An intensive, target driven intervention reduced cardiovascular and microvascular events in patients with type 2 diabetes and microalbuminuria


**QUESTION:** In patients with type 2 diabetes and microalbuminuria, what is the effect of a target driven, long term, intensive, multifactorial intervention compared with conventional treatment on cardiovascular and microvascular disease?

**Design**
Randomised [allocation concealed]*, blinded [data collectors and outcome assessors]*, controlled trial with mean follow up of 7.8 years (the Steno-2 Study).

**Setting**
A diabetes centre in Denmark.

**Patients**
160 patients (mean age 55 v) with persistent micro-albuminuria. Follow up was 81%.

**Intervention**
80 patients were allocated to intensive treatment involving strict treatment goals with stepwise implementation of behavioural modification (diet plan, exercise, and smoking cessation) and target driven pharmacological therapy for hyperglycaemia, hypertension, dyslipidaemia, and microalbuminuria. All patients in the intervention group received either an angiotensin converting enzyme inhibitor or angiotensin II receptor antagonist. Aspirin was given for secondary prevention of cardiovascular disease. 80 patients were allocated to conventional treatment of risk factors from their general practitioner according to Danish Medical Association guidelines.

**Main outcome measures**
The primary outcome was a composite endpoint of death from cardiovascular causes, non-fatal myocardial infarction, revascularisation, non-fatal stroke, amputation resulting from ischaemia, or vascular surgery for peripheral atherosclerotic artery disease. Secondary outcomes were development of diabetic nephropathy and development or progression of diabetic retinopathy or neuropathy.

**Main results**
Analysis was by intention to treat. Intensive treatment was associated with a lower risk than conventional treatment for the primary composite endpoint, development of diabetic nephropathy, development or progression of retinopathy, and progression of autonomic neuropathy (table). Treatment groups did not differ for progression of peripheral neuropathy (p=0.66) or rates of having ≥1 minor hypoglycaemia event (p=0.50) or ≥1 major hypoglycaemia event (p=0.12).

**Conclusion**
In patients with type 2 diabetes and microalbuminuria, a target driven, long term, intensive multifactorial intervention using behavioural modification and polypharmacological therapy was more effective than conventional treatment for reducing risk of cardiovascular and microvascular events.

*Information provided by author.

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**Table: Outcomes**

<table>
<thead>
<tr>
<th>Outcomes (mean 7.8 y follow up)</th>
<th>Intensive</th>
<th>Conventional</th>
<th>Adjusted HR (95% CI)</th>
<th>NNT (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite endpoint‡</td>
<td>24%</td>
<td>44%</td>
<td>0.47 (0.22 to 0.74)</td>
<td>5 (3 to 19)</td>
</tr>
<tr>
<td>Diabetic nephropathy</td>
<td>20%</td>
<td>30%</td>
<td>0.26 (0.11 to 0.60)</td>
<td>3 (1 to 12)</td>
</tr>
<tr>
<td>Retinopathy (developed or progressed)</td>
<td>48%</td>
<td>64%</td>
<td>0.75 (0.47 to 1.18)</td>
<td>4 (3 to 15)</td>
</tr>
<tr>
<td>Autonomic neuropathy</td>
<td>30%</td>
<td>54%</td>
<td>0.66 (0.41 to 1.02)</td>
<td>6 (4 to 14)</td>
</tr>
</tbody>
</table>

HR = hazard ratio. Other abbreviations defined in glossary; RRR, NNT, and CI calculated from data provided by author. HR adjusted for baseline characteristics.

‡Composite endpoint of various cardiovascular events.