Analyses and Management of Healthcare Data for Cancer Care

Agastya Silvina

Outline

- My Background
- EngD: Analyses & Management of Healthcare Data for Cancer Care
- Previous projects
- Current project
- The Difficulties

Background

Continuos-Integration
GraphQL-Proxy Server

Graduated from ITB
Electrical Eng.

Graduate from St. Andrews
MSc. of Computer Science

IBM

2011 — 2012 — 2015 — 2015 — 2016...

EngD

Telekom Malaysia (TM)
Billing-payment Migration

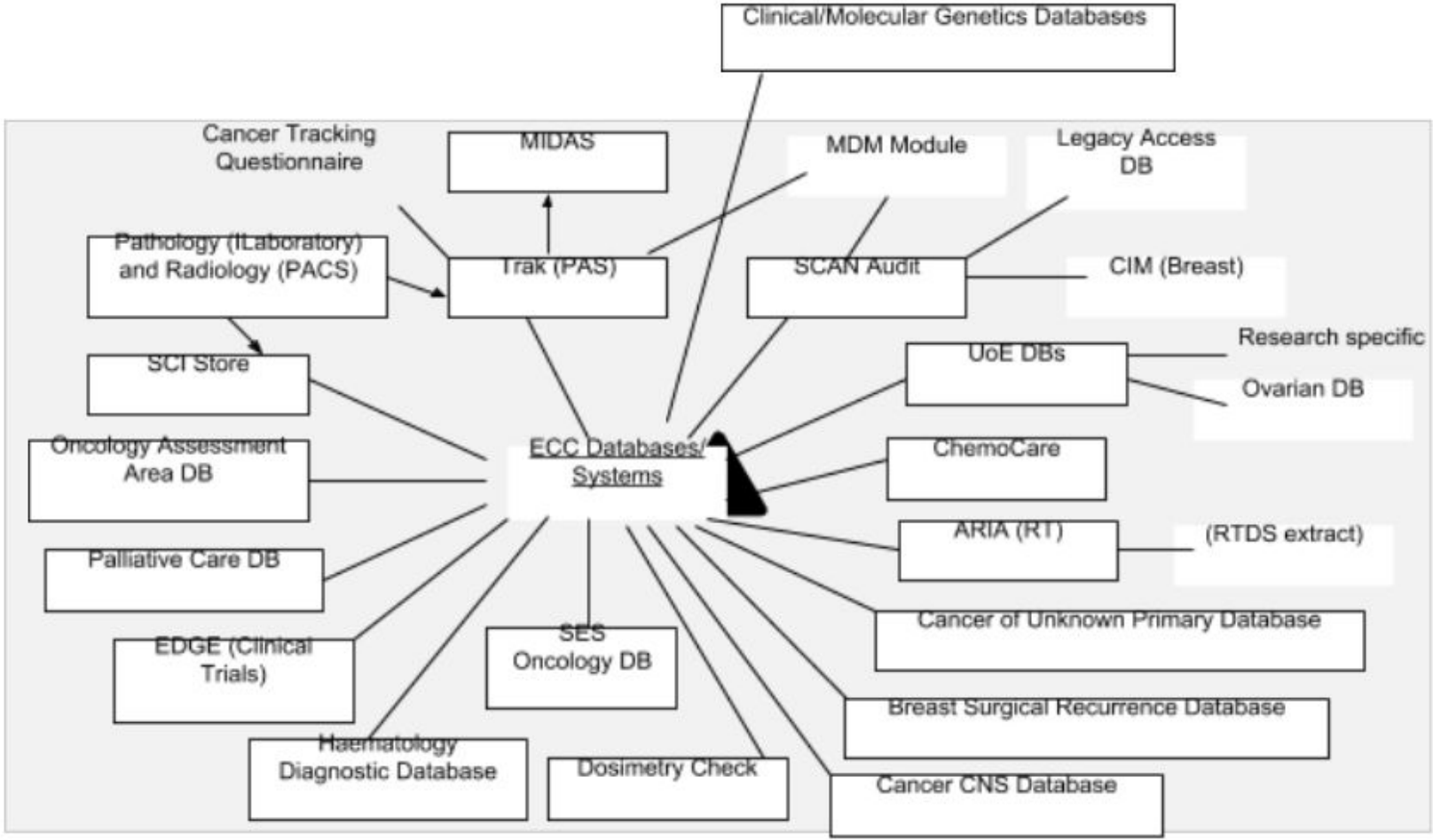
accenture

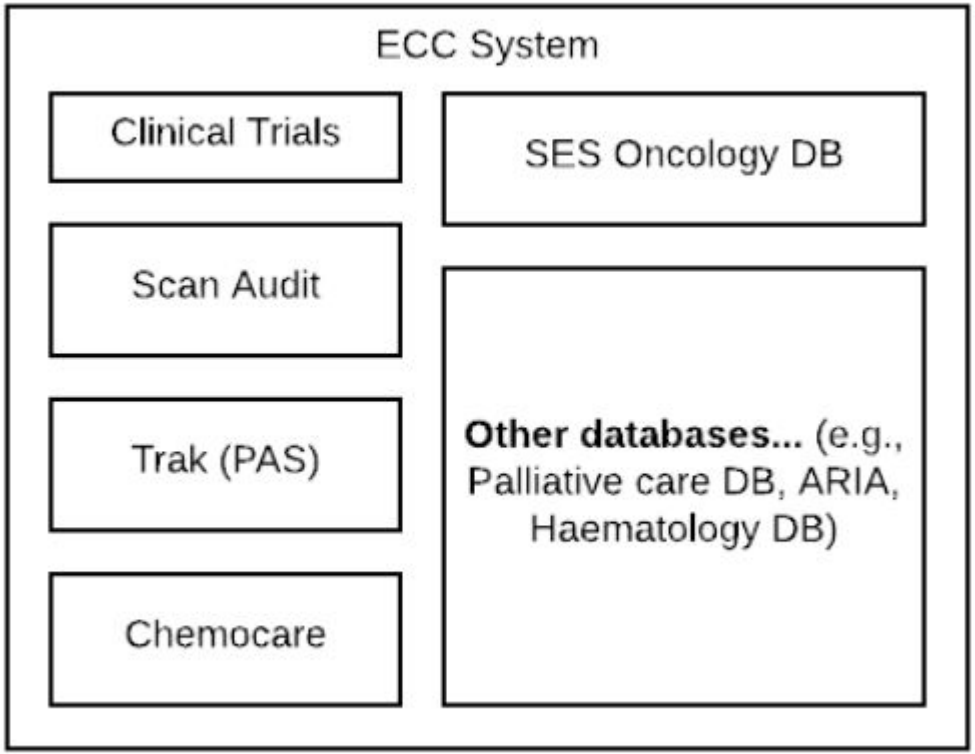
EngD: Analyses Healthcare data

- *KEY OBJECTIVE:*

*To **develop analytical solutions** to **improve the quality** and capability of real-time outcomes reporting within South East Scotland using routinely captured electronic healthcare data.*

- **Through a series of research projects**


Clinical/Molecular Genetics Databases
Cancer Tracking Questionnaire
MIDAS
MDM Module
Legacy Access DB
Pathology (ILaboratory) and Radiology (PACS)
Trak (PAS)
SCAN Audit
CIM (Breast)
SCI Store
UoE DBs
Research specific
Ovarian DB
Oncology Assessment Area DB
ECC Databases/ Systems
ChemoCare
Palliative Care DB
ARIA (RT)
(RTDS extract)
Cancer of Unknown Primary Database
EDGE (Clinical Trials)
SES Oncology DB
Breast Surgical Recurrence Database
Haematology Diagnostic Database
Dosimetry Check
Cancer CNS Database

