

SUPPLEMENTARY DATA

A listing of the T1D Exchange Clinic Network sites with participating principal investigators (PI), co-investigators (I) and coordinators (C) ordered by the number of participants recruited per site as of August 1, 2012 is included below:

Philadelphia, PA Children's Hospital of Philadelphia (n=1451) Steven Willi (PI); Terri Lipman (I); Tammy Calvano (C); Olena Kucheruk (C); Pantea Minnock (C); Chau Nguyen (C) Aurora, CO Barbara Davis Center for Childhood Diabetes (n=1440) Georgeanna Klingensmith (PI); Carolyn Banion (I); Jennifer Barker (I); Cindy Cain (I); Peter Chase (I); Rosanna Fiallo-Scharer (I); Sandy Hoops (I); Megan Kelsy (I); Georgeanna Klingensmith (I); David Maahs (I); Cathy Mowry (I); Kristen Nadeau (I); Marian Rewers (I); Arleta Rewers (I); Robert Slover (I); Andrea Steck (I); Paul Wadwa (I); Philippe Walravens (I); Philip Zeitler (I); Eric Cruz (C); Heidi Haro (C); Maria King (C) Syracuse, NY SUNY Upstate Medical University (n=1301) Ruth Weinstock (PI); Roberto Izquierdo (I); Suzan Bristol (C) New York City, NY Naomi Berrie Diabetes Center, Columbia University P&S (n=1249) Robin Goland (PI); Rachelle Gandica (I); Mary Chan (C); Ellen Greenberg (C); Amy Kurland (C) Ann Arbor, MI University of Michigan (n=927) Joyce Lee (PI); Brigid Gregg (I); Meng Tan (I); Ashley Eason (C) Aurora, CO University of Colorado/Denver, Barbara Davis Center for Childhood Diabetes (n=897) Satish Garg (PI); Aaron Michels (I); Audrey Morris (C); Haley Stewart (C); Sonya Walker (C) Indianapolis, IN Riley Hospital for Children, Indiana University School of Medicine (n=859) Linda DiMeglio (PI); Tamara Hannon (I); Donald Orr (I); Stephanie Woerner (C) Boston, MA Children's Hospital Boston (n=836) Joseph Wolfsdorf (PI); Maryanne Quinn (I); Kayla Fitch (C) Portland, OR Harold Schnitzer Diabetes Health Center at Oregon Health and Science University (n=793) Andrew Ahmann (PI); Jessica Castle (I); Farahnaz Joarder (I); Chris Bogan (C); Rebecca Fitch (C); Bethany Wollam (C) Atlanta, GA Atlanta Diabetes Associates (n=742) Bruce Bode (PI); Katie Gazaway (C); RaShonda Hosey (C) Buffalo, NY University Pediatric Associates (n=673) Kathleen Bethin (PI); Teresa Quattrin (I); Michelle Ecker (C) Los Angeles, CA Children's Hospital Los Angeles (n=605) Jamie Wood (PI); Lynda Fisher (I); Debra Jeandron (I); Francine Kaufman (I); Mimi Kim (I); Roshanak Monzavi (I); Pisit Pitukcheewanont (I); Anna Sandstrom (I); Marisa Cohen (C); Brian Ichihara (C); Megan Lipton (C) Grand Rapids, MI Helen DeVos Children's Hospital Endocrinology and Diabetes (n=576) Michael Wood (PI); Yaw Appiagyei-Dankah (I); Ayse Cemeroglu (I); Maala Daniel (I); Daniel Postellon (I); Michael Racine (I); Lora Kleis (C); Laura Wagner (C) Seattle, WA University of Washington, Diabetes Care Center (n=569) Irl Hirsch (PI); Anthony DeSantis (I); DC Dugdale (I); R Alan Failor (I); Lisa Gilliam (I); Mary Janci (I); Peggy Odegard (I); Dace Trence (I); Brent Wisse (I); Jan Ginsberg (C); Dori Khakpour (C); Christina Peterson (C); Pam Thomson (C) Idaho Falls, ID Rocky Mountain Diabetes & Osteoporosis Center, PA (n=557) David Liljenquist (PI); Mark Sulik (PI); Carl Vance (PI); Jean Halford (C); James Manning (C) Morristown, NJ BD Diabetes Center at Goryeb Children's Hospital (n=542) Harold Starkman (PI); Tymara Berry (I); Laurie Ebner-Lyon (I); Elaine Nussbaum (I); Christine Wagner (I); Marie Fox (C) Stanford, CA Stanford University School of Medicine, Division of Pediatric Endocrinology (n=525) Bruce Buckingham (PI); Avni Shah (I); Breanne Harris (C) Minneapolis, MN International Diabetes Center/Park Nicollet Adult Endocrinology (n=514) Richard Bergenstal (PI); Amy Criego (I); Greg Damberg (I); Glenn Matfin (I); Margaret Powers (I); David Tridgell (I); Beth Olson (C) Boston, MA Joslin Diabetes Center- Pediatric (n=451) Sanjeev Mehta (PI); Lori Laffel (I); Camille Ratliff (C) New Haven, CT Yale Pediatric Diabetes Program (n=398) Eda Cengiz (PI); William Tamborlane (I); Melody Martin-Fredericksen (C); Amy Steffen (C) Los Angeles, CA University of Southern California - Community Diabetes Initiatives (n=365) Anne Peters (PI); Lucy Montoya (C); Valerie Ruelas (C) Durham, NC Duke University Medical Center - Pediatric Endocrine Division (n=364) Robert Benjamin (PI); Juanita Cuffee (C); Jean Litton (C); Amber Spruill (C) Minneapolis, MN International Diabetes Center/Park Nicollet Pediatric Endocrinology (n=357) Richard Bergenstal (PI); Amy Criego (I); Greg Damberg (I); Glenn Matfin (I); Margaret

