granton J, Waddell T
2005 – 2008	$290,001
Major goals of the project:	See title
% of overlap with current application	0%

73. Investigating socio-behavioural risk, prevention and treatment factors for HCV in special populations
Canadian Institute for Health Research

Principal Investigator:	Fischer B
Co-Investigators	Butt G, Kerr T, **Krahn M**, Krajden M, Myers T, Paterson B, Rehm J, Wild C
2004-2008	$600,000
Major goals of the project	See title
% of overlap with application	0%

74. Age-stratified rates of 30 day morbidity and mortality after radical prostatectomy for localized prostate cancer

Canadian Institute of Health Research (CIHR)
Principal Investigator: Alibhai S
Co-Investigators: **Krahn M**, Naglie G, Tomlinson G
2004 – 2005 $75,000
Major goals of the project: See title
% of overlap with current application 0%

75. Research Training Program Grant in Hepatitis C
Canadian Institute of Health Research (CIHR)
Principal Investigator: Bilodeau M
Co-Investigators: Babiuk L, Balfour L, Bruneau J, Conway B, Edwards A, Fischer B, Gotte M, Heathcote J, Klein M, Kneteman N, **Krahn M**, Krajden M, Levy G, McGilrary I, Michalak T, Mugford G, Ostrowski M, Paterson B, Pause A, Pezacki J, Richardson C, Roberts E, Shoukry N, Sonenberg N, Tellier R, Tyndall M, Tyrrell D, Walmsley S
2003 - present $3,607,500
Major goals of the project: See title
% of overlap with current application 0%

76. Estimating costs associated with hepatitis C (HCV) infection for input into a comprehensive decision analytic policy model to inform clinical decision and policy development
CIHR Doctoral Training Fellowship
Recipient: John-Baptiste A
Supervisor: **Krahn M**
2003 – 2007 $120,000
Major goals of the project: See title
% of overlap with current application 0%

77. Developing a Canadian policcy model for hepatitis C: Estimating cost and quality of life
Canadian Institute for Health Research (CIHR)
Principal Investigator: **Krahn M**, Krajden M
Co-Investigators: Anis A, Heathcote E, Maetzel A, Naglie G, ritvo P, Sherman M, Tomlinson G
2003 - 2004 $50,340

78. Optimized molecular diagnosis for malignant hyperthermia and central core disease
Canadian Institute for Health Research (CIHR)
Principal Investigator: MacLennan D
Co-Investigators: Gallie B, Kraeva N, **Krahn M**, Loke J, Phillips M, Reid G
2003 - 2004 $100,000

79. Canadian Alzheimer's Disease Quality of Life Study
Canadian Institute for Health Research (CIHR)
Principal Investigator: Naglie G

Co-Investigators:	Tomlinson G, Hogan D, Freedman M, **Krahn M**, Irvine J, Patterson C, Borrie M, Streiner D, Black S, MacKnight C, Bergman H, Beattie L, Bacher Y, Byszewski A, Ritvo P
2002 – 2008	$779,374
Major goals of the project:	See title
% of overlap with current application	0%

80. Decision analytic and cost-effectiveness analyses of non-surgical conservative neck pain treatments (non-steroidal anti-inflammatory drugs and cervical spinal manipulation)

Canadian Institue for Health Research (CIHR)

Principal Investigator:	Van der Velde G
Co-Investigators:	Hogg-Johnson S, **Krahn M**
2002 - 2006	$157,416
Major goals of the project	See title
% of overlap with application	0%

81. A prospective, longitudinal study to examine health effects of androgen deprivation therapy on older me prostate cancer

Canadian Institutes for Health Research (CIHR)

Principal Investigator:	Alibhai S
Co-Investigators:	**Krahn M**, Naglie G, Tannock I, Duff-Canning S, Tomlinson G,
2002 – 2004	$72,127
Major goals of the	See title
% of overlap with current application	0%

82. A national hepatitis C research training program grant

Canadian Institute of Health Research (CIHR)

Principal Investigator:	Babiuk L, Edwards A, Fischer B, Heathcote E, Kneteman N, **Krahn M,** MacDonald K, Paterson B, Richardson C, Rottapel R, Sonenberg N, Tyrrell D
2002-2003	$5,000
Major goals of the project:	See title
% of overlap with current:	0%

83. Practices, Parameters, and Priorities: Operationalizing the Behaviour of the Great Attending Physician

PSI Foundation

Principal Investigator:	Tzanetos K
Co-Investigators:	**Krahn M**, Regehr G
2002 – 2003	$8,400
Major goals of the project:	See title
% of overlap with	0%

84. Large Centre Training Grant, The Canadian Prostate Cancer Research Initiative
The Prostate Cancer Group, Princess Margaret Hospital

Principal Investigator:	Tannock I
Co-Investigators:	Sherar M, Warde P, Trachtenberg J, Stewart K, **Krahn M**, Crook J, Moore M
2001 – 2006	$397,750
Major goals of the project:	See title
% of overlap with current application	0%

85. Using Policy Models to Improve Resources Allocation in Health
Canadian Institutes for Health Research (CIHR)

Principal Investigator:	**Krahn M**
2001 - 2007	$201,054
Major goals of the	See title
% of overlap with current application	0%

86. Canadian Institute of Health Research (CIHR)

Principal Investigator:	**Krahn M**
Co-Investigators:	Holowaty E, Naglie G, Irvine J, Ritvo P, Mamdani M, Alibhai S,Trachtenberg J, Laporte A
2001 – 2007	$525,661
Major goals of the project:	See title
% of overlap with	0%

87. Utility values for health state outcomes to two conservative treatments for neck pain obtained from a sample of neck pain patients and the general public: a pilot study
Ministry of Health and Long-Term Care/Ontario Chiropractic Association Research Fund

Principal Investigator:	van der velde G
Co-Investigators:	Hogg-Johnson S, **Krahn M**, Maetzel A, Naglie G
2001 – 2003	$47,500
Major goals of the project:	See title
% of overlap with	0%

88. Gender differences in in-hospital resource utilization outcomes
Canadian Institute for Health Research (CIHR)

Principal Investigator:	Cheung A
Co-Investigators:	Abrams H, Alibhai S, Bacchus C, Choudhry N, Gold W, Kapral M, **Krahn M**, Lee Y, Naglie G, Tomlinson G
2001-2002	$10,000
Major goals of the project:	See Title
% of overlap with current:	0%

89. Preference functions for a health state classification system for prostate cancer
National Cancer Institute of Canada
Principal Investigator: **Krahn M**

Co-Investigators:	Ritvo P, Naglie G, Irvine J, Trachtenberg J, Tomlinson G, Bezjak A, Warde P, Torrance G
2000 – 2003	$163,124
Major goals of the project:	See title
% of overlap with	0%

90. Preference functions for a health state classification system for prostate cancer
Medical Research Council of Canada/CIHR

Principal Investigator:	**Krahn M**
Co-Investigators:	Ritvo P, Naglie G, Irvine J, Trachtenberg J, Tomlinson G, Bezjak A, Warde P, Torrance G
1999 - 2001	$58,197
Major goals of the project:	See title
% of overlap with	0%

91. Examination of the cost-effectiveness of Cyclo-oxgenase-2 (COX2) inhibitors
Canadian Coordinating Office for Health Technology Assessment (CCOHTA)

Principal Investigator:	Maetzel A
Co-Investigators:	**Krahn M**, Bombardier C
1999 – 2000	$25,000
Major goals of the project:	See title
% of overlap with	0%

92. Canadian Network for vaccines and immunotherapeutics of cancer and chronic viral disease (CANVAC)

National Centre of Excellence

Principal Investigator:	Ritvo P
Co-Investigators:	**Krahn M**, Irvine J, Fong G, Llewellyn-Thomas H, O'Connor A
Industry	$89.65M
NCE	$33.6M
Social Sciences Research Theme	$755,291
Major goals of the project:	See title
% of overlap with	0%

93. Do age, comorbidity and are of residence influence the treatment of prostate cancer?
The Physicians' Services Incorporated Foundation

Principal Investigator:	Alibhai S
Co-Investigators:	**Krahn M**, Cohen M, Fleshner N, Naglie G
1999 – 2000	$13,000
Major goals of the project:	See title
% of overlap with	0%

94. Comparison of population-weighted generic utility instruments to direct utility assessment in prostate Cancer patients

Medical Research Council of Canada

Principal Investigator:	**Krahn M**
Co-Investigators:	Naglie G, Irvine J, Trachtenberg J
1997	$51,442
1998 – 2000	$61,572
Major goals of the project:	See title
% of overlap with	0%

95. Arthur Bond Fellowship for Innovation Health Systems Research

Physicians' Services Incorporated Foundation (Career Award)

Recipient:	**Krahn M**
1996 – 1997	$50,000
1997 – 1998	$50,000
Major goals of the project:	See title
% of overlap with	0%

96. An economic evaluation of Synsorb-PK for the prevention of HUS in children

Medical Research Council of Canada (MRC)

Principal Investigator:	Klassen T
Co-Investigators:	**Krahn M**, Capelli M, Orrbine E
1996 – 1997	$51,400
1997 – 1998	$26,700
Major goals of the project:	See title
% of overlap with	0%

97. Development and validation of a utility instrument for prostate cancer

National Cancer Institute

Principal Investigator:	**Krahn M**
Co-Investigators:	Ritvo P, Naglie G, Irvine J, Trachtenberg J
1994 – 1997	$48,100
Major goals of the project:	See title
% of overlap with	0%

Non-Peer Reviewed

1. Update of National Hepatitis C Prognostic Compensation Model

Hepatitis C Plaintiffs, Federal Provincial, and Territorial Governments of Canada

Principal Investigator:	**Krahn M**
Co-Investigators:	Locke K, Heathcote J, Scully L
2008 - 2009	$192,000

2. Roche Modeling Fellowship

Hoffman-LaRoche Canada
Recipient: **Krahn M**
2008 - $50,000/year

3. Update of National Hepatitis C Prognostic Compensation Model
Hepatitis C Plaintiffs, Federal Provincial, and Territorial Governments of Canada
Principal Investigator: **Krahn M**
Co-Investigators: Locke K, Heathcote J, Scully L
2004 – 2005 $196,645

4. Decision analysis of non-surgical treatment for neck pain
Canadian Chiropractic Protective Agency
Principal Investigator: van der Velde G
Co-Investigators: **Krahn M**, Hogg-Johnson S, Cassidy JD, Llewellyn-Thomas H, Cote P
2003 – 2006 $88,000

5. Cost-effectiveness of a decompression chamber for use in the international space station
Canadian Space Agency
Principal Investigator: **Krahn M**
Co-Investigators: Gray G, Straus S, Naglie G, Sackett D
2002 – 2003 $96,145

6. Update of National Hepatitis C Prognostic Compensation Model
Hepatitis C Plaintiffs, Federal Provincial, and Territorial Governments of Canada
Principal Investigator: **Krahn M**
Co-Investigators: Locke K, Heathcote J, Scully L
2000 – 2002 $196,645

7. Cost-effectiveness of universal hepatitis A vaccination
Health Canada
Principal Investigator: **Krahn M**
03/2000 – 06/2001 $25,000

8. Comparison of generic and disease specific preference instruments
Zeneca Pharma
Principal Investigator: **Krahn M**
Co-Investigators: Ritvo P, Naglie G, Irvine J, Trachtenberg J
06/2001 – 07/2002 $20,000
06/2000 – 07/2001 $20,000
06/1999 – 06/2000 $20,000

9. Developing a natural history model of HCV infection
   Canadian Association for the study of the liver
   Principal Investigator: **Krahn M**
   Co-Investigators: Seeff L, Wong J, Heathcote J
   01/1999 – 12/1999 $75,000

10. Health and economic effects of PSA screening in Canada
    National Cancer Institute of Canada
    Principal Investigator: **Krahn M**
    1999 $10,000

11. Economic evaluation of chemotherapy with Mitoxantrone Plus Prednisone for symptomatic hormone Resistant prostate cancer
    Immunex Inc.
    Principal Investigator: Tannock I
    Co-Investigators: **Krahn M**, Bloomfiel D
    06/1996 – 06/1997 $108,464

12. Direct and indirect costs of asthma in Canada
    Glaxo Canada
    Principal Investigator: **Krahn M**
    Co-Investigators: Detsky A
    1992 – 1993 $20,000

13. Cost-effectiveness of universal vaccination of grade six students in British Columbia with Hepatitis B Vaccine
    SmithKline Beecham Canada
    Principal Investigator: **Krahn M**
    1991 – 1992 $22,500

Patents Awarded

None

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Five Most Significant Papers

1. **Krahn M**, Ritvo P, Naglie G, Irvine J, Bezjak A, Trachtenberg J. Construction of PORPUS: an Empirically Derived, Multi-attribute Health State Classification System for Prostate Cancer. Journal of Clinical Epidemiology.2000;53:920-930.

   A methodologically innovative approach to constructing a family of health status instruments based on a common health state classification system. This paper describes the construction of the classification system. This system has been used to develop i) a disease specific psychometric instrument; ii) a disease specific utility instrument, requiring direct preference elicitation; iii) a disease specific utility instrument that incorporates patient-derived weights, such that valid utilities can be generated by completing a 10 item questionnaire.

2. **Krahn M**, Mahoney J, Trachtenberg J, Eckman M, Pauker S, Detsky AS. Screening for Prostate Cancer: A Decision Analytic View. Journal of the American Medical Association 1994;272:773-780.

   Suggested that screening for prostate cancer may reduce health overall. Highly controversial, widely cited (>400 times), generated intense media attention, quoted and cited in numerous screening guidelines.

3. **Krahn M** et. al. Primer on medical decision analysis: Part 4 - Analyzing the model and interpreting the results. Medical Decisio Making 17.2 (1997):142-151

   Together with serveral collaborators we wrote a widely used 5 - part primer on how to conduct medical decision analysis. The primer has been used in many decision modeling courses, and has been cited over 800 times.

4. Thein HH et. al. Estimation of stage-specific fibrosis progression rates in chronic hepatitis C virus infection: a meta analaysis and meta regression. Hepatology 48.2 (2008): 418-431.
   This paper represents a world wide review of the literature of HCV prognosis, using a set of innovative methods. It is used in nearly all current HV pharmacoeconomic models . This and a companion paper on HCV prognosis in coinfected patients has been cited over 450 times.

5. **Krahn M**, Naglie G. The next step in guideline development: incorporating patient preferences. JAMA 300.4 (2008): 436-438.

   This editorial suggested a new direction in the development of clinical practice guikdelines, that involves

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Non-Refereed Publications

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9. Chen W, **Krahn M**. Cost-effectiveness of epidermal growth factor receptor gene mutation testing for patients with advanced non-small cell lung cancer living in Ontario. THETA Report TR 2010.3. November 2010.
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2. **Krahn M**, Neumann P, Prosser L. Cost Effectiveness Analysis as a Guide to Resource Allocation in Health: Roles and Limitations. Chapter for Panel II Edition, 2nd Panel on Cost-effectiveness in Health and Medicine 2013 The University of California.
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Commentary

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Abstracts Submitted

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4. Krahn M, Giacomini M, Miller F, Bayoumi A, Goeree R, Wagner F. Developing The Ontario Decision Framework (ODF): Basing decisions on clinical evidence, opportunity cost, and social values. HTAi 2015 in Oslo.
5. van der Velde G, Paulden M, Ieraci L, Wijeysundera H, Witteman W, **Krahn M**. Cost-effectiveness of Non-invasive Cardiac Imaging Technologies in Outpatients with Suspected Coronary Artery Disease. 33rd Annual Meeting of the Society of Medical Decision Making. *Medical Decision Making* 2012;32:E126-7.
6. van der Velde G, Paulden M, Ieraci L, Wijeysundera H, Witteman W, **Krahn M**. Cost-effectiveness of Non-invasive Cardiac Imaging Technologies in Outpatients with Suspected Coronary Artery Disease. 2012 CADTH (Canadian Agency for Drugs and Technologies in Health) Symposium 'Evidence Matters: Outcomes, Efficiency, Impact'. Conference Proceedings - Concurrent Oral Session B5 (Cardiovascular), page 39.
7. Bouchard M, **Krahn M** et al. Alleviating the injury burden by improving access to orthopaedic medical devices: A case stdy of Uganda. 2012 AAOS Annual Meeting.
8. Pham B, Tomlinson G, Grootendorst P, Witteman W, Wijeysundera H, **Krahn M**. A Systematic Approach to Calibration Analysis of Decision Models for Health Technology Assessment. 31st Annual Meeting of the Society for Medical Decision Making (SMDM), October 18, 2009 at Hollywood (Los Angeles), California, USA.
9. Wijeysundera H, Ko D, Tomlinson G, **Krahn M**. Medical Therapy versus Percutaneous Coronary Intervention in Symptomatic Coronary Artery Disease: Decision Analysis and Economic Evaluation . Canadian Cardiology Congress, October 26th 2009 at Edmonton, Canada
10. Wijeysundera HC, Machado M, Witteman W, Farahati F, van der Velde G, Tu J, Lee DS, Goodman S, Petrella R, O'Flaherty M, Capewell S, **Krahn M**. Reductions in coronary heart disease mortality associated with changes in risk factors in Ontario between 1994 and 2005. Submitted to The Canadian Cardiovascular

Congress - CCC, October 24 to 28, 2009 in Edmonton, AB

11. Chen W, Zagorski B, Krajden M, Heathcote J, **Krahn M**. Population-Derived Estimates of Direct Medical Costs Among Late-Stage Hepatitis C Patients with Diabetes Canadian Agency for Drugs and Technologies in Health (CADTH) Symposium 2009, April 5, 2009, Ottawa, Canada
12. van der Velde G, Llewellyn-Thomas H, Hogg-Johnson S, Hurwitz E, Côté P, Cassidy D, **Krahn M.** Neck Pain Patients' Evaluative Scores for their Current Health. 29th Annual Conference SMDM October 22-24, 2007. Pittsburgh.
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14. Chen WD, **Krahn M**, Healthcote J. Prevalence and predictors of obesity among individuals testing positive for hepatitis C antibody in a multicultural, urban, tertiary care referral clinic. 58th Annual Meeting of the AASLD , Boston, Massachusetts November 2 - 6, 2007
15. Chen WD, **Krahn M**, Healthcote J. A cost-effectiveness analysis of hepatitis C screening among immigrants in Canada. 58th Annual Meeting of the AASLD, Boston, Massachusetts November 2 - 6, 2007.
16. van der Velde G, Llewellyn-Thomas H, Hogg-Johnson S, Hurwitz E, Cassidy JC, Côté P, **Krahn M**. Neck pain patients' evaluative scores for their current health. Palma International Forum IX Primary Care Research on Low Back Pain. October 4-6, 2007. Palma de Mallorca, Spain.
17. Kilbridge KL, Connors AF, Fraser G, Conaway M, **Krahn M**, Bashore R, Wolf A, Barry MJ. Barriers to measuring prostate cancer (CaP) quality of life (QOL) in underserved patients. Department of Defense Prostate Cancer Research Program Meeting, Innovative Minds in Prostate Cancer Today (IMPaCT), September 5-8, 2007, Atlanta, Georgia.
18. Thein H. H., Yi Q, Dore G, **Krahn M**. Natural history of hepatitis C virus infection in HIV-infected individuals in the era of HAART: systematic review and meta-analysis. IAS meeting March 2007.
19. Pham B, Escobar M, **Krahn M**, Tomlinson G, Thein R, Chen H. Multi-parameter evidence synthesis for disease prognosis in chronic hepatitis C virus infection. 28th Annual Meeting of the Society for Medical Decision Making, Boston, Massachusetts, October 14-18, 2006
20. Bauch C, Anonychuk A, Pham B, Gilca V, Duval B, **Krahn M**. Cost-effectiveness of universal hepatitis A vaccination in Canada via dynaic modeling. 28th Annual Meeting of the Society for Medical Decision Making, Boston, Massachusetts, October 14-18, 2006
21. Anonychuk A, **Krahn M**, Gilca V, Pham B, Duval B, Bauch C. The cost of hepatitis A in Canada: Ministry of societal perspectives. 28th Annual Meeting of the Society for Medical Decision Making, Boston, Massachusetts, October 14-18, 2006
22. Chong AKY, Chen I, Naglie G, **Krahn M**. Clinical practice guidelines incorporate evidence on patient preferences? 28th Annual Meeting of the Society for Medical Decision Making, Boston, Massachusetts, October 14-18, 2006.
23. John-Baptiste A, **Krahn M**, Tomlinson G. Natural history of chronic HCV infection obtained through injection drug use: A Bayesian meta-analysis. 28th Annual Meeting of the Society for Medical Decision Making, Boston, Massachusetts, October 14-18, 2006
24. Chen WD, Cope S, Watkins J, Heathcote J, **Krahn M**. Primary prevention of esophageal variceal bleeding among cirrhotic patients with hepatitis c and grade 2 to 3 esophageal varices: a cost-utility analysis. 28th Annual Meeting of the Society for Medical Decision Making, Boston, Massachusetts, October 14-18, 2006
25. Bremner KE, Trachtenberg J, **Krahn M**. The effects of age, clinical stage, and treatment history on disease specific utility in prostate cancer patients. 28th Annual Meeting of the Society for Medical Decision Making, Boston, Massachusetts, October 14-18, 2006
26. Varenbut M, John-Baptiste A, Teplin D, Lingley M, Daiter J, **Krahn M**. Treatment of hepatitis C infection

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27. Tricco A, Pham B, Duval B, De Serres G, Gilca V, Vrbova L, **Krahn M**, Moher, D. Burden of hepatitis A intervention triggered by infected food-handlers in Canada. CNIC 2006 Conference
28. Thein HH, Butler T, **Krahn M**, Rawlinson W, Levy M, Kaldor JM, Dore GJ. The effect of hepatitis C virus infection on health-related quality of life in prisoners. 2nd Annual Canadian Association for the Study of the Liver Winter Meeting 2006, Toronto, Canada.
29. Witkos M, Bremner KE, Trachtenberg J, **Krahn M**. The effects of age, clinical stage, and treatment history on disease specific utility in prostate cancer patients. 28th Annual Meeting of the Society for Medical Decision Making, Boston, Massachusetts, October 14-18, 2006
30. G. va der Velde, M. **Krahn, S**. Hogg-Johnson, E. Hurwitz, H. Llewellyn-Thoms, J.D. Cassidy, P. Cote. Neck pain patients' preferences for health outcomes associated with neck pain. Palma International Forum IX Primary Care Research on Low Back Pain. October 4-6, 2007 Palma de Mallorca, Spain.
31. **Krahn M**. Effect of age on preferences for health outcomes in prostate cancer. ASCO The Prostate Cancer Symposium, Orlando, Florida, February 22-24, 2007.
32. **Krahn M**. The patient-oriented prostate utility scale (PORPUS-U_i) – a prostate cancer-specific utility instrument. ASCO The Prostate Cancer Symposium, Orlando, Florida, February 22-24, 2007.
33. **Krahn M**. Predictors of life-time and stage-specific costs of prostate cancer. ASCO The Prostate Cancer Symposium, Orlando, Florida, February 22-24, 2007.
34. **Krahn M**, Zagorski B, Forde N, Laporte A, Alibhai S, Bremner KE, Tomlinson G, Naglie G. Predictors of stage-specific and lifetime coss of prostate cancer. 28th Annual Meeting of the Society for Medical Decision Making, Boston, Massachusetts, October 14-18, 2006.

