

Future vision

Risk stratification software offers the NHS the chance to identify high-risk patients who would benefit from early intervention. But can it solve problems such as growing emergency admissions, asks Seamus Ward

Unplanned admissions are a big problem for the health service, but what if we could rewind a few months, identify patients most at risk of needing an emergency admission and intervene to stop it happening? Potentially, such an approach would combine improved care, better patient experience and best use of resources – a value-based care triptych. It is little wonder then that interest in risk stratification, which can identify those most at risk, is growing.

Risk stratification or predictive risk tools generally work in the same way. They examine a defined population – a GP list, for example. Using routinely collected data – such as number of episodes per spell in prior admissions, age and presence of a chronic disease – the software estimates the likelihood of future healthcare events.

These could include the chances of the patient being an emergency admission to hospital over the next 12 months or short-term readmission following discharge. Each patient is assigned a risk score and categorised according to pre-set thresholds.

Parts of the NHS in England have been using risk stratification to predict admissions or readmissions for about 10 years, using tools such as PARR (patients at risk of readmission). The 2014/15 GP contract in England introduced an enhanced service for unplanned admissions that uses a risk stratification tool to profile the most at-risk patients, whose cases are managed proactively.

NHS England has gained health secretary approval for commissioning and GP data to be disclosed to a limited number of organisations (principally commissioning support units)

carrying out risk stratification on behalf of clinical commissioning groups.

Scotland and Wales have their own systems – SPARRA (Scottish patients at risk of readmission and admission) and Prism (see box), respectively.

Cautious approach

In January, Geraint Lewis, NHS England's chief data officer, published a discussion paper on the prospects for predictive risk analysis to be harnessed by the NHS. Overall, his position was cautious.

While recognising the potential to improve the quality and experience of care for patients and reduce the cost to taxpayers, *Next steps for risk stratification in the NHS* said it was beset with a number of potential problems.

The first is that the accuracy of many tools

Welsh outlook

Risk stratification is potentially a powerful tool, but does it work? In Wales, a large-scale study intends to find out.

About 100 GP practices in Wales are using the Prism risk stratification tool. However, the evaluation, which was commissioned by the National Institute for Health Research, focuses on 32 general practices in and around Swansea (Abertawe Bro Morgannwg University Health Board). It will publish its results later this year.

The software has been introduced into the practices over the past two years. Every patient registered with those practices is evaluated and given a score according to their estimated risk of needing an emergency hospital admission in the following 12 months.

This is based on 37 factors (such as age) and primary data (for example, chronic conditions) and hospital care data (such as previous admissions history). An algorithm then sorts the patients into four risk categories (strata).

The project has strict information governance rules, with all patient data leaving practices

for the purpose of the study anonymised and unidentifiable.

Helen Snooks (pictured), professor of health services research at Swansea University College of Medicine, is leading the evaluation of Prism. She says Prism is not a case



management tool, where the focus is solely on those with the highest risk.

'It is intended that it will allow the targeting of different services at different groups. The top group – those most at risk – may already be in hospital or in and out of hospital often. They are high risk, high dependency patients.'

'There may be more benefit in targeting the group below where there may be more room to intervene, for example by encouraging smoking

cessation or exercise. Although the tool was not designed to focus only on those at the highest risk, emerging findings suggest it is being used in that way.'

This indication has come from focus groups and interviews with GPs and practice nurses. While the data has not been analysed yet, she believes practices are tending to focus on the most at risk patients.

This is partly a response to the quality and outcomes framework, which encourages practices to target these patients.

'It's just a feeling I'm getting, but we need to look at it in more detail,' she says. Savings may follow the use of the tool. 'More efficient use of resources does not conflict with benefits to patients – no-one wants to be admitted to hospital,' she says. 'If an emergency admission is avoided, the commissioner does not have that cost, but there may be additional resource spend in the community to achieve that. That is one of the elements our evaluation is focusing on – how Prism affects the use of resources.'

'We are not getting too hung up on the accuracy of the tool at the individual patient level. The system doesn't provide a diagnosis; it's an alerting tool.'

is modest. Accepting that no risk stratification tool will ever be completely accurate, Dr Lewis says that this means the adverse impact of false positive and false negative results must be considered alongside the benefits of true positive and true negative results. Overall, the benefits must outweigh the costs for a risk stratification programme to be effective, the document says.

