

BIOGRAPHICAL SKETCH

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NAME: W. Ray Kim

eRA COMMONS USER NAME (credential, e.g., agency login): wraykim

POSITION TITLE: Professor and Chief, Division of Gastroenterology and Hepatology, Stanford University School of Medicine

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
Seoul National University, Seoul, Korea	MD	02/1986	Medicine
Seoul National University, Seoul, Korea	MSc	02/1990	Clinical Research
Wharton School, U of PA, Philadelphia, PA	MBA	05/1992	Healthcare Administration
University of Arkansas, Little Rock, AR	-	06/1994	Internal Medicine (Residency)
Mayo Clinic, Rochester, MN	-	06/1997	Gastroenterology (Fellowship)
Mayo Clinic, Rochester, MN	-	06/1998	Transplant Hepatology (Fellowship)

A. Personal Statement

Chronic liver disease is one of the most common causes of premature death in Americans. My career goal is to improve the outcome of individuals with chronic liver disease by identifying the optimal means for diagnosis, monitoring, treatment and prevention. The path I have chosen to achieve this goal is through clinical epidemiology and patient-oriented, effectiveness research. Disease areas in which I conduct my research include viral hepatitis, end-stage liver disease, hepatobiliary malignancies, and liver transplantation.

B. Positions and HonorsPositions and Employment

1991 Administrative Intern, Kaiser-Permanente, Atlanta, GA
 1991 Project Consultant, Merck, Sharp & Dohme, West Point, PA
 1999-2004 Assistant Professor of Medicine, Mayo Medical School
 2004-2012 Associate Professor of Medicine, Mayo Clinic College of Medicine
 2000-2013 Joint appointee, Division of Health Care Policy and Research, Mayo Clinic
 2012-2013 Professor of Medicine, Mayo Clinic College of Medicine
 2011-2013 Director of Post-Doctoral Programs, Center for Translational Science Activities, Mayo Clinic College of Medicine
 2013- Professor of Medicine, Stanford University School of Medicine
 2013- Chief, Division of Gastroenterology and Hepatology, Stanford University School of Medicine

Honors/Awards

1982-1986 Merit Scholarship of Seoul National University
 1986 Chancellor's award, Seoul National University
 1996 ACG/Astra Merck Senior Fellow Award
 1997 Litta Foundation Scholar
 2002 Regal Award
 2009 Sheila Sherlock Liver Research Award (University of Toronto)
 2012 Hilda Schwartz Award (Baylor College of Medicine)

Other Activities/Society Membership

1994-	American Gastroenterological Association
1994-	American Association for the Study of Liver Disease (AASLD)
1994-	American College of Gastroenterology
1998-	Sigma Xi Society
1998-	American Society for Transplant Physicians
2003-2006	Special Emphasis Panel, NIDDK, (ZDK1 GRB)
2004-2007	Public Policy Committee, American Association for the Study of Liver Disease (AASLD)
2006-2011	Associate Editor, Hepatology
2008-2011	Chair, Clinical Research Committee, AASLD
2011-2014	Chair, Development Committee, AASLD
2014- 2017	Founding Trustee, AASLD Foundation
2014- 2017	Governing Board, AASLD (Treasurer)
2017-	Chair, Global Outreach and Engagement Committee, AASLD