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Powers (I); David Tridgell (I); Beth Olson (C) Chicago, IL Northwestern University (n=352) Grazia Aleppo-Kacmarek (PI); Elaine Massaro (C); Kimberly Webb (C) Charlottesville, VA University of Virginia Health System (n=342) William Clarke (PI); Christine Burt Solorzano (I); Mark DeBoer (I); Dianne Shifflett (C) St. Louis, MO Washington University (n=342) Janet McGill (PI); Lori Buechler (C); Mary Jane Clifton (C); Stacy Hurst (C); Sarah Kissel (C); Carol Recklein (C) Iowa City, IA University of Iowa Children's Hospital (n=327) Eva Tsalikian (PI); Michael Tansey (I); Joanne Cabbage (C); Julie Coffey (C); Sarah Salamati (C) Kansas City, MO Children's Mercy Hospital (n=323) Mark Clements (PI); Sripriya Raman (I); Angela Turpin (I); Jennifer Bedard (C); Cyndy Cohoon (C); Aliza Elrod (C); Amanda Fridlington (C); Lois Hester (C); Terri Luetjen (C) Detroit, MI Henry Ford Health System (n=316) Davida Kruger (PI); Andrew Hofmann (C) Gainesville, FL University of Florida (n=306) Desmond Schatz (PI); Michael Clare-Salzler (I); Colleen Digman (I); Becky Fudge (I); Mike Haller (I); Henry Rohrs (I); Janet Silverstein (I); Sujata Wagh (I); David Weinstein (I); Tamara Wright (I); Erica Dougherty (C) Orange, CA Children's Hospital of Orange County (n=305) Mark Daniels (PI); Susan Clark (I); Timothy Flannery (I); Nikta Forghani (I); Ajanta Naidu (I); Christina Reh (I); Peggy Scoggin (I); Lien Trinh (I); Rebeca Quintana (C); Heather Speer (C) Columbus, OH Central Ohio Pediatrics Endocrinology and Diabetes Services (n=303) William Zipf (PI); Diane Seiple (C) Sioux Falls, SD Avera Research Institute (n=281) Brad Uhing (PI); Julie Kittelsrud (C); Ashley Stoker (C) San Diego, CA University of California (n=280) Michael Gottschalk (PI); Marla Hashiguchi (C) Tampa, FL University of South Florida Diabetes Center (n=276) Henry Rodriguez (PI); Craig Bobik (C); Danielle Henson (C) Nashville, TN Vanderbilt Eskind Diabetes Clinic (n=276) Jill Simmons (PI); William Russell (I); Brooke Babington (C); Margo Black (C); Faith Brendle (C) Cleveland, OH Case Western Reserve University (n=251) Rose Gubitosi-Klug (PI); Beth Kaminski (I); Susan Bergant (C); Wendy Campbell (C); Mary Beth Frohnapfel (C); Jennifer Haky (C); Catherine Tasi (C) Oklahoma City, OK University of Oklahoma Health Sciences Center Dept. of Pediatric Diabetes and Endocrinology (n=243) Kenneth Copeland (PI); Joni Beck (I); Jill Schanuel (C); Jennifer Tolbert (C) San Francisco, CA University of California, San Francisco Medical Center (UCSF) (n=237) Saleh Adi (PI); Andrea Gerard-Gonzalez (I); Stephen Gitelman (I); Nassim Chettout (C); Christine Torok (C) Seattle, WA Seattle Children's Hospital (n=226) Catherine Pihoker (PI); Susan Kearns (C) Pittsburgh, PA Children's Hospital of Pittsburgh of UPMC (n=217) Ingrid Libman (PI); Ana Diaz (C) Minneapolis, MN University of Minnesota (n=204) Brandon Nathan (PI); Antoinette Moran (I); Melena Bellin (I); Shannon Beasley (C); Anne Kogler (C); Janice Leschyshyn (C); Jennifer Smith (C) Greenville, SC Greenville Hospital System Pediatric Endocrinology (n=196) Bryce Nelson (PI); D'Anne Hannah (C) Houston, TX Baylor College of Medicine / Texas Children's Hospital (n=187) Morey Haymond (PI); Maria Redondo (I); Teresa Falk (C); Janette Gonzalez (C); Christina Lopez (C); Mariam Pontifes (C) Ocean Springs, MS The Diabetes Center, PLLC (n=187) Kathleen Arnold (PI); Sharon Sellers (C) Salt Lake City, UT University of Utah - Utah Diabetes Center (n=181) Vandana Raman (PI); Eric Garcia (C) Worcester, MA University of Massachusetts Medical School (n=179) David Harlan (PI); Mary Lee (I); Lisa Hubacz (C) Durham, NC University of North Carolina Diabetes Care Center (n=179) John Buse (PI); Michelle Duclos (C) Sioux Falls, SD Sanford Research/USD (n=178) Verdayne Brandenburg (PI); Julie Blehm (I); Julie Hallanger-Johnson (I); Ryan Bosch (C); Jennifer Weiss (C) Columbus, OH The Research Institute at Nationwide Children's Hospital (n=168) Robert Hoffman (PI); Monika Chaudhari (I); David Repaske (I); Jesse Haines (C) Billings, MT St. Vincent Healthcare/Internal Medicine and Diabetes (n=165) Justen Rudolph (PI); Charles McClave (I); Doris Biersdorf (C) Bismarck, ND Medcenter One (n=156) Anthony Tello (PI); Donna Amundson (C); Rhonda Ward (C) Philadelphia, PA University of Pennsylvania School of Medicine/Rodebaugh Diabetes Center (n=156) Michael Rickels (PI); Stan Schwartz (I); Cornelia Dalton-Bakes (C); Carissa Fuller (C); Nora Rosenfeld (C) Cincinnati, OH Cincinnati Children's Hospital Medical Center (n=148) Lawrence Dolan (PI); Jessica Kichler (I); Holly Baugh (C); Debbie Standiford (C) Spokane, WA Rockwood Research Center, P.S. (n=132) Jeanne Hassing (PI); Jennifer Jones (I); Stephen Willis (I); Carol Wysham (I); Tammy Freels (C); Candice Garcia (C); Deann Rice (C) Baltimore, MD Johns Hopkins University Pediatric Endocrinology (n=120) Scott Blackman (PI); Kimber-Lee Abel (C); Loretta Clark (C); Andrea Jonas (C); Ellie Kagan (C) Miami, FL University of Miami, Diabetes Research Institute (n=119) Jay Sosenko (PI); Ramon Arce (C) Rapid City, SD Regional Health Clinical Research (n=118) Rachel Edelen (PI); Denise Baldwin (C); Christina Conroy (C); Kelly DeGrote (C); Rod Marchiando (C); Michelle Wasson

