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Predictive modelling busting the myths on choosing, populating and testing

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Predictive Modelling - What

Predictive modelling can be used to estimate the probability of a range of future events happening for individuals. For example:

- Mike has a 1.2% chance of having an emergency admission in the next 12 months
- Jim has a 0.5% chance of developing diabetes

Predictive modelling can be used to estimate the probability of a range of future events happening within populations. For example:

- 10% of people in Leeds have a 60% chance of having an emergency admission in the next 12 months

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Predictive Modelling - Why

By being able to predict future events – interventions can be planned and executed to:

- Optimise individual health and social outcomes
- Optimise population health and social outcomes
- Increase efficiency and effectiveness of health and social service delivery
- Reduce cost of health and social service delivery

Predictive modelling is therefore applicable in both commissioner and provider contexts, across all health and social care settings and all health and social care professionals.

Probability

Predictive modelling technically generates a “probability” of an event happening in the future.

A probability ranges from 0.0 (will never happen) to 1.0 (is absolutely guaranteed to happen). For example:

- The probability of matching all six numbers in the lottery is 0.000000000000005
- The probability of flipping heads in a coin toss is 0.5

Probabilities can be expressed as a percentage, for example the probability of flipping heads in a coin toss is 50%

Sometimes the word “chance” is used instead of probability.

Risk

Risk relates to the probability of an adverse or unwanted event happening in the future.

Probability and Risk can be presented as an absolute value or a relative value. For example:

- Mike has a 1.2% absolute risk of having an emergency admission in the next 12 months
- Mike has a 0.001% relative risk of having an emergency admission in the next 12 months compared to the average risk of emergency admission in the next 12 months for a specific CCG/PCT population

Note when talking about relative measures be clear what it is relative to!

Risk stratification and risk profiling relates to predicting risk values for individuals in a population, then grouping them into groups or strata based on these risk values.

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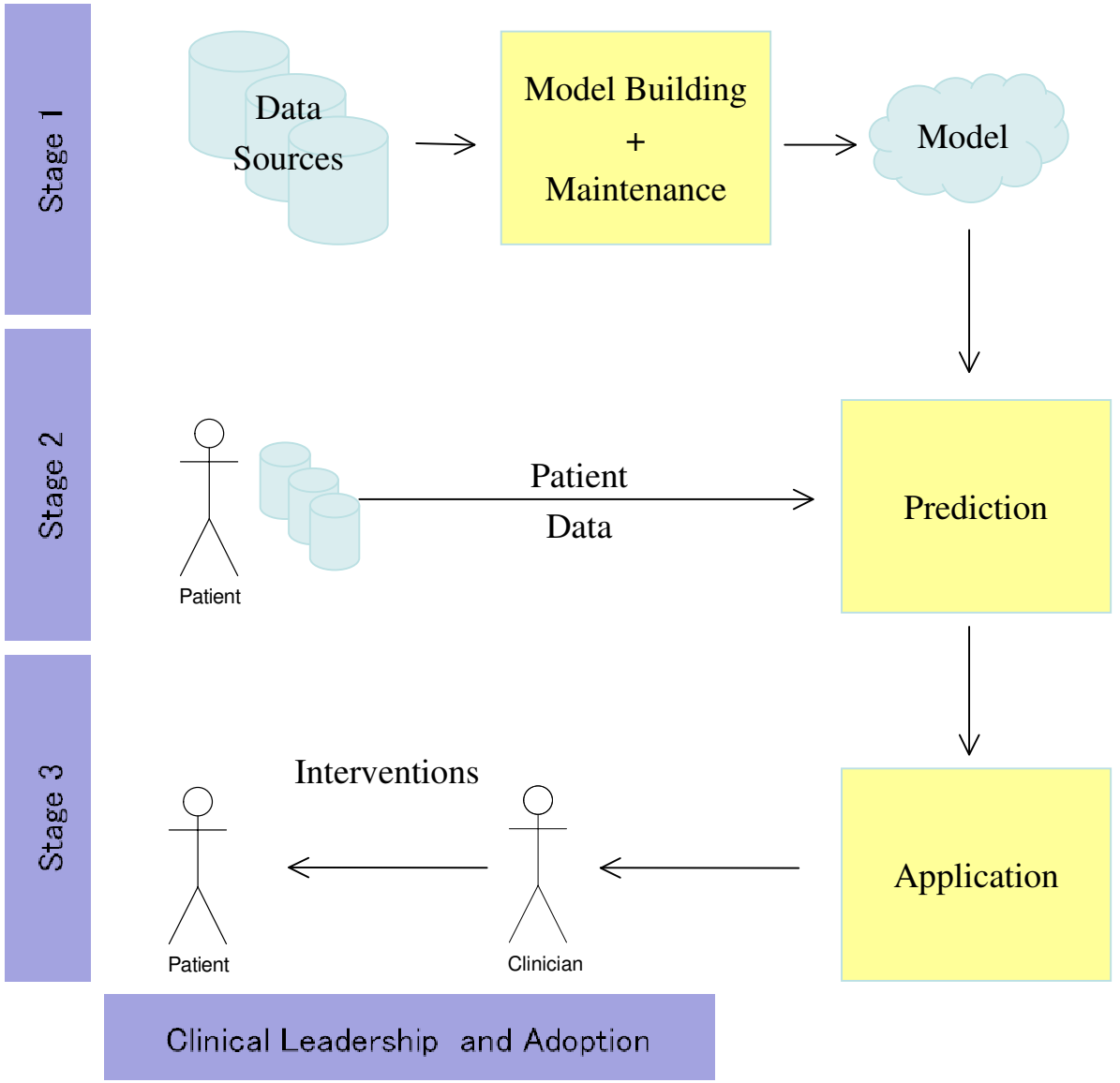
Predictive Modelling - How