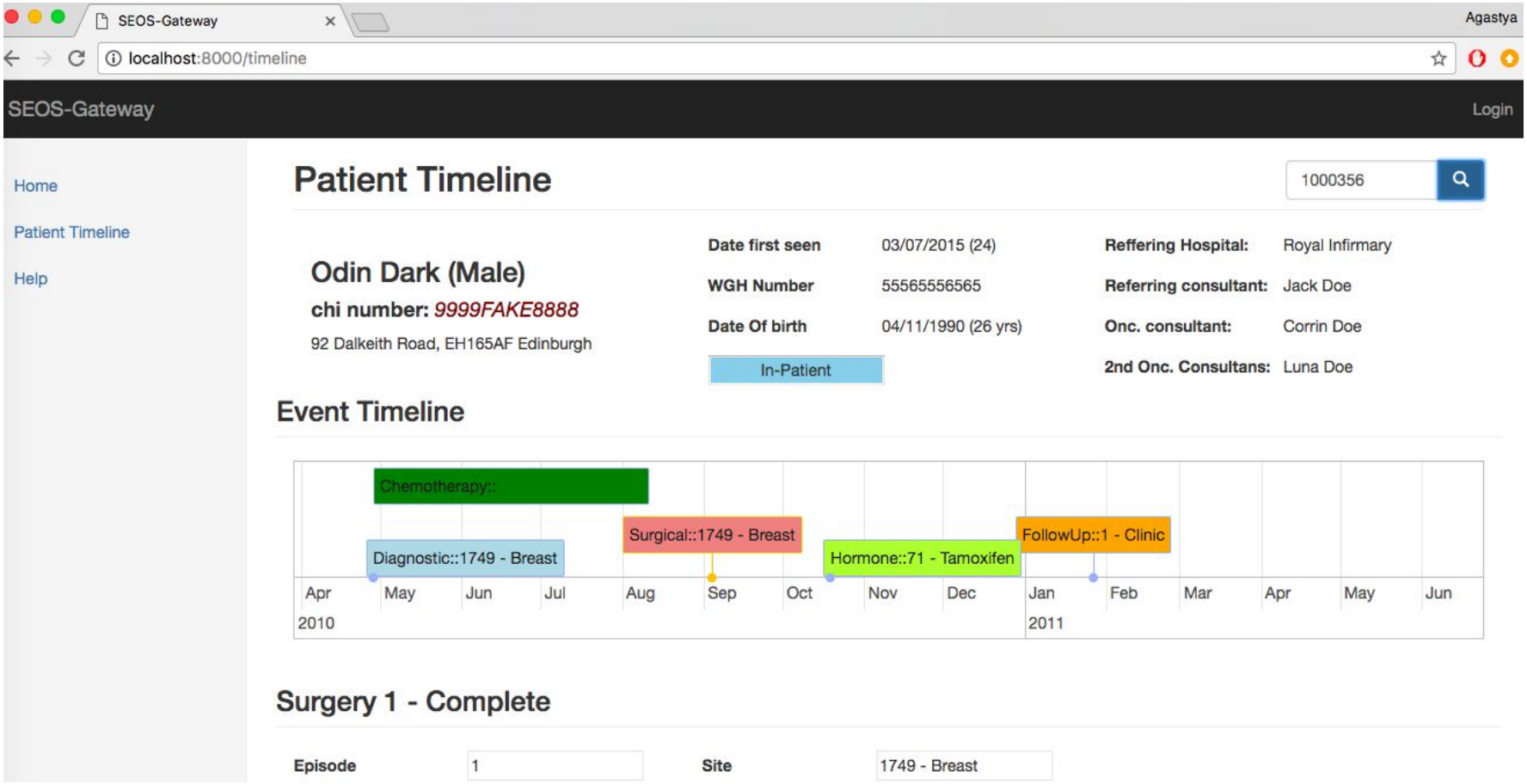


ECC Cancer Patient Data Sources

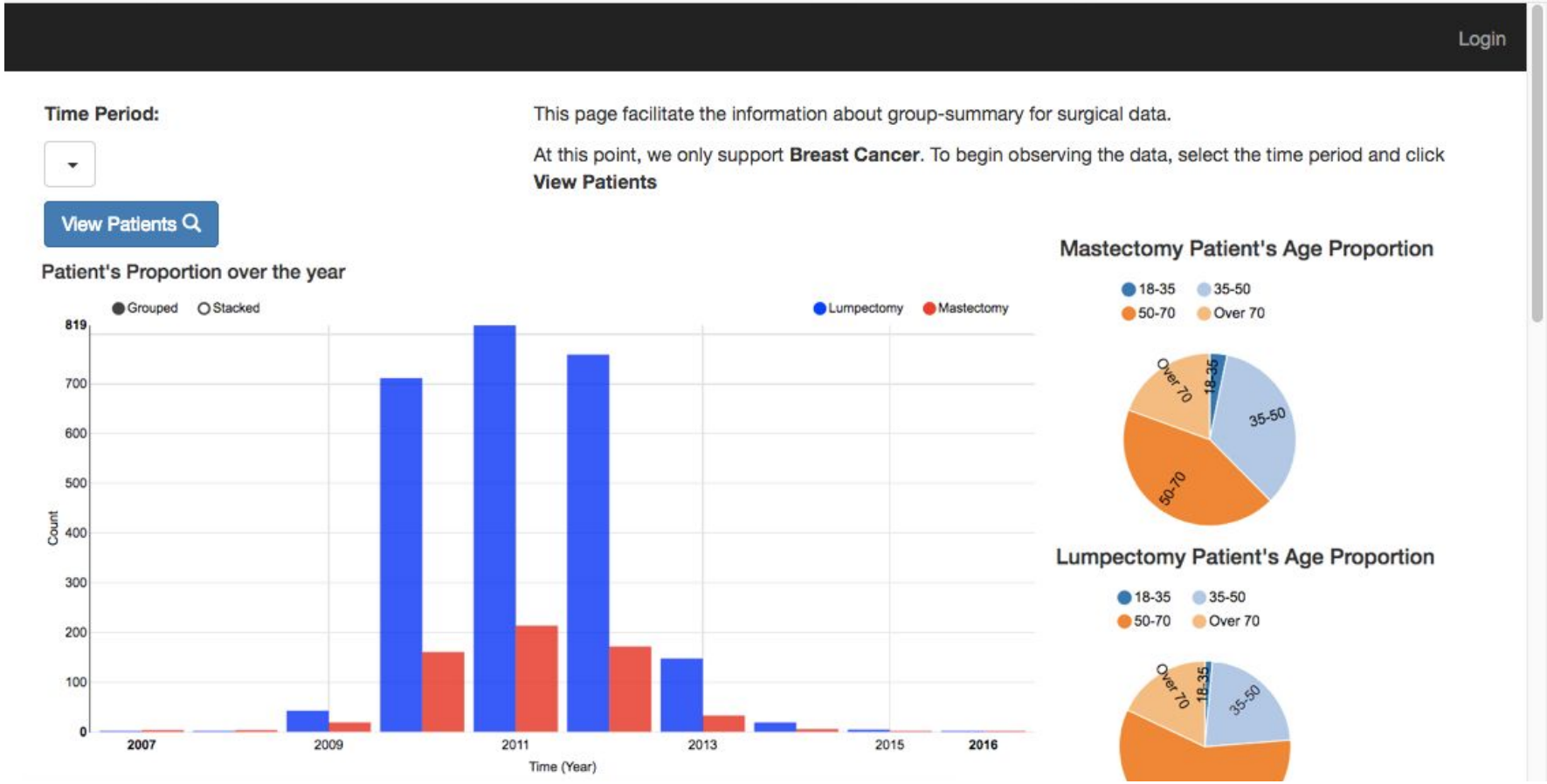
Patient Data Visualisation

- Design ***a method to accurately visualise patient pathway*** data from the South East Scotland Oncology Database
    - ***View pathway progress at an individual level*** (for example in clinic) but also on a cohort basis to analyse against a set of metrics, e.g. time between treatment, following a specific pathway, outcome against disease management protocols.