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(C) Jacksonville, FL Nemours Children's Clinic (n=116) Larry Fox (PI); Nelly Mauras (I); Katie Black (C); Ligeia Damaso (C) Cleveland, OH Cleveland Clinic Department of Endocrinology, Diabetes and Metabolism (n=111) Laurence Kennedy (PI); Michelle Schweiger (I); Pantelis Konstantinopoulos (C); Carolyn Mawhorter (C); Amy Orasko (C); Denise Rose (C) Tallahassee, FL Tallahassee Memorial Diabetes Center (n=108) Larry Deeb (PI); Kim Rohrbacher (C) Albany, NY The Endocrine Group, LLP (n=107) Jill Abelseth (PI); Carol Duma (C); Sara Duma (C) Findlay, OH Blanchard Valley Medical Associates (n=100) Leroy Schroeder (PI); Amanda Roark (C) Milwaukee, WI The Medical College of Wisconsin/ Children's Hospital of WI (n=99) Omar Ali (PI); Joanna Kramer (C); Donna Whitson-Jones (C) Nashville, TN Vanderbilt Eskind Diabetes Clinic (n=98) Amy Potter (PI); Brooke Babington (C); Margo Black (C); Faith Brendle (C) Vallejo, CA Kaiser Permanente (n=74) Heidi Gassner (PI); Sobha Kollipara (I); Vicky Bills (C) Paterson, NJ St. Joseph's Children's Hospital (n=53) Katerina Harwood (PI); Vijaya Prasad (I)

