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**CDE-Ambassador**  
**A Novel Approach To Comprehensive Diabetes Care At The Primary Care Level**

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**Objective**

To determine whether the participation of a certified diabetes educator actively guided by a diabetologist (CDE Ambassador, CDE-A) working with physicians at the primary care level to interact and teach patients with type 2 diabetes improves glycemic control and other indices of cardiovascular risk

### Facts

- ❖ According to the CDC-Diabetic leadership initiative, the estimated prevalence of diagnosed and undiagnosed in the United states in 2012 was **29.1** million or **9.3%** of the populations
- ❖ If current trends continue, as many as **1 in 3** adults will have diabetes by the year 2050
- ❖ Diabetes was among the top ten most costly conditions in terms of health care expenditures for both women and men in 2008

### Facts

- ❖ The American Diabetes Association in 2013 estimated the total costs of diagnosed diabetes have risen to **\$245 billion** in 2012 from **\$174 billion** in 2007, when the cost was last examined
- ❖ People with diagnosed diabetes incur average medical expenditures of about **\$13,700** per year, of which about **\$7,900** is attributed to diabetes
- ❖ **1 in 10** health care dollars is spent treating diabetes and its complications

### Patients &Methods

- ❖ This is a Retrospective review of patients with type 2 diabetes who were managed by their primary care provider and whose treatment was further organized/modified by a CDE-A
- ❖ These patients were not seen by an endocrinologist during that period and for at least 3 years prior to inclusion in this management plan
- ❖ A CDE-A was attached to this primary care group to advise/guide the management of diabetic patients in collaboration with the primary care physicians (PCP's)

### Patients &Methods

- ❖ The initial training of the CDE-A's was for a period of 3 months by the endocrinologists
- ❖ Following the initial training period, the CDE-A continued to be in regular consultation with the endocrinologists in case further advice was needed
- ❖ Any changes to the anti-diabetic regimen that was suggested by the CDE-A had to be authorized by the PCP

### Patients & Methods

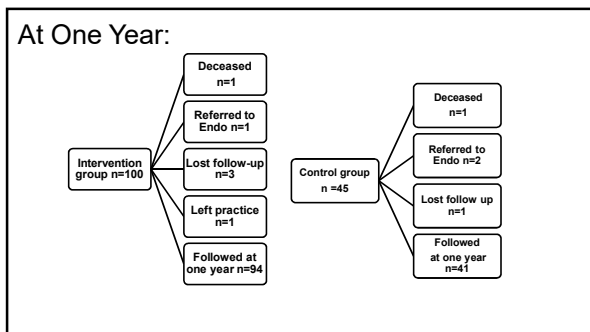
- ❖ The first consecutive 100 subjects who were referred and seen by CDE-A were included in this analysis
- ❖ The start date was the first visit with the CDE-A (i.e. intervention visit)
- ❖ The follow up visit date was the first scheduled visit with their physician following the intervention
- ❖ The last set of HbA1c and labs done prior to intervention was used as baseline data for the purpose of the analysis

### Patients & Methods

- ❖ Most patients met with the CDE-A twice during that period
- ❖ Follow up data (weight, BP) was documented on the date of follow up with PCP in 6 months then again at one year mark.
- ❖ Follow up laboratory values were collected around the dates of follow up
- ❖ Another group of 45 patients who had not been referred to the CDE-A and were managed by the PCP's alone over the same period were used as the controls

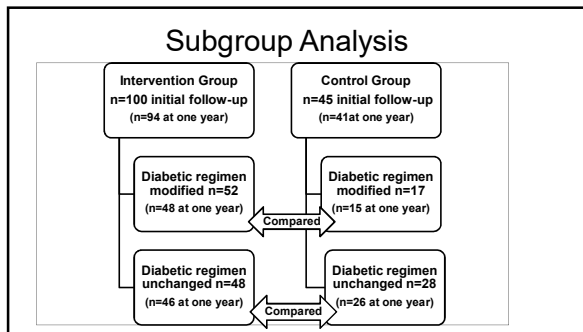
Last year we presented our data after the initial 6 months follow up.  
 We are now presenting our follow up data at 12 months without further intervention after 6 months.