- ***Assess transferability by applying the same method to a dataset that includes ChemoCare*** data to evaluate the effect of the use of drugs, time on treatment and relative dose intensity on the time between lines of therapy (duration of disease control).



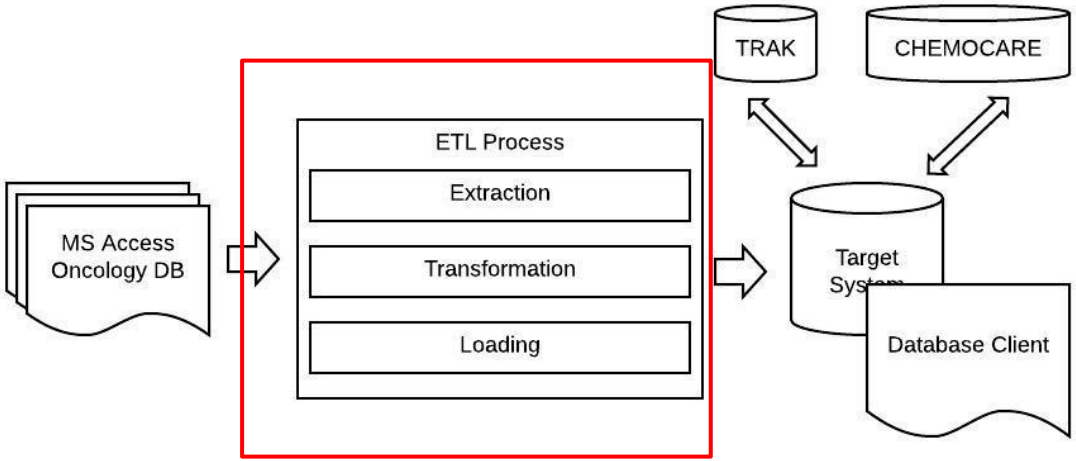
An Example of individual patient timeline



An example of the surgical cohort information

Oncology Migration

- Migrated the DB from **Microsoft Access Oncology DB** to **SQL Server**
- Motivation: we need a new robust and more scalable database for recording the cancer patient data within NHS Lothian.