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Supplementary Table 1. Comparison of Diabetes Management Characteristics in the Excellent Control and Fair/Poor Control Groups Stratified by Insulin Delivery Method.

	Pump Users			Injection Users		
	Excellent HbA1c <6.5	Fair/Poor HbA1c ≥8.5	P value	Excellent HbA1c <6.5	Fair/Poor HbA1c ≥8.5	P value
	(N=336) ^a	(N=580) ^a		(N=291) ^b	(N=687) ^b	
Self-reported SMBG Frequency (per day)			<0.0001			<0.0001
<i>mean±SD</i>	7.11±2.82	4.60±2.33		5.66±2.88	3.93±2.24	
Times per Day – n(%)						
0-2 times	5 (2%)	77 (14%)		27 (10%)	144 (23%)	
3-4 times	56 (17%)	232 (43%)		81 (30%)	306 (48%)	
5-9 times	199 (61%)	210 (39%)		138 (50%)	173 (27%)	
≥10 times	66 (20%)	26 (5%)		28 (10%)	17 (3%)	
Frequency of SMBG prior to bolusing at time of meal^c – n(%)			<0.0001 ^f			<0.0001 ^f
Never/Rarely	2 (1%)	41 (9%)		15 (7%)	61 (12%)	
Sometimes/Most of the time	92 (43%)	274 (63%)		78 (37%)	279 (53%)	
Always	119 (56%)	123 (28%)		116 (56%)	188 (36%)	
Total Daily Insulin Dose (units/kgday)			<0.0001			<0.0001
<i>mean±SD</i>	0.54±0.23	0.62±0.28		0.54±0.30	0.71±0.37	
Tertiles – n(%)						
1 st tertile (<0.48)	127 (40%)	186 (34%)		131 (49%)	144 (23%)	
2nd tertile (0.48-<0.68)	127 (40%)	189 (35%)		68 (26%)	182 (30%)	
3rd tertile (≥0.68)	67 (21%)	166 (31%)		67 (25%)	289 (47%)	
Number of boluses (or short-acting) on a typical day – n(%)			0.03			0.5
≤2 boluses	8 (3%)	27 (5%)		42 (16%)	84 (13%)	
3-4 boluses	126 (40%)	263 (51%)		190 (71%)	462 (74%)	