Abstracts Accepted for Oral or Poster

1. **Krahn M**, Miller F, Bayoumi A, Giacomini M, Goeree R, Wagner F, Winsor S, Schunemann H, van de Velde G, Pham B, Petersen S, Brooker AS, Rac V. Improving the appraisal of non-drug technologies: Revising the Ontario Decision Framework. 2015 CADTH Symposium Apr 12 -14, TCU Place in Saskatoon, SK. [accepted for panel session]
2. Rac V, Abrahamyan L, **Krahn M**. Complex interventions for comparative effectiveness and health technology assessment. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for 1/2 day workshop)
3. **Krahn M**, Wong W. Public policy in the post-interferon era: Can we afford to cure Hepatitis C? 2015 CADTH Syposium April 12 - 14, TCU Place in Saskatoon, SK [accepted for panel sessions].
4. Wong W, Feld J, **Krahn M**. Cost-effectiveness of a one-time national hepatitis C screening program: impact of a selective drug reimbursement policy. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted oral presentation)
5. Miller F, Barg C, **Krahn M**, Lehoux P, Peacock S, Rac V. Two solitudes: HTA and procurement as pathways to the adoption of health technologies. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for oral presentation)
6. Rac V, Wong J, Mitsakakis N, Haratsidis E, **Krahn M**. Implementation challenges of a community-based pragmatic randomized controlled trial in wound care. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for poster presentation)
7. Mitsakakis N, Bremner K, **Krahn M**. Benefits of transformations in mapping health utilities. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for poster presentation)
8. Pechlivanoglou P, Abrahamyan L, Pham B, Hsu S, Paulden M, **Krahn M**. Projecting mortality rates in economic evaluation: A simulation study. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for poster presentation)
9. Pham B, Fowler R, Tanuseputro P, Manuel D, Sikich N, Baidoobonso S, Pechlivanoglou P, Levin L, Guerriere D, Coyte P, **Krahn M**. Including the patient's family in cost-effectiveness analysis of end-of-life

interventions. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for poster presentation)

10. Xie X, Wang M, Schaink A, **Krahn M**. Pulmonary rehabilitation for post-acute exacerbations of chronic obstructive pulmonary disease: A cost-effectiveness and budget impact analysis. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for poster presentation)
11. Tadrous M, mamdani MM, Juurlink DN, **Krahn M**, Levesque LE, Cadarette SM. Looking both ways before using the Disease Risk Score (DRS): Performance of the DRS in a cohort with known selection bias. International Conference in Pharmacoepidemiology and Therapeutic Risk Management Annual Meeting. October 2014, Taipei, Taiwan [poster presentation]
12. Rac V, Abrahamyan L, **Krahn M**. Complex interventions for comparative effectiveness and health technology assessment. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. (1/2 day short course teaching)
13. Pechlivanoglou P, Abrahamyan L, Pham B, Paulden M, **Krahn M**. The impact of estimating mortality rates in cost-effectiveness analysis: A simulation study. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [oral presentation]
14. Pham B, Fowler R, Tanuseputro P, Manuel D, Sikich N, Baidoobonso S, Pechlivanoglou P, Levin L, **Krahn M**. Cost-effectiveness analysis of palliative team care for patients nearing end-of-life. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [oral presentation]
15. Muhlberger N, Heijnsdijk E, Kurzthaler C, **Krahn M**, Oberaigner W, Klocker H, Conrads-Frank A, Sroczynski G, Siebert U. The oncotyrol prostate cancer outcome and policy model-lessons learned from natural history calibration. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL.[oral presentation]
16. Wong W, Feld J, Wong T, **Krahn M**. Cost-effectiveness of screening hepatitis C in Canada. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [poster presentation]
17. Wong W, Hicks L, Tu HA, **Krahn M**, Pritchard K, Feld J, Chan K. Cost-effectiveness of hepatitis B virus screening before adjuvant chemotherapy in patients with early stage breast cancer. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [poster presentation]
18. Nanwa N, Kendzerska T, **Krahn M**,. Kwong J, Daneman N, Witmann W, Mittmann N, Cadarett S, Rosella L, Sander B. The economic impact of clostridium difficile: A systematic review. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL.[poster presentation]
19. Rac V, Wong J, Mitsakakis N, Pechlivanoglou P, Carcone S, **Krahn M**. Wound Interdisciplinary Teams (WIT): A community-based pragmatic randomized controlled trial. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL.[poster presentation]
20. Wong J, Rac V, Mitsakakis N, Haratsidis E, **Krahn M**. Implementation challenges of a community-based pragmatic randomized controlled trial in wound care. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. (poster presentation)
21. Nanwa N, Kwong J, **Krahn M**, Daneman N, Lu H, Govindarajan A, Rosella L, Cadarette S, Sander B. Adopting the phase-of-care approach to estimate costs of a secondary diagnosis of clostridium difficile. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [poster presentation]
22. Jiang M, Pechlivanoglou P, Wong J, Mitsakakis N, Carcone S, Pham B, Rac V, **Krahn M**. Cost-effectiveness analysis of systmatic referral to multidisciplinary wound care teams in Ontario. Evidence from teh wound interdisciplinary teams (WIT) trial. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL.[poster presentation]
23. Tawfik A, Wodchis W, Hoch J, **Krahn M**. Estimating healthcare costs for decision-analytic models in atrial fibrillation using administrative data. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [poster presentation]
24. Tadrous M, Mamdani MM, Juurlink DN, **Krahn M**, Levesque LE, Cadarette SM. Looking both ways before using the Disease Risk Score (DRS): Performance of the DRS in a cohort with known selection bias.

Canadian Association of population Therapeutics Annual Conference. November 2014, Toronto ON, Canada [poster presentation].

25. Tu HA, Deeks S, Morris S, Strifler L, Crowcroft N, Jamieson F, Kwong J, Coyte P, **Krahn M**, Sander B. Economic evaluation of meningococcal serogroup B childhood vaccination in Ontario, Canada. The 35th Annual Meeting of the Society for Medical Decision Making, Baltimore MD. October 19-23, 2013 (accepted for poster presentation).
26. Boehme K, Perlis N, Finelli A, Alibhai S, Kulkarni G, **Krahn M**, Bremner K. Developing the Bladder Utility Symptom Scale (BUSS): A multiattribute health state classification system for bladder cancer. The 35th Annual Meeting of the Society for Medical Decision Making, Baltimore MD. October 19-23, 2013 (accepted for poster presentation).
27. Wijeysundera H, Wang X, Bennell M, Ko D, Abrahamyan L, Tu J, Austin P, **Krahn M**. Characteristics of multi-disciplinary heart failure clinics that predict 1-year cumulative health care costs; a population-based study. The 35th Annual Meeting of the Society for Medical Decision Making, Baltimore MD. October 19-23, 2013 (accepted for oral presentation).
28. Wong W, Tu HA, Chen W, Feld J, Chelak K, Lee K, **Krahn M**. The hepatitis C drug pipeline: collaboration between academic and HTA agency partners to develop an early economc model. The 35th Annual Meeting of the Society for Medical Decision Making, Baltimore MD. October 19-23, 2013 (accepted for oral presentation).
29. Hogan ME, Shah V, Katz J, **Krahn M**, Taddio A. A systematic review of cost-of-illness studies of chronic pain in children. 9th International Symposium on Pediatric Pain. Stockholm, Sweden. June 17-20, 2013. (accepted for poster presentation).
30. Hogan ME, Shah V, Katz J, **Krahn M**, Taddio A. A systematic review of cost-of-illness studies for chronic pain. Canadian Association for Health Services and Policy Research Annual Conference, Vancouver, British Columbia. May 28-30, 2013. (accepted for oral presentation).
31. **Krahn M.** Economic evaluation of mono and sequential hormone therapies for ER+ women with early breast cancer in Canada. ISPOR 15th Annual European Congress, November 3-7, 2012, Berlin, Germany. (accepted for poster presentation).
32. **Krahn M**. Lessons learned from a cross-validaton between a discrete-event simulation model and a Markov Model for personalized breast cancer treatment. ISPOR 15th Annual European Congress November 3-7, 2012, Berlin, Germany. (accepted for podium presentation).
33. Sander B, Ormanidhi O, Paszat L, Atkin K, Murphy J, **Krahn M**, Deeks S. The cost-effectiveness of integrated cervical cancer prevention strategies in the Ontario setting - can we do better? The 34th annual meeting of the Society for Medical Decision Making, Phoenix AZ. October 17 - 20, 2012 (Oral presentation).
34. Tawfik A, Wodchis W, Hoch J, **Krahn M**. Cost-effectiveness of stroke prevention therapies in atrial fibrillation patients: A new generation of drugs. The 34th annual meeting of the Society for Medical Decision Making, Phoenix AZ. October 17 - 20, 2012 (Poster presentation)
35. Karen E. Bremner, **Murray D. Krahn**, K. Robin Yabroff, Jeffrey S. Hoch, Lisa Barbera, Ning Liu, Michael J. Barrett, Joan L. Warren. Opportunities and challenges in using administrative data for cross-country comparisons of health care costs. 34th Annual Meeting of the Society for Medical Decision Making, October 17-20, 2012 in Phoenix, Arizona, USA. (poster presentation).
36. **M.D. Krahn**, K.E. Bremner, J. Luo, S.M.H. Alibhai. UsingAdministrative Databases to Estimate Health Care Costs from Adverse Drug Effects: The Case of Prostate Cancer. Biennial Society for Medical Decision Making European Meeting. June 10 - 12, 2012. Institute of Health Management and Health Economics, University of Oslo, Oslo, Norway (oral presentation).
37. de Oliveira C, Bremner K, Gunraj N, Chan K, **Krahn M**. Evaluation of Trends in the Cost of Initial Cancer Treatment in Ontario. Canadian Association of Health Services and Policy Research, Montreal Quebec. May 29-31,2012 (poster)
38. de Oliveira C, Bremner K, Gunraj N, Chan K, **Krahn M**. First-year Costs of Cancer Care in Ontario. Canadian Centre for Applied Research in Cancer Control Conference, May 28, 2012. Montreal Quebec.
39. de Oliveira C, Bremner K, Gunraj N, Chan K, **Krahn M**. Using Administrative Health Care Data to Inform Cancer Care Research and Policy: Estimating the Economic Burden of Disease. Ontario Institute for Cancer Research/Cancer Care Ontario 4th Annual Meeting, May 17, 2012. Toronto. (poster)

40. Wijeysunder H, Mitsakakis N, **Krahn M**, Trubiani G, Ko D, Austin P, Lee D, Wang X. A population-based study to evaluate the effectiveness of multi-disciplinary heart failure clinics and identify important service components. American Heart Association Quality of Care and Outcomes Research 2012 Scientific Sessions May 9 – 11, 2012, Atlanta, GA. (accepted for poster presentation).
41. **M.D. Krahn**, K.E. Bremner, J. Luo, S.M.H. Alibhai. Using Ontario Administrative Data to Estimate Health Care Costs of Drug Adverse Effects: The Case of Prostate Cancer. Fourth Annual Meeting of the Ontario Institute for Cancer Research/ Cancer Care Ontario Health Services Research Program. May 17, 2012 at the Faculty Club, University if Toronto (poster presentation).
42. Wong W, Bayoumi A, **Krahn M**, Thein HH. Developing a complex agent network model to predict HIV and HCV incidence in Canada. The 3rd International Conference on Infectious Disease Dynamics, Boston, MA, USA 2011 (accepted for poster presentation)
43. Wong WWL, Woo G, Heathcote JE, **Krahn M**. Cost effectiveness of screening immigrants for Hepatitis B. American Association for the Study of Liver Disease (AASLD), October 29-November 2, 2011, Boston, MA (accepted for poster presentation)
44. Brooker AS, Carcone S, **Krahn M**. Integrating quantitative preference-related evidence into health technology assessment: The case of ventilation for chronic obstrructive pulmonary disease. The 33rd annual meeting of the Society for Medical Decision Making. Chicago IL. October 22- 26, 2011. (accepted for poster presentation)
45. **Krahn M**. Predicting utility scores for prostate cancer: mapping the prostate cancer index to the patient oriented prostate utility scale (PORPUS). The 33rd annual meeting of the Society for Medical Decision Making. Chicago IL. October 22- 26, 2011. (Accepted for oral presentation)
46. **Krahn M**, Bremner K, Zagorski B, Alighai S, Tomlinson G, Naglie G. Using large administrative datasets and chart reviews to estimate costs for health states: the case of prostate cancer. 33rd annual meeting of the Society for Medical Decision Making. Chicago IL. October 22- 26, 2011. (Accepted for oral presentation)
47. Wong W, Bayoumi A, **Krahn M**, Thein HH. Developing a complex agent network model to predict HIV and HCV incidence in Canada. The 33rd Annual Meeting of the Society for Medical Decision Making, Chicago, IL 2011 (accepted for oral presentation)
48. Paulden m, Franek J, Pham B, **Krahn M**. Gene expression profiling for guiding adjuvant chemotherapy decisons in women iwth early breast cancer: A cost-effectiveness analysis of 1000 strategies for the provision of adjuvant! Online, 21-Gene assay and chemotherapy. The 33rd Annual Meeting of the Society for Medical Decision Making, Chicago, IL 2011 (accepted for oral presentation)
49. Wong WWL, Woo G, Heathcote JE, **Krahn M**. Disease Burden of Chronic Hepatitis B among Immigrants in Canada. The 33rd Annual Meeting of the Society for Medical Decision Making, October 22-26, 2011, Chicago IL (accepted for poster presentation)
50. Hincapie CA, Schieir O, Cote P, Hogg-Johnson S, Paulden M, **Krahn M**, van der Velde G. A cost-effectiveness analysis of common nonsurgical treatments for neck pain. National Student Conference of the Canadian Society of Epidemiology and Biostatistics, June 19-20, 2011, Montreal Canada (Accepted for oral presentation)
51. Lee L, Hodgson D, Crump M, Khor S, Luo J, **Krahn M**, Bremner K, Hoch J. Impact of Rituximab on Outcomes of Very Elderly Patients With Diffuse Large B-Cell Lymphoma. 11th International Conference on Malignant Lymphoma, Lugano Switzerland, June 15-18, 2011 (Accepted for poster presentation)
52. van der Velde G, Schieir O, Hincapié C, Coté P, Hogg-Johnson S, Paulden M, **Krahn M**. Economic Evaluation of the Most Commonly Used Non-surgical Treatments for Neck Pain in Canada: A Cost-utility Analysis. International Health Economics Association (iHEA) 8th World Congress, July 10-13, 2011, Toronto, Canada. (Accepted for oral and poster presentation)
53. van der Velde G, Hincapié C, Schieir O, Coté P, Hogg-Johnson S, Paulden M, **Krahn M**. Cost-effectiveness of the Most Common Nonsurgical Treatments for Neck Pain. 16th International Meeting of the International Society for Pharmacoeconomics and Outcomes Research (ISPOR), Poster Session II, May 24, 2011, Baltimore, United States. (Accepted for poster presentation - February 23, 2011)
54. Chen W, Ellis P, **Krahn M**. Cost-effectiveness of epidermal growth factor receptor gene mutation testing for patients with advanced non-small cell lung cancer living in Ontario, Canada. The 33rd Annual Meeting of the Society for Medical Decision Making, October 22-26, 2011, Chicago IL (accepted for oral

presentation)

55. Ieraci L, **Krahn M**, Paulden M, van der Velde G, Wijeysundera H, Machado M, Witteman W. The cost – effectiveness analysis of five non-invasive cardiac imaging technologies in Ontario. 32nd Annual Meeting of Society for Medical Decision Making Oct 24-27, 2010, Sheraton Centre Toronto, Ontario Canada (Accepted for poster presentation).
56. Bornstein M, Franek J, Parthimos M, Nakhai-Pour H, Ieraci L, Paulden M, **Krahn M**, Onetto N, Levin L. Pharmacogenetic testing and evidence-based decision-making in Ontario: The application of Ontario's decision determinants framework to the evaluation of pharmacogenetic tests. 32 Annual Meeting of the Society for Medical Decision Making, October 24-27, 2010, Toronto, ON, Canada (Accepted for poster presentation.
57. de oliveira C, Wijeysundera H, Tobe S, Moy Lum-Kwong M, Sychowski S, Tu J, **Krahn M**. An economic analysis of heart and stroke foundation of Ontario's Hypertension Management Initiative (HMI). 32 Annual Meeting of the Society for Medical Decision Making, October 24-27, 2010, Toronto, ON, Canada (Accepted for oral presentation.
58. Tsui T, Boon H, **Krahn M**, Boecker A, Kachan N. Using the means-end chain approach to map consumer decsion making: The case of natural health products. 32 Annual Meeting of the Society for Medical Decision Making, October 24-27, 2010, Toronto, ON, Canada (Accepted for oral presentation).
59. Lee L, Khor S, Crump M, Hoch J, Bremner K, **Krahn M**, Hodgson D. "Challenges in the Identification of Accurate Pathological Diagnoses and Treatment for B-cell Lymphoma: A Comparison of Ontario Databases", presented at Cancer Care Ontario Research Day, Toronto, Ontario, April 2010. (accepted for poster presentation)
60. Beate S, Bauch C, Fisman D, Fowler R, Kwong J, McGeer A, **Krahn M**. Is a mass immunization program for pandemic (H1N1) 2009 good value for money? Early evidence from the Canadian experience. 14th International Congress on Infectious Disease, Miami FL, March 9-12, 2010(Accepted for oral presentation)
61. Thein HH, **Krahn M**, Hoare A, Dore G, Wilson D. The current and future burden of hepatitis C in Australia. 32 Annual Meeting of the Society for Medical Decision Making, October 24-27, 2010, Toronto, ON, Canada (Accepted for oral presentation).
62. Sikich N, Pham B, **Krahn M**, Levin L. A systmatic review and meta-analysis of survival curve data to determine the effectiveness of liver and kidney transplantation in persons with end-stage organ failure and human immunodefieciency virus. 32 Annual Meeting of the Society for Medical Decision Making, October 24-27, 2010, Toronto, ON, Canada (Accepted for oral presentation).
63. Zivkovic Gojovic M, Bauch C, Fishman D, **Krahn M**, Sander B. Assessing H1N1(2009) mitigation strategies under epidemiologic and programmatic uncertainty. 14th International Congress on Infectious Diseases, Miami FL, March 9-12, 2010.(poster presentation).
64. Wong WWL, Woo G, Heathcote JE, **Krahn M**. Cost effectiveness of screening immigrants for Hepatitis B. The 32nd Annual Meeting of the Society For Medical Decision Making, October 24-27, 2010, Toronto, Ontario Canada (accepted for poster presentation).
65. Pham B, Tomlinson G, Grootendorst P, **Krahn M**. Monte Carlo approach to calibration of disease history models for health technology assessment: A case study. The 32nd Annual Meeting of the Society For Medical Decision Making, October 24-27, 2010, Toronto, Ontario Canada (accepted for poster presentation).
66. Wong WWL, Woo G, Heathcote JE, **Krahn M**. Cost effectiveness of screening immigrants for Hepatitis B. Canadian Agency for Drugs and Technologies in Health (CADTH) Symposium, April 18-20, 2010 Halifax, NS, Canada (accepted for poster presentation)
67. Sander B, **Krahn M**, Bauch C, Fisman D. Impact of mathematical modelling on health policy decision-making in the context of the recent novel Swine-Origin Influenza A Virus (SOIV) outbreak response in Ontario, Canada. 31st Annual Meeting of the Society for Medical Decision Making (SMDM) October 18-21, 2009, California, USA (Accepted for poster presentation)
68. Lathia N, Walker S, Cheung M, **Krahn M**, DeAngelis C, Mittmann N. Cost-effectiveness of filgrastim and pegfilgrastim as primary prophylaxis against febrile neutropenia in lymphoma patients receiving r-chop chemotherapy. 2009 Annual Meeting of the American Society of Hematology in New Orleans, LA,

