Using AI to predict vascular complications in diabetes

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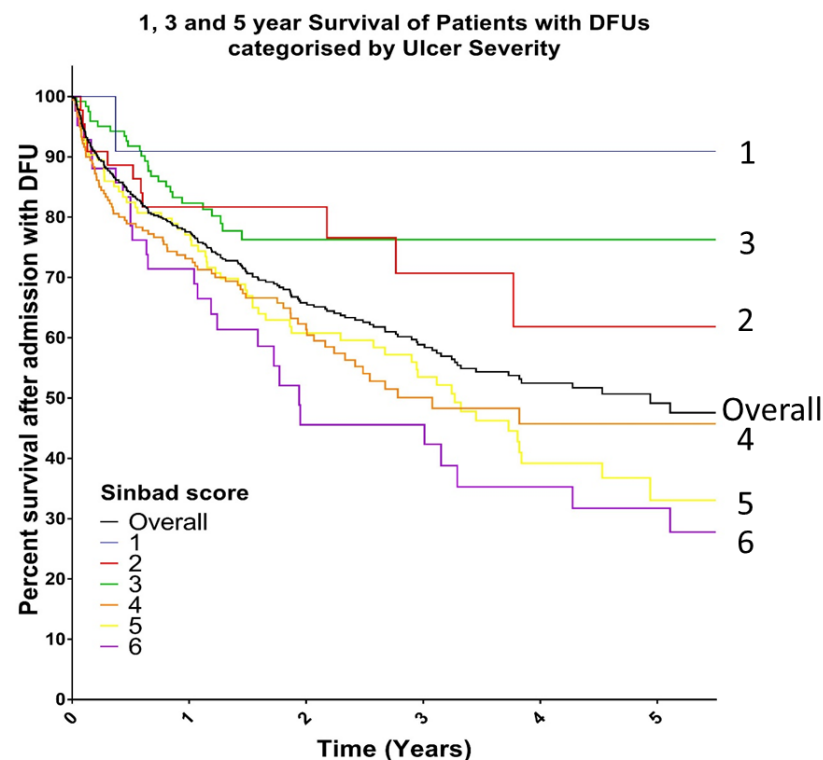# Health and financial burden of increased diabetic vascular complications

Background:

- 1 in 10 patients with diabetes will get a foot ulcer
    - More than 60,000 people with diabetes in England are thought to have foot ulcers at any given time
- In 2014-15 the annual cost of diabetic foot disease to the NHS in England was estimated at £1 billion
- Diabetes is the leading cause of non-traumatic lower limb amputations in the UK
- High mortality rates from diabetic foot disease (DFD) and amputation

1, 3 and 5 year Survival of Patients with DFUs categorised by Ulcer Severity

Understanding the disease, predict individuals risk, better outcomes

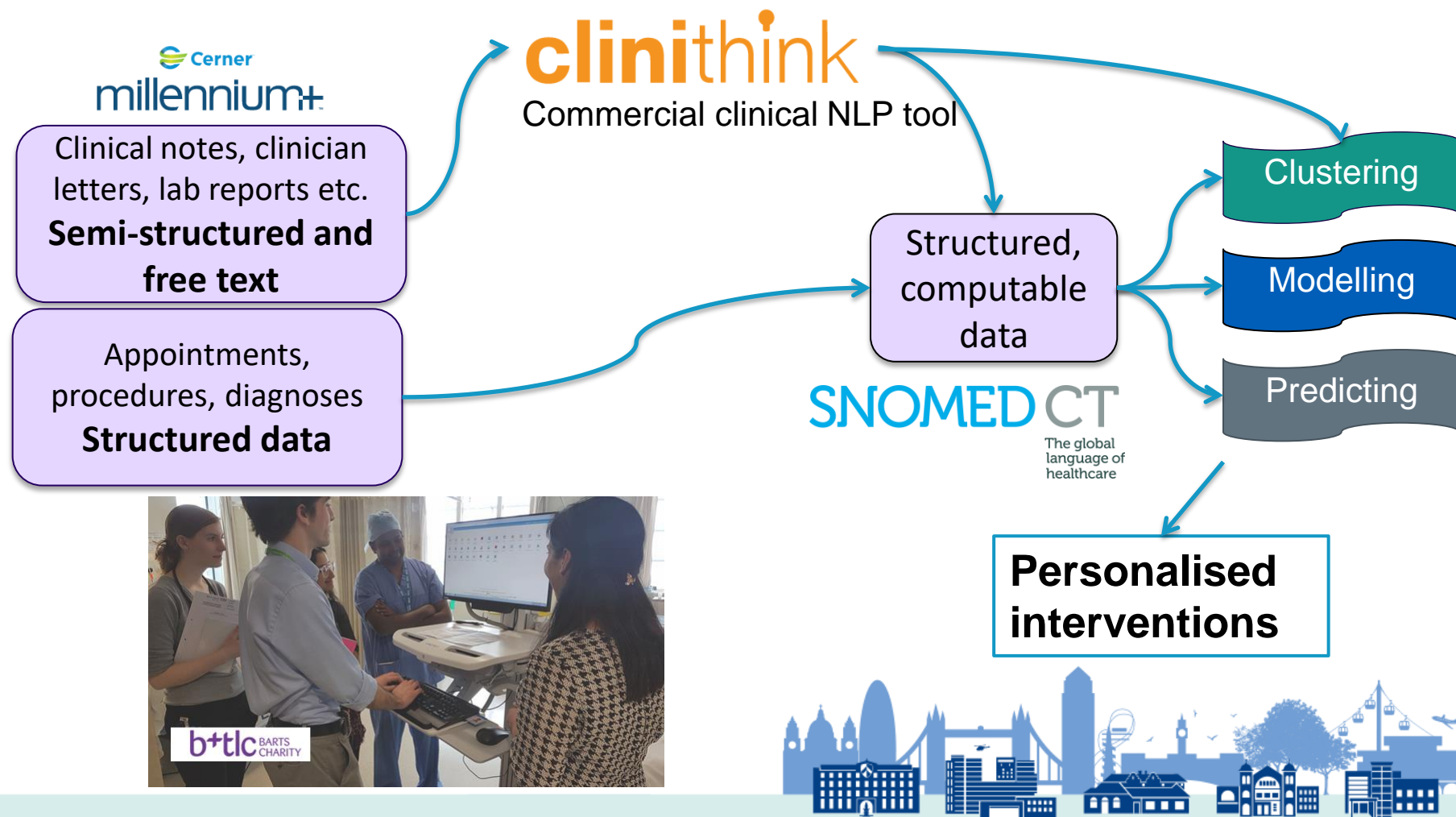More severe foot ulceration is associated with worse prognosis