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≥5 boluses	180 (57%)	226 (44%)		37 (14%)	82 (13%)	
Ratio of Bolus to Basal Insulin (or Short-acting to Long-acting)			0.02			0.04
<i>mean±SD</i>	1.41±1.26	1.11±2.23		1.46±2.69	1.09±1.01	
Ratio – n(%)						
<0.9	99 (32%)	266 (53%)		92 (37%)	276 (50%)	
0.9 - <1.5	106 (34%)	156 (31%)		87 (35%)	177 (32%)	
≥1.5	103 (33%)	81 (16%)		69 (28%)	104 (19%)	
Bolus given for daytime snacks – n(%)			0.0001 ^f			0.8 ^f
Never/ Rarely	37 (13%)	95 (17%)		128 (48%)	320 (50%)	
Sometimes/Most of the time	172 (58%)	353 (65%)		115 (44%)	266 (42%)	
Always	87 (29%)	976(18%)		21 (8%)	52 (8%)	
Timing of Mealtime insulin bolus – n(%)			<0.0001			0.002
Not given regularly	3 (1%)	33 (6%)		7 (3%)	35 (5%)	
Before meal	237 (72%)	287 (51%)		183 (66%)	361 (55%)	
During or after meal	48 (15%)	178 (32%)		39 (14%)	150 (23%)	
Depends on glucose level prior to meal	40 (12%)	60 (11%)		49 (18%)	107 (16%)	
Insulin:Carb Ratios Used to Determine Amount of Insulin Bolus – n(%)			0.002			0.1
No/Don't Know	31 (10%)	56 (11%)		99 (39%)	254 (42%)	
Yes, all 3 meals the same	176 (58%)	336 (68%)		109 (43%)	285 (47%)	
Yes, 3 meals not all the same	98 (32%)	103 (21%)		43 (17%)	73 (12%)	
Frequency of Missing Insulin Dose – n(%)			<0.0001 ^f			<0.0001 ^f
Never	218 (67%)	157 (28%)		208 (75%)	233 (36%)	
<1x/wk	89 (27%)	129 (23%)		52 (19%)	145 (22%)	
1-2x/wk	15 (5%)	131 (23%)		16 (6%)	155 (24%)	
≥3x/wk	5 (2%)	141 (25%)		2 (1%)	120 (18%)	

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Frequency of Exercise^d (days/week)- n(%)			0.0003			0.007
0 day	27 (13%)	81 (20%)		15 (8%)	76 (17%)	
1-2 days	37 (18%)	92 (23%)		36 (18%)	100 (22%)	
3-5 days	98 (47%)	170 (43%)		103 (52%)	190 (42%)	
6-7 days	45 (22%)	55 (14%)		45 (23%)	87 (19%)	
Composite of 4 factors^e			<0.0001			<0.0001
<i>mean±SD</i>	2.83±0.88	1.67±1.19		2.61±0.95	1.71±1.16	
Factors – n(%)						
0	3 (1%)	109 (20%)		0	106 (16%)	
1	20 (6%)	149 (27%)		39 (14%)	197 (30%)	
2	81 (25%)	158 (28%)		85 (31%)	176 (27%)	
3	150 (46%)	101 (18%)		100 (36%)	128 (20%)	
4	74 (23%)	41 (7%)		54 (19%)	46 (7%)	
How meal bolus is determined – n(%)			0.005 ^g			<0.0001 ^g
Uses bolus calculator	203 (61%)	348 (60%)	1.0 ^h	3 (1%)	12 (2%)	0.4 ^h
arb counting with correction for elevated glucose (w/o bolus calculator)	16 (5%)	40 (7%)	0.2 ^h	54 (19%)	146 (22%)	0.2 ^h
arb counting with no correction for elevated glucose (w/o bolus calculator)	73 (22%)	109 (19%)	0.3 ^h	99 (35%)	176 (27%)	0.01 ^h
Experience	28 (8%)	29 (5%)	0.05 ^h	76 (27%)	85 (13%)	<0.0001 ^h
Gives fixed dose/use a chart	1 (<1%)	20 (3%)	0.002 ^h	28 (10%)	178 (27%)	<0.0001 ^h
Does not bolus	0 (0%)	4 (1%)	0.1 ^h	4 (1%)	10 (2%)	0.9 ^h

