

Best Healthcare Analytics Project for the NHS

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Predicting 999 Ambulance Demand Modelling

KPMG and South Central Ambulance Service FT

Everyone knows that demand for ambulances varies over time – but the details of that variance are not well understood. An analytics project undertaken by KPMG working with South Central Ambulance Service Foundation Trust could help all ambulance services plan better and deploy resources to meet these variations.

Ambulance services need to understand not only how overall demand varies over time but also how the clinical response needed changes. Changing demand for different clinical response groups (CRGs) affects what resources the service needs to have in place. Getting the right CRG to a patient incident can make the difference between life and death by ensuring staff with the right capabilities are used for each call out.

SCAS had already mapped the allocation of CRGs to clinical needs segments and had a good understanding of historic trends. But it wanted to go deeper and understand what factors might drive demand for different CRGs. The initiative was part of the NHS England Global Digital Exemplar initiative and enabled the trust to work with KPMG to dig deeper into the data and find out what factors influenced demand for different CRGs over time.

This meant accessing a large number of datasets covering “signals” which could influence demand such as weather, levels of deprivation in each area, crime statistics, economic indicators such as unemployment rates, and lifestyle statistics such as obesity rates. Data often had to be cleaned and appropriate models selected in order to get a better picture.

This required close collaboration between the trust and KPMG’s core team, and the need to consult with experts in both data science and ambulance services.

Machine learning was used to cope with the size and complexity of data sets. To produce the best modelling five years of data had to be coded into clinical needs segments and CRGs. The phasing out of paper clinical incident records presented particular challenges in the ability to map demand data onto CRGs. To avoid the risk of using misleading trends from historic data, the findings had to be sense checked and replayed at regular intervals.

But what emerged was a fascinating and granular picture of what drives demand. The most significant factors were found to be the index of multiple deprivation score, unemployment levels, and the area’s level on the older people in deprivation index. But the data also revealed that average air temperature is the most important single feature in predicting future demand at a monthly level and humidity levels affect demand – but whether demand went up or down depended on the CRG. More localised data also gave insights such as the influence of particular types of businesses in an area on demand for different CRGs at specific points over time.

The work has now moved on to looking at how these insights might be incorporated into demand modelling in the future. Office of National Statistics data is used to forecast population and the modelling techniques have been adapted to enable forecasts five years into the future, as well as more short term projections. But because the work is part of the GDE the intention has always been to share it with other trusts through a report and “rule books” to assist with resource allocation.

Judges commented on the level of innovation, testament to the partnership of skill and knowledge the team have created between KPMG and SCAS.