

Maahs, David

OMB No. 0925-0001 and 0925-0002 (Rev. 10/15 Approved Through 10/31/2018)

BIOGRAPHICAL SKETCH

NAME: David Matthew Maahs

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

POSITION TITLE: Professor of Pediatrics, Division Chief of Pediatric Endocrinology, Stanford University

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Kansas, Lawrence, KS	B.A.	1988	English
University of Kansas, Lawrence, KS	M.A.	1990	English
University of New Mexico, Albuquerque, NM	M.D.	1997	Medicine
University of New Mexico, Albuquerque, NM	Residency	1997-2000	Pediatric Resident
University of Colorado Denver, Denver, CO	Fellowship	2003-2006	Pediatric Endocrinology
University of Colorado Denver, Denver, CO	PhD	2010	Epidemiology

A. Personal Statement

In 2016 I moved to become Professor of Pediatrics and Division Chief of Pediatric Endocrinology at Stanford University. My research interest is to improve care and prevent complications in people with type 1 diabetes (T1D). I was co-author with Dr Peter Chase on the 12th and 13th editions of *Understanding Diabetes*, or Pink Panther education books. Specifically, my research has extended from epidemiologic studies identifying targets to development of clinical trials to test interventions. My NIDDK sponsored K23 “Cardiovascular Disease in Type 1 Diabetes Mellitus: Young Adults to Adolescents” focused on cardiovascular and kidney complications in young adults with T1D. I continued this work as part of the Coronary Artery Calcification in Type 1 Diabetes (CACTI) Study with Drs. Marian Rewers and Janet Snell-Bergeon and in the pediatric population with Dr. Paul Wadwa and as investigator with the Search for Diabetes in Youth study. I am a past co-Chair for Protocols and Publications with the Type 1 Diabetes Exchange and continue as a Steering Committee member and director of international collaborations, which complement my role as Secretary-General for ISPAD. While in Colorado I was local PI on PERL, an RCT to prevent early kidney function decline with Drs Michael Mauer (UMinnesota) and Alessandro Doria (Joslin) as PIs. I am a PI on FLEX, an innovative

behavioral intervention for adolescents with T1D with Drs. Elizabeth Mayer-Davis (UNC) and Michael Seid (Cincinnati). As a logical extension of this research to prevent T1D complications, my research has increasingly focused on the development of the artificial pancreas as improved glucose control is the best proven method to prevent T1D complications. In Colorado I was the local PI on 3 UC4 funded artificial pancreas studies and I continue this research at Stanford with Drs Bruce Buckingham and Korey Hood. I work with clinical and engineering collaborators at RPI, JAEB, Sansum/UCSB, Yale, UVA, Cambridge, Boston University, and UC-Boulder on JDRF, NIDDK, and NSF funded studies as listed below. I was co-PI with Dr. Klingensmith on the Barbara Davis Center T32 and K12 training grants in Pediatric Endocrinology. I am Associate Director for the NIDDK P30 funded Stanford University Diabetes Research Center <https://sdrc.stanford.edu>.

B. Positions and Honors

Positions and Employment

1990-1991	Instructor in English, U.S. Peace Corps, Ecole Normale Superieure, Sousse, Tunisia
1991-1992	Instructor in English, U.S. Peace Corps, Ecole Normale Superieure, Bangui, Central African Republic
1997-2000 Albuquerque, NM	Pediatric Resident, University of New Mexico Hospital,
2001-2003 Mexico Hospital	Medical Director, Pediatric Sub-Acute Unit, University of New Mexico Hospital, Albuquerque, NM
2000-2003	Clinical Assistant Professor of Pediatrics, University of New Mexico Hospital, Albuquerque, NM
2003-2006	Fellow, Pediatric Endocrinology, University of Colorado Health Sciences Center, Denver, CO
2006-2011 Center for Childhood	Assistant Professor, Pediatric Endocrinology, Barbara Davis Diabetes, University of Colorado Denver
2011-2016 Center for Childhood	Associate Professor, Pediatric Endocrinology, Barbara Davis Diabetes, University of Colorado Denver
2016 for Childhood	Professor, Pediatric Endocrinology, Barbara Davis Center Diabetes, University of Colorado Denver
2011-2016 Hypertension	Secondary Appointment in Division of Renal Diseases and University of Colorado Denver
2011-2016	Secondary Appointment in Department of Epidemiology, Colorado School of Public Health, University of Colorado Denver