C. Contributions to Science

- Population-based epidemiology of liver disease: From an early stage of my career, I studied epidemiology of chronic liver disease with support by a K-23 award from NIDDK. I took advantage of the Rochester Epidemiology Project (REP) – a population-based data resource available in Olmsted County, Minnesota. Healthcare in the semi-rural County is self-contained because of the presence of a large tertiary center, namely, Mayo Clinic and medical information from essentially all Mayo and non-Mayo healthcare providers for each resident of Olmsted County is linked to a single record. I was able to conduct a series of studies determining the burden, longitudinal trends and determinants of outcome in chronic liver diseases in the population.
 1. Kim WR, Lindor KD, Locke GR 3rd, Therneau TM, Homburger HA, Batts KP, Yawn BP, Petz JL, Melton LJ 3rd, Dickson ER. Epidemiology and natural history of primary biliary cirrhosis in a US community. *Gastroenterology*. 2000 Dec; 119(6):1631-6. PMID:11113084.
 2. Bambha K, Kim WR, Talwalkar J, Torgerson H, Benson JT, Therneau TM, Loftus EV, Yawn BP, Dickson ER, Melton LJ. Incidence, clinical spectrum, and outcomes of primary sclerosing cholangitis in a United States community. *Gastroenterology*. 2003 Nov; 125(5):1364-9. PMID:14598252.
 3. Rocca LG, Yawn BP, Wollan P, Kim WR. Management of patients with hepatitis C in a community population: Diagnosis, discussions, and decisions to treat. *Ann Fam Med*. 2004 Mar-Apr; 2(2):116-24. PMID:15083850. PMCID:1466643.
 4. Kim WR, Benson JT, Therneau TM, Torgerson HA, Yawn BP, Melton LJ. Changing epidemiology of hepatitis B in a US community. *Hepatology*. 2004 Mar; 39(3):811-6. PMID:14999701.
 5. Kim WR, Gores GJ, Benson JT, Therneau TM, Melton LJ 3rd. Mortality and hospital utilization for hepatocellular carcinoma in the United States. *Gastroenterology*. 2005 Aug; 129(2):486-93. PMID:16083705.
 6. Lee TH, Kim WR, Benson JT, Therneau TM, Melton LJ 3rd. Serum aminotransferase activity and mortality risk in a United States community. *Hepatology*. 2008 Mar; 47(3):880-7. PMID:18302294.
 7. Mendes FD, Kim WR, Pedersen R, Therneau T, Lindor KD. Mortality attributable to cholestatic liver disease in the United States. *Hepatology*. 2008 Apr; 47(4):1241-7. PMID:18318437.
 8. Yang JD, Kim B, Sanderson SO, Sauver JS, Yawn BP, Larson JJ, Therneau TM, Roberts LR, Gores GJ, Kim WR. Biliary tract cancers in Olmsted County, Minnesota, 1976-2008. *Am J Gastroenterol*. 2012 Aug; 107(8):1256-62. Epub 2012 Jul 03. PMID:22751468. PMCID:3654834.
 9. Asrani SK, Larson JJ, Yawn B, Therneau TM, Kim WR. Underestimation of liver-related mortality in the United States. *Gastroenterology*. 2013 Aug; 145(2):375-82.e1-2. Epub 2013 Apr 09. PMID:23583430. PMCID:3890240.
 10. Allen AM, Kim WR, Larson JJ, Rosedahl JK, Yawn BP, McKeon K, Hay JE. The Epidemiology of Liver Diseases Unique to Pregnancy in a US Community: A Population-Based Study. *Clin Gastroenterol Hepatol*. 2016;14(2):287-294
- The MELD score and other prognostic models: The most notable achievement by my research team to

date has been the development, validation and refinement of the Model for End stage liver disease (MELD) score. This is a survival model that is firmly accepted as an index that represents severity of liver failure and thus is used to estimate short term survival probability. MELD is now adopted as a standard by which the priority for allocation of donated livers is determined. In addition to MELD, we have created mathematical models with which prognosis of an individual patient is predicted. While individualized medicine is sometimes thought to be limited to genomic and other deterministic data used to tailor treatment strategies in individual patients, robust epidemiological models contribute to the assessment of individual risk, which, in some cases, drives value of specific therapeutic approaches.

