Impactability Modelling for Population Health Management
A review of current concepts and practices

Population Health Management Working Party

Presented to the International Actuarial Association Health Section (IAAHS)

1st December 2020
Introduction

Background to the Working Party

Alpesh Shah
Introduction

- Population Health Management in the NHS
- Genesis of the PHM working party
- Focus on Impactability Modelling for this phase
- First report on current concepts and practices:
  - Definition
  - Practical challenges
  - Examples of models
  - Ethics and patient view
Defining impactability
Overview, principles, problem statements
Dr. Chris Martin
Defining Impactability

• No universally accepted definition exists
• Working party technical definition of impactability and impactability modelling:

**Impactability:** defines the degree to which different sub-populations will benefit from a range of interventions

**Impactability modelling:** uses this information to tailor appropriate interventions within agreed boundaries for the 'value' gained from resources spent
The role of Impactability within PHM

Agree system / ICS health policy goals

Identify target cohorts / disease group (through risk stratification and related approaches)

Identify potential / available interventions relevant to target cohort

Apply impactability models to optimise intervention allocation within cohort

Integrated Care System (‘ICS’) Level: Set practical application guidelines across system around target sub-groups

Primary Care Network (‘PCN’) Level: Engage clinicians / others to apply interventions to targeted subsets of cohort as identified through impactability modelling

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Practical considerations

What are the barriers and enablers to effective impactability modelling?

Lisa Morgan
Practical considerations

• **Purpose of research**: identify key themes from current and potential end users of impactability modelling and document these insights as well as related advice

• **Observation**: knowledge and use of impactability modelling is comparatively sparse – limited the research, however, highlights future opportunities

• **Research methodology**:
  – 10 semi-structured interviews with key personnel involved in the development, application or study of PHM programmes involving risk stratification and impactability modelling
  – Literature review searching the Embase database
Practical considerations – Emerging themes

- Impactability
- Modelling
- Emerging Themes
- Issues about the concept
- Organisational issues
- Evaluation
- Analytical capability
- Data issues

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Practical considerations – Emerging themes

Issues about the concept

Impactability Modelling

Emerging Themes

Evaluation

Organisational issues

Analytical capability

Data issues
Practical considerations – Emerging themes

- Availability of resources – awareness, diversion to statutory returns.
- Handling results - communication & visualisation.
- Common pitfalls in analysis - changes over time and ‘downstream’ effects.
- New methods – Artificial intelligence and machine learning brings its own challenges.
Practical considerations – Emerging themes

- **Availability of resources** – awareness, diversion to statutory returns.

- **Handling results** - communication & visualisation.

- **Common pitfalls in analysis** - changes over time and ‘downstream’ effects.

- **New methods** – Artificial intelligence and machine learning brings its own challenges.

**Quality**
- Consistency,
- Completeness,
- Vagueness.

**Access**
- Types of data,
- Regulation,
- Searchability.
Data issues – recommendations

**Improving and standardising access to data**

- Prepare a well-crafted business case and engage with stakeholders and ethical reviewers early for accessing data to gain the trust of data guardians;
- Build an open and transparent compliance infrastructure for data handling; and
- A phased approach to systems integration across organisations may have a greater chance of success than a waterfall approach where all systems change at once.
Analytical capability – recommendations

- Local involvement across the UK as data is only held on local systems.
- Develop ‘hubs of excellence’ that would allow skills and resources to provide analytic services to organisations across the NHS.
- Increase the number of analysts and broaden analysts’ skillset. Strengthen of reporting, data visualisation skills and verbal presentations.
- Consumers of the results of risk-stratification and impactability modelling need training for proper understanding and application.
- Greater collaboration between analysts and clinicians to develop and refine impactability models and implement with patient care.
- A cultural change to get clinicians and analysts working together more closely.
Examples of models

Focus on a selection from the wide range of approaches

David Beddows
Examples of impactability models

Wide range of diverse approaches and input requirements
Examples of impactability models

Impactability Models

- Gaps-In-Care Scores
- Condition Severity Benchmarking
- Patient Activation Scores
- Propensity Scores
Gaps-in-Care Scores

Compare a person’s treatment received versus standard treatment guidelines for their condition. Calculate a score for their gaps-in-care by applying weights to each element of treatment. Higher scores imply higher impactability.

Consistency of treatment
Impact is measurable
Reduces inequalities

Treatment guidelines may not be available
Challenge to set weights

Gaps-in-Care Score per individual & per condition
Condition Severity Benchmarking

Compare condition severity or health service utilisation rates against benchmark levels for given conditions or risk segments. Individuals or groups with values outside the expected ranges are considered to be impactable.

- Uses data that is routinely collected
- Creates the metrics for measuring itself
- Challenge to define “severity” and “risk” and expected ranges of values
- Says nothing about treatments

Severity for given risk group; Utilisation for given severity
For individuals or population segments
Propensity Scores

Identify individuals for specific treatment plans based on a score calculated with a statistical model and risk and health data.

Leverages statistical methods and big data
Aligns patients to care programmes

Challenges around accuracy of results, e.g. risk of false-positives
Requires historical results of treatment plans
Not a single clear choice of statistical model

Propensity-to-benefit score;
For individuals or population segments;
For a specific care programme

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Patient Activation Scores

Conduct detailed questionnaires of individual patients and develop measures of patient activation from the results.

Encourages personalised interventions
Reduces inequalities

Proprietary surveys & algorithms
Requires non-routine data collection

Patient Activation score;
For individuals or population segments;
For a specific care programme
Ethics and Patient Involvement

• Range of ethical considerations when developing an Impactability model:
Ethics: Data In

• Leverage existing frameworks
• Key considerations:
  – Clarity on purpose and expected patient benefit
  – Only necessary data is collected, stored, used
  – Relevant data sharing agreements and privacy impact assessments
  – Data security integral to design of model
  – Transparent about limitations and biases in data and its intended use
Ethics: Decision Support Out

- Align to classic public/population health ethics
- Ethical Framework and Reflexivity Exercise for practitioners
- Key considerations:
  - Beneficence (do good)
  - Non-maleficence (do not harm)
  - Fairness
  - Autonomy
  - Utility
  - Transparency
  - Procedural justice
Ethics: Posing an impactability question

• **Context**
  – The quintuple aim
  – Pandemic reset
  – Elective procedures waiting list

• **How to prioritise and rationalise the delivery of services w.r.t.**
  – Population need
  – Quintuple aim
  – COVID19 risk
    • Vaccines
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Link to full report