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Predictive Modelling – Stage 1

Model building issues to consider:

- Scope of data sources (IP, OP, A&E, GP, SS, Census…)
- Data quality and missing values
- Data sharing and IG
- Data linkage
- Data storage and management
- Population scope
- Model internal validity
- Model predictive accuracy (external validity)
- Being able to compare models
- Model creation tools
- Model maintenance
- Model representation and sharing

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Predictive Modelling – Stage 2

Prediction tool issues to consider:

- Which model to use (PARR, CPM, LACE…)
- Sourcing input data – sharing, IG, quality
- Linkage of input data
- Standalone and integrated
- Batch and transactional
- Configuration and adaptability
- Interoperability – discovery and interface
- Implementation
- Testing
- When to predict – event or time driven

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Predictive Modelling – Stage 3

Application issues to consider:

- Prediction representation – standards
- Prediction patient record status
- Storage and management of generated predictions
- Down stream modelling integration (for example impact modelling)
- Health and social care setting application constraints
- Measuring usage/utility

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Predictive Modelling – Adoption

User Adoption considerations:

- Usability and easy access to the risk information for clinicians is a significant factor impacting end user adoption.
- The LTC guidance indicates that you need to look at the top 5% patients, this may be a significant volume and you will need to work out how the local team(s) can work through these systematically.
- Providing a mechanism for tracking climbers and new entries on an on-going basis will be needed by many teams.
- Look for opportunities to present the risk information in a context where it helps decision making and prompts interventions e.g. Including the scores on an Urgent Care Clinical Dashboard.
- Clinical leadership, engagement and change management will be key to any risk stratification implementation project.

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So what next?

Predictive modelling in health and social care is very much an art rather than a science at the moment, so do not expect a shrink wrapped solution to your needs.

However there is now some good detailed guidance available (for example the Nuffield Trust - Choosing a predictive risk model: a guide for commissioners in England) that you should read.

There are also many NHS organisations implementing or using predictive modelling. These organisations are keen to share their experiences through QIPP events and online forums. Talk to them.

A key decision is to build or buy:

- Model
- Prediction Tool

The decision will be based on your organisation's capabilities, costs, required flexibility and expected VFM.

Other key areas to start thinking about from the outset include:

- The data sources you plan to use
- Information Governance including data sharing agreements
- Clinical leadership and adoption

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Demonstration

To show how an organisation could build their own predictive modelling solution we have a demonstration of:

- Building a prediction model
- Building a prediction tool that uses the model
- Testing the model/tool
- Using the tool

The demonstration is presented by Sussex Health Informatics Service.