1. Kim WR, Wiesner RH, Therneau TM, Poterucha JJ, Porayko MK, Evans RW, Klintmalm GB, Crippin JS, Krom RA, Dickson ER. Optimal timing of liver transplantation for primary biliary cirrhosis. *Hepatology*. 1998 Jul; 28(1):33-8. PMID:96570932. Kim WR, Poterucha JJ, Benson JT, Therneau TM. The impact of competing risks on the observed rate of chronic hepatitis C progression. *Gastroenterology*. 2004 Sep; 127(3):749-55. PMID:15362031.
 2. Malinchoc M, Kamath PS, Gordon FD, Peine CJ, Rank R, Ter Borg PCJ. A Model to Predict Poor Survival in Patients Undergoing Transjugular Intrahepatic Portosystemic Shunts. *Hepatology* 2000;31:864-871.
 3. Kamath PS, Wiesner RH, Malinchoc M, Kremers W, Therneau TM, Kosberg CL, D'Amico G, Dickson ER, Kim WR. A model to predict survival in patients with end-stage liver disease. *Hepatology*. 2001;33(2):464-70. PMID:11172350.
 4. Bambha K, Kim WR, Kremers WK, Therneau TM, Kamath PS, Wiesner R, Rosen CB, Thostenson J, Benson JT, Dickson ER. Predicting survival among patients listed for liver transplantation: an assessment of serial MELD measurements. *Am J Transplant*. 2004 Nov; 4(11):1798-804. PMID:15476479.
 5. Kim WR, Therneau TM, Benson JT, Kremers WK, Rosen CB, Gores GJ, Dickson ER. Deaths on the liver transplant waiting list: an analysis of competing risks. *Hepatology*. 2006 Feb; 43(2):345-51. PMID:16440361.
 6. Biggins SW, Kim WR, Terrault NA, Saab S, Balan V, Schiano T, Benson J, Therneau T, Kremers W, Wiesner R, Kamath P, Klintmalm G. Evidence-based incorporation of serum sodium concentration into MELD. *Gastroenterology*. 2006 May; 130(6):1652-60. PMID:16697729.
 7. Lee TH, Shah N, Pedersen RA, Kremers WK, Rosen CB, Klintmalm GB, Kim WR. Survival after liver transplantation: Is racial disparity inevitable? *Hepatology*. 2007 Nov; 46(5):1491-7. PMID:17929234.
 8. Kim WR, Biggins SW, Kremers WK, Wiesner RH, Kamath PS, Benson JT, Edwards E, Therneau TM. Hyponatremia and mortality among patients on the liver-transplant waiting list. *N Engl J Med*. 2008; 359(10):1018-26. PMID:18768945.
 9. Bambha K, Kim WR, Pedersen R, Bida JP, Kremers WK, Kamath PS. Predictors of early re-bleeding and mortality after acute variceal haemorrhage in patients with cirrhosis. *Gut*. 2008 Jun; 57(6):814-20. PMID:18250126.
 10. Leise MD, Kim WR, Kremers WK, Larson JJ, Benson JT, Therneau TM. A revised model for end-stage liver disease optimizes prediction of mortality among patients awaiting liver transplantation. *Gastroenterology*. 2011 Jun; 140(7):1952-60. Epub 2011 Feb 18. PMID:21334338.
 11. Yang JD, Kim WR, Park KW, Chaiteerakij R, Kim B, Sanderson SO, Larson JJ, Pedersen RA, Therneau TM, Gores GJ, Roberts LR, Park JW. Model to estimate survival in ambulatory patients with hepatocellular carcinoma. *Hepatology*. 2012 Aug; 56(2):614-21. PMID:22370914. PMCID:3564594.
 12. Kim D, Kim WR, Kim HJ, Therneau TM. Association between noninvasive fibrosis markers and mortality among adults with nonalcoholic fatty liver disease in the United States. *Hepatology*. 2013 Apr;57(4):1357-65. PMID:23175136. PMCID:3622816.
 13. Flemming JA, Yang JD, Vittinghoff E, Kim WR, Terrault NA. Risk prediction of hepatocellular carcinoma in patients with cirrhosis: the ADDRESS-HCC risk model. *Cancer*. 2014 Nov 15;120(22):3485-93.
 14. Allen AM, Kim WR, Larson JJ, Colby C, Therneau TM, Rule AD. Serum Cystatin C as an Indicator of Renal Function and Mortality in Liver Transplant Recipients. *Transplantation*. 2015;99(7):1431-5
- US liver transplant policy analysis: Working as a senior hepatology lead at the Scientific Registry for Transplant Recipients (SRTR), I have taken the role of a principal investigator in projects that provided data that formed the basis for a new policy, evaluated the potential impact of a new policy proposal, and examined the impact of a new policy implemented. The data have shaped the policies governing the

practice of liver transplantation in the US.

