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Diabetes and Its Complications

Diabetes and Its Complications

- 16 million are Americans affected
- Serious and fatal complications cost $92 billion in 1992
  - Blindness
    - diabetes as the leading cause in age 25-74, 27,000 /yr
  - Amputations
    - 28 times higher risk, 54,000/yr
  - Heart disease
    - 2-4 times higher risk, 77,000 die/yr
  - Stroke
    - 5 times higher risk, 11,000 die/yr
  - Kidney disease
    - 1/3 of all kidney failure, 13,000/yr

Care for Patients with Diabetes

To optimize glycemic control and minimize complications

Medical Care + **Self-management education**

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American Diabetes Association

"*Diabetes Self-Management Education (DSME) is the cornerstone of care for all individuals with diabetes who want to achieve successful health-related outcomes.*"

"Continuing patient education for self-management is an integral component of diabetes treatment. This is particularly so for diabetes; successful management of diabetes is greatly dependent on the patient's own efforts. Therefore, all people with diabetes must have access to affordable patient education services."

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Diabetes Self-Management Education (DSME)

A process of providing

- Knowledge
- Skills for self-care

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DSME Works

- Participants in DSME
  - Decrease in complication rates
  - Fewer emergency room visits and hospitalizations
  - Reduced medication costs

Examples

- 49% reduction of lower extremity amputations, 65% fewer severe ketoacidosis
  - J Am Dieb Ass 1979, 75: 250-7

- 78% reduction in hospital length of stay, saves $2,319/person/year
  - N Eng J Med 1972, 286: 1388-91

DSME is Paid

Most insurers reimburse for DSME programs that have met accepted standards

National Standards for Diabetes Self-Management Education

Standard 8.

An individualized assessment, development of an educational plan, and periodic reassessment between participant and instructor(s) will direct the selection of appropriate educational materials and interventions.

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BioSignia's Diabetes Complication Predication Model: A Useful Tool in DSME

- Individualized complications prediction
- Detail disease stages, 19 predicted stages
- Comprehensive and up to date medical knowledge
- Advanced statistical algorism: Monte Carlo assimilation
- Interactive animation and simple graphic presentation

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Objective of the Tool

- Increase knowledge
- Motivate self-care
- Increase adherence to treatment
- Evaluate effectiveness of treatment

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What Does The Model Predict ?

- Cardiovascular
  - Stroke, Heart Disease
- Retinopathy
  - NPDR 1-3, PDR, ME, Blindness
- Nephropathy
  - MA, GPA, ESRD
- Neuropathy
  - Clinical Neuropathy, LEA

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How Was It Developed ?