(Accepted for poster presentation)

69. van der Velde G, **Krahn M**, Machado M, Ieraci L, Witteman W, Pham Ba'. The cost-effectiveness of biologic disease modifying anti-rheumatic drugs (DMARDS) compared to conventional DMARDS: A systematic review of economic evaluations. 31st Annual Meeting of the Society for Medical Decision Making (SMDM) Oct 18-21, 2009, California, USA (Accepted for poster presentation)
70. **Krahn M**. Collaboration between HTA agency and health authority: Ontario Canada. 6th Annual meeting HTAi Globalisation and Health Technology Assessment. Singapore June 21-24, 2009 (accepted for panel session)
71. **Krahn M**. Economic evaluation of preventive strategies for pressure ulcers. iHEA 7th World Congress on Health Economics, July 12-15, 2009 Beijing China (panel session)
72. Thein HH, **Krahn M** et. al. Health status utilities in long-term care residents in Ontario. iHEA 7th World Congress on Health Economics, July 12-15, 2009 Beijing China (panel session)
73. Chen WD, **Krahn M** et al. Economic evaluation of pressure ulcer preventive strategies for long-term residents in Ontario. iHEA 7th World Congress on Health Economics, July 12-15, 2009 Beijing China (panel session)
74. Chen WD, **Krahn M** et al. Economic evalutation of preventive strategies for pressure ulcers: A systematic review. iHEA 7th World Congress on Health Economics, July 12-15, 2009 Beijing China (panel session)
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Guidelines

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Letter (Correspondence)

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Invited Lectures

A. National / International:

1. Introduction to Health Technology Assessment. SMDM Asia Pacific, Singapore, January 6, 2014
2. Plenary Speaker, Applied Research Conference in Cancer Control (ARCC) 2013, Vancouver, May 27, 2013
3. Panel Discussion, CADTH 2013, St. Johns, NL, May 5, 2013, won for "Best Idea"
4. Keynote speaker, Canadian Symposium on Hepatitis C Virus. Victoria, BC. March 4, 2013
5. HTA Institute: Health Technology Assessment for Decision Maker. Beijing University, Sept 12 -14, 2012, Beijing, China.
6. Health Technology Assessment in Ontario. European SMDM, Oslo Norway, June 12, 2012
7. 2011 CISNET Annual Meeting, Natcher Conference Center in Bethesda, MD
8. 2010 Annual Meeting of the Canadian Agency for Drugs and Technologies in Health (CADTH), Halifax
9. End of life care for elderly patients with advanced lung cancer in Ontario and the Uniited States. 2010 Annual Canadian Association for Health Services and Policy Research (CAHSPR) Conference. Toronto, ON May 10-13, 2010
10. Keynote address - 2010 Annual Meeting of the Canadian Association for Population Therapeutics (CAPT), Toronto, March 28-30.
11. Relative influence of treatment and prevention strategies on mortality: The Ontario experience. Canadian Cardiovacular Society, Edmonton, AB, Oct 24-28, 2009.
12. Modeling best practice to treat small HCC. 60th Annual Meeting AASLD Symposium, Boston MA, USA, Oct 30-Nov 3, 2009.
13. Collaboration between HTA agency and health authority: Ontario Canada. 6th Annual meeting HTAi Globalisation and Health Technology Assessment. Singapore June 21-24, 2009.
14. Effect of age on preferences for health outcomes in prostate cancer. ASCO The Prostate Cancer Symposium, Orlando, Florida, February 22-24, 2007.
15. The patient-oriented prostate utility scale (PORPUS-U_i) – a prostate cancer-specific utility instrument. ASCO The Prostate Cancer Symposium, Orlando, Florida, February 22-24, 2007.
16. Predictors of life-time and stage-specific costs of prostate cancer. ASCO The Prostate Cancer Symposium, Orlando, Florida, February 22-24, 2007
17. Decision analysis in prostate cancer outcomes assessment. ASTRO Health Services Research Meeting, October 2006, San Diego.
18. Economic evaluation in the assessment of new vaccines. Journees Annuelles de Sante Publique. October 2006, Montreal.
19. Health technology assessment in Canada: problems and opportunities. Canadian Association for Population Therapeutics 2006, Toronto
20. Age-thresholds for prostate cancer screening. Iowa Department of Public Health Consensus guidelines meeting, April 2005
21. Burden of illness in HCV infection. National planning meeting for HCV-related behavioural research. February 2003, Toronto
22. Screening for hepatocellular carcinoma. AASLD Screening Workshop, Atlanta, February 2003
23. Economic evaluation of cancer screening programs. Cape Breton Regional Cancer Symposium. Cape Breton, NS, October 2001
24. Quality of life and economic outcomes in localized prostate cancer. ASTRO Consensus Development Meeting, San Francisco, October 2001.
25. Prostate cancer; is there value in treatment. Prostate Cancer Symposium, Whistler, BC, March 2000.
26. Uncertainty in prostate cancer. Prostate Cancer Symposium Whistler, BC.
27. WHO task force on neck pain scientific meeting: Decision analysis, an introduction. Toronto, September 1999.
28. "Principles of decision analysis." American Academy of Orthopedic Surgeons short course on Outcomes, Measurement, and Effectiveness, Chicago, July 1998.

29. "Utility Aspects of Quality of Life Measurement in Prostate Cancer." Prostate, Lung, Colorectal, and Ovarian (PLCO) Trial Investigators' Quality of Life Meeting. National Institutes of Health, Bethesda, Maryland, April 1995.
30. "Screening for Prostate Cancer: A Decision Analytic View." Medical Grand Rounds Englewood Hospital and Medical Center, Englewood, New Jersey, USA. May, 1995.
31. "Conservative Treatment of Localized Prostate Cancer." Medical Advisory Council on Urology Annual Meeting. Carmel CA, April 1994.
32. "Issues in COPD Screening: A Decision Analytic View." COPD 1992: Second
33. "A Clinician's Guide to Cost Effectiveness" Group Health Association of America Annual Meeting, February 1991.
34. "Quality of Life Issues in Cholesterol Lowering," National Heart, Blood, and Lung Institute Conference on Cholesterol Lowering in Adults, Sept. 1990.

B. Provincial:

1. Developing a Values Based Framework for Decision Making in Technology Assessment (and Health). CADTH Lecture Series. March 12, 2015, Ottawa, ON.
2. HTA Institute: Health Technology Assessment for Decision Maker. Dalhousie University. July 14 - 16, 2014.
3. Panel Discussion: HTA Guidance: Key factors that lead to favorable assessments. 3rd Annual Medical Device Innovation & Market Access Strategies in Canada. May 1-2, 2014, Ottawa.
4. Economic Model. CADTH HepC Workshop April 25, 2014, Ottawa, ON
5. HTA Institute: Health Technology Assessment for Decision Maker. University College July 26-28, 2013, Toronto, Ontario
6. Symposium on early HTA, CADTH May 5- 7, 2013, St. John's, Newfoundland.
7. Opportunities for Collaboration over the Lifecycle of Health Technologies. CADTH Board of Directors Retreat, September 26, 2012
8. HTA Institute: Health Technology Assessment for Decision Maker. Medical Science Building, University of Toronto, July 25 - 27, 2012, Toronto, Ontario
9. "Costs for End-of-Life Care for Elderly Patients with Advanced Lung Cancer in Ontario" Canadian Cancer Research Conference November 2011
10. HTA Institute: Health Technology Assessment for Decision Maker. University of Toronto, July 20- 22, 2011, Toronto, Ontario
11. "Paradigms in Health Technology Assessment" BCCDC April 3, 2009
12. "Conditionally funded field evaluations in Ontario" 2009 CADTH Invitational Symposium, March 17, 2009
13. "Three scientific paradigms in health technology assessment: Experiences of the committee to evaluate drugs in Ontario." 2007 CADTH Invitational Symposium, April 2007
14. "The concept of cost-efficiency in immunization programs." 10th JASP Symposium, Monteal, October 2006
15. "Modeling outcomes in prostate cancer". Issues and Controversies in Prostate Cancer Care. Whistler, BC., March 1999.
16. "Risk, uncertainty, and decision-making in prostate cancer". Issues and Controversies in Prostate Cancer Care. Whistler, B.C., March 1999
17. "Introduction to decision analysis." Institute of Pharmacoeconomics short course, Calgary, Alta, January 1998.

18. "Screening for Prostate Cancer," Grand Rounds, St. Paul's Hospital, Vancouver, November 1994.
19. PSA Screening for Prostate Cancer." Canadian Urological Association annual meeting, Quebec City, March 1993
20. "The Cost of Asthma in Canada." Atlantic Respirology Conference, Halifax, November 1993.
21. "Cost Effectiveness of Universal Hepatitis B Vaccination." Society of Community Medicine and Public Health of Quebec, November 1991.
22. "Cost Effectiveness of Universal Hepatitis B Vaccination of Neonates," National Advisory Committee on Immunization, Ottawa, April 1990.

C. Local:

1. Health Technology Assessment in Ontario. Clnical Epidemiology Synthesis Sessions, March 23, 2015 or April 20, 2015, Toronto, Ontario
2. Health Technology Assessment in Ontario (and UHN). General Internal Medicine/Geriatrics Division Grand Rounds. February 19, 2015, Toronto, ON
3. Research Development Advisory Committee. Emerging health services research at UHN. Collaborative Academic Practice (CAP). UHN Research, February 18, 2015, Toronto, ON
4. Health Technology Assessment: Evidence, cost-effectiveness and social value. Cancer Care Ontario Prevention Intervention Workshop, January 28, 2015, Toronto, Ontario
5. Evaluation of complex health interventions. Baycrest Geriatric Medicine Rounds. December 4, 2014, Toronto, Ontario.
6. Sleep Apnea screening and smoking cessation. Yogendran memorial lecture grand round. October 3, 2014, Toronto Western Hospital, Toronto, Ontario
7. Systematic review on treatment decision-making for older adults with Cancer. February 10, 2014 Hart House, Toronto, ON
8. End-of-life Care, 6th Annual THETA Symposium, May 30, 2013, Toronto Ontario
9. Vaccine Pharmacoeconomics Workshop, November 25, 2013. Toronto.
10. Living with Myeloproliferative Neoplasms: Quality of Life Indicators and Survey. Canadian MPN Network Patient & Family Support Day, November 10, 2013. Toronto
11. Health Techology Assessment in Ontario. TGRI Research Day. Toronto, October 8, 2013.
12. Sunnybrook Health Sciences GIM Noon Rounds, Toronto, February 25, 2013
13. HTA Aspects of Evaluation of Robotic Surgery. Robotic Surgery Retreat. Toronto, February 1, 2013.
14. Health Technology Assessment in Ontario, SMH clinical and Population Research Rounds. Toronto, January 17, 2013.
15. Health Technology Assessment in Ontario. UTM Guest Lecture, September 25, 2012. Toronto
16. Knowlege Translation to Policy: Chronic Wound Prevention & Wound Care Delivery. THETA 3rd Annual KT Symposium, May 10, 2012, Toronto, ON
17. Challenges of Quality, Evidence and Patient-Centered Care. IHPME Research Day, May 2, 2012, Toronto
18. Knowlege Translation to Policy: Cardiovascilar Research & Personalized Medicine. THETA 2nd Annual KT Symposium, May 13, 2011, Toronto, ON
19. Knowlege Translation to Policy: Wound Care and Cardiovascular Research. THETA 1st Annual KT Symposium, May 27, 2010, Toronto, ON
20. Three scientific paradigms in health technology assessment. Sigma Xi Distinguished Lecture Series, University of Toronto. November 26, 2009, Toronto, ON.
21. Three paradigms in Health Technology Assessment: How decisions are made about funding new drugs and

other technologies. East End Community Health Centre Annual General Meeting, June 17, 2009, Toronto, ON.

22. Field Evaluations in HTA, Second Annual THETA Symposium, May 22 - 24, 2009, Niagara-on-the-Lake, Ontario
23. Paradigms in Health Technology Assessment. HCTP Annual Interdisciplinary Workshop
24. March 26-27, 2009 St. Andrew's Club & Conference, Toronto, ON
25. "Conditionally funded field evaluations in Ontario." HPME city-wide clinical epidemiology rounds March 25, 2009.
26. "Pharmacists and Pharmacoeconomics." Leslie Dan Faculty of Pharmacy, University of Toronto, March 2006
27. Are "cost effectiveness" analyses of value in determining cancer drug funding. Cancer systemic therapy search conference, McLean House, The estates of Sunnybrook, September 2005
28. "Prevalence and predictors of high body mass index among native born and immigrant patients with chronic hepatitis C." Research Day, Toronto 2005
29. "The cost-utility of Ontario's universal influenza immunization program (UIIP)." Research Day, Toronto 2005.
30. Health economics, outcomes research, and health services research in prostate cancer. Bierstock lecture. Toronto, September 2001.
31. "Estimating the Prognosis of Hepatitis C Patients Infected by Transfusion in Canada between 1986 and 1990", Grand Rounds, the Toronto General Hospital, May 2000.
32. "Decision sciences and economic evaluation." Cardiology trainees, The Toronto Hospital, February 1999.
33. "The Value of Treatment in Prostate Cancer: The Role of Decision Models in Clinical Policy and Patient/Physician Decision Support." Opening of the Prostate Centre, University Health Network, Toronto, September 1999.
34. Modeling hepatitis C outcomes." Canadian Association for the Study of the Liver Conference on hepatitis C prognosis, Toronto, September 1998.
35. "PSA Screening for Prostate Cancer." 1st Annual Retreat, Department of Preventive Oncology, University of Toronto, Toronto, May 1997.
36. "Principles of Economic Evaluation in Screening Programs," invited seminar, annual meeting of the Canadian Society for Epidemiology and Biostatistics, London, Ontario, May 1997.
37. "Cost Effectiveness of Spirometric Screening for COPD," COPD Round Table, Toronto, Ontario, May 1996.
38. "Principles of Health Economics," Palliative Care Rounds, the Toronto Hospital, February 1996
39. "Uncertainty," Grand Rounds, The Toronto Hospital, Western Division, March 1996
40. "Cost Effectiveness of Hepatitis B Vaccination," Grand Rounds, The Toronto Hospital, April 1996.
41. "PSA Screening for Prostate Cancer," Grand Rounds, The Toronto Hospital, Western Division, Toronto, February 1995.
42. "PSA Screening for Prostate Cancer: A Decision Analytic View." Rounds at the National Cancer Institute, Bethesda, Maryland, April 1995.
43. "Biochemical Screening for Prostate Cancer." Ontario Medical Association Annual Meeting , Section on Laboratory Medicine and Hematology /Medical Oncology. Toronto, May 1995.
44. "PSA Screening for Prostate Cancer," Grand Rounds, The Toronto Hospital, General Division, Toronto, May 1995.
45. "Screening for Prostate Cancer: A Decision Analytic View." Laboratory Medicine Series. Telemedicine Canada, Toronto, June 1995.

46. "Cost Effectiveness of BC's Grade Six HBV Vaccination Program." Telemedicine Canada. Toronto, October 1995.
47. "A Decision Analytic View of PSA Screening for Prostate Cancer." Mount Sinai Hospital, Grand Rounds. Toronto, November 1995.
48. "Principles of Economic Evaluation in Cancer Screening." Citywide Clinical Biochemistry Rounds, Mount Sinai Hospital, Toronto, November 1995.
49. "New Research Findings in Screening and Treatment for Prostate Cancer." Minisymposium: Advances in PSA. Division of Clinical Biochemistry, University of Toronto. November, 1995.
50. "Screening for Prostate Cancer." Ontario Cancer Treatment and Research Foundation Annual Research Symposium. Toronto, April 1994.
51. "Guidelines for Hepatitis B Vaccination in Childhood." Canadian Task Force on the Periodic Health Examination. Toronto, April 1994.
52. "Dying with or Dying from Prostate Cancer: A Decision-Analytic View of the Screening Question." Proceedings of the OCTRF Cancer Epidemiology Seminar. Toronto, April, 1994.
53. "Screening for Prostate Cancer," Grand Rounds, Wellesley Hospital, Toronto. October 1994.
54. "The Debate on Prostate Cancer Screening," presentation to Friends of the University of Toronto, Gluskin, Scheff and Associates, Toronto. November 1994.
55. "Quality of Life, Patient Empowerment, and Decision Support in Prostate Cancer," NCIC Forum, Toronto, February 1994.
56. "PSA Screening for Prostate Cancer." American Academy of Insurance Medicine Annual Meeting, Toronto, September 1993.
57. "PSA Screening for Prostate Cancer," OMA Section on Family Practice meeting, Toronto, May 1993
58. "Screening for Prostate Cancer: A Decision Analytic View." Ontario Society of Clinical Biochemists Annual Meeting, North York, Ontario. October 1993.
59. "The Cost Effectiveness of Asthma Education." First Annual Conference on Asthma and Education. Toronto, November 1993.
60. "Decision Support for Localized Cancer Treatment Decisions." Prostate Centre anniversary, Toronto, March 1993.
61. Annual Conference on COPD in Canada. Toronto, June 1992.
62. "PSA Screening for Prostate Cancer." University of Toronto CME Prostate Cancer Symposium, Toronto, September 1992

Presentation and Special Lectures

1. Seattle Panel Meeting. Seattle, WA February 11- 13th, 2015
2. **Krahn M**, Miller F, Bayoumi A, Giacomini M, Goeree R, Wagner F, Winsor S, Schunemann H, van de Velde G, Pham B, Petersen S, Brooker AS, Rac V. Improving the appraisal of non-drug technologies: Revising the Ontario Decision Framework. 2015 CADTH Symposium Apr 12 -14, TCU Place in Saskatoon, SK. [accepted for panel session]
3. Rac V, Abrahamyan L, **Krahn M**. Complex interventions for comparative effectiveness and health technology assessment. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for 1/2 day workshop)
4. **Krahn M**, Wong W. Public policy in the post-interferon era: Can we afford to cure Hepatitis C? 2015 CADTH Syposium April 12 - 14, TCU Place in Saskatoon, SK [accepted for panel sessions].
5. Wong W, Feld J, **Krahn M**. Cost-effectiveness of a one-time national hepatitis C screening program: impact of a selective drug reimbursement policy. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted oral presentation)
6. Miller F, Barg C, **Krahn M**, Lehoux P, Peacock S, Rac V. Two solitudes: HTA and procurement as

pathways to the adoption of health technologies. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for oral presentation)

7. Rac V, Wong J, Mitsakakis N, Haratsidis E, **Krahn M**. Implementation challenges of a community-based pragmatic randomized controlled trial in wound care. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for poster presentation)
8. Mitsakakis N, Bremner K, **Krahn M**. Benefits of transformations in mapping health utilities. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for poster presentation)
9. Pechlivanoglou P, Abrahamyan L, Pham B, Hsu S, Paulden M, **Krahn M**. Projecting mortality rates in economic evaluation: A simulation study. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for poster presentation)
10. Pham B, Fowler R, Tanuseputro P, Manuel D, Sikich N, Baidoobonso S, Pechlivanoglou P, Levin L, Guerriere D, Coyte P, **Krahn M**. Including the patient's family in cost-effectiveness analysis of end-of-life interventions. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for poster presentation)
11. Xie X, Wang M, Schaink A, **Krahn M**. Pulmonary rehabilitation for post-acute exacerbations of chronic obstructive pulmonary disease: A cost-effectiveness and budget impact analysis. 2015 CADTH Symposium April 12-14, TCU Place in Saskatoon, SK [accepted for poster presentation)
12. Tadrous M, mamdani MM, Juurlink DN, **Krahn M**, Levesque LE, Cadarette SM. Looking both ways before using the Disease Risk Score (DRS): Performance of the DRS in a cohort with known selection bias. International Conference in Pharmacoepidemiology and Therapeutic Risk Management Annual Meeting. October 2014, Taipei, Taiwan [poster presentation]
13. Rac V, Abrahamyan L, **Krahn M**. Complex interventions for comparative effectiveness and health technology assessment. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. (1/2 day short course teaching)
14. Pechlivanoglou P, Abrahamyan L, Pham B, Paulden M, **Krahn M**. The impact of estimating mortality rates in cost-effectiveness analysis: A simulation study. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [oral presentation]
15. Pham B, Fowler R, Tanuseputro P, Manuel D, Sikich N, Baidoobonso S, Pechlivanoglou P, Levin L, **Krahn M**. Cost-effectiveness analysis of palliative team care for patients nearing end-of-life. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [oral presentation]
16. Muhlberger N, Heijnsdijk E, Kurzthaler C, **Krahn M**, Oberaigner W, Klocker H, Conrads-Frank A, Sroczynski G, Siebert U. The oncotyrol prostate cancer outcome and policy model-lessons learned from natural history calibration. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL.[oral presentation]
17. Wong W, Feld J, Wong T, **Krahn M**. Cost-effectiveness of screening hepatitis C in Canada. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [poster presentation]
18. Wong W, Hicks L, Tu HA, **Krahn M**, Pritchard K, Feld J, Chan K. Cost-effectiveness of hepatitis B virus screening before adjuvant chemotherapy in patients with early stage breast cancer. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [poster presentation]
19. Nanwa N, Kendzerska T, **Krahn M**,. Kwong J, Daneman N, Witmann W, Mittmann N, Cadarett S, Rosella L, Sander B. The economic impact of clostridium difficile: A systematic review. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL.[poster presentation]
20. Rac V, Wong J, Mitsakakis N, Pechlivanoglou P, Carcone S, **Krahn M**. Wound Interdisciplinary Teams (WIT): A community-based pragmatic randomized controlled trial. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL.[poster presentation]
21. Wong J, Rac V, Mitsakakis N, Haratsidis E, **Krahn M**. Implementation challenges of a community-based pragmatic randomized controlled trial in wound care. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. (poster presentation)
22. Nanwa N, Kwong J, **Krahn M**, Daneman N, Lu H, Govindarajan A, Rosella L, Cadarette S, Sander B. Adopting the phase-of-care approach to estimate costs of a secondary diagnosis of clostridium difficile.