2016-present Professor and Division Chief, Pediatric Endocrinology, Stanford University

Awards and Honors

1994	Summer Research Grant, Department of History and Philosophy of Medicine University of Kansas School of Medicine, Kansas City, KS
1999-2000	Chief Resident for Education, University of New Mexico Department of Pediatrics
2000	Outstanding Teacher Award, Pediatric Residency Program, Albuquerque, NM
2005	International Society for Pediatric and Adolescent Diabetes Science School Attendee
2012-14	Committee Member/Editorial team member, ISPAD Guidelines
2011-2013	Associate Editor, <i>Diabetes Technology and Therapeutics</i>
2013-present	Editorial Board, <i>Diabetes Technology and Therapeutics</i>
2013-2016	Type 1 Diabetes Exchange, Co-Chair for Publications and Protocol Development
2013-present	Type 1 Diabetes Exchange, Steering Committee
2014-2015	Scientific Advisory Board, International Society for Pediatric and Adolescent Diabetes
2014-2015	ADA Scientific Sessions Planning Committee, Clinical Diabetes/Therapeutics YOUTH
2015	Secretary General elect, International Society of Pediatric and Adolescent Diabetes
2016-2020	<u>Secretary General</u> , International Society of Pediatric and Adolescent Diabetes
2016-present	<u>Editor</u> , ISPAD Clinical Practice Consensus Guidelines
2016-present	<u>Associate Director</u> , NIDDK P30 funded Stanford Diabetes Research Center
2017-2019	Professional Practice Committee, American Diabetes Association
2017-2019	Editorial Board, <i>Journal of Pediatrics</i>
2017-2020	Associate Editor, <i>Diabetic Medicine</i>

C. Contribution to Science

1. **Cardiovascular (CVD) Complications of T1D:** CVD is the leading cause of death for people with T1D. I have worked with local colleagues as part of the CACTI study, then with national groups to investigate early CVD and its risk factors in people with T1D, including being 1st author on an AHA Scientific Statement on CVD risk factors in youth with diabetes.
 - a. **DM Maahs, L Ogden, G L. Kinney, P Wadwa, J Snell-Bergeon, J Hokanson, D Dabelea, J Ehrlich, RH Eckel, M Rewers.** Low Plasma Adiponectin Levels Predict Progression of Coronary Artery Calcification, *Circulation*. 2005;111:747-753. PMID:

- 15699257.
- b. **DM Maahs**, D Dabelea, RB D'Agostino Jr, JS. Andrews, AS Shah, N Crimmins, EJ. Mayer-Davis, S Marcovina, G Imperatore, RP Wadwa, SR Daniels, K Reynolds, RF Hamman, LM Dolan for the SEARCH for Diabetes in Youth Study. Glucose Control Predicts 2-Year Change in Lipid Profile in Youth with Type 1 Diabetes. *J Pediatr.* 2013;162:101-7.e1. PMID: 22795314.
 - c. **DM Maahs**, Chair; S Daniels, SD deFerranti, HL Dichek, J Flynn, BI Goldstein, AS Kelly, KJ Nadeau, P Martyn-Nemeth, S Osganian, L Quinn, AS Shah, E Urbina, Co-Chair, on behalf of the Atherosclerosis, Hypertension & Obesity in Youth Committee of the Cardiovascular Disease in the Young Council of the American Heart Association. AHA Scientific Statement. Cardiovascular Disease Risk Factors in Youth with Diabetes: A Scientific Statement From the American Heart Association. *Circulation.* 2014 Oct 21;130:1532-58. PMID: 25170098.
 - d. P Bjornstad; KC Donaghue, **DM Maahs**. Update on Macrovascular Disease and Risk Factors in Youth with Type 1 Diabetes -- Time to be More Attentive to Treatment? *Lancet Diabetes & Endocrinology*, in press 2017.
2. **Renal Complications of T1D:** Renal disease continues to cause early morbidity and mortality and increase health costs for people with T1D. My work in this area includes identification of novel risk factors for diabetic kidney disease (DKD), such as uric acid, leading to the multi-center PERL study to intervene early in the pathophysiologic process to preserve renal function. Similarly, I have developed a practical method to measure GFR in the outpatient setting to better identify early DKD.
- a. **DM Maahs**, BM Snively, G Imperatore, R Bell, EJ Mayer-Davis, L Dolan, DJ Pettitt, I Hirsch, B Rodriguez, B Linder, S Marcovina, D Dabelea. Prevalence and Determinants of Elevated Albumin to Creatinine Ratio in Youth with Diabetes: The SEARCH for Diabetes in Youth Study, *Diabetes Care.* 2007;30:2593-8. PMID: 17630264.
 - b. **DM Maahs**, LG Ogden, A Kretowski, JK Snell-Bergeon, GL Kinney, T Berl, and M Rewers. Serum Cystatin C Predicts Progression of Subclinical Coronary Atherosclerosis in Persons with T1D, *Diabetes.* 2007;56:2774-9. PMID: 17660266.
 - c. **DM Maahs**, ML Caramori, DZI Cherney, AT Galecki, C Gao, D Jalal, BA Perkins, R Pop-Busui, P Rossing, M Mauer, A Doria on behalf of the PERL Consortium. Uric Acid Lowering to Prevent Kidney Function Loss in Diabetes: The Preventing Early Renal Function Loss (PERL) Allopurinol Study. *Curr Diab Rep.* 2013;13:550-9. PMID:23649945.
 - d. **DM Maahs**, L Bushman, B Kerr, SL Ellis, L Pyle, K McFann, A Bouffard, FK Bishop, N Nguyen, PL Anderson. A Practical Method to Measure GFR in people with type 1 diabetes. *Journal of Diabetes and its Complications.* 2014;28:667-73. PMID: 25027389.
3. **Epidemiologic/Registry of T1D:** National and international studies (especially in a leadership role with the T1D Exchange) have identified shortcomings in current T1D care and contributed to changes in practice guidelines and development of clinical trials to test interventions to improve care for people with T1D.
- a. JR Wood, KM Miller, **DM Maahs**, RW Beck, LA DiMeglio, IM Libman, M Quinn, WV Tamborlane, and SE Woerner, for the T1D Exchange Clinic Network. Most Youth

- with Type 1 Diabetes in the T1D Exchange Clinic Registry do not Meet ADA or ISPAD Clinical Guidelines. *Diabetes Care*. 2013;36:2035-7. PMID: 23340893.
- b. **DM Maahs**, JM Hermann, SN DuBose, KM Miller, B Heidtmann, LA DiMeglio, B Rami-Merhar, RW Beck, E Schober, WV Tamborlane, TM Kapellen, and RW Holl for the DPV Initiative and the T1D Exchange Clinic Network. Contrasting the Clinical Care and Outcomes of 2,622 Children with Type 1 Diabetes less than 6 Years of Age in the United States T1D Exchange and German/Austrian DPV Registries. *Diabetologia*. 2014;57:1578-85. PMID: 24893863.
 - c. **DM Maahs**, J Hermann, N Holman, N Foster, T Kapellen, J Allgrove, D Schatz, S Hofer, F Campbell, C Steigleder-Schweiger, R Beck, J Warner, and R Holl on behalf of the NPDA, the DPV, and the T1DX. Rates of Diabetic Ketoacidosis: International comparison with 49,859 Pediatric Patients with Type 1 Diabetes from England, Wales, the United States of America, Austria and Germany. *Diabetes Care*. 2015 Oct;38(10):1876-82. PMID:26283737.
 - d. KM Miller, NC Foster, RW Beck, RM Bergenstal, SN DuBose, LA DiMeglio, **DM Maahs**, and WV Tamborlane for the T1D Exchange Clinic Network. Current state of type 1 diabetes treatment in the US: Updated data from the T1D Exchange Clinic Registry. *Diabetes Care*. 2015;38:971–978.
4. **Behavioral & Nutritional Challenges of T1D:** The day-to-day management of T1D imposes tremendous burden on people with T1D and their families. These psychosocial challenges require advances in clinical care to reduce the burden of care and improve patient outcomes. Therefore, work in this area has spanned from epidemiologic investigations (CACTI, T1D Exchange) to being a PI of the FL3X study.
- a. N Gendelman, JK Snell-Bergeon, K McFann, G Kinney, RP Wadwa, F Bishop, M Rewers, **DM Maahs**. Prevalence and Correlates of Depression in Persons with and without Type 1 Diabetes. *Diabetes Care* 2009;32:575-579. PMCID: PMC2660458.
 - b. PM Trief, D Xing, N Foster, **DM Maahs**, JM Kittelsrud, BA Olson, LA Young, AL Peters, RM Bergenstal, KM Miller, RW Beck, RS Weinstock, for the T1D Exchange Clinic Network. Depression in Adults in the T1D Exchange Clinic Registry. *Diabetes Care*. 2014;37:1563-72. PMID: 24855157.
 - c. G Spiegel, A Bortsov, FK Bishop, D Owen, GJ Klingensmith, EJ Mayer-Davis, **DM Maahs**. Randomized Nutrition Education Intervention to Improve Carbohydrate Counting in Adolescents with Type 1 Diabetes Study: Is More Intensive Education Needed? *J Acad Nutr Diet*. 2012; 112:1736-46. PMCID: PMC3487717.
 - d. EJ Mayer-Davis, M Seid, J Nachreiner, J Crandell, T Wysocki, J Thomas, D Standiford, **DM Maahs**, WH Lagarde, L Dolan. The Flexible Lifestyles for Youth (FL3X) behavioral intervention for at risk adolescents with type 1 diabetes: Report of a randomized pilot and feasibility trial. *Diabetic Medicine*. 2015 Jun;32(6):829-33. PMID: 25424501.
5. **Artificial Pancreas:** My research has increasingly focused on the development of the artificial pancreas. Improved glucose control is the best proven method to prevent the complications of T1D and promises to reduce the burden of care of T1D. I work with clinical, engineering, and psychosocial collaborators at RPI, Jaeb, Sansum/UCSB, Yale, UVa, and UC-Boulder on JDRF, NIDDK, and NSF funded studies.
- a. **DM Maahs**, P Calhoun, BA Buckingham, P Chase, I Hramiak, J Lum, F Cameron, BW Bequette, T Aye, HT Paul, R Slover, P Wadwa, DM Wilson, C Kollman, and RW