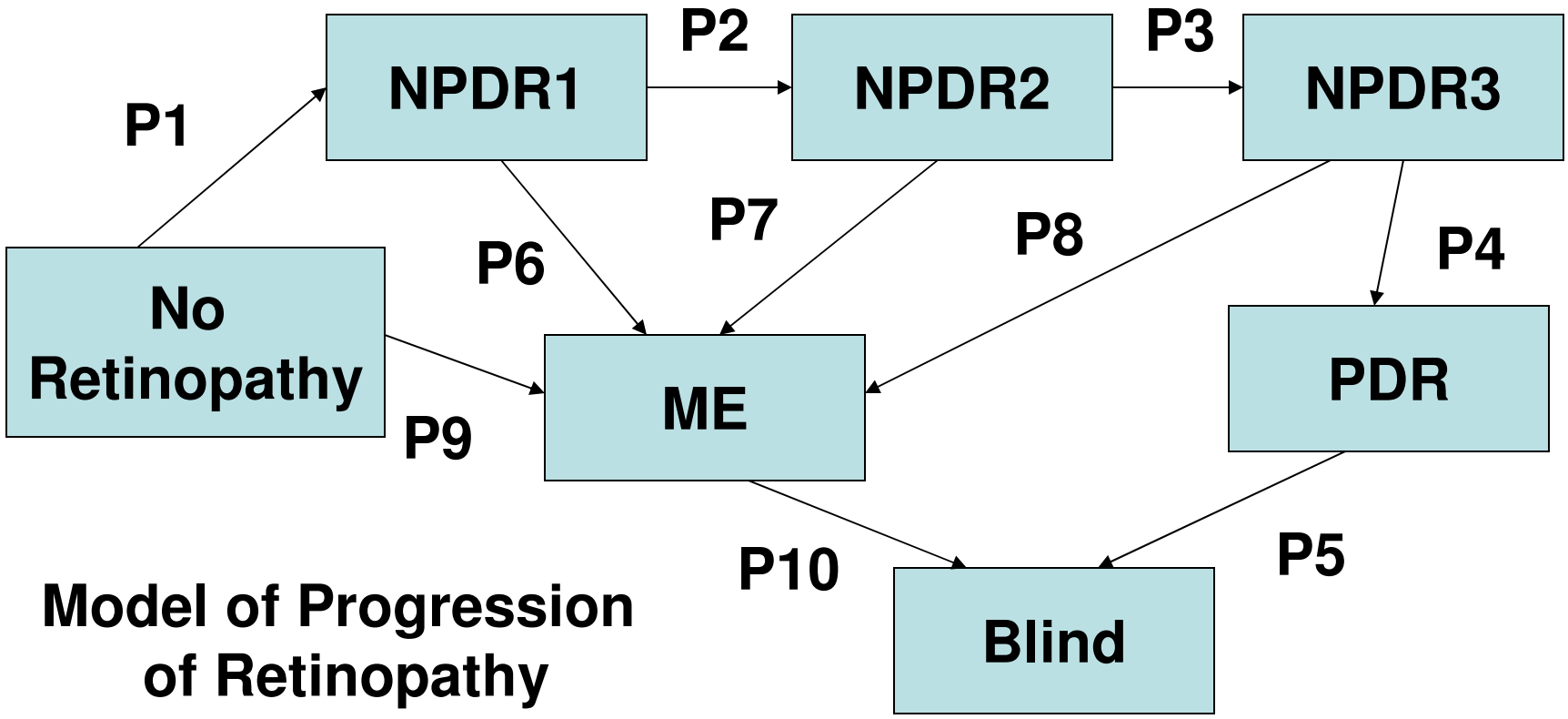
Review of the known epidemiology of diabetes natural history and effects of intervention.

Information sources:

- DCCT
- UKPDS
- WESDR
- Rochester, Minnesota population study

How Was It Developed ?

Probability modeling (Monte Carlo simulation)



Model of Progression of Retinopathy

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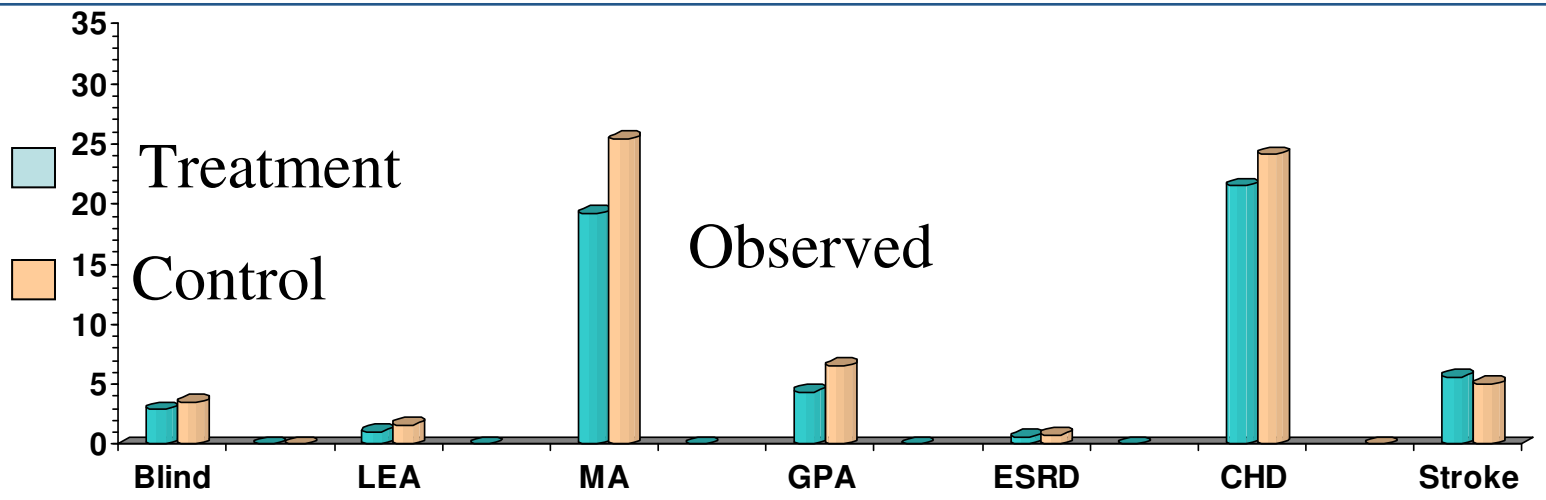
Validation: Question