Baseline characteristics	Intervention group n (%)	Controls	P-Value
Numbers*	100	45	
Mean Age	58 ±10	61±12	0.172
Female (%)	54 (54%)	23 (51%)	0.751
Diabetes Duration(years):	4.5 ± 5.4	5.7 ± 4.1	0.206
<5 years	62 (62%)	19 (42.2%)	0.027
5-10 years	28 (28%)	24 (53.3%)	0.003
>10 years	10 (10%)	2 (4.4%)	0.343
Mean Duration of initial post intervention follow-up	132 ± 107 days (4.4 ±3.6 months)	139 ± 64 days (4.6 ±2.1 months)	0.704
Mean Duration of follow-up at one year	406 ± 94 days (13.5 ±3.1 months)	385 ± 53 days (12.8 ± 1.8 months)	0.192
Baseline Anti-Diabetic Regimen	Intervention group n (%)	Controls	P-Value
None	26 (26%)	5 (11%)	0.043
Metformin	64 (64%)	33 (73%)	0.269
Sulfonylureas	20 (20%)	12 (27%)	0.371
Thiazolidinedione	3 (3%)	7 (16%)	0.010
GLP-1 Agonists	4 (4%)	4 (9%)	0.254
DPP-4 inhibitor	5 (5%)	4 (9%)	0.459
Long acting Insulin preparation	14 (14%)	9 (20%)	0.254
Short acting Insulin preparation	6 (6%)	4 (9%)	0.724
Combination of the above	30 (30%)	22 (49%)	0.028



Intervention (n=100)	Baseline	Initial Post intervention follow up data			One year follow up data		
		Post intervention	Mean change	P Value	One year	Mean change	P Value
Weight (Kg)	102±22	99±22	-2.8 ± 4.4	<.0001	98±21	-3.2 ± 6.7	<.0001
BMI (Kg/m <sup>2</sup> )	36±7	36±7	-0.96±1.7	<.0001	35±6	-1.1±2.3	<.0001
HbA1c (%)	8.4±2.2	6.8±1.2	-1.6±2.1	<.0001	7.3±2.0	-1.1±2.5	<.0001
SBP (mmHg)	134±17	128±13	-6±17	0.002	128±16	-6±19	0.037
DBP (mmHg)	80±10	77±9	-3±10	0.003	78±10	-2±11	0.064
LDLc*(mg/dl)	108±36	96±36	-12±30	0.0004	100±40	-9±34	0.027
Triglycerides(mg/dl)	189±121	162±90	-27±90	0.003	164±90	-30±68	0.0005
Microalbuminuria	64±536	27±153	-38±385	0.329	12±37	-66±54	0.334
Control (n=45)	Baseline	Initial	Mean change	P Value	One year	Mean change	P Value
Weight (Kg)	98.4±24	97.7±25	-0.66±2.6	0.089	96.8±23	-1.6±4.7	0.0395
BMI (Kg/m <sup>2</sup> )	34.3±7.3	34.1±7.5	-0.22±0.9	0.092	33.7±7.0	-0.5±1.6	0.043
HbA1c (%)	8.1±1.5	7.8±1.2	-0.26±1.2	0.151	7.9±1.5	-0.23±1.6	0.412
SBP (mmHg)	131±17	133±17	3±19	0.394	130.5±18	-0.61±22	0.858
DBP (mmHg)	75±9	77±12	2±11	0.229	75.3±13	0.27±10	0.866
LDLc <sup>†</sup> (mg/dl)	95.8±41	95.6±35	-0.18±22	0.960	94±31	-9±24	0.066
Triglyceridest	206.6±144	206.7±105	0.17±80	0.992	205±122	-2.8±85	0.886
Microalbuminuria	78±273	33±188	-45±288	0.295	42±145	-43±287	0.338

Results		
Anti-diabetic regimen	Intervention group (%)	Control group (%)
No change	48 (48%)	28 (62%)
Metformin added or increased	30 (30%)	3 (7%)
Sulfonylurea		
Added	11 (11%)	3 (7%)
Stopped	0	1 (2%)
GLP1 agonist added	5 (5%)	3 (7%)
Long acting Insulin dose:		
Increased/added	11 (11%)	3 (7%)
Decreased	2 (2%)	
Short acting Insulin stopped	1 (1%)	0
SGLT2 added	1 (1%)	0
Thiazolidinedione added	0	2 (4%)
DPP-4 added	0	3 (7%)
Meglitinide added	0	1 (2%)
Multiple medication changes	7 (7%)	2 (4%)
Statin Therapy	Intervention group (%)	Control group (%)
No statin	47 (47%)	12 (27%)
Statin started within a month of intervention start date	3 (3%)	3 (7%)
Statin Dose Unchanged	48 (48%)	26 (58%)
Statin Dose Changed	0	3 (7%)
Statin Stopped	0	1 (2%)
Unclear documentation	2 (2%)	0



Baseline characteristics of the subgroups at one year.			
Groups in which diabetic regimen modified	Intervention subgroup (%)	Control subgroup (%)	P-Value
Numbers	48	15	
Mean Age	56±9	60±12	0.110
Female (%)	25 (52%)	9 (60%)	0.598
Diabetes Duration(years)	3.8±4.3	4.2 ± 2	0.571
Mean Duration of follow-up	411 ± 111 days (13.7 ±3.7 months)	378 ±43 days (12.6 ±1.4 months)	0.090
Groups in which diabetic regimen not modified	Intervention subgroup (%)	Control subgroup (%)	P-Value
Numbers	46	26	
Mean Age	61 ±10	62 ±11	0.811
Female (%)	26 (56%)	11 (42%)	0.254
Diabetes Duration(years)	5.1±6.5	6.0±4.6	0.504
Mean Duration of follow-up	400±73 days (13.3 ±2.4 months)	390 ±59 days (13.2 months)	0.544