^a n ranges between 296 and 332 in the Excellent group and between 495 and 576 in the Fair/Poor group, depending on availability of data for each factor (except for frequency of SMBG and frequency of exercise).

^b n ranges between 248 and 282 in the Excellent group and between 557 and 653 in the Fair/Poor group, depending on availability of data for each factor (except for frequency of SMBG and frequency of exercise).

^c 125 subjects missing frequency of SMBG data in the Excellent group and 142 in the Fair/Poor group in pump users; 82 and 159 missing, respectively in injection users.

^d 129 subjects missing frequency of exercise data in the Excellent group and 182 in the Fair/Poor group in pump users; 92 and 234, respectively in injection users.

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^e The composite variable (ranging 0-4) is composed of 4 dichotomous items (0/1): bolus before meal, always SMBG prior to bolusing at time of meal, miss doses < 1x/wk, and SMBG frequency ≥ 5 .

^f Mantel-Haenszel chi square statistics.

^g P value derived from comparing all exclusive categories in meal bolus method between the two glycemic control groups.

^h P value derived from chi square test without adjusting for multiple comparison. For each test, one category was contrast to all other categories combined.

Supplementary Table 2. Comparison of Pump Insertion & Basal Rate Change in the Excellent Control and Fair/Poor Control Groups for Pump Users.

	Excellent	Fair/Poor	
	HbA1c <6.5%	HbA1c \geq8.5%	P value
Usual duration of pump insertion			0.2
<i>mean\pmSD</i>	3.25 \pm 0.66	3.33 \pm 0.84	
Number of Days – n(%)			
<3 days	19 (7%)	42 (8%)	
3 days	195 (67%)	338 (64%)	
4 days	63 (22%)	107 (20%)	
5 days	13 (4%)	32 (6%)	
6 days	1 (<1%)	7 (1%)	
7 days	0	6 (1%)	
Number of basal insulin rate changes on a typical day			0.001
<i>mean\pmSD</i>	3.85 \pm 2.08	3.36 \pm 1.95	
Number per day – n(%)			
0-1 time	33 (12%)	77 (16%)	
2-4 times	146 (53%)	291 (61%)	
5 or more times	96 (35%)	110 (23%)	

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Supplementary Table 3. Comparison of Insulin Regimens in the Excellent Control and Fair/Poor Control Groups for Injection Users.

	Excellent	Fair/Poor	
	HbA1c <6.5%	HbA1c ≥8.5%	P value
Current use of insulin(s) – n(%)			0.03
Rapid Acting Analog [†] + Long Acting [‡]	244 (87%)	613 (92%)	
Rapid Acting Analog [†] + NPH	14 (5%)	17 (3%)	
Rapid Acting Analog [†] + Long Acting [‡] + NPH	4 (1%)	7 (1%)	
Regular + Long Acting [‡]	2 (1%)	5 (1%)	
Regular + NPH	2 (1%)	8 (1%)	
Long Acting Only ^{‡§}	3 (1%)	0	
Rapid Acting Analog Only ^{†§}	4 (1%)	2 (<1%)	
Other Combination	6 (2%)	12 (2%)	

[†]Includes: Humalog (Lispro), NovoLog (Aspart), and Apidra (Glulisine)

[‡]Includes: Levemir (Detemir) and Lantus (Glargine)

[§]All subjects on Rapid Acting Analog Only and all subjects on Long Acting Only were confirmed by clinic.