The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [poster presentation]

23. Jiang M, Pechlivanoglou P, Wong J, Mitsakakis N, Carcone S, Pham B, Rac V, **Krahn M.** Cost-effectiveness analysis of systmatic referral to multidisciplinary wound care teams in Ontario. Evidence from teh wound interdisciplinary teams (WIT) trial. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL.[poster presentation]
24. Tawfik A, Wodchis W, Hoch J, **Krahn M.** Estimating healthcare costs for decision-analytic models in atrial fibrillation using administrative data. The 36th Annual Meeeting of the Society for Medical Decision Making October 18-22, 2014. Miami, FL. [poster presentation]
25. Tadrous M, Mamdani MM, Juurlink DN, **Krahn M**, Levesque LE, Cadarette SM. Looking both ways before using the Disease Risk Score (DRS): Performance of the DRS in a cohort with known selection bias. Canadian Association of population Therapeutics Annual Conference. November 2014, Toronto ON, Canada [poster presentation]
26. Tu HA, Deeks S, Morris S, Strifler L, Crowcroft N, Jamieson F, Kwong J, Coyte P, **Krahn M**, Sander B. Economic evaluation of meningococcal serogroup B childhood vaccination in Ontario, Canada. The 35th Annual Meeting of the Society for Medical Decision Making, Baltimore MD. October 19-23, 2013 (accepted for poster presentation).
27. Boehme K, Perlis N, Finelli A, Alibhai S, Kulkarni G, **Krahn M**, Bremner K. Developing the Bladder Utility Symptom Scale (BUSS): A multiattribute health state classification system for bladder cancer. The 35th Annual Meeting of the Society for Medical Decision Making, Baltimore MD. October 19-23, 2013 (accepted for poster presentation).
28. Wijeysundera H, Wang X, Bennell M, Ko D, Abrahamyan L, Tu J, Austin P, **Krahn M.** Characteristics of multi-disciplinary heart failure clinics that predict 1-year cumulative health care costs; a population-based study. The 35th Annual Meeting of the Society for Medical Decision Making, Baltimore MD. October 19-23, 2013 (accepted for oral presentation).
29. Wong W, Tu HA, Chen W, Feld J, Chelak K, Lee K, **Krahn M.** The hepatitis C drug pipeline: collaboration between academic and HTA agency partners to develop an early economc model. The 35th Annual Meeting of the Society for Medical Decision Making, Baltimore MD. October 19-23, 2013 (accepted for oral presentation).
30. Bermingham S, Chandra K, Masucci L, Ieraci L, Chan B, Goeree R, **Krahn M** Seven months to complete seventy cost-effectiveness analyses! How to achieve the impossible using administrative data. HTAi. June 2013. Seoul [poster presentation]
31. Miller F, **Krahn M**, Levin L, Pham B, and Rac VE. Early Health Technology Assessment and Sustained Innovation. Panel Discussion. CADTH Meeting. St. John, New Foundland, May 2013
32. L Abrahamyan, Wijeysundera HC, **Krahn M**, Rac VE. Exploring Gender Bias in Heart Failure Patients Treated in Specialized Multi-Disciplinary Ambulatory Clinics of Ontario. CIHR YI Forum, Toronto, Canada. May 27-29, 2013 (poster presentation)
33. Mitsakakis N., Bremner K., and **Krahn M**. Methodological challenges in mapping a disease specific psychometric instrument to a disease specific utility instrument, Oral Presentation. 41st Annual Meeting of the Statistical Society of Canada, Edmonton, May 26-29, 2013
34. Mitsakakis N., Bremner K., and **Krahn M**. Methodological challenges in mapping a disease specific psychometric instrument to a disease specific utility instrument [poster]. ISPOR 2013, New Orleans. May 20th 2013
35. Miller F, **Krahn M**, Levin L, Pham B, and Rac VE. Early Health Technology Assessment and Sustained Innovation. Panel Discussion. CADTH Meeting. St. John, Newfoundland, May 2013.
36. **Krahn M.** Lessons learned from a cross-validaton between a discrete-event simulation model and a Markov Model for personalized breast cancer treatment. ISPOR 15th Annual European Congress November 3-7, 2012, Berlin, Germany.
37. Sander B, Ormanidhi O, Paszat L, Atkin K, Murphy J, **Krahn M**, Deeks S. The cost-effectiveness of integrated cervical cancer prevention strategies in the Ontario setting - can we do better? The 34th annual meeting of the Society for Medical Decision Making, Phoenix AZ. October 17 - 20, 2012 (Oral presentation).
38. Bremner K, **Krahn M**, Yabroff R, Hoch J, Barbera L, Liu N, Barrett M, Warren J. Opportunities and challenges in using administrative data for cross-country comparisons of health care costs. The 34th annual

meeting of the Society for Medical Decision Making, Phoenix AZ. October 17 - 20, 2012 (Poster presentation)

39. Tawfik A, Wodchis W, Hoch J, **Krahn M**. Cost-effectiveness of stroke prevention therapies in atrial fibrillation patients: A new generation of drugs. The 34th annual meeting of the Society for Medical Decision Making, Phoenix AZ. October 17 - 20, 2012 (Poster presentation)
40. **Krahn M.** Economic evaluation of mono and sequential hormone therapies for ER+ women with early breast cancer in Canada. ISPOR 15th Annual European Congress November 3-7, 2012, Berlin, Germany.
41. Bremner KE, **Krahn M**, Yabroff KR, Hoch J, Barbera L, Liu L, Barrett MJ, Warren JL. Opportunities and challenges in using administrative data for cross-country comparisons of health care costs. 34th Annual Meeting of the Society for Medical Decision Making, October 17-20, 2012 in Phoenix, Arizona, USA
42. **Krahn M**, Bremner KE, Luo J, Alibhai S. Using Administrative Databases to Estimate Health Care Costs from Adverse Drug Effect: The Case of Prostate Cancer. Biennial Society for Medical Decision Making European Meeting. June 10 - 12, 2012. Institute of Health Management and Health Economics, University of Oslo, Oslo, Norway
43. de Oliveira C, Bremner K, Gunraj N, Chan K, **Krahn M**. Evaluation of Trends in the Cost of Initial Cancer Treatment in Ontario. Canadian Association of Health Services and Policy Research, Montreal Quebec. May 29-31,2012
44. de Oliveira C, Bremner K, Gunraj N, Chan K, **Krahn M**. First-year Costs of Cancer Care in Ontario. Canadian Centre for Applied Research in Cancer Control Conference, May 28, 2012. Montreal Quebec
45. Paulden M, Franek J, Pham B, **Krahn M.** Gene expression profiling for guiding adjuvant chemotherapy decisions in women with early breast cancer. HOPE Research Centre, Sunnybrook Research Institute, Toronto, Ontario, Canada, 24 May 2012.
46. de Oliveira C, Bremner K, Gunraj N, Chan K, **Krahn M.** Using Administrative Health Care Data to Inform Cancer Care Research and Policy: Estimating the Economic Burden of Disease. Ontario Institute for Cancer Research/Cancer Care Ontario 4th Annual Meeting, May 17, 2012. Toronto.
47. **Krahn M**, Bremner KE, Luo J, Alibhai S. Using Ontario Administrative Data to Estimate Health Care Costs of Drug Adverse Effects: The Case of Prostate Cancer. Fourth Annual Meeting of the Ontario Institute for Cancer Research/ Cancer Care Ontario Health Services Research Program. May 17, 2012
48. van der Velde G, Paulden M, Ieraci L, Wijeysundera H, Witteman W, **Krahn M.** Cost-effectiveness of Non-invasive Cardiac Imaging Technologies in Outpatients with Suspected Coronary Artery Disease. 2012 Canadian Agency for Drugs and Technologies in Health (CADTH) Symposium, April 15 – 17, 2012, Ottawa, Canada [Concurrent Oral Session B5 (Cardiovascular) – April 16, 2012].
49. Schieir O, Hincapie CA, Cote P, Hogg-Johnson S, Paulden M, **Krahn M** et al. A cost-utility analysis of common nonsurgical treatments for neck pain. 3rd Annual North American Congress of Epidemiology. Montreal, Canada, June 21-24, 2011 [poster presentation]
50. van der Velde G, Schieir O, Hincapie C, Cote P, Hogg-Johnson S, Paulden M, **Krahn M**. Economic evaluation of the most commonly used non-surgical treatments for neck pain: A cost-tility analysis. International Health Economics Association (iHEA) 8th World Congress, July 10-13, 2011, Toronto Canada (Accepted for oral and poster presentation)
51. Wong W, Bayoumi A, **Krahn M**, Thein HH. Developing a complex agent network model to predict HIV and HCV incidence in Canada. The 3rd International Conference on Infectious Disease Dynamics, Boston, MA, USA 2011 (accepted for poster presentation)
52. Wong W, Bayoumi A, **Krahn M**, Thein HH. Developing a complex agent network model to predict HIV and HCV incidence in Canada. The 33rd Annual Meeting of the Society for Medical Decision Making, October 22-26, 2011, Chicago, IL (accepted for oral presentation)
53. van der Velde G, **Krahn M,** Paulden M, Hincapie C, Schieir O, Cote P, Hogg-Johnson S. Cost-effectiveness of the most commonly used non-surgical treatments for neck pain. 33rd Annual Meeting of the Society for Medical Decision Making, October 22-26, 2011, Chicago IL (accepted for poster presentation).
54. Wong WWL, Woo G, Heathcote JE, **Krahn M**. Disease Burden of Chronic Hepatitis B among Immigrants in Canada. The 33rd Annual Meeting of the Society for Medical Decision Making, October 22-26, 2011, Chicago IL (accepted for poster presentation)
55. Khor S, **Krahn M**, Hodgson D, Bremner K, Luo J, Hoch J. Real World Cost-effecctiveness of Expensive Cancer Drugs: An Example Using Rituximab for Diffuse-Large-B-Cell Lymphoma. CADTH, April 3 - 5, 2011 (Oral presentation)

56. Khor S, **Krahn M**, Hodgson D, Bremner K, Luo J, Hoch J. Real World Cost-effecctiveness of Expensive Cancer Drugs: An Example Using Rituximab for Diffuse-Large-B-Cell Lymphoma. OICR Meeting, Feb 1, 2011 (Poster presentation)
57. Khor S, **Krahn M**, Hodgson D, Bremner K, Luo J, Hoch J. "Real-world cost-effectiveness analysis of cancer drugs; comparative effectivess research using retrospective Canadian registry data before and after drug approval", presented at the International Society for Pharmaceoeconomics and Outcomes Research 16th Annual International Meeting, Baltimore, May 2011
58. G van der Velde, C Hincapié, O Schieir, P Coté, S Hogg-Johnson, M Paulden, M Krahn. Cost-effectiveness of the Most Common Nonsurgical Treatments for Neck Pain. 16th International Meeting of the International Society for Pharmacoeconomics and Outcomes Research (ISPOR), Poster Session II, May 24, 2011, Baltimore, United States. *(Accepted for poster presentation February 23, 2011)*
59. Hincapie CA, Schieir O, Cote P, Hogg-Johnson S, Paulden M, **Krahn M**, van der Velde G. A cost-effectiveness analysis of common nonsurgical treatments for neck pain. National Student Conference of the Canadian Society of Epidemiology and Biostatistics, June 19-20, 2011, Montreal Canada (Accepted for oral presentation)
60. Lee L, Hodgson D, Crump M, Khor S, Luo J, **Krahn M**, Bremner K, Hoch J. Impact of Rituximab on Outcomes of Very Elderly Patients With Diffuse Large B-Cell Lymphoma. 11th International Conference on Malignant Lymphoma, Lugano Switzerland, June 15-18, 2011 (Accepted for poster presentation)
61. Ieraci L, **Krahn M**, Paulden M, van der Velde G, Wijeysundera H, Machado M, Witteman W. The cost – effectiveness analysis of five non-invasive cardiac imaging technologies in Ontario. 32nd Annual Meeting of Society for Medical Decision Making Oct 24-27, 2010, Sheraton Centre Toronto, Ontario Canada (*Accepted for poster presentation*).
62. Bornstein M, Franek J, Parthimos M, Nakhai-Pour H, Ieraci L, Paulden M, **Krahn M**, Onetto N, Levin L. Pharmacogenetic testing and evidence-based decision-making in Ontario: The application of Ontario's decision determinants framework to the evaluation of pharmacogenetic tests. 32 Annual Meeting of the Society for Medical Decision Making, October 24-27, 2010, Toronto, ON, Canada (*Accepted for poster presentation*)
63. Wong WWL, Woo G, Heathcote JE, **Krahn M**. Cost effectiveness of screening immigrants for Hepatitis B. American Association for the Study of Liver Disease (AASLD), October 29-November 2,2011, Boston, MA (accepted for poster presentation)
64. Wong WWL, Woo G, Heathcote JE, **Krahn M**. Cost effectiveness of screening immigrants for Hepatitis B. The 32nd Annual Meeting of the Society For Medical Decision Making, October 24-27, 2010, Toronto, Ontario Canada (accepted for poster presentation)
65. Wong WWL, Woo G, Heathcote JE, **Krahn M**. Cost effectiveness of screening immigrants for Hepatitis B. Canadian Agency for Drugs and Technologies in Health (CADTH) Symposium, April 18-20, Halifax, NS, Canada (accepted for poster presentation)
66. **Krahn M**. Economic evaluation of preventive strategies for pressure ulcers. iHEA 7th World Congress on Health Economics, July 12-15, 2009 Beijing China (panel session)
67. Thein HH, **Krahn M** et. al. Health status utilities in long-term care residents in Ontario. iHEA 7th World Congress on Health Economics, July 12-15, 2009 Beijing China (panel session)
68. Chen WD, **Krahn M** et al. Economic evaluation of pressure ulcer preventive strategies for long-term residents in Ontario. iHEA 7th World Congress on Health Economics, July 12-15, 2009 Beijing China (panel session)
69. Chen WD, **Krahn M** et al. Economic evalutation of preventive strategies for pressure ulcers: A systematic review. iHEA 7th World Congress on Health Economics, July 12-15, 2009 Beijing China (panel session)
70. Sander B, Kwong J, Bauch C, Maetzel A, McGeer A, Raboud J, **Krahn M**. The cost-effectiveness of Ontario's universal influenza immunization program. iHEA 7th World Congress on Health Economics, July 12-15, 2009 Beijing China (accepted for oral presentation).
71. Woo G, Tomlinson G, Pham B, **Krahn M**. Comparing efficacies of treatments for chronic hepatitis B: A Bayesian mixed treatment comparison meta-analysis. . iHEA 7th World Congress on Health Economics,

July 12-15, 2009 Beijing China (accepted for poster presentation)

72. Wijeysundera H. C, Tomlinson G, Norris CM, Ghali WA, Ko DT; **Krahn M**. Predicting EuroQol EQ-5D Utility Scores from the Seattle Angina Questionnaire in Coronary Artery Disease: A Mapping Algorithm using a Bayesian Framework. 31st Annual Meeting of the Society for Medical Decision Making (SMDM), October 20, 2009 at Hollywood (Los Angeles), California, USA.
73. Pham B, Tomlinson G, Grootendorst P, Witteman W, Wijeysundera H, **Krahn M**. A Systematic Approach to Calibration Analysis of Decision Models for Health Technology Assessment. 31st Annual Meeting of the Society for Medical Decision Making (SMDM), October 18, 2009 at Hollywood (Los Angeles), California, USA.
74. Wijeysundera H, Ko D, Tomlinson G, **Krahn M**. Medical Therapy versus Percutaneous Coronary Intervention in Symptomatic Coronary Artery Disease: Decision Analysis and Economic Evaluation . Canadian Cardiology Congress, October 26th 2009 at Edmonton, Canada
75. Wijeysundera HC, Machado M, Witteman W, Farahati F, van der Velde G, Tu J, Lee DS, Goodman S, Petrella R, O'Flaherty M, Capewell S, **Krahn M**. Reductions in coronary heart disease mortality associated with changes in risk factors in Ontario between 1994 and 2005. Submitted to The Canadian Cardiovascular Congress - CCC, October 24 to 28, 2009 in Edmonton, AB
76. van der Velde G, **Krahn M**, Machado M, Ieraci L, Witteman W, Pham Ba'. The cost-effectiveness of biologic disease modifying anti-rheumatic drugs (DMARDS) compared to conventional DMARDS: A systematic review of economic evaluations. 31st Annual Meeting of the Society for Medical Decision Making (SMDM) Oct 18-21, 2009, California, USA (Accepted for poster presentation)
77. Sander B, **Krahn M**, Bauch C, Fisman D. Impact of mathematical modelling on health policy decision-making in the context of the recent novel Swine-Origin Influenza A Virus (SOIV) outbreak response in Ontario, Canada. 31st Annual Meeting of the Society for Medical Decision Making (SMDM) October 18-21, 2009, California, USA (Accepted for poster presentation)
78. Thein HH, Zagorski BM, Krajden M, **Krahn M**. Population-based estimates of long-term health care costs attributable to hepatitis C. 7th World Congress on Health Economics 12-15 July, 2009, Beijing, China.[Oral]
79. Thein HH, Pham B, **Krahn M**, Wodchis W. Health status utilities and the impact of pressure ulcer in long-term care residents in Ontario. 7th World Congress on Health Economics 12-15 July, 2009, Beijing, China.[Organised session]
80. Machado M, Wijesundera H, Farahati F, Witteman W, van der Velde G, Ieraci, L, Pham B', **Krahn M**. Development of the Ontario Cardiovascular Economic Model. Canadian Agency for Drugs and Technologies in Health (CADTH) Symposium 2009, April 5, 2009, Ottawa, Canada
81. Chen W; Zagorski B; Krajden M; Heathcote J; **Krahn M**. Population-Derived Estimates of Direct Medical Costs Among Late-Stage Hepatitis C Patients with Diabetes Canadian Agency for Drugs and Technologies in Health (CADTH) Symposium 2009, April 5, 2009, Ottawa, Canada
82. Matthew A, Ritvo P, Fleshner N, Lockwood G, Alibhai S, **Krahn M**, Kalnin R, Nesbitt M, Currie K, Santa Mina D, Trachtenberg J: Disease-Specific Distress, Sexual Functioning, and Age in Men After Radical Prostatectomy: An Initial Look at a Complex Picture. (Poster) Canadian Association of Psychosocial Oncology, Survivorship. Transitions & Transformations, Vancouver, British Columbia, April 1-4, 2009.
83. Naglie G, Borrie M, Black S, Beattie B, **Krahn M**, Irvine J, Hogan D, Bergman H, MacKnight C, Patterson C, Byszewski A, Freedman M, Streiner D, Ritvo P, Comrie J, Kowgier M, Tomlinson G. Predictors of quality of life in dementia caregivers. Annual Meeting of the American Geriatrics Society in Chicago, April 20, 2009 (Accepted for Presidential Poster Session)
84. Sander B, Kwong J, Bauch C, Maetzel A, McGeer A, Raboud J, **Krahn M**. The cost-effectiveness of Ontario's universal influenza immunization program. Oral presentation, International Health Economics Association 7th World Congress 2009.
85. Woo G, Pham B, Tomlinson G, **Krahn M**. Comparing efficacies of treatements for chronic hepatitis B: A