It adds that there is a risk of increasing health inequalities. CCGs may use tools known as impactability models, including gap analysis, to increase the sensitivity of risk stratification by identifying high-risk individuals for whom intervention would make the biggest impact.

While gap analysis is likely to reduce health inequalities by reducing suboptimal care, which tends to be more prevalent in more deprived areas, Dr Lewis believes that less formal impactability models could have the opposite effect.

For example, clinicians may review the high-risk list and select only those most likely to benefit from intervention or patient education – perhaps excluding those with alcohol problems or whose first language is not English. While he describes these clinicians as 'well meaning', he urges CCGs to ensure their actions do not increase health inequalities.

The discussion paper adds that many interventions offered as a result of risk stratification appear to increase costs.

Unmet need

Risk stratification programmes across the UK have uncovered a number of other issues. For example, there has been concern that assessing patients on GP lists would identify large amounts of unmet need, putting greater pressure on an already hard-pressed system.

In addition, there have been legal concerns. For example, if a risk stratification programme flagged up a patient as at risk of emergency admission and their GP did nothing, could they be sued if the patient went on to require hospitalisation?

Ian Blunt, senior research analyst at the Nuffield Trust, says predictive risk modelling has been used successfully in both the UK and internationally. However, he is concerned by the security of the data, a worry that is echoed by a number of patient and clinical professionals' groups.

'Information governance is the elephant in the room,' he says. 'The rules on information governance are not clear or helpful, but only



those making the direct intervention need to differentiate between patients. The bigger question is when the information is sent to a CSU or an analysis company – they shouldn't have identifiable information; it should be pseudonomised.'

Mr Blunt adds: 'One of the big risks in predictive modelling is it being oversold. If people expect it to be more precise than it is, then they are inevitably going to be disappointed with the results.'

Despite this, he believes predictive modelling has a place in modern healthcare. 'It's a useful and effective tool to identify patients at high risk of needing certain interventions. I think one of the big challenges facing the NHS is getting to grips with how it uses all the data it has. We are in the foothills of what can be achieved with some of these patient-level data processes.'

He says predictive modelling can be used to identify those at risk of unplanned admissions or readmissions within 30 days. 'You could also use it for people moving into high-intensity social care – care homes. While it might be appropriate for the patient at a particular time, it may be expensive. An earlier intervention might prolong their independent living, so it's win-win.'

“The big question is when the information is sent to a CSU or an analysis company – they shouldn't have identifiable information; it should be pseudonomised”

Ian Blunt, Nuffield Trust



The Nuffield Trust and the King's Fund developed the PARR tool around 10 years ago so that it could be used to predict risk of readmission within a year of discharge.

Though effectively mothballed in 2010, when the Department of Health declined to recommission it, Mr Blunt says it is still available to the NHS.

'People are welcome to use it, but the problem is that the data input must be based on HRG 3.5. If you wish to back convert your HRG4 data to 3.5, it will still work, but there are also proprietary solutions on the market,

where a firm will provide you with the whole package, including analysis.'

He adds that data warehousing companies frequently offer open source risk stratification modules as an add-on to their software.

Criticisms of stratification

As for the criticisms of risk stratification, Mr Blunt points out that if the use of predictive modelling leads to higher costs, it could be that the model is identifying substantial unmet needs. 'If people don't appear in your data, you are not going to target them,' he says. 'A

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question for organisations is: are they aware of what is not being recorded in their data and do they have strategies to cope with that?’

He insists that risk stratification is just a tool; a process to identify at-risk individuals, that must be accompanied by clear plans and pathways for intervention.


‘Though not perfect – no model ever will be – the predictive power means we understand how well we are detecting patients at risk. The challenge now is to make the interventions effective. When a patient is high risk, that information is only useful if you can do something about it,’ he says.

Prevention strategy

‘In the past, we have seen organisations implementing predictive risk plans, securing the best software,’ Mr Blunt continues. ‘But they haven’t thought about how it fits with their prevention strategy.’

‘You can have a risk pool created using a wonderfully sophisticated model, but this is just the first step. You must implement cultural change if you are going to make a success of it.’