- ... More complex as most adults with diabetes have at least one comorbid chronic disease and up to 40% have at least three

Project aims:

- Understand how previous medical history, demographics, lifestyle and environmental factors (in type 2 diabetes) affect **development** and **severity** of vascular complications ...focusing on diabetic foot disease
    - Documentation of long, complex medical history in health record
- Identify cohorts of the population at risk
- **Actionable insights** provide better care for individuals at risk of DFD.

Electronic Health Records for health data science research

Commercial clinical NLP tool
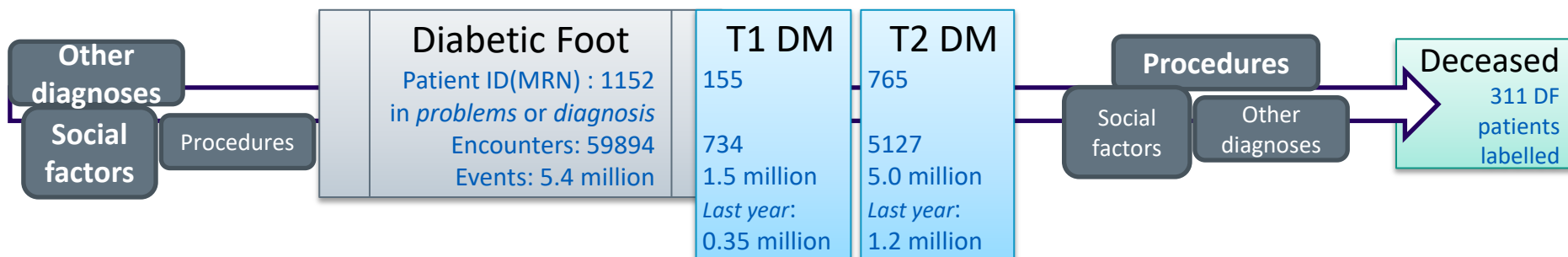
Clinical notes, clinician letters, lab reports etc.
Semi-structured and free text

Appointments, procedures, diagnoses
Structured data

Structured, computable data

Clustering

Modelling

Predicting

Personalised interventions

Bart's Health NHS Trust
2.5 million patients/ year

NHS
Barts Health
NHS Trust

Bart's DWH
Patient ID: 2.2 million
Encounters: 21 million
Events: 705 million
Procedures: 8.1 million

Last year
1.1 million
8.1 million
158 million
868,684

UK diabetes prevalence is 6% population (diagnosed and undiagnosed)

Type 1 Diabetes
Last year
Patient ID: 2462
Encounters: 5560
Events: 0.66 million
Procedures: 3930

Type 2 Diabetes
Last year
Patient ID: 33175
Encounters: 91175
Events: 13.5 million
Procedures: 92583

Other diagnoses

Social factors

Procedures

Diabetic Foot
Patient ID(MRN) : 1152
in *problems* or *diagnosis*
Encounters: 59894
Events: 5.4 million

T1 DM
155

734
1.5 million
Last year:
0.35 million

T2 DM
765

5127
5.0 million
Last year:
1.2 million

Procedures

Social factors

Other diagnoses

Deceased
311 DF patients labelled

DF Diagnosis vs problem
902 MRN in *problem*
568 MRN in *diagnosis*
360 MRN have DF listed in *diagnosis* **AND** *problem*