Bayesian mixed treatment comparison meta-analysis. iHEA 7th World Congress on Health Economics July 12-15, 2009. Beijing, China (Accepted for Poster presentation)

86. Woo G, Pham B, Tomlinson G, **Krahn M**. Comparing efficacies of treatements for chronic hepatitis B: A Bayesian mixed treatment comparison meta-analysis. 44th Annual Meeting of the European Association for the Study of the Liver (EASL), April 22-26, 2009, Copenhagen, Denmark (Accepted for Poster presentation)
87. Chen W, **Krahn M**, et. Al. Population-derived estimates of direct medical costs among late-stage hepatitis C patients with diabetes. iHEA 7th World Congress on Health Economics July 12-15, 2009. Beijing, China (Accepted for Oral presentation)
88. Sander B, Kwong J, Bauch C, Maetzel A, McGeer A, Raboud J, **Krahn M**. The cost-effectiveness of Ontario's universal influenza immunization program. Poster presentation, Society for Medical Decision Making 30th Annual Meeting, 2008.
89. Van der Velde G, Llewellyn-Thomas H, Hogg-Johnson S, Hurwitz E, Cassidy JC, Cote P, **Krahn M**. Neck pain patients' evaluative scores for their current health state. World Congress on Neck Pain, January 20-22, 2008, Los Angeles, United States.
90. John-Baptiste A, Tomlinson G, Hsu P, Krajden M, Heathcote J, Laporte A, Yoshida E, Anderson F, **Krahn M**. Quality of life following antiviral therapy for chronic hepatitis C virus infection. Poster presentation, 30th Annual Meeting of the Society for Medical Decision Making, Philadelphia, Pennsylvania, USA. October 2008.
91. Thein HH, Pham B, **Krahn M**, Wodchis W. Health status utilities in long-term care residents in Ontario. The 30th Annual Meeting of the Society for Medical Decision Making
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93. Thein HH, Yi Q, **Krahn M**. Long-term sequelae of hepatitis C virus-infected Canadian post-transfusion compensation claimant cohort. 2008 CADTH Symposium 27-29 April 2008, Edmonton, Canada. [Poster]
94. Thein HH, Yi Q, Dore G, **Krahn M**. Natural history of hepatitis C in HIV-infected individuals and the impact of HIV in the era of HAART: a meta-analysis. Can J Gastroenterol 2008;22:(Suppl A), 75A.[Oral]
95. Sander B, Kwong J, Bauch C, Maetzel A, McGeer A, Raboud J, **Krahn M**. The cost-effectiveness of Ontario's universal influenza immunization program. Poster presentation, the European Scientific Working Group on Influenza, 3rd European Influenza Conference 2008.
96. Sander B, **Krahn M**. Influenza vaccine delivery programs: A systematic review. Poster presentation, the European Scientific Working Group on Influenza, 3rd European Influenza Conference 2008.
97. John-Baptiste A, Varenbut M, Lingley M, Teplin D, Daiter J, **Krahn M**. Treatment of hepatitis C infection for current or former substance abusers in a community setting. Oral presentation, 2nd Biennial conference, American Society of Health Economics, Durham, North Carolina, USA. June 2008.
98. John-Baptiste A, **Krahn M**, George Tomlinson. Natural History of Chronic HCV infection obtained through Injection Drug Use: A Bayesian Meta-Analysis. Poster presentation, 2nd Biennial conference, American Society of Health Economics, Durham, North Carolina, USA. June 2008.
99. Wendong Chen, Dinner K, Wong T, Heathcote J, **Krahn M**. Hepatitis C screening among immigrants in Canada. (Podium presentation). Toronto, ISPOR, May 3-7, 2008. Selected as Best Student Podium presentation.
100. Pham B, Machado M, Bombardier C, McMartin K, Bornstein M, Levin L, **Krahn M**. Cost effectiveness of biologics for rheumatoid arthritis: A systematic review (Poster presentation). Toronto, ISPOR, May 3-7, 2008
101. Sander B, **Krahn M**. Influenza vaccine delivery programs: A systematic review (Poster presentation). 2008 CADTH Invitational Symposium, Edmonton, Alberta, April 27-29, 2008.
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104. Thein HH, John-Baptiste A, Yi Q, Sander B, Krajden M, **Krahn M**. The Cost-Effectiveness of Nucleic Acid Amplification Testing in the detection of acute hepatitis C virus infection. 6th World Congress on Health Economics 8-11 July, 2007, Copenhagen, Denmark. [Poster]
105. Thein HH, John-Baptiste A, Yi Q, Sander B, Krajden M, **Krahn M**. The Cost-Effectiveness of Nucleic Acid Amplification Testing in the detection of acute hepatitis C virus infection. 2007 CADTH Symposium April 2007, Ottawa, Canada. [Poster]
106. Thein HH, Yi Q, Tomlinson, **Krahn M**. Natural History of Hepatitis C: Systematic Review and Meta-Analysis. National Canadian Research Training Program in Hepatitis C 4th Program Advisory Committee Meeting 2007, Banff, Canada.[Oral]
107. Wendong Chen, **Murray Krahn**, Jenny Healthcote. A cost-effectiveness analysis of hepatitis C screening among immigrants in Canada. 58th Annual Meeting of the AASLD ,Boston, Massachusetts November 2 - 6, 2007
108. Van der Velde G, Llewellyn-Thomas h, Hogg-Johnson S, Hurwitz E, Cassidey JD, Cote P, **Krahn M**. Neck pain patients' preferences for their current health state. Palma International Forum IX Primary Care Research on Low Back Pain, October 4-6, 2007, Palma de Mllorca, Spain.
109. van der Velde G, Llewellyn-Thomas H, Hogg-Johnson S, Hurwitz E, Cassidy JC, Côté P, **Krahn M**. Neck pain patients' evaluative scores for their current health state. Society for Medical Decision Making Annual Meeting, October 20-24, 2007, Pittsburgh, United States.
110. van der Velde G, Llewellyn-Thomas H, Hogg-Johnson S, Hurwitz E, Cassidy JD, Côté P, **Krahn M**. Neck pain patients' evaluative scores for their current health state. 14th Annual Conference of the International Society for Quality of Life Research, October 10-13, 2007, Toronto, Canada. [accepted]
111. van der Velde G, Hogg-Johnson S, Bayoumi A, Cassidy JD, Côté P, Chan S, Subrata P, Hoving JL, Bombardier C, **Krahn M**. A decision analysis of non-invasive neck pain treatments. Society for Medical Decision Making Annual Meeting, October 20-24, 2007, Pittsburgh, United States
112. Chen WD, **Krahn M**, Healthcote J. Prevalence and predictors of obesity among individuals testing positive for hepatitis Cantibody in a multicultural, urban, tertiary care referral clinic. 58th Annual Meeting of the AASLD , Boston, Massachusetts November 2 - 6, 2007.
113. Naglie G., Comrie J., Beattie L., Bergman H., Black S., Borrie M., Byszewski A., Freedman M., Hogan D., Irvine J., **Krahn M**., MacKnight C., Patterson C., Ritvo P., Streiner D., Kowgier M. and Tomlinson G. Patient and Caregiver Quality of Life in Alzheimer's Disease in Relation to Dementia Severity. AGS Annual Meeting, Seattle, May 2007.
114. Sander B, Tomlinson G, **Krahn M**, The Cost-Utility Of Ontario's Universal Influenza Immunization Program, 28th Annual Meeting of the Society for Medical Decision Making, Boston, Massachusetts, October 14-18, 2006.
115. Thein HH, Maruff P, **Krahn M**, Kaldor JM, Koorey D, Brew BJ, Dore GJ. Cognitive and mood effects of antiviral therapy in HCV monoinfected and HIV/HCV coinfected individuals. 2nd Annual Canadian Association for the Study of the Liver Winter Meeting 2006, Toronto, Canada. [Poster]
116. Thein HH, Law M, **Krahn M**, Kaldor JM, Dore GJ. Estimating the impact of antiviral treatment on hepatitis C-related disease burden in Australia. 2nd Annual Canadian Association for the Study of the Liver Winter Meeting 2006, Toronto, Canada. [Poster]
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118. Tricco A, Pham B, Duval B, De Serres G, Gilca V, Vrbova L, **Krahn M**, Moher, D. Burden of hepatitis A intervention triggered by infected food-handlers in Canada. CNIC 2006 Conference
119. Anonychuk A, Gilca V, Pham B, Duval B, Bauch C, **Krahn M**. Burden and cost of hepatitis A infection in Canada. 7th Canadian Immunization Conference, Winnipeg Dec 3-6, 2006.
120. Tricco A, Pham B, Duval B, De Serres G, Gilca V, Vrbova L, Anonychuk A, **Krahn M**, Moher D. Published data underestimates the burden of hepatitis A intervention triggered by infected food handlers. 7th Canadian Immunization Conference, Winnipeg Dec 3-6, 2006

121. EM Nelson, G Fraser, AF Connors, MJ Barry, **M Krahn**, MR Conaway, R Bashore, A Wolf, KL Kilbridge, Misunderstanding of Prostate Cancer (CaP) among African American (AA) Men of Lower Socioeconomic Status (Lo-SES), 2006 ASCO Annual Meeting, Atlanta, Georgia, June 2-6, 2006
122. Chen WD, Heathcote J, **Krahn M**. Primary prevention of esophageal variceal bleding among cirrhotic patients with hepatitis C and grade 2 to 3 esophageal varices: a cost-utility analysis. HTAi 2006 Annual Meeting in Adelaide, Australia July 2-5, 2006.
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127. Chen WD, Heathcote J, **Krahn M**. Primary prevention of esophageal variceal bleeding among cirrhotic patients with hepatitis C and grade 2 to 3 esophageal varices: a cost-utility analysis. AASLD Program Committee 2006.
128. Bremner K, Bayoumi A, Sherman M, **Krahn M**. Management of solitary 1-2 cm liver nodules in patients with cirrhosis – a decision analysis. 2nd Annual CASL Winter Meeting, Toronto 2006
129. Anonychuk A, Duval B, Bauch C, **Krahn M**, Pham B, Gilca V, Tricco A. Methodological issues in cost effectiveness evaluation of hepatitis A vaccine: A systematic review. 2nd Annual CASL Meeting, Toronto 2006.
130. Anonychuk A, Duval B, Bauch C, **Krahn M**, Pham B, Gilca V, Tricco A. Under-reporting of hepatitis A case notification data in a low endemic country. 2nd Annual CASL Winter Meeting Toronto 2006.
131. Singer L, **Krahn M**, Tullis E, Granton J, Waddell T, Chowdhury N. Disease-specific differences in health-related quality of life in patients referred or listed for lung transplantation. ISHLT 26th Annual Meeting and Scientific Session, Madrid April 2006.
132. Cohen J, Faughnan M, Letarte M, Kennedy M, Vandezande K, **Krahn M**. Cost comparison of genetic and clinical screening in families with HHT. 6th International HHT Conference, Lyon 2005.
133. Anonychuk A, Tricco A, Bauch C, Pham B, **Krahn M**. Methodological issues in cost effectiveness evaluation of hepatitis A vaccine: A systematic review. Society for Medical Decision Making Annual Meeting – San Diego, CA October 2005
134. Anonychuk A, Tricco A, Bauch C, Pham B, **Krahn M**. Methodological issues in cost effectiveness evaluation of hepatitis A vaccine: A systematic review. 56th Annual Meeting of the American Association for the Study of Liver Diseases- San Francisco, CA November 2005
135. Chen WD, **Krahn M**, Wong T, Heathcote J. Body mass index as an independent prognostic factor in chronic hepatitis C infection. Canadian Association for the Study of the Liver Annual Meeting, Banff AB, March 2005
136. Pham B, Tricco A, Bauch C, Chen H, Rao A, **Krahn M**. Use of a catalytic modeling to estimate hepatitis A incidence in a low endemicity country: Implications for modeling immunization policies. 21st. International Conference on Pharmacoepidemilogy and therapeutic risk management: August 2005
137. Tricco A, Pham B, Duval B, Gilca V, **Krahn M**, Moher D. Assessing mass vaccination in outbreaks among infected food handlers: Methodological challenges. 21st International Conference on Pharmacoepidemiology and Therapeutic Risk Management: August 2005
138. Pham B, Tricco A, **Krahn M**. Markov models for cost effectiveness analyses: A framework for assessing

external consistency. 27th annual meeting of the Society for Medical Decision Making, San Francisco, CA October 2005

139. Singer L, **Krahn M,** Gordon CL, Mironyuk L, Tullis DE, Waddell TK, Granton JT. A web-based health-related quality of life (HRQL) assessment tool for lung disease and lung transplant patients. American Thoracic Society Annual Meeting – San Diego May 2005
140. Bauch C, Tricco A, Rao A, Gilca V, Duval B, Pham B, **Krahn M**. Evaluating periodicity of disease transmission prior to cost effectiveness evaluation of immunization programs. Society for Medical Decision Making Annual Meeting, San Francisco, CA October 2005
141. **Krahn M**, Forde N, Mamdani M, Laporte A, Alibhai S, Bremner K, Tomlinson G, Naglie G. Design of longitudinal cost models for the prostate cancer policy model. Society for Medical Decision Making Annual Meeting, October 2005
142. Thein HH, Law M, **Krahn M**, Kaldor JM, Dore GJ. Estimating the impact of antiviral treatment on health burden of HCV in Australia. Student Conference, Sydney, Australia 2005
143. Thein H, Maruff P, **Krahn M**, Kaldor JM, Doorey D, Brew BJ, Dore GJ. The prevalence and correlates of depressive symptoms during pegylated interferon-alpha and ribavirin therapy in HCV monoinfection and HIV-HCV coinfection. 17th Annual Conference of the Australasian Society for HIV Medicine, Hobart, Australia 2005
144. Thein HH, Law M, **Krahn M**, Kaldor JM, Dore GJ. Estimating the impact of antiviral treatment on health burden of HCV in Australia. 17th Annual Conference of the Australasian Society for HIV Medicine, Hobart, Australia 2005
145. Thein H, Maruff P, **Krahn M,** Kaldor JM, Koorey D, Brew BJ, Dore GJ. Health-related quality of life effects of pegylated interferon-alpha and ribavirin therapy in HCV monoinfection and HIV-HCV coinfection. 17th Annual Conference of the Australasian Society for HIV Medicine, Hobart, Australia 2005 (Poster)
146. Thein HH, Law M, **Krahn M**, Kaldor JM, Dore GJ. Estimating the impact of antiviral treatment on health burden of HCV in Australia. Communicable Diseases Control Conference, Sydney, Australia 2005
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148. Thein HH, Krahn M, Kaldor JM, Dore GJ. Estimation of utilities for chronic hepatitis C virus infection from SF-36 scores. NCRTP-HepC PAC Meeting, Banff, Alberta, Canada 2005
149. Ba Pham, **Krahn M**. Assessing the costs of Hepatitis A food related interventions: methodological challenges. 12th International Conference on Pharmacoepidemiology & Therapeutic Risk management, 2005.
150. Thein H, **Krahn M**, Kaldor J, Dore G. Utilities in HCV Infection. National Centre in HIV Epidemiology and Clinical Research, The University of New South Wales. Canadian Association for the Study of the Liver Annual Meeting, Banff, March 2005
151. Cotterchio M, Howlett R, Klar N, **Krahn M**, Mai V, McLachlin M, Paszat L, Ritvo P, Stewart D. Ontairo HPV Pilot Study: Practice Implications of Reflex Testing. 22nd International Papillomavirus Conference and Clinical Workshop 2005
152. Sander B, Naglie G, **Krahn M**, Maetzel A. Prevention or Treatment of Influenza in Healthy Adults – A cost-effective option for Society. International Health Economics Association (IHEA) Annual Meeting, Barcelona, July 2005.
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154. Cohen J, Faughnan M, Letarte M, Kennedy S, Vandezande K, **Krahn M**. Cost comparison of genetic and clinical screening in families with hereditary hemorrhage telangiectasia. The American Society of Human

Genetics Annual Meeting, Toronto October 26-30, 2004.

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158. **Krahn M**. Cost effectiveness of universal hepatitis A vaccination in Canada. Canadian National Immunization Conference, Montreal 2004
159. **Krahn M**, Witkos M, Sanders G, Sugano D, Cantor S. What would make the society and the annual meeting better? a survey of the society for Medical Decision Making Membership. Society for Medical Decision Making Annual Meeting, 2004
160. Bremner K, Bayoumi A, Sherman M, **Krahn M**. Biopsy or resection for single small liver nodules in patients with compensated cirrhosis- a decision analysis. Society for Medical Decision Making, 2004
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163. Thein HH, **Krahn M**, Kaldor JM, Dore GJ. Estimation of utilities for chronic hepatitis C virus infection from SF-36 scores. 15th Annual conference of the Australasian Society for HIV Medicine, Cairns, Australia 2003
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166. John-Baptiste A, Cook T, Straus S, Naglie G, Tomlinson G, **Krahn M**. Economic and health consequences of a hyperbaric oxygen cchamber in the international space station. Medical Decision Making 2003;23(6):544.
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172. Chong CAKY, Heathcote J, **Krahn M**. "Health State Utilities and Quality of Life in Hepatitis C Patients". 1st Prize, Category 2, Annual Mount Sinai Hospital and University Health Network Department of Medicine Research Competition, June 2002.
173. **Krahn M**., Wang PP & Yi Q. Allocating funds from a national compensation agreement using Markov modeling: The case of the 1986-1990 post-transfusion hepatitis C victims. American College of

Epidemiology Annual Scientific Meeting, Albuquerque, New Mexico, September 22-24, 2002.

174. Cantor SB, Volk RJ, **Krahn M**, Cass AR, Spann SJ. Prostate Cancer Screening Recommendations Based on Couples' Utilities. INFORMS annual meeting, San Antonio Texas, November 2000.
175. Kilbridge KL, Fraser G, **Krahn MD**, Gong DA, Bashore R, Wolf A, Nease RF, Connors AF. Assessing prostate cancer outcomes in rural Africal-American men: are common terms understood? American Society for Clinical Oncology, 2000.
176. Alibhai SMH, Nam R, Naglie G, Trachtenberg J, **Krahn M**. The impact of age, comorbidity, and source of efficacy data on the optimal treatment choice for localized prostate cancer: a decision-analytic view (poster). The Canadian Geriatrics Society Annual Meeting, Edmonton, Canada, October 29, 2000. (senior author)
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Poster:

179. Narayanan U, Allan V, **Krahn M**. The optimal mode of delivery of infants with a prenatal diagnosis of spina bifida: a decision analysis . Podium presentation, Society for Medical Decision Making annual meeting, September 2000. (senior author)
180. Alibhai S, Naglie G, **Krahn M**. Surgery, radiotherapy, or watchful waiting for localized prostate cancer: a decision analytic view. Poster presentation, annual student research day, University of Toronto Programme in Clinical Epidemiology and Health Care Research. April 1999. Second prize. (senior author)
181. Narayanan U, Allan V, **Krahn M**. The optimal mode of delivery of infants with a prenatal diagnosis of spina bifida: a decision analysis . Poster presentation, annual student research day, University of Toronto Programme in Clinical Epidemiology and Health Care Research. April 1999. First prize. (senior author)
182. Alibhai S, Naglie G, **Krahn M**. Surgery, radiotherapy, or watchful waiting for localized prostate cancer: a decision analytic view. Poster presentation, student prize for best clinical research project among Geriatrics trainees at the University of Toronto, McMaster University, and The University of Western Ontario, September 1999. (senior author)
183. Sivarajan B, **Krahn M**, Harrison D, Webb G, Siu S. Financial impact of adults with congenital heart disease on health care delivery. Presented at U. of Toronto medical research day, February 1997.
184. Bloomfield D, **Krahn M**, Tannock I. Economic evaluation of chemotherapy with mitoxantrone plus prednisone for symptomatic hormone resistant prostate cancer based on a randomized trial with palliative endpoints. Podium presentation, student prize, American Society for Clinical Oncology, May 1997. (senior author)
185. Czaykowski P, **Krahn M**, Oza A. Adjuvant chemotherapy for Stage II colon cancer: clinical and economic effects. Poster presentation, student prize, American Society for Clinical Oncology, May 1997. (senior author)
186. Naglie G, **Krahn M**, Tansey C, Bolley H, Detsky A. Cost-Utility Analysis of Coronary Artery Bypass Surgery Versus Medical Therapy in the Elderly. Podium presentation, Society for Medical Decision Making annual meeting, October 1996.
187. Bloomfield DJ, Tannock IF, **Krahn M**. Should Luteinizing Hormone Releasing Hormone (LHRH) Agonists be continued in the Presence of Hormone Refractory Metastatic Prostate Cancer? A Decision Analysis. Poster presentation, Society for Medical Decision Making annual meeting, October 1996. (senior author)
188. **Krahn M**, Naglie IG, Irvine J, Ritvo P, Trachtenberg J. Patient and expert quality of life ratings in the

construction of an empirically devised domain linked utility instrument for prostate cancer. Poster presentation, Society for Medical Decision Making annual meeting, October 1996.