- Beck, for the In Home Closed Loop Study Group. A randomized trial of a home system to reduce nocturnal hypoglycemia in type 1 diabetes. *Diabetes Care*. 2014;37:1885-91. PMID: 24804697.
- b. MJ Rewers, K Pillay, C de Beaufort, M Craig, R Hanas, CL Acerini and **DM Maahs**. 2014 ISPAD Clinical Practice Consensus Guidelines. Assessment and monitoring of glycemic control in children and adolescents with diabetes. *Pediatric Diabetes*. 2014;15 Suppl 20:102-14. PMID: 25182311.
 - c. **Maahs DM**, Buckingham BA, Castle JR, Cinar A, Damiano ER, Dassau E, DeVries JH, Doyle FJ 3rd, Griffen SC, Haidar A, Heinemann L, Hovorka R, Jones TW, Kollman C, Kovatchev B, Levy BL, Nimri R, O'Neal DN, Philip M, Renard E, Russell SJ, Weinzimer SA, Zisser H, Lum JW. [Outcome Measures for Artificial Pancreas Clinical Trials: A Consensus Report](#). *Diabetes Care*. 2016 Jul;39(7):1175-9. PMID: 27330126
 - d. M Breton, D Cherňavvsky, G Forlenza, M DeBoer, J Robic, RP Wadwa, L Messer, B Kovatchev, **DM Maahs**. Closed Loop Control During Intense Prolonged Outdoor Exercise in Adolescents with Type 1 Diabetes: The Artificial Pancreas Ski Study. *Diabetes Care*. 2017 Dec;40(12):1644-1650. PMID: 28855239.

Link to PubMed citations:

<http://www.ncbi.nlm.nih.gov/pubmed?otool=uchscilib&term=maahs%20d&cmd=search>

D. Research Support **Ongoing Research Support**

2018PG-T1D052, Helmsley Charitable Trust, (Haller, PI, **Maahs, co-PI**)
01/01/2018 – 6/30/2019

ECHO Type 1 Diabetes: A Feasibility and Planning Proposal
Role: Co-PI and Stanford site PI

1P30DK116074 - 01, Stanford Diabetes Research Center, (Kim, PI)
09/15/17 - 06/30/22
Stanford Diabetes Research Center
Role: Associate Director