Migration Issue

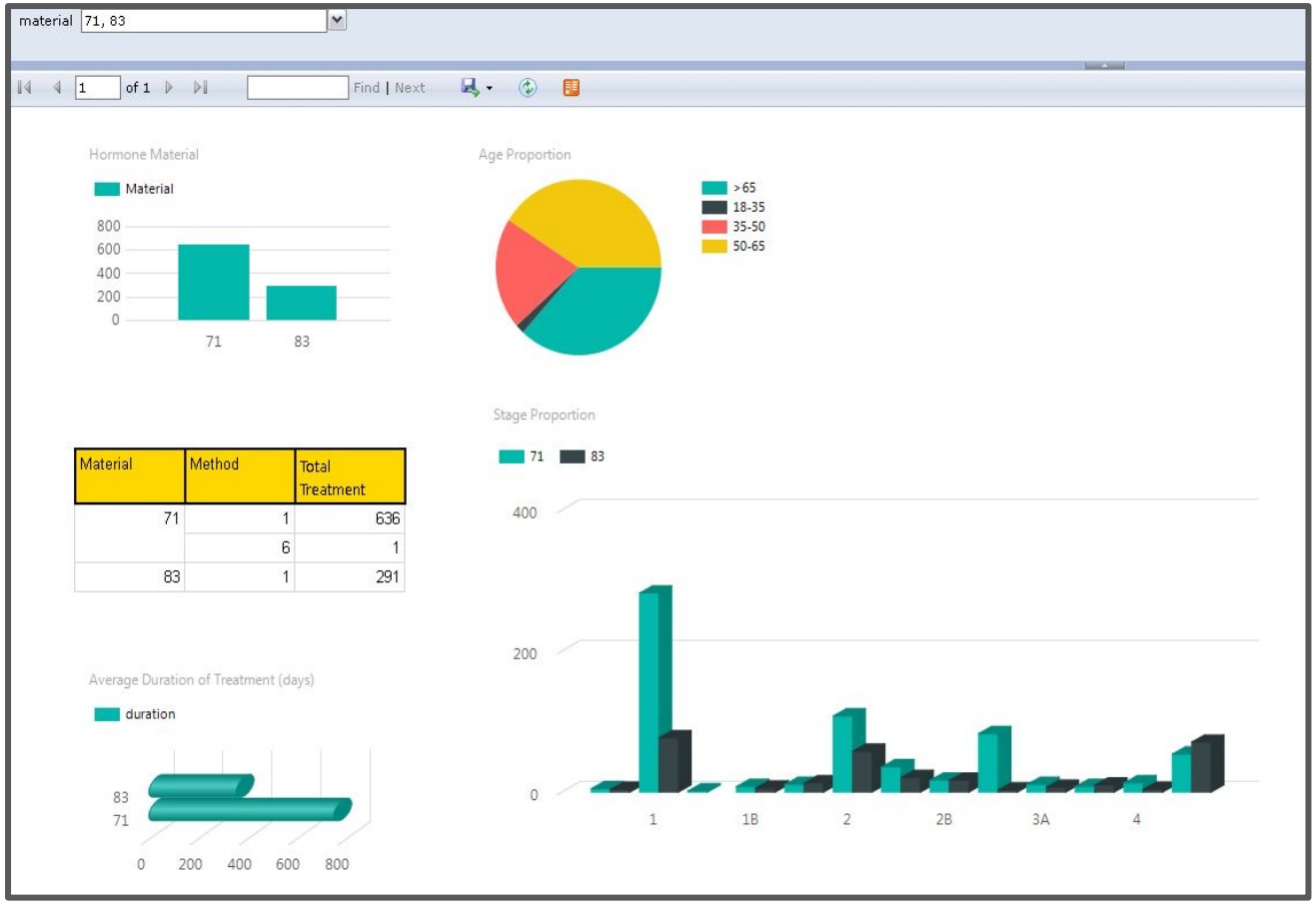
- There are several issues related to the migration, as shown below:
  - driver installation
  - invalid UHPI - CHI
  - invalid date
  - previous primaries duplication
  - date of death discrepancies
  - unknown value for the cause of death

Develop a Reports for the MS SQL Oncology DB

- We have evaluated several reporting system based on these criterias:
  - Cost
  - Setup
  - Accessibility
  - Maintenance
  - Usability
  - Lifetime of product

Reporting System Option

- In-House Visualisation Tool Integration:
  - Development of custom in-house reporting pages using ASP.NET and JS libraries
- SQL Server Reporting Service (SSRS)
  - Microsoft reporting tool that comes with SQL Server
- PowerBI
  - The latest Microsoft reporting tool.
- Stimulsoft
  - Reporting tool for ASP.NET that ChemoCare uses for their older reports.
- Tableau
  - A third party data visualisation tool created by Tableau Software.