189. Taylor MC, **Krahn M**, Langer B, Taylor B. The management of liver metastases from colorectal cancer- a decision analysis. Poster presentation, Society for Medical Decision Making annual meeting, Phoenix, October 1995. (senior author)
190. Taylor MC, **Krahn M**, Langer B, Taylor B. "The Management of Liver Metastases from Colorectal Cancer - A Decision Analysis". Poster presentation. The Royal College of Physicians and Surgeons 65th Annual Meeting, Halifax, September, 26-29,1995. (senior author)
191. Naglie G, Tansey C, Bolley H, **Krahn M**, Detsky A. Coronary Bypass Surgery in the Elderly: How Much Does It Cost? Poster presentation. American Geriatrics Society Annual Meeting, 1995.
192. Naglie G, Tansey C, Bolley H, **Krahn M**, Detsky A. An Itemized Costing of Coronary Artery Bypass Surgery in the Elderly. Poster presentation. Royal College of Physicians and Surgeons Annual Meeting, September 1995.
193. **Krahn M**, Detsky AS. Costs and cost effectiveness of British Columbia's grade six hepatitis B vaccination program. Podium presentation. Society for Medical Decision Making annual meeting, October 1995.
194. **Krahn M**, Mahoney J, Eckman M, Detsky AS. PSA Screening for prostate cancer: a decision analytic perspective. Poster presentation, American Urological Association annual meeting, September 1993.
195. **Krahn M**, Detsky AS. Universal Vaccination for Hepatitis B in North America. Podium presentation, American Federation for Clinical Research Annual Meeting, Seattle, May 1991.
196. **Krahn M**, Naylor CD, Basinski AS, Detsky AS. Quality of Life and Cholesterol Policy. Podium presentation, American Federation for Clinical Research Annual Meeting, Washington D.C. won Henry Christian Memorial Award for best abstract in Clinical Epidemiology, May 1990.
197. **Krahn M**. Thyrotoxic periodic paralysis," Clinical Vignette, College of Physicians and Surgeons Annual Meeting, 1986.

LIST OF COURSES TAUGHT SINCE DATE OF LAST PROMOTION

2011 – Present
Develop, coordinate and teach for the Health Technology Institute

2010- Present
PHM 1128 Introduction to Models and Methods of Research in Clinical, Social and Administrative Pharmacy
Annual lecture in Technology assessment models and methods.

2005 - Present
HAD 5312H Decision Modeling for Clinical Policy and Economic Evaluation

2003 - 2005
HAD 7002 Decision Modeling for Clinical Policy and Economic Evaluation
Developed the course, coordinate the course, teach 4 sessions, mark assignments, tutor 2-4 students per year.

1998 - 2004
CHL 5760. Introduction to Health Economics. Annual lecture in decision analysis.

1993-2004
HAD 5304F Medical Decision and Cost Effectiveness Analysis. Course co-coordinator 1993-2000. Prepared course materials for two sessions, co-wrote the "Primer" series which serves as the course text. Teach 2 sessions: Introduction to Tree age, and "Sensitivity Analysis". Tutor 4-6 students over the entire half-course, review and mark final oral and written presentations for tutored students.

1993-2000
CLB 1407: From Bench to Bedside (Introduction to Clinical Epidemiology and Health Services Research for Laboratory Scientists). Course coordinator. Designed and prepared course materials, taught 7-8 sessions x 2 hrs each year.

1993-1998
HAD 5301 Introduction to Clinical Epidemiology and Health Care Research, taught 1-3 sessions x 2.5 hrs each year. Prepared course materials for "Decision Analysis" Module.

STUDENTS SUPERVISED

Postdoctoral Fellows

1. Frieda Daniels, 2013. Institute of Health Policy, Management and Evaluation, University of Toronto.
2. Petros Pechlivanglou, 2012 - , Institute of Health Policy, Management and Evaluation, University of Toronto.
3. Hong Anh Tu (co-supervisor), 2011 - , Institute of Health Policy, Management and Evaluation, University of Toronto.
4. Gabrielle van der Velde (primary supervisor), 2005-2008. Health Policy, Management, and Evaluation,University of Toronto.
5. William Wong (supervisor) University of Toronto, 2010 - 2012
6. Claire Oliveira (supervisor) University of Toronto, 2010 -
7. Hla Hla Thein (supervisor) University of New South Wales, 2007- 2009.
8. Tony Dowling, (co-supervisor) (Melbourne, Australia). Department: Clinical Epidemiology, 1999. Topic: Using PSA as a marker of disease progression in advanced prostate cancer.
9. Wendy Chiu, (secondary supervisor), McGill University, 1999- Topic: Age as a predictor of treatment choice in elective aortic aneurysm repair. A decision analytic view.
10. Ellen Mozurkewich, (co-supervisor), University of Michigan, 1999. Topic: Alternate strategies for threatened pre-term delivery: a decision analysis.
11. Rob Klassen, (secondary supervisor), University of Toronto, 1998-1999, Topic: Initial bone-marrow aspiration in childhood ITP: a decision analysis.
12. Jane Collier, (primary supervisor) (Cambridge University), 1997-8. Topic: Cost-utility analysis of screening HbsAg carriers.
13. David Bloomfield, (co-supervisor) (University of London), 1997-8, Topic: Economic evaluation of mitoxantrone and prednisone for hormone refractory prostate cancer.

PhD Students

1. Aysegul Erman. Faculty of Pharmacy, University of Toronto, 2013
2. Arlene Nugent (co-supervisor), The use of quality of life data in health policy decision making, Institute of Health Policy, Management and Evaluation, University of Toronto, 2013 -
3. Yeesha Poon (primary supervisor), Cost effectiveness analysis in prostate cancer, Faculty of Pharmacy, University of Toronto, 2011 - present
4. Mary-Ellen Hogan, (co-supervisor), Cost of chronic pain, University of Toronto, 2011 - present
5. Amy Tawfik (supervisor), Understanding the real world functioning of the drug reimbursement in Canada; from model building to listing decision, Faculty of Pharmacy, University of Toronto, 2011- present
6. Nader Kabboul (supervisor), The cost-effectiveness of Cardiac Rehabilitaion treatment strategies in patients with Coronary Faculty of Pharmacy, University of Toronto 2010 –
7. Natasha Nanwa (primary supervisor), Estimating the economic burden of infectious diseases using health administrative data, Graduate Department of Pharmaceutical Sciences, University of Toronto, 2010 –
8. Brian Chan (primary supervisor), The Economic Burden of Chronic Ulcers, Graduate Department of Pharmaceutical Sciences, University of Toronto, 2010 –
9. Mina Tadrous (committee member), Graduate Department of Pharmaceutical Sciences, University of Toronto, 2010 - present
10. Milica Nikitovic (committee member), Graduate Department of Pharmaceutical Sciences,

University of Toronto, 2010 - present
11. Maryse Bouchard (committee member), University of Toronto, 2010 - present
12. Harindra Wijeysundera (Supervisor), Clinician-Scientist Program, Department of Medicine, U of T, 2007-2010
13. Gloria Woo (primary supervisor), Faculty of Pharmacy, University of Toronto, 2005- 2010
14. Ba Pham (co-supervisor), Health Policy, Management, and Evaluation, University of Toronto, 2005-2011
15. Wendong Chen (primary supervisor), HPME, NCRTP-Hep C, 2005 - 2010
16. Holly Witteman (committee member) Mechanical and Industrial Engineering, University of Toronto, 2003-2010
17. Beate Sander (primary supervisor), Health Policy, Management, and Evaluation, 2003-2011
18. Ava John-Baptiste (primary supervisor) Health Policy, Management, and Evaluation. Costs, quality of life, and cost effectiveness of treating injection drug users for HCV infection. 2002-2009
19. Andreas Maetzel (thesis committee), 1999-2002. Institute of Medical Science. Topic: Cost effectiveness of cyclo-oxygenase 2 inhibitors: a cost effectiveness analysis.
20. HeYu (co-supervisor). PSA as a predictor of prognosis in breast and prostate cancer. PhD, Department of Clinical Biochemistry, 1995.

MSc / MHSc Students

1. Troy Francis (Co-supervisor), Leslie Dan Faculty of Pharmacy, University of Toronto, 2014 - present
2. Austin Nam (Co-supervisor), Health Services Research MSc program, University of Toronto, 2013 - present
3. Nathan Perlis (primary supervisor), Quality of life and bladder cancer, University of Toronto, 2011 - 2013
4. Bridget Maturi (supervisor), the cost effectiveness of intermittent versus continuous androgen deprivation therapy in advanced prostate cancer, University of Toronto, 2009 – present
5. Amy Tawfik (supervisor), 2009 - 2011
6. Matt Witkos (primary supervisor). MSc 2003, Department of Health Policy, Management, and Evaluation. Predictors of antiviral therapy in a cohort of post transfusion HCV patients.
7. Gabrielle van der Velde (primary supervisor), 2001- 2005. Utility assessment and decision modeling in patients with acute and chronic neck pain. MSc in clinical epidemiology- transferring to PhD
8. Mark Taylor (primary supervisor), 1997-99. Department: Clinical Epidemiology. Topic: Costs of liver transplantation: effects of clinical diagnosis, disease severity, and surgical complications. MSc in Clinical Epidemiology, completed in 1999.
9. Rob Nam (primary supervisor), 1998-2000. Department: Clinical Epidemiology. Topic: Genetic predictors of metastatic disease progression in prostate cancer: a case control study. MSc in Clinical Epidemiology completed in 2000.
10. Katina Tzanetos (primary supervisor), 2000-4. Department: Clinical Epidemiology. Topic: Characteristics of the Great Attending Physician.
11. Derek Wilke (thesis committee), 2000-2005. Department of Clinical Epidemiology. Topic: Probability tradeoffs in patients considering adjuvant hormonal therapy for localized prostate cancer.
12. Unni Narayanan (thesis committee), 2000-. Department of Clinical Epidemiology. Topic: Spontaneous vaginal delivery versus elective cesarian section in spina bifida infants: a decision analysis. In progress.
13. Yelena Potylitsina (primary supervisor), 2000-. MHSc Degree, Department of Laboratory Medicine

and Pathobiology. Topic: Meta-analysis of natural history studies in HCV infection. In progress.

14. Piotr Czaykowski (primary supervisor), 1997-1998. Department: Clinical Epidemiology. Topic: Cost-utility of adjuvant chemotherapy for colorectal cancer. Degree not completed.
15. Vanita Jassal (thesis committee), 1998-1999. Department: Clinical Epidemiology. Topic: Renal transplant in the elderly: a decision analysis. MSc completed in 1999.
16. Phil McFarland (thesis committee), 1999- . Department: Clinical Epidemiology. Topic: Cost-effectiveness of home nocturnal hemodialysis. In progress.
17. Sergio Rueda (thesis committee), 1999-2000. Institute of Medical Science. Topic: Adequacy of three quality of life measures for dementia: patient and family input. MSc completed in 1999.
18. Shabbir Alibhai (thesis committee), 1999- Department of Clinical Epidemiology. Topic: Age and co-morbidity as predictors of treatment choice for patients with localized prostate cancer. Completed 2002.

Undergraduate

1. Judy Chou, 2009
2. Man Wah Yeung, 2008 – 2009
3. Victoria Leung, 2009
4. Kevin Schwartz (co-supervisor), 2004.
5. Chris Chong, 2002-2003. Utilities in hepatitis C patients.
6. Jamil Asaria (primary supervisor), 1999. National survey of practice patterns among urologists and radiation oncologists.
7. Anil Srivastava (primary supervisor), 1995, Topic: Utilities for impotence: self health and standardized health states.

Thesis Committee

1. Rebecca Waldie
2. Kavisha Jayasundera
3. Mallory Tsao
4. Aysegul Erman
5. Mina Tadrous
6. Dolly Han
7. Sojung Lee
8. Chang Ho Lee
9. Jamie Lineen
10. Stephanie Choi

This is Exhibit "C" referred to in the
Affidavit of Murray Krahn
sworn before me,
this 16th day of March, 2015

A COMMISSIONER FOR TAKING AFFIDAVITS

Wendong Chen, MD, PhD

Independent Health Economist, Normin Health

000235

Assistant Professor (status only),
Division of Social and Administrative Pharmacy
Leslie Dan Faculty of Pharmacy, University of Toronto

Investigator, Toronto Health Economics and Technology Assessment Collaborative (THETA),
University of Toronto

723-2 Eva Road, Toronto, Ontario, Canada M9C 0A9
Phone (416) 604-1287; Mobile (647) 289-3918
wendong.chen@normin.ca

A. DATE PREPARED: November 4, 2014

B. BIOGRAPHICAL INFORMATION

1. EDUCATION

1991-1996	Bachelor of Medicine Beijing University, Beijing, China
2000	Introduction to Product Management, IMS HEALTH, Shanghai, China
2002	Evidence-based Clinical Practice and Health Technology Assessment, Copenhagen Trial Unit, University of Copenhagen, Copenhagen, Denmark.
2005-2009	Research Trainee National Canadian Research Training Program in Hepatitis C, Toronto, Canada
2010	Health Care Management in United Kingdom: the application of National Institute for Health and Clinical Excellence (NICE). London, UK.
2005-2010	Doctor of Philosophy Department of Health Policy, Management and Evaluation, University of Toronto Thesis: Chronic Hepatitis C infection among Immigrants Living in Canada: Natural History, Disease Burden, and Cost-effectiveness of Screening Primary supervisor: Dr. Murray Krahn; Co-supervisor: Dr. Jenny Heathcote

2. EMPLOYMENT

1996-1999	Research Associate, Department of Pharmacology, Xuanwu Hospital, Capital University of Medical Sciences, Beijing, China
1999-2001	Product Manager, Division of Marketing, Merck Beijing Representative Office, Beijing, China.
2001-2003	Cochrane Systematic Reviewer, The Cochrane Heapto-Biliary Review Group, University of Copenhagen, Copenhagen, Denmark.
2003-2004	Research Associate, Department of Medicine, University Health Network,

	Toronto, Canada.
2010-2012	Senior Scientific Associate, Department of Medicine, Toronto General Hospital, University Health Network, Toronto, Canada
2012-Present	Independent Health Economist, Normin Health, Toronto, Canada

3. ACADEMIC APPOINTMENT

2010-present	Assistant Professor, Division of Social and Administrative Pharmacy Leslie Dan Faculty of Pharmacy, University of Toronto
2010-present	Investigator, Toronto Health Economics and Technology Assessment Collaborative (THETA), University of Toronto
2010-present	Adjunct Scientist, China National Health Development Research Center, Ministry of Health of People's Republic of China

4. TEACHING EXPERIENCE

2005	University of Toronto: Summer student supervisor. Summer student: Terence Wong, undergraduate at University of Toronto Project: The relationship between body mass index and chronic hepatitis C
2006	University of Toronto: Summer student supervisor. Summer student: Ayaaz Sachedina, undergraduate at University of Western Ontario. Project: The prevalence of comorbidities in patients with chronic hepatitis C
2007	University of Toronto: Teaching Assistant. Course name: Canadian Health Policy and Health Economic Evaluation. Faculty of Pharmacy, University of Toronto.
2008	University of Toronto: Tutorial leader. Course name: Canadian Health Policy and Health Economic Evaluation. Faculty of Pharmacy, University of Toronto.
2009	University of Toronto: Summer student supervisor. Summer student: Mo Yu, undergraduate at University of Toronto Project: Direct medical costs associated with patients with chronic hepatitis C.
2011	Core Faculty for 2011 HTA Summer Institute, Toronto, Canada
2012	Core Faculty for 2012 HTA Summer Institute, Toronto, Canada
2012	Core Faculty for 2012 HTA Workshop for Decision Makers in Beijing, China
2012	Academic Secretary and Core Faculty for 2012 Canadian Liver Foundation International Clinical Research Program in Hepatology
2012 to 2014	Course lecturer for pharmacoeconomics (PHM213H1)
2013	Summer student supervisor for Weifang Dai
2013	Supervisor for visiting fellows (Drs. Huaying Zhou and Zhengping Xiong)

2013	Lecturer for cost-effectiveness analysis for economic evaluation course at HPME
2013 to 2014	4th undergraduate research course supervisor for Irfan Nagi
2013 to 2014	Neda Ebrahimi's PhD committee member
2014	Lecturer for cost-effectiveness analysis for graduate research methods course at pharmacy, U of T

5. HONOURS AND AWARDS

2005	Doctoral Award, National Canadian Research Training Program in Hepatitis C
2006	Province of Ontario Graduate Award
2006	Second Prize for Oral Presentation, Toronto Western Hospital Research Day
2007	Province of Ontario Graduate Award
2007	Graduate Award, Canadian Liver Foundation
2007	Trainee Travel Award, Canadian Agency for Drugs and Technologies in Health 2007 Symposium
2008	Best Student Podium Presentation, International Society for Pharmacoeconomics and Outcomes Research (ISPOR) 13th Annual International Meeting
2008	Trainee Travel Award, Canadian Agency for Drugs and Technologies in Health 2008 Symposium
2009	Trainee Travel Award, Canadian Agency for Drugs and Technologies in Health 2009 Symposium
2011	Poster Finalist Award, International Society for Pharmacoeconomics and Outcomes Research (ISPOR) 16th Annual International Meeting in Baltimore, USA.

6. PROFESSIONAL AFFILIATIONS AND ACTIVITIES

A. PROFESSIONAL MEMBERSHIPS

2005-present	Canadian Association for the Study of the Liver
2005-present	Society for Medical Decision Making
2005-present	International Society for Pharmacoeconomics and Outcomes Research
2005-present	International Health Economics Association

B. RESEARCH AWARDS

Salary support

2005-2009	Doctoral Award National Canadian Research Training in Hepatitis C

$88,000

2006 Province of Ontario Graduate Award
Government of Ontario
$15,000

2007 Province of Ontario Graduate Award
Government of Ontario
$15,000

2008-2010 Graduate Award
Canadian Liver Foundation
$40,000

Approved operating grants

2009 Patterns of care and direct medical costs associated with type 2 diabetes in China and Canada: comparisons between a developing country and a developed country (Letter of Intent).
Funding agency: Canadian Institutes of Health Research
Funding approved: $10,000
Principal Investigator: Murray Krahn
Co-Investigators: **Wendong Chen**, Baiju Shah, Zhengzhong Zhang, Kun Zhao

2011-2012 The burden of chronic hepatitis C under the patterns of current care in British Columbia, Canada.
Funding agency: Canadian Liver Foundation
Funding approved: $375,275
Principal Investigator: Murray Krahn
Co-Investigators: **Wendong Chen**, Mel Krajden.

2012 Comparing microsimulation model versus Markov model in assessing the cost-effectiveness of low-dose computed tomography for lung cancer screening in heavy smokers.
Funding agency: Canadian Partnership Against Cancer
Funding approved: $15,000
Principal Investigator: **Wendong Chen**
Co-Investigators: Murray Krahn

2012 Cost-effectiveness of antiviral therapy for chronic hepatitis B: a systematic review
Funding source: BMS unrestricted research grant
Funding approved: $60,000
Principal Investigator: **Wendong Chen**

2013 Tumor response, toxicity, and hospital costs associated with patients with advanced non-squamous non-small cell lung cancer
Funding source: Eli Lilly unrestricted health outcomes research grant
Funding approved: $160,000
Principal Investigator: **Wendong Chen**

2013 Clinical effectiveness and hospital costs associated with vancomycin and linezolid for treating hospitalized-acquired pneumonia in a tertiary hospital setting: a retrospective cohort study
Funding source: Eli Lilly unrestricted health outcomes research grant
Funding approved: $46,000
Principal Investigator: **Wendong Chen**

2013 The fifth revision plan for the long-term predictions in a hepatitis C compensation cohort in Canada.
Funding source: The hepatitis C compensation settlement trust fund
Funding approved: $200,000
Principal Investigator: Murray Krahn; Co-principal investigator: **Wendong Chen**

2014 Clinical effectiveness, toxicity, and cost-effectiveness of bortezomib for multiple myeloma: a systematic review
Funding source: J & J unrestricted research grant
Funding approved: $50,000
Principal Investigator: **Wendong Chen**

C. PUBLICATIONS

Peer-Reviewed

1. Yan Wang, Jianhua Chen, Shengqi Wu, Chenping Hu, Xiaoling Li, Yuqin Wang, Yicheng Yang, Narayan Rajan, Yun Chen, Yi Chen, Zhuanzhuan Luo and **Wendong Chen**. Clinical Effectiveness and Clinical Toxicity Associated with Platinum-Based Doublets in the First-Line Setting for Advanced Non-Squamous Non-Small Cell Lung Cancer in Chinese Patients: A Retrospective Cohort Study. BMC Cancer 2014; 14:937.
2. Yuanlin Song, Yicheng Yang, **Wendong Chen,** Wei Liu, Kai Wang, Xuehai Li, Ke Wang, Manny Papadimitropoulos, William Montgomery. Clinical response and hospital costs associated with the empirical use of vancomycin and linezolid for hospital-acquired pneumonia in a Chinese tertiary care hospital: a retrospective cohort study. Journal of ClinicoEconomics and Outcomes Research 2014;6: 451-461.
3. Chengping Hu, Yan Wang, Jianhua Chen, Shengqi Wu, Xiaoling Li, Yuqin Wang, Yicheng Yang, Narayan Rajan, Manny Papadimitropoulos, Qiong Xiao, Huan Zhan, **Wendong Chen**. Tumor Response and Clinical Toxicity Associated with Second-Line Chemotherapy Regimens for Advanced Non-Squamous Non-Small Cell Lung Cancer: A Retrospective Cohort Study. Thoracic Cancer 2014;5(5):365-376.
4. Krahn MD, Bremner KE, Zagorski B, Alibhai SM, **Chen W**, Tomlinson G, Mitsakakis N, Naglie G.Health Care Costs for State Transition Models in Prostate Cancer. Med Decis Making. 2013 Jul 26.
5. **Chen W.** Economic burden of liver cancer and economic evidence of interventions preventing liver cancer in low or middle-income countries. Disease Control Priorities, Third Edition (2014). World Bank.
6. **Chen W**, Tomlinson G, Krahn M, Heathcote J. Immigrant Patients with Advanced Fibrosis and Hepatitis C Infection have a higher risk of hepatocellular carcinoma. Journal of viral hepatitis 2012; 19(8): 574-80.
7. Pham B, Stern A, **Chen W**, et al. Preventing pressure ulcers in long-term care: a cost-

effectiveness analysis. Arch Intern Med. 2011;171(20):1839-47.