He adds: ‘To be effective, you have to think through what interventions you want to predict and how you are going to prevent them. Then you can pick the appropriate predictive model and build it into your workflow processes, including who to contact and how the patient should be approached when invited to join the early intervention groups. If you don’t do this, you will not have a joined up service.’

Risk stratification clearly has potential, but the approach is not without shortcomings. There are questions over its accuracy, information governance and its impact on health inequalities and finances. When it comes to seeing into the future, staff in the NHS will have to keep their eyes peeled. 

Vanguards focus on risk

The growth of value-based health organisations internationally, such as accountable care organisations, has seen an increased interest in risk stratification.

This has not gone unnoticed in England, where many of the emerging provider models are planning to use stratification tools to enhance the care of their populations and reduce or avoid costs.

This is true of both the primary and acute care systems (PACS) and multispecialty community provider (MCP) vanguards. These include the Wirral University Teaching Hospital NHS Foundation Trust PACS and the Lakeside MCP in Northamptonshire, which showcased their plans at a recent NHS England event on the vanguard sites.

The Lakeside MCP is based on a GP super practice (Lakeside Healthcare) that currently covers 100,000 patients and plans to expand in two further waves that will each add around 100,000 patients. The GPs are working with NHS healthcare providers, local social care bodies and Celesio (Lloyds Pharmacy).

Lakeside Healthcare general partner Robert Harris (pictured) told the NHS England event that it had put each of its patients into one of seven risk categories, ranging from those most in need to the relatively healthy.

‘We then rearranged the workforce so GPs are largely freed from the

10-minute slots and can spend half an hour or 40 minutes with the patients who need more time.’

The Wirral PACS will use technology to spot gaps in services to patients. Justin Whatling, who leads on population health for Cerner, Wirral’s informatics partner, told the NHS England event that the predictive analytics it will use would allow clinicians to spot issues



early. The PAC would implement a population health management system spanning existing patient records.

‘The data will be normalised into a single source of truth,’ Dr Whatling said. ‘This will enable Wirral to operate a clinically integrated network. It is going to be able to identify and spot the care gaps for individual patients for health and wellness across that population and be able to act on that proactively.’

Once the Wirral integrated model was implemented, it would identify older people at risk of fractures following minor falls that result in emergency admissions.

Technology is central to many of the vanguards’

plans, but so too is service transformation and workforce changes as they strive to develop integrated care. Lakeland, for example, believes its size allows it not only to provide care that would traditionally be provided in hospital, but also to employ or offer partnerships to hospital consultants.

Nicola Walsh, the King’s Fund’s assistant director, leadership, says the vanguard initiative is a good move that takes the integration agenda forward proactively.

‘We need new models of care in the sense that the conditions and diseases affecting our population are very different to those in 1948 and we haven’t seen any changes in the boundaries between primary, community and hospital care since then,’ she says.

‘Clinical leadership, access to shared information through better IT and workforce development will be key enablers for the vanguards.’

She adds that while the focus has been on older people, new models must consider the wider population. ‘If you go back to the *Five-year forward view*, the key thing is prevention – what Wanless set out 12 years ago.

‘We need to focus on population health. In the past we have looked mainly at the top 5% of service users, but the biggest gains, if you are thinking long term, could be made by addressing the strategies set out by Wanless and taking a more proactive approach to people’s health.’

Achieving efficiencies through the use of technology

Wherever you look, whatever you do, technology is constantly changing the way in which we do things. The healthcare sector is not immune to such changes and has long stood at the forefront, in terms of innovation and medical advancements.

But, step outside of the clinical sphere – has technology had the same influence in driving efficiencies and streamlining the way in which the public and private health and social care markets operate? While progress has been made, there is still a clear argument for even greater measures to help reduce costs, standardise processes, and create visibility and control to produce a healthier sector.

One area that is relatively untouched is the procurement and management of a temporary workforce. Each year, the NHS alone spends approximately £2.5 billion on recruiting agency workers. Through the adoption of technology, this amount could be drastically reduced, enabling NHS Trusts to ease the pressure on strained budgets, while maintaining high levels of service and patient care.

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**Andrew Preston, Managing Director,
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