SSRS dashboard example

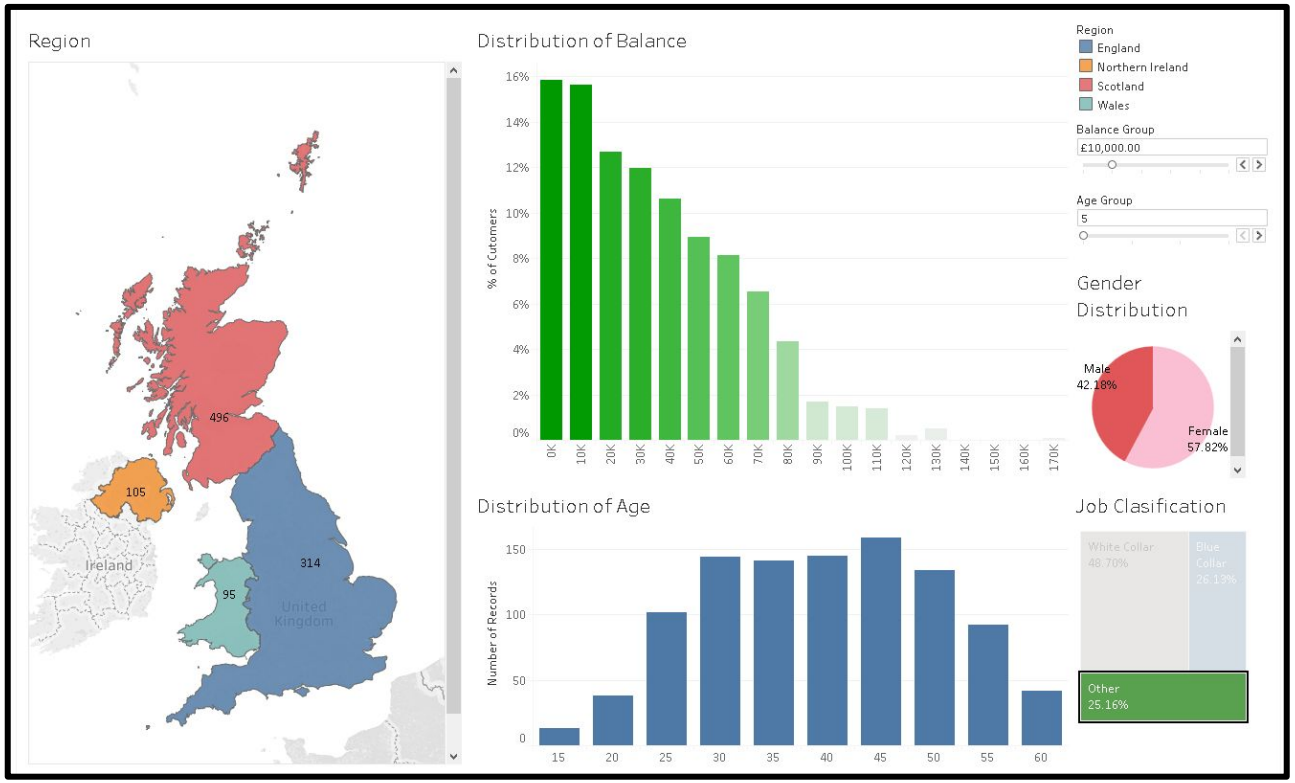
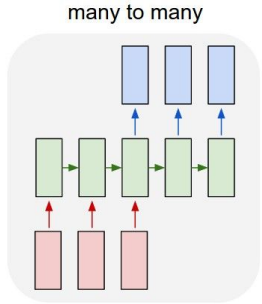


Tableau dashboard example - [link]

Ongoing Project: Toxicity predictor



- Using several machine/deep learning techniques to predict the outcome of Chemotherapy treatments
- Several techniques includes:
  - COX regression - survival analysis
  - Ensemble learning method for classification, i.e., Random forest, GBT
  - Markov model - a stochastic model **(memoryless)**
  - HMM (Hidden Markov Model) - a statistical Markov Model to observe a condition based on the hidden state, e.g. POS tag **(one memory)**
  - RNN - sequential ANN **(all memory)**
- Github repository: toxicityPredictor

DIFFICULTIES

- Analyses Difficulties:
  - Understanding the key problem
  - Finding relevant information
  - Medical terminologies
- Technical Difficulties:
  - Gaining access to data (from backend)
  - Installing the right tool for development
  - Choosing Development Machine
  - ***Testing***

THANK YOU