8. **Chen W**, Wong T, Tomlinson G, Krahn M, Heathcote EJ. Prevalence and predictors of obesity among individuals with positive hepatitis C antibody in a tertiary referral clinic. J Hepatol. 2008;49(5):711-7.
9. Veldt BJ, **Chen W**, Heathcote EJ, Wedemeyer H, Reichen J, Hofmann WP, de Knegt RJ, Zeuzem S, Manns MP, Hansen BE, Schalm SW, Janssen HL. Increased risk of hepatocellular carcinoma among patients with hepatitis C cirrhosis and diabetes mellitus. Hepatology 2008;47(6):1856-62.
10. Siersma V, Als-Nielsen B, **Chen W**, Hilden J, Gluud LL, Gluud C. Multivariable modelling for meta-epidemiological assessment of the association between trial quality and treatment effects estimated in randomized clinical trials. Stat Med. 2007;26(14):2745-58.
11. **Chen W**, Krahn M. Review: Ribavirin is not better than placebo in chronic hepatitis C infection. ACP J Club. 2006. 145(2):47.
12. Klingenberg SL, **Chen W**. D-penicillamine for primary sclerosing cholangitis. The Cochrane Library. 2006. Issue 1.
13. **Chen W**, Gluud C. Hepatitis B vaccine for healthcare workers. The Cochrane Library. 2005. Issue 4.
14. **Chen W**, Gluud C. Bile acids for liver transplanted patients. The Cochrane Library. 2005. Issue 3.
15. **Chen W**, Gluud C. Glucocorticosteroids for primary sclerosing cholangitis. The Cochrane Library. 2004. Issue 3.
16. Als-Nielsen B, **Chen W**, Gluud C, Kjaergard LL. Association of funding and conclusions in randomized drug trials: a reflection of treatment effect or adverse events? JAMA.2003.290(7):921-8.
17. **Chen W**, Liu J, Gluud C.Bile acids for viral hepatitis.The Cochrane Library.2003.Issue 2.
18. **Chen W**, Gluud C. Bile acids for primary sclerosing cholangitis. The Cochrane Library. 2003. Issue 2.

Abstracts-Refereed

1. **Chen W**, Tomlinson G, Krahn M, Heathcote J. High Risk of Hepatocellular Carcinoma Associated with Immigrant Patients with Advanced Fibrosis and Hepatitis C Infection from a Tertiary Referral Clinic in Toronto, Canada. HEPATOLOGY. 2009; 50(4) suppl: 673A.
2. **Chen W**, Tomlinson G, Heathcote EJ, Krahn M. Disease burden and lifetime direct medical costs of chronic hepatitis C infection among immigrants living in Canada. HEPATOLOGY 2009;50(4) suppl: 658A.
3. **Chen W**, Zagorski, M. Krajden, Heathcote EJ, Krahn M. Population-derived estimates of direct medical costs among late-stage hepatitis C patients with diabetes. HEPATOLOGY 2008;47 (4): 120A.
4. **Chen W**, Dinner K, Wong T, et al. A cost-effectiveness analysis of hepatitis C screening among immigrants in Canada. HEPATOLOGY 2007;46 (4): 891A.
5. **Chen W**, Wong T, Tomlinson G, Krahn M, Heathcote EJ. Prevalence and predictors of obesity among individuals with positive hepatitis C antibody in a tertiary referral clinic. HEPATOLOGY. 2007;46 (4): 632A.
6. **Chen W**, Cope S, Watkins J, Heathcote J, Krahn M. Primary prevention of esophageal variceal bleeding among cirrhotic patients with hepatitis C and grade 2 to 3 esophageal varices: a cost-utility analysis. Gastroenterology. 2006.130 (suppl 2): A811.
7. **Chen W**, Wong T, Heathcote J, Krahn M. Prevalence and predictors of high body mass index among native born and immigrant patients with chronic hepatitis C in Canada. Gastroenterology. 2006.130 (suppl 2):A780.

8 **Chen W**, Nikolova D, Frederiksen SL, Gluud C. Beta-blockers for the prevention of first variceal

bleeding in cirrhotic patients with oesophageal varices. [A Cochrane systematic review]. Journal of Hepatology. 2004;40(S1):67.

9 **Chen W**, Gluud C. Bile acids for primary sclerosing cholangitis [A Cochrane systematic review]. Journal of Hepatology. 2003;38(S2):205.

D. PRESENTATIONS AND SPECIAL LECTURES

Invited lectures

August 2010	How to apply Markov model to estimate the disease burden. China National Health Development Research Center. Beijing, China.
August 2010	How to apply Markov model to estimate the disease burden. Chinese Center for Disease Control and Prevention. Beijing, China.
November 2010	Cost-Effectiveness of Epidermal Growth Factor Receptor Gene Mutation Testing For Patients with Advanced Non-Small Cell Lung Cancer Living in Ontario. Cancer Care Ontario. Toronto, Canada.
March 2011	Cost-Effectiveness of Epidermal Growth Factor Receptor Gene Mutation Testing For Patients with Advanced Non-Small Cell Lung Cancer Living in Ontario. The third teaching hospital of Hebei Medical University, Shijiazhuang, China.
November 2011	Chronic hepatitis C and immigrants living in Canada. Canadian Liver Foundation. Toronto, Canada.
May 2012	Applications of disease mathematical model in healthcare: from clinical research to health policy making • The second teaching hospital of Central-South University, Changsha, China • The third teaching hospital of Central-South University, Changsha, China • Hunan Provincial People Hospital, Changsha, Hunan, China • Hunan Cancer Hospital, Changsha, China • Hunan Children Hospital, Changsha, China • The second teaching hospital of Sichuan University, Chengdu, China • Beijing Cancer Hospital, Beijing University, Beijing, China • Xuanwu Hospital, Capital University of Medical Sciences, Beijing, China
August 2012	Chronic hepatitis C among immigrants living in Canada: natural history, disease burden, and cost-effectiveness of screening. Leslie Dan Faculty of Pharmacy, University of Toronto

Oral presentations at meetings

March 2003	A lecture on systematic review of bile acids for liver diseases. The 15th Gastroenterology International Club Meeting, Naples, Italy.
July 2003	A lecture on systematic review of bile acids for liver diseases. The 38th annual meeting of European Association for the Study of the Liver, Geneva, Switzerland.
April 2004	A lecture on systematic review of bile acids for liver transplanted patients. The 39th annual meeting of European Association for the Study of the Liver, Berlin,

	Germany.
April 2004	A lecture on systematic review of beta-blockers for the first variceal bleeding in cirrhotic patients. The 39th annual meeting of European Association for the Study of the Liver, Berlin, Germany. April 16, 2004.
November 2004	A lecture on systematic review of bile acids for variceal rebleeding in cirrhotic patients. The 55th annual meeting of American Association for the Study of Liver Diseases, Boston, USA.
April 2006	Prevalence and predictors of high body mass index among native born and immigrant patients with chronic hepatitis C in Canada. The 3nd annual meeting of Canadian Association for the Study of the Liver, Toronto, Canada.
March 2007	A cost-effectiveness analysis of hepatitis C screening among immigrants in Canada. The 2nd annual meeting of Canadian Association for the Study of the Liver, Banff, Canada.
May 2008	A cost-effectiveness analysis of hepatitis C screening among immigrants in Canada. The 13th annual meeting of International Society of Pharmcoeconomics and Outcome Research in Toronto, Canada.
October 2008	Health economic evaluation of pressure ulcer prevention options in long-term care setting across Ontario, Canada. The 30th annual meeting of the Society for Medical Decision Making in Philadelphia, USA.
November 2008	Population-derived estimates of direct medical costs among late-stage hepatitis C patients with diabetes. The 59th annual liver meeting of American Association for the Study of Liver Diseases. San Francisco, USA.
Februrary 2009	Population-derived estimates of direct medical costs among late-stage hepatitis C patients with diabetes. 4th Annual meeting of Canadian Association for the Study of the Liver. Banff, Canada.
March 2009	Population-derived estimates of direct medical costs among late-stage hepatitis C patients with diabetes. The Sheila Sherlock Research Day. Toronto, Canada.
March 2009	High risk of hepatocellular carcinoma associated with immigrant patients with advanced fibrosis and hepatitis C infection from a tertiary referral clinic in Toronto, Canada. The Sheila Sherlock Research Day. Toronto, Canada.
May 2009	Population-derived estimates of direct medical costs among late-stage hepatitis C patients with diabetes. Toronto Western Hospital Research Day. Toronto, Canada.
July 2009	Population-derived estimates of direct medical costs among late-stage hepatitis C patients with diabetes. The 7th World Congress of Health Economics, International Health Economics Association, Beijing China.
July 2009	Health economic evaluation of pressure ulcer prevention options in long-term care setting across Ontario, Canada. The 7th World Congress of Health Economics, International Health Economics Association, Beijing China.
October 2009	Diseases burden and lifetime direct medical costs of chronic hepatitis C among immigrants living in Canada. The 31th annual meeting of the Society for Medical Decision Making in Los Angeles, USA.
April 2011	Cost-effectiveness of EGFR gene mutation testing for patients with advanced non-small cell lung cancer living in Ontario. 2011 CADTH Symposium. Vancouver, Canada.
June 2011	Cost-effectiveness of EGFR gene mutation testing for patients with advanced non-small cell lung cancer living in Ontario. HTAi 2011 Annual Conference. Rio de Joneiro, Brazil.
October 2011	Cost-effectiveness of EGFR gene mutation testing for patients with advanced non-small cell lung cancer living in Ontario. The 33th annual meeting of the Society for

	Medical Decision Making in Chicago, USA.
September 2013	Cost-effectiveness of image-based methods for HCC screening: a systematic review. The 7th International Liver Cancer Association Annual Meeting in Washington DC

Post presentations at meetings

May 2003	**Chen W**, Gluud C. Bile acids for primary sclerosing cholangitis [A Cochrane systematic review]. The 39th annual meeting of European Association for the Study of the Liver, Berlin, Germany.
April 2004	**Chen W**, Nikolova D, Frederiksen SL, Gluud C. Beta-blockers for the prevention of first variceal bleeding in cirrhotic patients with oesophageal varices. [A Cochrane systematic review]. The 38th annual meeting of European Association for the Study of the Liver, Geneva, Switzerland.
May 2006	**Chen W**, Cope S, Watkins J, Heathcote J, Krahn M. Primary prevention of esophageal variceal bleeding among cirrhotic patients with hepatitis C and grade 2 to 3 esophageal varices: a cost-utility analysis. Digestive Diseases Week. Los Angeles, USA
May 2006	**Chen W**, Wong T, Heathcote J, Krahn M. Prevalence and predictors of high body mass index among native born and immigrant patients with chronic hepatitis C in Canada. Digestive Diseases Week. Los Angeles, USA
October 2007	**Chen W**, Dinner K, Wong T, et al. A cost-effectiveness analysis of hepatitis C screening among immigrants in Canada. The 29th annual meeting of the Society for Medical Decision Making in Pittsburg, USA.
November 2007	**Chen W**, Dinner K, Wong T, et al. A cost-effectiveness analysis of hepatitis C screening among immigrants in Canada. The 58th annual meeting of American Association for the Study of Liver Diseases in Boston, USA.
November 2007	**Chen W**, Wong T, Tomlinson G, Krahn M, Heathcote EJ. Prevalence and predictors of obesity among individuals with positive hepatitis C antibody in a tertiary referral clinic. The 58th annual meeting of American Association for the Study of Liver Diseases in Boston, USA.
November 2009	**Chen W**, Tomlinson G, Krahn M, Heathcote J. High Risk of Hepatocellular Carcinoma Associated with Immigrant Patients with Advanced Fibrosis and Hepatitis C Infection from a Tertiary Referral Clinic in Toronto, Canada. The 60th annual meeting of American Association for the Study of Liver Diseases. Boston, USA
November 2009	**Chen W**, Tomlinson G, Heathcote EJ, Krahn M. Disease burden and lifetime direct medical costs of chronic hepatitis C infection among immigrants living in Canada. The 60th annual meeting of American Association for the Study of Liver Diseases in Boston, USA.
October 2010	Pharmcogenetic testing and evidence-based decision making in Ontario: The application of Ontario's decision determinants framework to the evaluation of pharmacogenetic tests. The 32th annual meeting of the Society for Medical Decision Making in Toronto, Canada.
May 2011	**Chen W**, Ellis P, Krahn M. Cost-effectiveness of EGFR gene mutation testing for patients with advanced non-small cell lung cancer living in Ontario. International Society for Pharmacoeconomics and Outcomes Research (ISPOR) 16th Annual International Meeting in Baltimore, USA.
July 2011	**Chen W**, Ellis P, Krahn M. Cost-effectiveness of EGFR gene mutation testing for patients with advanced non-small cell lung cancer living in Ontario. The 8th World Congress of Health Economics, International Health Economics Association in Toronto, Canada.

October 2013	Chenping Hu, Yan Wang, Jianhua Chen, Shengqi Wu, Xiaoling Li, Yuqin Wang, Yicheng Yang, Narayan Rajan, Manny papadimitropoulos, Qiong Xiao, **Wendong Chen.** Tumor response, toxicity, and hospital costs associated with chemotherapy regimens in second-line setting for advanced non-squamous non-small cell lung cancer. The 15th World Lung Cancer Conference. Sydney, Australia.
October 2013	Huaying Zhou, Weifang Dai, Guozhong Gong, **Wendong Chen**. PREDICTORS FOR DOSE REDUCTION CAUSED BY HEMATOLOGICAL ADVERSE EVENTS IN PATIENTS WITH ADVANCED FIBROSIS RECEIVING PEGYLATED INTERFERON PLUS RIBAVIRIN FOR CHRONIC HEPATITIS C: A SYSTEMATIC REVIEW AND META-REGRESSION ANALYSIS. The 35th Annual Meeting of the Society for Medical Decision Making. Boston, USA.
November 2013	Zhengpin Xiong, **Wendong Chen**, Morris Sherman. Cost-effectiveness of image-based methods for HCC screening: a systematic review. The 64th Annual Meeting of the American Association for the Study of Liver Diseases: The Liver Meeting 2013. Washington DC. USA.
September 2014	• Hospital costs associated with platinum-based doublets in the first-line setting for advanced non-squamous non-small cell lung cancer in China: a retrospective cohort study • Cost-effectiveness of antiviral therapy for chronic hepatitis B: a systematic review • Clinical response and hospital costs associated with the empirical use of vancomycin and linezolid for hospital-acquired pneumonia in a Chinese tertiary care hospital: a retrospective cohort study The 6th ISPOR Asia-Pacific conference in Beijing, China

E. MEDIA REPORTS

March 6, 2012	Interviewed by OMNI TV on the high risk of liver cancer among immigrants with chronic hepatitis C.
March 7, 2012	Ming Pao newspaper reported the release of the publication on high risk of liver cancer among immigrants with chronic hepatitis C.
March 12, 2012	Phone interview with Fairchild Radio (FM88.9) about the high risk of chronic hepatitis C among immigrants from developing countries.

This is Exhibit "D" referred to in the
Affidavit of Murray Krahn
sworn before me,
this 16th day of March, 2015

A COMMISSIONER FOR TAKING AFFIDAVITS

CURRICULUM VITAE

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EDUCATION:

9/1996 – 1999.	MSc. in Biostatistics, Public Health Sciences, University of Toronto, Canada
9/85 – 7/1990	Ph.D. in Medical Statistics. School of Public Health, Shanghai Medical University, China
9/1978 – 1/1982	Bachelor in Medicine, Yang Zhou Medical School, Yang Zhou University, China

WORK & RESEARCH EXPERIENCE:

8/2005 –	Senior Biostatistician, Canadian Blood Services; Adjunct professor, University of Toronto and University of Ottawa
1/2001 – 8/2005	Biostatistician. Princess Margaret Hospital
1/2001 – 8/2007	Associate professor. Public Health Sciences, University of Toronto
4/1999 – 1/2001	Biostatistician. Canadian Cardiovascular Collaboration. McMaster University
11/1997 – 1999	Statistical Consultant (part time), Pasteur Merieux Connaught Company (Aventis)
10/1992 – 3/1996	Research Fellow in Epidemiology. Purdue University, United States
6/1990 – 10/1992	Assistant Professor in Medical Statistics, School of Public Health, Shanghai Medical University, China

KNOWLEDGE AND PROFESSIONAL SKILLS:

- Statistics, Medicine (Internal Diseases) and Epidemiology
- Computer Skills: SAS and Splus, etc.

TEACHING EXPERIENCE:

- Taught **Statistics** at George Brown College in Toronto for one semester
- Teaching assistant in **Categorical Data Analysis** at University of Toronto, Canada
- Teaching assistant in **Biostatistics** at University of Toronto, Canada
- Teaching assistant in **Epidemiology** at Purdue University, US
- Taught **Medical Statistics** for two years at Shanghai Medical University
- Taught **Multivariate Analysis in Medical Statistics** for one year at Shanghai Medical University

AWARDS:

1997	Two years University of Toronto open scholarship
1992	Fogarty International Research Fellowship by the National Institutes of Health, U.S.A. (Post doctoral training in Epidemiology for two years)
1991	Ho,Yingdong National Young Teacher Prize ($1000) by HOYINGDONG Foundation in Hong Kong

REVIEWER:

1. American Journal of Epidemiology
2. Statistics in Medicine
3. Controlled Clinical Trials
4. Psychology
5. Vox Sanguinis
6. Grant review panel member for Office of the Chief Scientist, Innovative Science Competition, Health Canada in 2003-2004 and 2004-2005

PUBLICATIONS:

1. Yi Q, Wang PP, He Y. Reliability analysis for continuous measurements: Equivalence test for agreement. Stat Med. 2008 Jul 10;27(15):2816-25.
2. Yi Q. Panzarella T. Corey P. Incorporating the sampling variation of the disease prevalence when calculating the sample size in a study to determine the diagnostic accuracy of a test. . [Journal Article] *Controlled Clinical Trials. 2004* August 2004, Pages 417-427
3. Yi Q. Wang PP. Krahn M. Improving the accuracy of long-term prognostic estimates in hepatitis C virus infection. [Evaluation Studies. Journal Article] *Journal of Viral Hepatitis. 11(2):166-74, 2004 Mar.*
4. Yi Q. Panzarella T. Estimating sample size for tests on trends across repeated measurements with missing data based on the interaction term in a mixed model. [Journal Article] *Controlled Clinical Trials. 23(5):481-96, 2002 Oct.*
5. Yi Q. Zhang Z. The survival analyses of 2738 patients with simple pneumoconiosis. [Journal Article] *Occupational & Environmental Medicine. 53(2):129-35, 1996 Feb.*
6. Yi Q. Glickman LT. Computer simulation analysis of Sartwell's incubation period model for diseases with uncertain etiology. The effect of competing risk. [Journal Article] *American Journal of Epidemiology. 142(3):363-8, 1995 Aug .*
7. McKelvey K, Attonito J, Madhivanan P, Yi Q, Mzayek F, Maziak W. Nicotine Tob Res. Determinants of Cigarette Smoking Initiation in Jordanian Schoolchildren: Longitudinal Analysis. 2014 Aug 20
8. McKelvey K, Attonito J, Madhivanan P, Jaber R, Yi Q, Mzayek F, Maziak W. Determinants of waterpipe smoking initiation among school children in Irbid, Jordan: a 4-year longitudinal analysis. Drug Alcohol Depend. 2014 Sep 1;142:307-13
9. Taha M, Kalab M, Yi QL, Landry C, Greco-Stewart V, Brassinga AK, Sifri CD, Ramirez-Arcos S. Biofilm-forming skin microflora bacteria are resistant to the bactericidal action of disinfectants used during blood donation. Transfusion. 2014 Nov;54(11):2974-82
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11. O'brien SF[1], Xi G[2], Fan W[2], Yi QL[1], Osmond L[2], Delage G[3], Goldman M[4] Are donors in Canada compliant with deferral for tattoos and piercing? Blood Transfus. 2014 Jan;12(1):141-2.
12. Hansen AL, Turner TR, Yi QL, Acker JP. Quality of red blood cells washed using an automated cell processor with and without irradiation. Transfusion. 2013 Nov 14.
13. Lieberman L, Maskens C, Cserti-Gazdewich C, Hansen M, Lin Y, Pendergrast J, Yi QL, Callum J. A retrospective review of patient factors, transfusion practices, and outcomes in patients with transfusion-associated circulatory overload. Transfus Med Rev. 2013 Oct;27(4):206-12.
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15. O'Brien SF, Goldman M, Scalia V, Yi QL, Fan W, Xi G, Dines IR, Fearon MA. The epidemiology of human T-cell lymphotropic virus types I and II in Canadian blood donors. Transfus Med. 2013 Jul 17.
16. Lieberman L, Petraszko T, Yi QL, Hannach B, Skeate R. Transfusion-related lung injury in children: a case series and review of the literature. Transfusion. 2014 Jan;54(1):57-64.
17. O'Brien SF, Uzicanin S, Choquet K, Yi QL, Fan W, Goldman M. Impact of changes to policy for Mexican risk travel on Canadian blood donor deferrals. Blood Transfus. 2013 Oct;11(4):580-4.
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19. Hansen A, Yi QL, Acker JP. Quality of red blood cells washed using the ACP 215 cell processor: assessment of optimal pre- and postwash storage times and conditions. Transfusion. 2013 Mar 22. doi: 10.1111/trf.12170. [Epub ahead of print]
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BOOK or JOURNAL PUBLICATIONS in Chinese:

1. **Yi, Qilong**, Multilevel analysis, in <<Applied Methods for Medical Research>> by Wang JH. Published in Peiking China , 2003, P464-480.