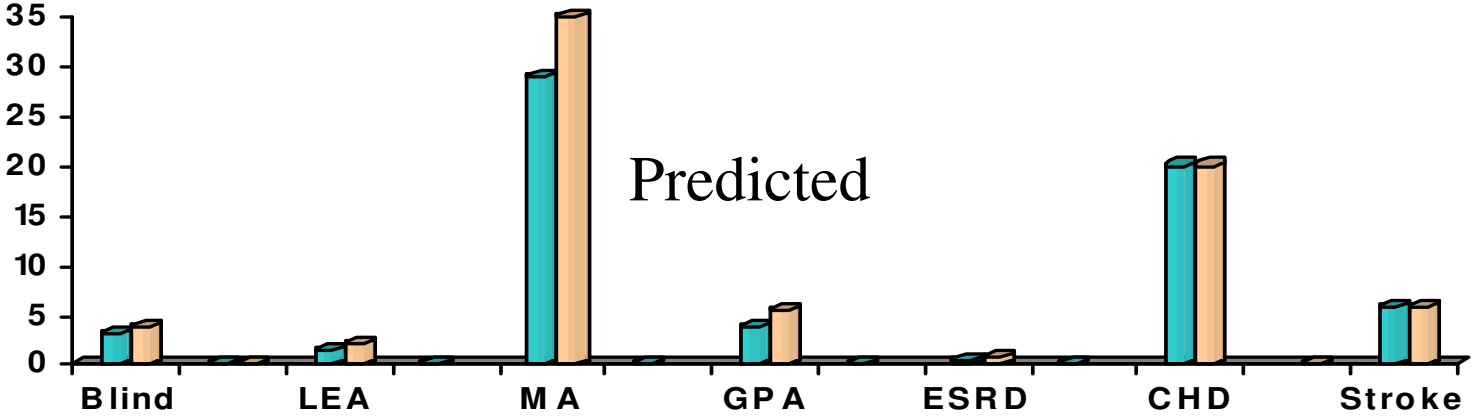
- Among general population does the model
  - predict complications incidence close to what were observed?
  - predict the effectiveness of interventions close to what were observed?