1. Lee TH, Shah N, Pedersen RA, Kremers WK, Rosen CB, Klintmalm GB, Kim WR. Survival after liver transplantation: Is racial disparity inevitable? *Hepatology*. 2007 Nov; 46(5):1491-7. PMID:17929234.
 2. Yun BC, Kim WR, Benson JT, Biggins SW, Therneau TM, Kremers WK, Rosen CB, Klintmalm GB. Impact of pretransplant hyponatremia on outcome following liver transplantation. *Hepatology*. 2009 May; 49(5):1610-5. PMID:19402063. PMCID:2902984.
 3. Kim WR, Terrault NA, Pedersen RA, Therneau TM, Edwards E, Hindman AA, Brosgart CL. Trends in waiting list registration for liver transplantation for viral hepatitis in the United States. *Gastroenterology*. 2009 Nov; 137(5):1680-6. Epub 2009 Jul 24. PMID:19632234. PMCID:2910398.
 4. Asrani SK, Lim YS, Therneau TM, Pedersen RA, Heimbach J, Kim WR. Donor race does not predict graft failure after liver transplantation. *Gastroenterology*. 2010 Jun; 138(7):2341-7. PMID:20176028. PMCID:2907133.
 5. Darwish Murad S, Kim WR, Therneau T, Gores GJ, Rosen CB, Martenson JA, Alberts SR, Heimbach JK. Predictors of pretransplant dropout and posttransplant recurrence in patients with perihilar cholangiocarcinoma. *Hepatology*. 2012 Sep; 56(3):972-81. PMID:22290335. PMCID:3830980.
 6. Asrani SK, Kim WR, Edwards EB, Larson JJ, Thabut G, Kremers WK, Therneau TM, Heimbach J. Impact of the center on graft failure after liver transplantation. *Liver Transpl*. 2013 Sep; 19(9):957-64. PMID:23784730 127.
 7. Allen AM, Kim WR, Xiong H, Liu J, Stock PG, Lake JR, Chinnakotla S, Snyder JJ, Israni AK, Kasiske BL. Survival of recipients of livers from donation after circulatory death who are relisted and undergo retransplant for graft failure. *Am J Transplant*. 2014;14(5):1120-8. PMID: 24731165
 8. Allen AM, Kim WR, Therneau TM, Larson JJ, Heimbach JK, Rule AD. Chronic Kidney Disease and Associated Mortality after Liver Transplantation - a Time-Dependent Analysis Using Measured Glomerular Filtration Rate. *J Hepatol*. 2014 Apr 5. PMID: 24713190
 9. Heimbach JK, Hirose R, Stock PG, Schladt DP, Xiong H, Liu J, Olthoff KM, Harper A, Snyder JJ, Israni AK, Kasiske BL, Kim WR. Delayed hepatocellular carcinoma model for end-stage liver disease exception score improves disparity in access to liver transplant in the United States. *Hepatology*. 2015;61(5):1643-50.
- Health economic analysis and technology assessment: In the past two decades, an explosive growth of biomedical innovations took place in hepatology and liver transplantation, including biomarkers for diagnosis and prognostication, diagnostic devices, and surgical and radiographical technologies, as well as pharmaceutical agents. Our work in evaluating these technologies has ranged from descriptive cost identification studies to cost-utility analyses to macro trend projection studies. While the US healthcare system continues grapple with increasing scarcity in healthcare resources, our work in this area has provided evidence for value decisions in healthcare
1. Kim WR, Poterucha JJ, Hermans JE, Therneau TM, Dickson ER, Evans RW, Gross JB Jr. Cost-effectiveness of 6 and 12 months of interferon-alpha therapy for chronic hepatitis C. *Ann Intern Med*. 1997 Nov 15; 127(10):866-74. PMID:9382364
 2. Vanness DJ, Kim WR. Bayesian estimation, simulation and uncertainty analysis: the cost-effectiveness of ganciclovir prophylaxis in liver transplantation. *Health Econ*. 2002 Sep; 11(6):551-66. PMID:12203757.
 3. Kim WR, Gores GJ, Benson JT, Therneau TM, Melton LJ 3rd. Mortality and hospital utilization for hepatocellular carcinoma in the United States. *Gastroenterology*. 2005 Aug; 129(2):486-93. PMID:16083705.
 4. DiBonaventura MD, Wagner JS, Yuan Y, L'Italien G, Langley P, Kim WR. The impact of hepatitis C on labor force participation, absenteeism, presenteeism and non-work activities. *J Med Econ*. 2011;14(2):253-61. Epub 2011 Mar 09. PMID:21385147.
 5. Kim DH, Kim WR, Talwalkar JA, Kim HJ, Ehman RL. Advanced fibrosis in nonalcoholic fatty liver disease: noninvasive assessment with MR elastography. *Radiology*. 2013 Aug; 268(2):411-9. Epub 2013 Apr 05. PMID:23564711. PMCID:3721
 6. McEwan P, Kim WR, Yuan Y. Assessing the cost utility of response-guided therapy in patients with