Data from the Intervention and Control Groups whose anti-diabetic treatment was modified

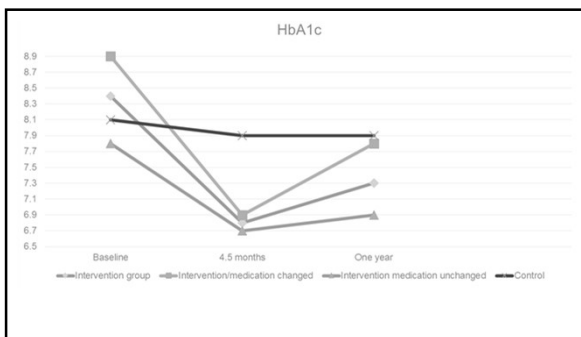
- ❖ 3 patients in the Intervention subgroup had statin started at time, 49 had no statin or no change in dose.
- ❖ In this intervention subgroup, HbA1c at one year mark was available in 44 patients, LDL in 34 patients, and triglycerides in 37.
- ❖ In the Control Group HbA1c was available in 13 patients, LDL in 8 patients and triglycerides in 10 patients.

Diabetes Regimen modified Intervention Group (n=52)	Baseline	Initial Post intervention follow up data			One year follow up data		
		Post Intervention	Mean change	P Value	One year***	Mean change	P Value
Weight(kg)	103±25	99.5±25	-3.7±4.9	<.0001	99±24	-3.7±7.2	0.0008
BMI(Kg/m <sup>2</sup> )	36.6±8	35.3±8	-1.3±1.9	<.0001	35.2±7	-1.2±2.5	0.003
HbA1c (%)	8.9±2.4	6.9±1.2	-1.9 ±2.0	<.0001	7.8±2.5	-1.4 ±2.8	0.002
SBP(mmHg)	133±17	126±11	-8±16	0.001	130±18	-3.7±21	0.232
DBP(mmHg)	90±9	76±9	-14±10	0.003	78±10	-2.9±16	0.083
LDLc(mg/dl)	110±36	85±39	-15 ±26	0.001	99±42	-15 ±26	0.002
Triglycerides	212±148	172±95	-40±81	0.123	163±103	-32±75	0.013
Microalbuminuria	9.8±19	9.6±17	-0.2±13	0.929	5.6±8	-3±13	0.162
Control (n=17)	Baseline	Initial followup	Mean change	P Value	One year	Mean change	P Value
Weight(kg)	97.3±22	97.1±22	-0.2±2.4	0.695	98±23	-1±3.9	0.320
BMI(Kg/m <sup>2</sup> )	34.1±7	34 ± 7	-0.1±0.8	0.776	34 ± 6.5	-0.4±1.3	0.228
HbA1c (%)	8.4±1.5	8±1.5	-0.4±1.3	0.202	7.9±1.2	-0.7±1.1	0.037
SBP(mmHg)	128±15	130 ± 17	2±17	0.666	130 ± 21	1±22	0.837
DBP(mmHg)	74±9	76±9	2±8	0.263	75±9	2±8	0.437
LDLc(mg/dl)	100±27	97±29	-3±22	0.653	100±31	-1±31	0.225
Triglycerides	267±158	260±112	-7±81	0.731	251±121	25±98	0.450
Microalbuminuria	132±418	627.1	-126±420	0.224	15±20	-134±450	0.269

Data from the Intervention and Control Groups whose anti-diabetic treatment was not modified

- ❖ In this intervention subgroup, HbA1c at one year mark was available in 43 patients, LDL and triglycerides in 34 patients.
- ❖ In the Control subgroup HbA1c was available in 20 patients, LDL in 15 patients and triglycerides in 16 patients.