Validation: Population

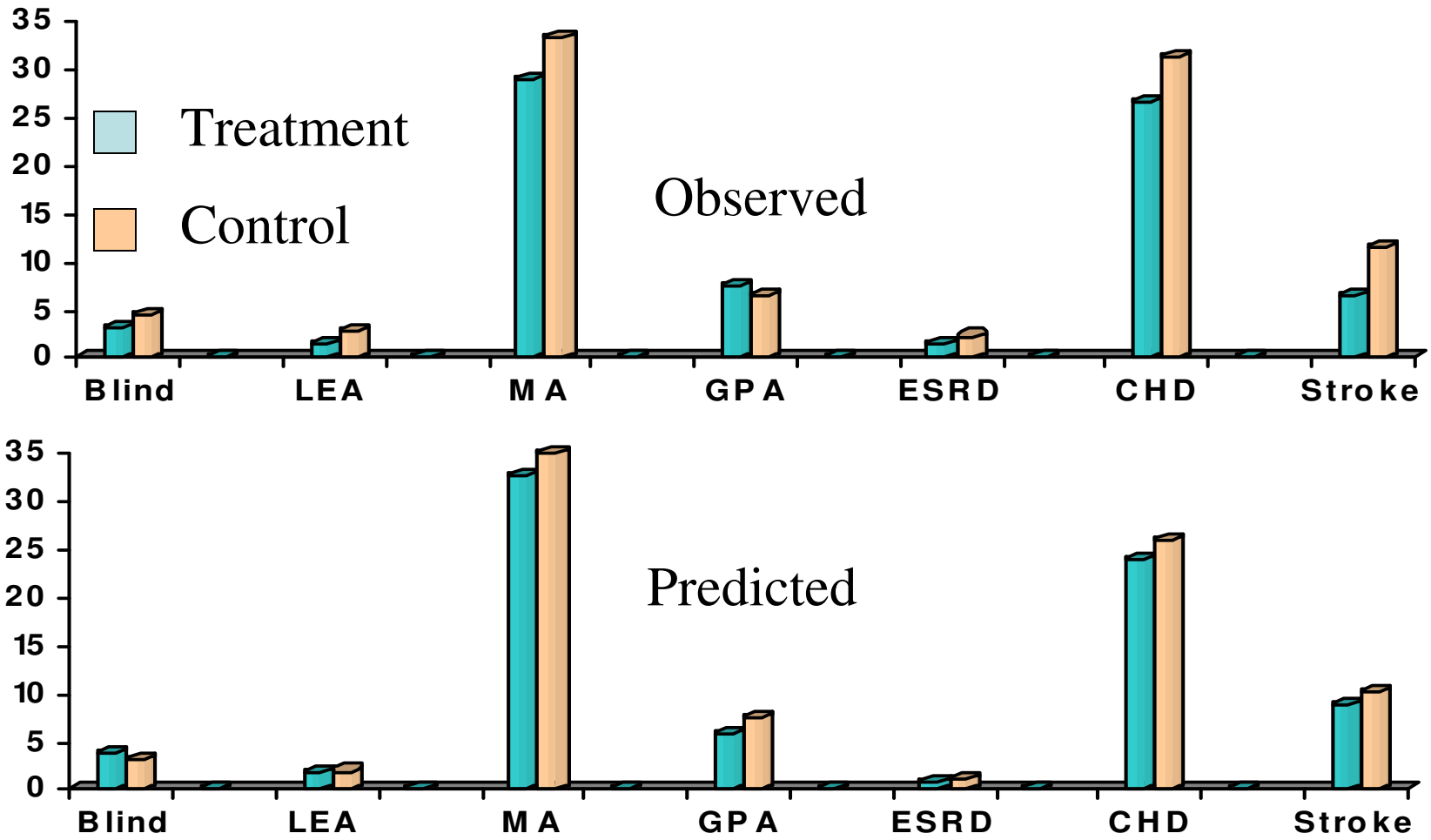
- UKPDS, glycemic control trial
  - average 9 year of follow up
  - Treatment (n=2729) with HbA1c=7.0% vs. control (n=1138) with HbA1c=7.9%
- UKPDS, BP control trial
  - Treatment (n=758) with SBP=145 vs. control (n=390) with SBP=155
- DCCT (second cohort)
  - Average 6 year of follow up
  - Treatment (363) with HbA1c=7.0% vs. control (n=352) with HbA1c=9.0%