chronic hepatitis C genotype 1 in the UK using the MONARCH model. Appl Health Econ Health Policy. 2013 Feb; 11(1):53-63. PMID:23329380.

- Kim WR, Loomba R, Berg T, Aguilar Schall RE, Yee LJ, Dinh PV, Flaherty JF, Martins EB, Therneau TM, Jacobson I, Fung S, Gurel S, Buti M, Marcellin P. Impact of long-term tenofovir disoproxil fumarate on incidence of hepatocellular carcinoma in patients with chronic hepatitis B. Cancer. 2015;121(20):3631-8.

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

R01 DK 34238 Kim (PI) 08/2012 - 06/2018
Models for Optimal Liver Transplant Outcomes. Funded by National Institute of Diabetes and Digestive and Kidney Diseases.

The goal of the study is to investigate epidemiology and pathophysiology of kidney damage that occurs in patients undergoing liver transplantation.

Roles: PI, Program Director

K24 DK 92336 Kim (PI) 07/2012 - 06/2018
Patient-oriented and Effectiveness Research in Chronic Liver Disease

The goal of this grant is to provide effective mentorship to junior members of the institution to guide them for an academic career.

Roles: PI, Program Director

HSRA 006471700-5 Kim (PI) 09/2010 –
Scientific Registry of Transplant Recipients. Funded by Health Resources and Services Administration
The goal of this contract is to guide statistical analysis conducted by the staff at the Scientific Registry of Transplant Recipients.

Completed Research Support

U01 DK 82843 Kim (PI) 06/2008 - 05/2015
Optimal Long-term Outcome of Chronic Hepatitis B. Funded by National Institutes of Health.

The goal of the study is to understand the natural history of chronic hepatitis B virus infection in the US and investigate optimal treatment strategies.

Roles: PI, Program Director

R01 DK 34238 Kim (PI) 03/2002 - 06/2012
Models for Optimal Liver Transplant Outcomes. Funded by National Institute of Diabetes and Digestive and Kidney Diseases.

Roles: PI, Program Director

K23 DK 61617 Kim (PI) 03/2003 - 12/2007
Epidemiology and Impact of Hepatitis C in the Community. Funded by National Institute of Diabetes and Digestive and Kidney

Diseases. Role: PI

R01 DK 34238 Kim (PI) 08/2007 - 12/2012
Models for Optimal Liver Transplant Outcomes. Funded by National Institute of Diabetes and Digestive and Kidney Diseases. (R01 DK 34238)

R21 AT 04174 Kim (PI) 09/2008 - 03/2012
L-arginine supplement for the prevention of calcineurin inhibitor nephrotoxicity. Funded by National Center for Complementary and Alternative Medicine

Roles: PI, Program Director