Medications unchanged Intervention n=48	Baseline	Initial Post intervention follow up data			One year follow up data		
		Post Intervention	Mean change	P Value	One year data*	Mean change	P Value
Weight(kg)	100±18	98±19	-1.9±3.6	0.001	98±19	-2.6±5.9	0.005
BMI(Kg/m <sup>2</sup> )	35.2±5	34.6±5	-0.6±1.3	0.002	35±5	-0.9±2.1	0.005
HbA1c (%)	7.8±2.0	6.7±0.9	-1.1±2.1	0.001	6.9±1.0	-0.9±2.3	0.015
SBP(mmHg)	134±17	131±15	-3±19	0.330	128±14	-4.4±16	0.067
DBP(mmHg)	80±11	78±10	-2±11	0.232	78±9	-1.3±11	0.411
LDLc(mg/dl)	107±37	98±34	-9±33	0.064	101±38	-4±41	0.593
Triglycerides	168±74	154±85	-14±80	0.244	143±68	-27±61	0.017
Microalbuminuria	123±773	45±220	-78±555	0.332	19±52	-110±792	0.352
Control (n=28)	Baseline	Initial follow up	Mean change	P Value	One year data	Mean change	P Value
Weight(kg)	95.9±25	95±26	-0.9± 2.7	0.897	95.9±24	-1.9± 5.2	0.078
BMI(Kg/m <sup>2</sup> )	34.5± 8	34.2± 8	-0.3± 0.9	0.068	33.3± 7	-0.6± 1.8	0.108
HbA1c (%)	7.9± 2.1	7.8± 1	-0.1± 1.1	0.647	7.9± 1.7	0.1± 1.9	0.875
SBP(mmHg)	132± 17	135 ± 18	3± 21	0.460	131 ± 17	-1.6± 22	0.707
DBP(mmHg)	76± 11	78± 14	2± 13	0.436	75.4± 15	-0.5± 11	0.805
LDLc(mg/dl)	93± 47	95± 39	1.4± 22	0.905	90± 32	7± 20	0.198
Triglycerides	164± 128	169± 85	5± 82	0.760	176± 117	20± 74	0.301
Microalbuminuria	45± 115	48± 238	4± 153	0.898	57± 180	9± 101	0.834



### HIGHLIGHTS OF RESULTS

- ❖ In the CDE-A intervention group, HbA1c fell by  $1.6 \pm 2.1\%$  with a fall in HbA1c was  $1.9 \pm 2.0\%$  in those in whom anti-diabetic treatment was altered and by  $1.1 \pm 2.1\%$  in whom drug therapy was not changed six months post intervention.
- ❖ The reduction in all the parameters were significantly greater in the intervention group when compared to controls

### HIGHLIGHTS OF RESULTS

- ❖ Our data clearly show that the participation of the CDE-A, under the guidance of an endocrinologist at the primary care level led to a marked reduction in HbA1c, LDLc, triglycerides, blood pressure and body weight within 5 months
- ❖ These changes were dependent on changes in dietary habits and drug therapy including the addition or optimization in the doses of anti-diabetic drugs and insulin therapy

### HIGHLIGHTS OF RESULTS

- ❖ In the intervention group, the anti-diabetic regimen was modified in **52%** of the subjects as compared to **38%** in the control group
- ❖ It is interesting that while **78%** of the patients managed by PCP alone continued to remain uncontrolled, recommendations of a CDE authorized by the same PCP providers resulted in majority (**69%**) of the uncontrolled patients in the intervention arm achieving an **HbA1c of < 7%**. This suggests that the clinical inertia of the PCP's can be improved by the CDE-A intervention.

### HIGHLIGHTS OF RESULTS

- ❖ The beneficial effect on HbA1c diminished from a reduction of 1.6% from the baseline at 6 months to 1.1% over the following 6 months *without* further visits to the CDE-A.
- ❖ However, the benefits in BMI, blood pressure, triglycerides and LDLc were largely maintained, without significant attenuation. These indices did not change in the control group.

### HIGHLIGHTS OF RESULTS

- ❖ It is of interest that the changes in lipids occurred without any change in statin therapy, probably due to increased compliance
- ❖ The improvement in the HbA1c in the intervention group persisted after one year ( mean drop of 1.1 ) and remained statistically significant in comparison to the control group ( P = 0.0009)

### HIGHLIGHTS OF RESULTS

- ❖ There was a mean drop of 3.2 Kg and 1.1 in the BMI after one year in the intervention group. The weight loss and improvement in lipids remained statistically significant at one year after intervention
- ❖ The changes in glycemia, blood pressure, lipids and body weight would potentially result in a significant reduction in microvascular and macrovascular complications and improvement in the quality of life of these patients

## HIGHLIGHTS OF RESULTS

- ❖ In addition, it will reduce the magnitude of expenditure which currently occurs in the management of these complications
- ❖ We are now contemplating prospectively randomized studies comparing centers which are supported with CDE-A with those that are not and to study the durability of and cost saving related to these effects

We conclude that the involvement of the empowered CDE-A can contribute to improvements in diabetic control and indices of cardiovascular risk. While the maintenance of HbA1c probably requires repeated visits to CDE-A, the other indices related cardiovascular risk are effectively controlled for at least one year. A network of CDE-As, empowered by diabetologists at the primary care level could help prevent diabetic microvascular and macrovascular complications.

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