JDFR SPO# 128438 (PI- D. Wilson)
09/01/17-08/30/19
Improving Antibody Detection by Agglutination-PCF (ADAP) for Predictive Population-Based Screening of Type 1 Diabetes (T1D) Risk
Role: co-I

DP3DK113358, NIDDK, MAYERDAVIS, **Maahs**, Pratley (PD/PI)
05/05/17 - 04/30/21
Accelerating Solutions to Optimize Glycemic Control and Weight Management In Young Adults with T1D
Role: 1 of 3 PIs

T1D Exchange, Helmsley Charitable Trust, **Maahs** (PI)

3/1/16 – 2/28/19

Jaeb Center for Health Research, Co-Chair for Publications and Protocol Development

Goals: Facilitate International Collaborations for the T1D Exchange Clinic Registry

Role: Director for International Collaborations for T1D Exchange Clinic Registry

UC4DK108483, Kovatchev (PI)

1/1/2016 -- 12/31/19

“Clinical Acceptance of the Artificial Pancreas: the International Diabetes Closed Loop Trial (iDCLT)”.

Role: original **Colorado PI**, now Stanford co-I

1UC4DK108612, Damiano, Russell, El-Katib, Beck (PIs)

9/30/15 – 9/29/17

“Final clinical studies for submission of a pre-market approval application to the FDA for a Bionic Pancreas that automates type 1 diabetes management”.

Role: original **Colorado PI**, now Stanford co-I

UC4DK108520, Hovorka, Buckingham, Bergenstal, Campbell, Goldman,

9/30/15 – 9/29/18

Hood, Lum, **Maahs**, Weinzimer (PIs),

“One year day-and-night home closed loop in young people with type 1 diabetes,”

Role: original **Colorado PI**, now Stanford co-I

UC4 DK101132, NIDDK, Mayer-Davis, Seid, **Maahs** (PIs)

9/15/13 – 6/30/18

FL3X: An Adaptive Intervention to Improve Outcomes for Youth with Type 1 Diabetes

Goals: RCT to test novel behavioral intervention to improve outcomes in youth with T1D

Role: **1 of 3 PIs**

NSF Award No. CNS-1446900 Sankaranarayanan (PI)

10/1/14-9/30/18

CPS: Synergy: Collaborative Research: In-Silico Functional Verification of Artificial Pancreas Control Algorithms.

Goals: Develop verification framework for AP systems

Role: Co-I

Completed (past 3 years, selected):

UC4 DK101108, NIDDK, Doria (PI)

9/30/13 – 6/30/18

PERL: Preventing Early Renal Loss in Type 1 Diabetes

Goals: RCT to test hypothesis that lowering uric acid slows decline in GFR in adults with T1D

Role: original **Colorado PI**, now co-I and Steering committee member

T1D Exchange, Helmsley Charitable Trust, **Maahs (PI)**

3/1/13 – 2/28/16

Jaeb Center for Health Research, Co-Chair for Publications and Protocol Development

Goals: Facilitate the research proposal process and manuscript publication in the T1D Exchange

Role: Co-Chair for Publications and Protocol Development for T1D Exchange

17-2013-313, JDRF, Rewers (PI)

2/1/13-1/31/16

Models Predicting Accelerated Cardiorenal Complications of Type 1

Goals: Improve ability to predict cardiorenal complications in people with T1D in the CACTI study

Role: Co-I

DP3DK104059, NIDDK, Buckingham (PI)

12/1/14-11/30/17

Using a Closed-Loop System Plus Behavioral Supports in Preschoolers with Diabetes

Goals: Develop a program to improve care in young children with T1D with technology and behavioral support in this pilot and feasibility study

Role: original **Colorado PI**

R01 DK085591, NIH, NIDDK, Chase (PI)

7/1/12 – 8/30/16

In Home Closed Loop Reduction of Nocturnal Hypoglycemic and Daytime Hyperglycemic

Goals: Multi-center study to use closed-loop technology to safely reduce glucose variability

Role: Co-I

NIDDK R01 DK102188, Multiple PIs, Bequette, **Maahs**, Buckingham, Keith-Hynes

4/1/14-3/31/17

A probabilistic closed-loop artificial pancreas to handle unannounced meals

Goals: develop MMPPC algorithm on DiAs platform for out-patient trials

Role: 1 of 4 PIs