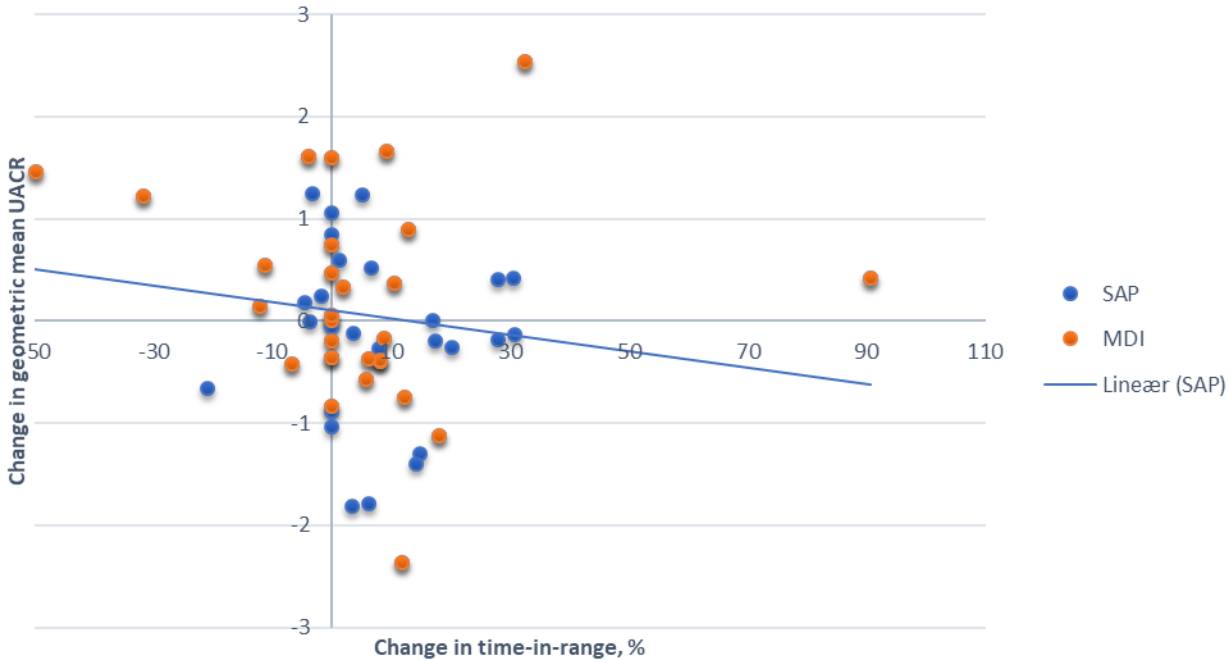
Supplemental materials: Improved Time-in-Range over 1 year is Associated with Reduced Albuminuria in Individuals with Sensor-Augmented Insulin Pump-Treated Type 1 Diabetes

Supplementary Figure 1: Scatter plot of the relationship of change in time-in-range and change in urine albumin-creatine-ratio from baseline to study end



Scatter plot showing the relationship of change in time-in-range (TIR) and change in urine-albumin-creatine- ratio (UACR) from baseline to study end for 55 participants with type 1 diabetes and albuminuria assigned to multiple daily injection therapy (MDI) or sensor-augment insulin pump therapy (SAP). The linear regression analysis showed that there was a significant relationship between the changes in UACR with the changes in %TIR (R=-0.03 and p=0.04)

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Supplementary Table 1. Associations of changes in urine albumin-creatine-ratio with quartile changes of time-in-range from baseline to study end.

Change in TIR		Change in UACR (%)			P-value
Quartile	**Range (%)**	**Median**	**Interquartile range**		
1	< -3.19	14.9	-30.0	188.2	0.50
2	- 3.2 - 6.6	-0.12	-43.8	81.4	
3	6.6-14.8	-23.6	-52.6	68.5	
4	>14.8	-14.3	-22.3	51.3	

The median changes in urine-albumin creatine ratio (UACR) stratified by the quartiles of change of time-in-range (TIR) from baseline to study end for 55 participants with type 1 diabetes and albuminuria assigned to multiple daily injection therapy (MDI) or sensor-augment insulin pump therapy (SAP). P values were calculated using a one-way analysis of variance (ANOVA).