10 Year Incidence of Complications in UKPDS (Glycemic Control Trial): Observed vs. Predicted





10 Year Incidence of Complications in UKPDS (BP Control Trial): Observed vs. Predicted



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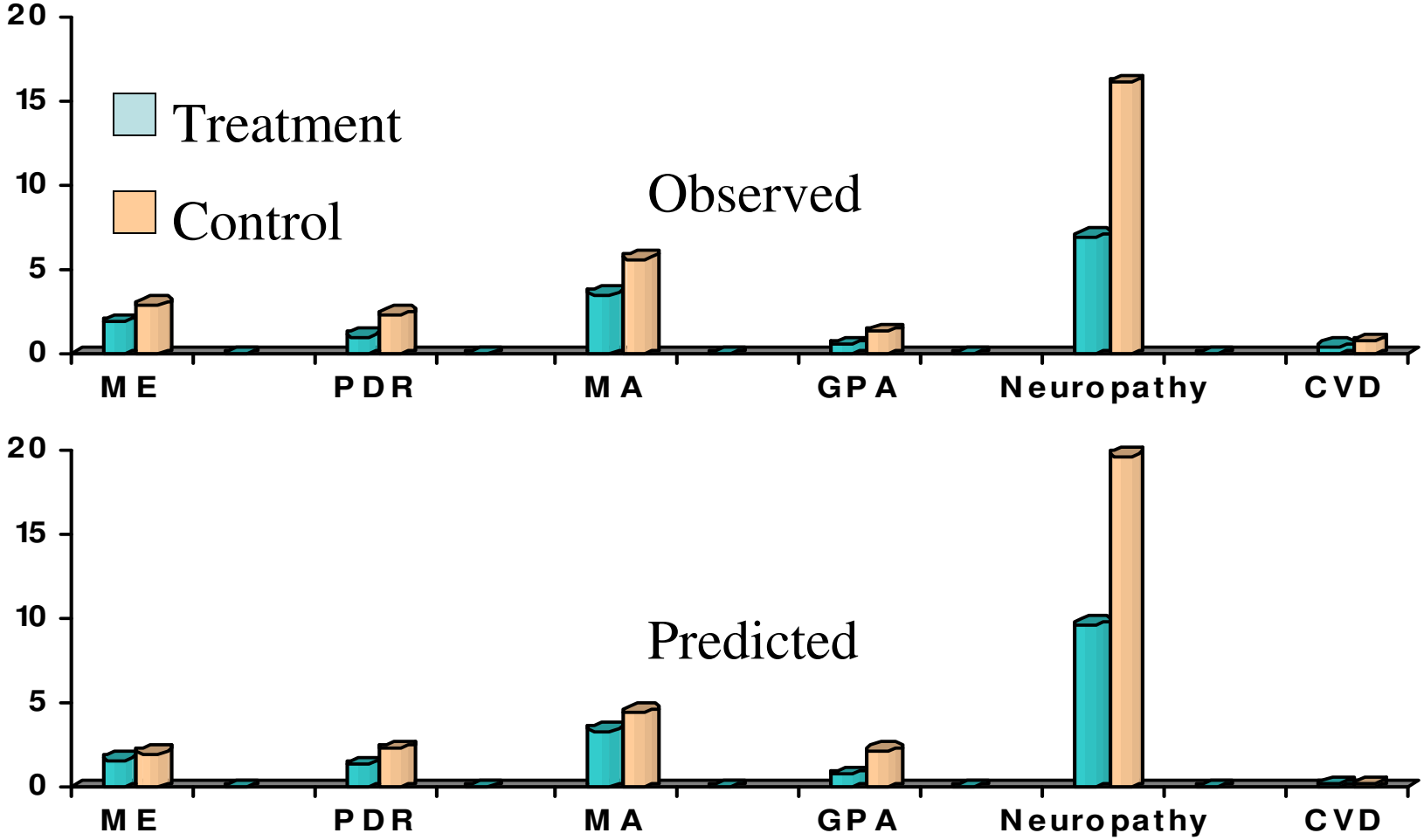
Annual Incidence of Complication in DCCT: Observed vs. Predicted



Validation: Conclusions

- The model predicts similar incidence of major complications with what were observed in UKPDS and DCCT
- The predicted reductions of complications due to glycemic control and blood pressure control are the same with what were observed in UKPDS and DCCT