2. **Yi,Qi-long,** Survival analysis, In Encyclopedia of Medicine in China, Vol. I, Preventive Medicine. Edited by Gu Xueqi et al. Published by Shanghai Scientific and Technological Publish Co. 1992, P355-361.

3. Cai Wen-Wei, Yu Shun-Zhang and **Yi, Qilong** (Editors). ACTA ACADEMIAE MEDICINAE SHANGHAI, Vol.20, Supplement (Health Service in Shanghai Country) 1993.

4. Shong Weiming, Cao Shuhua and **Yi, Qilong**. <<Multivariate Analysis in Medical Statistics>>, Published by Shanghai Medical University Press. 1993

This is Exhibit "E" referred to in the
Affidavit of Murray Krahn
sworn before me,
this 16th day of March, 2015

A COMMISSIONER FOR TAKING AFFIDAVITS

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Education

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- 1999 – 2000, M.Math. in Computer Science (Database), University of Waterloo, Ontario, Canada
- 1995 – 1999, B.Sc. in Computer Science and Statistics, York University, Ontario, Canada

Academic Appointment

- 2013 – current, Assistant Professor (status), Leslie Dan Faculty of Pharmacy, University of Toronto, Toronto, Ontario, Canada
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External Grant

- **Wong W.W.L.** (PI), Krahn M., Bruneau J., Feld J., Feng Z.Z., Lee S.S., Mitsakakis, N. Myers, R.P., Pechlivanoglous, P., Powis, J., Rac, V.E. Cross sectional and longitudinal measures of quality of life and utility among patients with chronic hepatitis C virus infection, *Canadian Institutes of Health Research (CIHR) Operating Grant*, Ottawa, Ontario, Canada. ($100,000) 2014 – 2015.
- **Wong W.W.L.** (PI), Sander B., Deeks S., Murphy K.J. Canadian Partnership Against Cancer's (CPAC) Cancer Risk Management Model (CRMM) Evaluation Case Study: The Cost-Effectiveness of Integrated Cervical Cancer Prevention Strategies in Ontario, Canadian Partnership Again Cancer, Toronto, Ontario, Canada ($15,000) 2014.
- Chan K., Feld J., Hicks L., Krahn M., Pritchard K., **Wong W.W.L.** Clinical Effectiveness and Cost-Effectiveness of HBV Screening Before Adjuvant Chemotherapy in Patients with Early Stage Breast Cancer: A Modeling Perspective, *Canadian Breast Cancer Foundation Research Project Grant*, Toronto, Ontario, Canada. ($105,040) 2013– 2014.

- Thein H., Dore G., Earle C.C., Feld J., Fisman D.N., Krahn M., **Wong W.W.L.** A pharmacoeconomic policy model for hepatitis C: development and applications, *Canadian Institutes of Health Research (CIHR) Operating Grant*, Ottawa, Ontario, Canada. ($133,475) 2011 – 2013.
- Thein H., Earle C.C., Isaranuwatchai W., Oliverira C., Tinmouth J., **Wong W.W.L.** Canadian Partnership Against Cancer's (CPAC) Cancer Risk Management Model (CRMM) Evaluation Case Study: Prevention for Colorectal Cancer, Canadian Partnership Again Cancer, Toronto, Ontario, Canada ($15,000) 2011.

External Grant Under Review

- **Wong W.W.L.** (PI). Computational Methods in Drug Discovery, *Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant*, Ottawa, Ontario, Canada. ($210,750) 2015 – 2020.
- **Wong W.W.L.** (PI). Better Health System through Computation, *Canadian Institutes of Health Research (CIHR) New Investigator Award,* Ottawa, Ontario, Canada. ($300,000) 2015 – 2020.
- Rac V., Abrahamyan L., Carcone S., Fan I., Krahn M., Shahid N. Sahakyan Y. **Wong W.W.L.** Evaluation of Telehomecare Intervention for Patients with Heart Failure. Heart and Stroke Foundation of Canada (HSFC) Grants-in-Aid ($295,011) 2015 – 2018.
- Rac V., Abrahamyan L., Fan I., Krahn M., Shahid N. Sahakyan Y. **Wong W.W.L.** Evaluation of Telehomecare for patients with Heart Failure or Chronic Obstructive Pulmonary Disease. *Technology evaluation in the elderly network (TVN) Catalyst Grant Program.* ($100,000) 2015 – 2016.

Publications and Presentations

Refereed Journal

- **Wong W.W.L.**, Tu H-A., Feld, J., Wong, T., Krahn M. (2015). Cost-Effectiveness of Screening Hepatitis C in Canada. *Canadian Medical Association Journal (CMAJ)*, v187, 3:E110.
- Lee E.K, **Wong W.W.L.**, Trudeau M.E., Chan K.K. (2015). Cost-Effectiveness of Prophylactic Granulocyte Colony-Stimulating Factor for Febrile Neutropenia in Breast Cancer Patients Receiving FEC-D. *Breast Cancer Research and Treatment*, in press.
- Sander B., Ormanidhi O., **Wong W.W.L.**, Atkin, K., Murphy, J., Krahn M., and Deeks S. L. (2015). The Cost-Effectiveness of Integrated Cervical Cancer Prevention Strategies in the Ontario Setting – Can We Do Better? *International Journal of Cancer*, Revision Requested.
- **Wong W.W.L.**, Hicks L.K., Tu H-A, Pritchard K.I., Krahn M.D., Feld, J., Chan K.K.. (2015). Hepatitis B Virus Screening before Adjuvant Chemotherapy in Patients with Early Stage Breast Cancer: A Cost-Effectiveness Analysis. *Journal of the National Cancer Institute*, submitted.
- Riesco-Martinez M.C., Berry S., Ko Y., Mittmann N., Giotis A., Lien K., **Wong W.W.L.**, and Chan K.K. (2015). Cost effectiveness analysis of the use of EGFR

inhibitors for wild type (WT) KRAS unresectable metastatic Colorectal Cancer (mCRC). *Journal of Clinical Oncology*, submitted.

- Wijeysundera H., **Wong W.W.L.**, Bennell M., Fremes S. E., Radhakrishnan S., Peterson M., Ko, D.T. (2014). Impact of increasing wait times on the effectiveness of transcatheter aortic-valve replacement (TAVR) in high-risk and inoperable patients with severe aortic disease: a discrete event simulation model. *The Canadian Journal of Cardiology*, v30 10:1162-1169.
- **Wong W.W.L.**, Griesman, J., Feng, Z. (2014). Imputing Genotypes Using Regularized Generalized Linear Regression Models. *Statistical Applications in Genetics and Molecular Biology*, v13 5:519-529.
- **Wong W.W.L.**, Woo, G., Heathcote J.E., Krahn M. (2013). Disease Burden of Chronic Hepatitis B among Immigrants in Canada. *Canadian Journal of Gastroenterology*, v27, 3:137-147.
- Oliverira C., Nguyen V.H., Wijeysundera H., **Wong W.W.L.**, Woo, G., Grootendorst P., Liu P., Krahn M. (2013). Estimating the payoffs from cardiovascular disease research in Canada: an economic analysis. *CMAJ Open*, v1, 2:E83:E90.
- Nguyen V.H., Oliverira C., Wijeysundera H., **Wong W.W.L.**, Woo, G., Grootendorst P., Liu P., Krahn M. (2013). Canada's Contribution to Global Research in Cardiovascular Diseases. *The Canadian Journal of Cardiology*, v29, 6:742-746.
- Oliverira C., Nguyen V.H., Wijeysundera H., **Wong W.W.L.**, Woo, G., Liu P., Krahn M. (2012). How Much Are We Really Spending? The Estimation of the Expenditures on Cardiovascular Disease Research in Canada. *BMC Health Services Research*, v12:281.
- **Wong W.W.L.** and Burkowski F. J. (2011). Using Kernel Alignment to Select Features of Molecular Descriptors in a QSAR study, *IEEE Transactions on Computational Biology and Bioinformatics*, v8, 5:1373–1384.
- Feng Z., **Wong W.W.L.**, Gao X., Schenkel F. (2011). Generalized Genetic Association Study with Samples of related subjects, *Annals of applied statistics*, v5, 3:2109–2130.
- **Wong W.W.L.**, Woo, G., Heathcote J.E., Krahn M. (2011). Cost Effectiveness of Screening Immigrants to Canada for Hepatitis B. *Liver International*, v31, 8:1179–1190.
- **Wong W.W.L.** and Burkowski F. J. (2009). Predicting Multiple Binding Modes Using a Kernel Method Based on a Vector Space Model Molecular Descriptor, *International Journal of Computational Biology and Drug Design*, v2, 1:58–80.
- **Wong W.W.L.** and Burkowski F. J. (2009). A Constructive Approach for Discovering New Drug Leads: Using a Kernel Methodology for the Inverse-QSAR Problem, *Journal of ChemInformatics*, v1:4

Reports

- **Wong W.W.L**, Khoo E., Deeks S.L., Murphy J. and Sander B.. (2014). The Cost-Effectiveness of Integrated Cervical Cancer Prevention Strategies in Ontario. Canadian Partnership Against Cancer

- Murphy G., Farah B., **Wong W.W.L.**, Krahn M., Wells G., Chen L., Kelly S., Kaunelis D., Blouin J., Carrie A.. (2014). CADTH THERAPEUTIC REVIEW: Scientific Report: Direct Acting Antiviral Agents for Chronic Hepatitis C Genotype 1. Canadian Agency for Drugs and Technologies in Health
- **Wong W.W.L.**, Tu H.A., Chen W., Feld J., Krahn M... (2013). Cost-Effectiveness of Screening Hepatitis C in Canada. Toronto Health Economics and Technology Assessment Collaborative
- **Wong W.W.L.**, Tu H.A., Chen W., Feld J., Krahn M.. (2013). Development of an Economic Policy Model for Hepatitis C. Toronto Health Economics and Technology Assessment Collaborative

Dissertation

- **Wong W. W. L.** (2009). Kernel methods in Computer-Aided Constructive Drug Design, Ph.D. dissertation, David R. Cheriton School of Computer Science, University of Waterloo.

Presentations:

- 2015, Canadian Agency for Drugs and Technologies in Health (CADTH) Symposium, Saskatoon, SK, Canada. "Cost-effectiveness of a one-time national hepatitis C screening program: impact of a selective drug reimbursement policy" Oral presentation.
- 2014, Canadian Agency for Drugs and Technologies in Health, Canadian Drug Expert Committee Meeting, Ottawa, Ontario, Canada. "Economic evaluation of direct-acting antiviral therapy for chronic hepatitis C Genotype 1." Invited presentation
- 2014, The 36th Annual Meeting of the Society for Medical Decision Making, Miami, FL, U.S.A. "Cost-Effectiveness of Screening Hepatitis C in Canada." Poster Presentation.
- 2014, The 36th Annual Meeting of the Society for Medical Decision Making, Miami, FL, U.S.A. "Cost-Effectiveness of Hepatitis B Virus Screening Before Adjuvant Chemotherapy in Patients with Early Stage Breast Cancer." Poster Presentation.
- 2014, American Society of Clinical Oncology (ASCO) Quality Symposium, Boston, MA, U.S.A. "HBV screening before adjuvant chemotherapy in patients with early breast cancer: A cost-effectiveness analysis." Poster Presentation.
- 2013, WHO technical consultation on the use of mathematical modelling for viral hepatitis programme planning, Geneva, Switzerland. "Two potential hepatitis C policy models in Canada." Invited presentation.
- 2013, The 35th Annual Meeting of the Society for Medical Decision Making, Baltimore, MA, U.S.A. "The hepatitis C drug pipeline: Collaboration between academic and HTA agency partners to develop an early economic model." Oral presentation.
- 2013, Public Health Agency of Canada: Hepatitis C Virus: Burden and Screening in Canada Workshop, Ottawa, Ontario, Canada. "Cost-Effectiveness of screening hepatitis C in Canada." Invited presentation.

- 2012, The 34th Annual Meeting of the Society for Medical Decision Making, Phoenix, AZ, U.S.A. "A Parallel Sliding Region Algorithm to Make Agent-based Modeling for Large Scale Simulation." Poster presentation.
- 2011, The International Conference on Advances in Probability and Statistics, Hong Kong, China. "Kernel Alignment Feature Selection for Computational Drug Design." Oral presentation.
- 2011, The 3rd International Conference on Infectious Disease Dynamics, Boston, MA, U.S.A. "Developing a complex agent network model to predict HIV and HCV incidence in Canada." Poster presentation
- 2011, The 33rd Annual Meeting of the Society for Medical Decision Making, Chicago, IL, U.S.A. "Developing a Complex Agent Network Model to Predict HIV and HCV Incidence in Canada." Oral presentation.
- 2011, The 33rd Annual Meeting of the Society for Medical Decision Making, Chicago, IL, U.S.A. "Disease Burden of Chronic Hepatitis B among Immigrants in Canada." Poster presentation.
- 2010, American Association for the Study of Liver Diseases (AASLD) – The liver meeting, Boston, MA, U.S.A. "Cost Effectiveness of Screening Immigrants for Hepatitis B." Poster presentation.
- 2010, The 32nd Annual Meeting of the Society for Medical Decision Making, Toronto, ON, Canada. "Cost Effectiveness of Screening Immigrants for Hepatitis B in Canada." Poster presentation.
- 2010, International Conference on Statistics and Society, Beijing, China. "Generalized Genetic Association Study with Samples of Related Individuals." Oral presentation.
- 2010, Canadian Agency for Drugs and Technologies in Health (CADTH) Symposium, Halifax, NS, Canada. "Cost Effectiveness of Screening Immigrants to Canada for Hepatitis B." Poster presentation.

Research Experience

- **Postdoctoral Fellow,** 2010 – 2011, Department of Health Policy, Management & Evaluation, University of Toronto.
  - Project titled: "Model-based economic evaluation of hepatitis C treatment strategies in individuals co-infected with HIV in Canada".
  - Supervisor: Dr. M. Krahn
- **Postdoctoral Fellow,** 2009 – 2010, Department of Health Policy, Management & Evaluation, University of Toronto.
  - Project titled: "Cost-Effectiveness of Screening Immigrants to Canada for Hepatitis B".
  - Supervisors: Dr. J.E. Heathcote and Dr. M. Krahn
- **Research Assistant,** 2002–2009, School of Computer Science, University of Waterloo.
  - Project titled: "Kernel methods in Computer-Aided Constructive Drug Design".
  - Supervisor: Dr. F. J. Burkowski
- **Research Assistant,** 1999–2000, School of Computer Science, University of Waterloo.
  - Project titled: "QX: A System for Visualizing and Mapping XML with SQL".

Teaching Experience

- **Course Guest Lecturer,** 2013-2015, Leslie Dan Faculty of Pharmacy, University of Toronto
  - Course serve:
    - PHM425: Pharmacy practice research
    - PHM1128H: Introduction to Models and Methods of Research
    - PHM1132: Applied Health Economics
- **Course Tutor,** 2013-2014, Leslie Dan Faculty of Pharmacy, University of Toronto
  - Course serve:
    - PHM213: health economics and pharmacoeconomics
    - HAD5304: clinical decision-making and cost-effectiveness analysis
- **Course Instructor,** 2004 – 2009, School of Computer Science, University of Waterloo.
  - Courses taught:
    - *Introduction to Computer Usage* (winter 2009)
    - *Business Systems Analysis* (summer 2006).
    - *Introduction to Computer Programming* (fall 2004 and summer 2005).
- **Teaching Assistant,** 1999 – 2000, 2002 – 2007, School of Computer Science, University of Waterloo.
  - Distinguished Teaching Assistantship Award, 2002.
  - Served as a teaching assistant for various courses in all undergraduate levels including: *Principles of Computer Science*, *Foundations of Sequential Programs*, *Computer Organization & Design*, *Introduction to Algorithm*, *Business Systems Analysis*, and *Structural Bioinformatics*.

Supervision Experience

- Principal Supervisor
  - Edwin Khoo (research associate), 2014/5 – 2014/10, project: Cost-effectiveness of integrated cervical Cancer prevention strategies in Ontario
- Co-supervisor (Unofficial)
  - Yasmin Saeed (MSc), 2014/9 – current, project: Measures of Quality of Life and Utility among Patients with Chronic Hepatitis C Virus Infection
  - Hong-ah Tu (post-doctorate), 2012/5 – 2013/5, project: Cost-Effectiveness of Screening Hepatitis C in Canada
- Academic Advisor
  - Hooman Zangneh (MSc), 2013/9 – current, project: Cost-Effectiveness Analysis of hepatocellular carcinoma screening in patients with hepatitis C related cirrhosis after sustained virological response
  - Ghassan Awadel Karim (MD), 2014/7 – current, project: Cost-effectiveness of interferon-free antivirals compared to standard treatment (Pegylated-interferon with Ribavirin) in Egyptians with Chronic Hepatitis C infection

Other Academic Activities

- Clinical, Social and Administrative Pharmacy Seminars Coordinator 2014 – 2015
- External Mitacs Accelerate grant committee member 2014
- Reviewer for
  - BMC Health Service Research, 2015
  - Hepatology, 2014
  - Pharmacoeconomics, 2014
  - Vaccine, 2013-2014
  - BMC Public Health, 2013
  - Preventing Chronic Disease, 2013, 2014
  - Journal of Hepatology, 2012
  - World Journal of Gastroenterology, 2012
  - Global Health Perspectives, 2012
  - Society for Medical Decision Making Meeting (SMDM) 2011-2013

Academic Awards and Achievements

- 2008 – 2009, University of Waterloo Ph.D. Completion Award
- 2002 – 2003, School of Computer Science Distinguished Teaching Award
- 1999 – 2003, University of Waterloo Graduate Scholarship

Industrial Experience

- **Software Developer,** 2000 – 2001, SWI Systemware Inc., Toronto, Ontario, Canada.

Computer Proficiency

- **Programming Languages:**
  - C/C++, Java, Java Script, Python, Perl, CORBA, Pascal and Visual Basic.
- **Statistical Software:**
  - R, SAS, SPlus, SPSS and Minitab.
- **Decision Making Software**
  - TreeAge Pro, MS-Excel, and Decision Manager.
- **Mathematical Modeling Software:**
  - AnyLogic, Arena, MATLAB, Simulink, and Mathematica.
- **Database:**
  - Oracle, MS SQL Server, Sybase SQL Server, IBM DB2, and MySQL.
- **Operating Systems:**
  - Unix, Linux, MS Windows, Mac OSX, and Sun Solaris.

Professional Memberships

- Society for Medical Decision Making (SMDM)
- American Society of Clinical Oncology (ASCO)
- Institute of Electrical and Electronics Engineers (IEEE)
- Association for Computing Machinery (ACM)
- International Society for Computational Biology (ISCB)

- Molecular Graphics and Modelling Society (MGMS)

PARSONS et al. KREPPNER et al. Plaintiffs	vs. THE CANADIAN RED CROSS SOCIETY et al. Defendants	Court File No. 98-CV-141369 CP00 98-CV-146405

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