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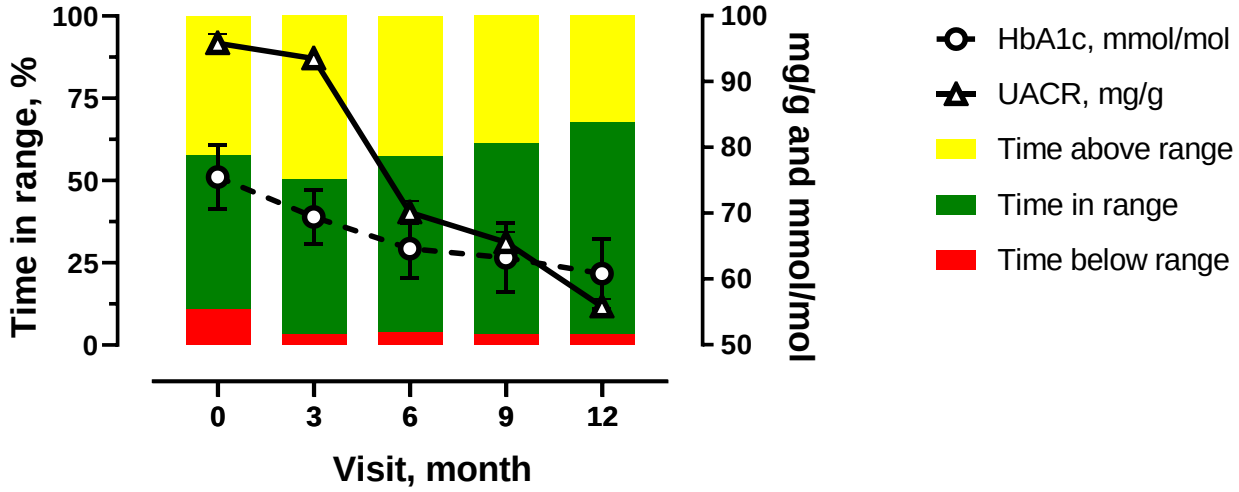
Supplementary figure 2. Changes in time in range, urine albumin-creatine-ratio and glycated hemoglobin A1c for 12 months after initiation of sensor-augmented insulin pump.



Twenty-six participants with type 1 diabetes were assigned to sensor-augmented insulin pump treatment for 12 months. The data from the continuous glucose monitors (CGM) were uploaded for each 3-month visit, showing the mean percentage of time spent above range >10.0 mmol/l (upper yellow bar), time within range of 3.9-10.0 mmol/l (middle green bar); and time below range <3.9 mmol/l (lower red bar). The corresponding glycated hemoglobin A1c (HbA_{1C}: solid line with white circles) and the urine albumin-creatine-ratio (UACR: dotted line with white triangles) are shown as mean (95% CI).

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Supplementary Table 2. Associations of changes in metrics with changes in urine albumin-creatine-ratio

Variable	Change of	Unadjusted change of UACR (95%CI)	P-value		
			Unadjusted	Adjusted$_1$	Adjusted$_2$
$TIR_{3.9\text{-}10}$	10 %	18.6 (9.5;27.9) %	**0.0006**	**0.021**	**0.038**
$Mean_{SG}$	1 mmol/l	- 2.6 (-5.9;8.5) %	0.54	0.35	**0.031**
CV_{SG}	1 %	0.53 (-0.98;2.5) %	0.51	0.17	0.250
GMI_{SG}	10 mmol/mol	-5.50 (-3.3;1.1)	0.66	0.29	**0.031**
HbA1c	10 mmol/mol	-18.1 (-8.2;29.6) %	**0.02**	**0.02**	0.071
BMI	1 kg/m^2	-3.6 (-4.0;4.3) %	0.38	0.79	0.830
MAP	10 mmHg	-22.1 (-33.0;-11.2) %	**<0.0001**	**0.0001**	**<0.0001**

The association of changes in time-in-range (TIR), mean sensor glucose ($Mean_{SG}$), coefficient of variance sensor glucose (CV_{SG}), glucose management index (GMI_{SG}), glycated hemoglobin A_{1c} (HbA_{1c}), body mass index (BMI), mean arterial pressure (MAP) with the geometric mean changes in urine albumin-creatine-ratio(UACR) (95% confidence interval) during the study. P values were calculated using a linear mixed model with participant-specific intercept as a random effect and time from baseline as a fixed effect. Unadjusted and adjusted (BMI and MAP) without (1) and with (2) HbA_{1c}.

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Supplementary Table 3. The changes in urine-albumin creatine ratio per change in glycemic metrics for persons using multiple daily injections and sensor-augmented insulin pump

MDI and SAP (n=55)	Unadjusted change in UACR				Adjusted change in UACR			
	Mean (%)	95% CI		p value	Mean (%)	95% CI		p value
TIR (Per 10%)	-5.95	-13.25	1.39	0.11	-6.98	-15.61	0.07	0.052
TAR (Per 10%)	6.89	-2.51	16.37	0.15	9.39	-0.79	19.68	0.07
%CV (Per 1%)	-0.47	-2.27	1.37	0.61	-0.41	-2.22	1.44	0.66
GMI_{SG} (Per 1 mmol/mol)	1.38	-0.69	3.50	0.19	2.00	-0.30	4.36	0.09
HbA1c (Per 1 mmol/mol)	0.06	-0.87	0.99	0.91	-1.04	-2.57	0.57	0.20

The mean changes (%) in urine-albumin creatine ratio (UACR) per 10% increase in time-in-range (TIR) and time-above-range, per 1% increase in %CV, per 1 mmol/mol in GMI and HbA1c for 55 participants with type 1 diabetes and albuminuria assigned to multiple daily injection therapy (MDI) or sensor-augment insulin pump therapy (SAP) for one year. P values were calculated using a linear mixed model with participant-specific intercept as a random effect and time from baseline, intervention (SAP or MDI) as a fixed effect. The model was either unadjusted or adjusted for changes in HbA_{1c}.