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Randomised trial on AI-guided Urgent Care prevention

First presentation of preliminary results

- Chris Sherlaw-Johnson MSc - Senior Fellow, Nuffield Trust
- Marc Farr PhD - Chief Analytical Officer, East Kent Hospitals University NHS Foundation Trust
- Joachim Werr MD, PhD - Founder and CEO, Health Navigator Ltd

Today we will speak about

The cost of avoidable urgent care

AI-guided coaching intervention

Randomised trial and interim results

from Vale of York and East Kent



nuffieldtrust

NIHR | National Institute
for Health Research

NHS
East Kent
Hospitals University
NHS Foundation Trust

NHS
Vale of York
Clinical Commissioning Group

Avoidable urgent care costs the NHS up to 5.5bn every year

42%

increase in non-elective spells between 2006-18, average 3.2% pa



24% of admissions & 40% of attendances preventable – £3.3-£5.5bn cost



“The NHS still has too many avoidable admissions and too much unexplained variation

...and....

The challenge is far from being under control”

National Audit Office 2018



yet just 1% of population...

Two important urgent care dynamics

- 1% of population consumes 53% of unplanned care
- This is a very transient population over time

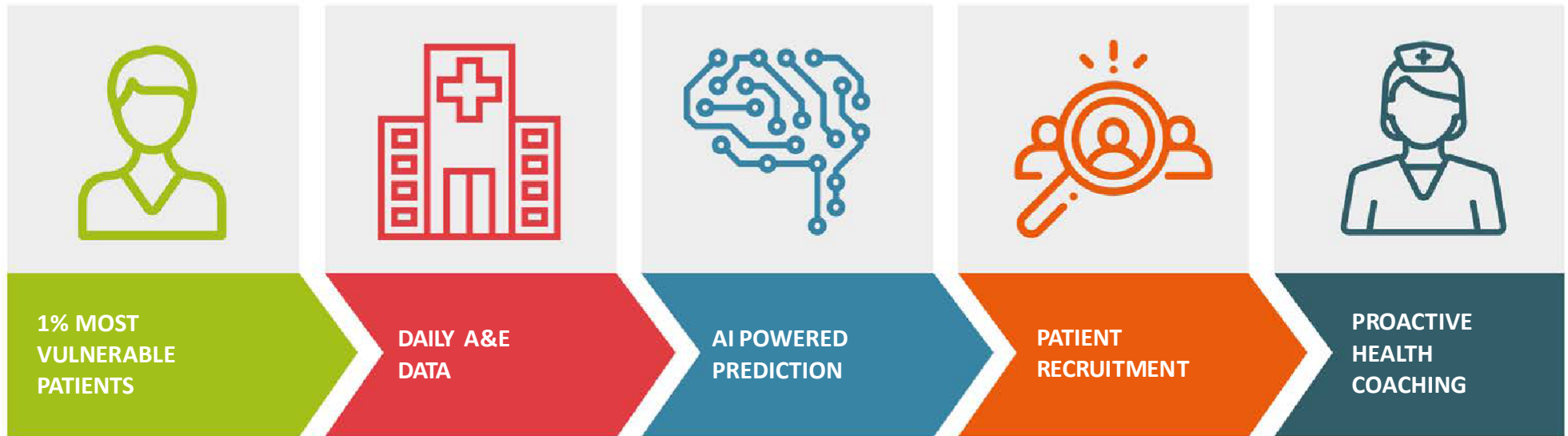


- Tight window of opportunity
- Real time identification and intervention needed
- Importance of proper control



AI-guided coaching intervention

AI and digitally enabled coaching to prevent urgent hospital care for vulnerable patients



International evidence from (two) EJEM published RCTs at size of 12,000 patients

- Lower health care utilisation
- Lower risk for inpatient stay
- Improved quality of life
- 12,000 patient RCT
- Reviewed in two journal articles





Chris Sherlaw-Johnson

Senior Fellow, Nuffield Trust

The Nuffield Trust

A photograph of a large, classical-style building with a balcony and a courtyard in front. The building is light-colored with multiple windows and a prominent balcony on the upper floor. The courtyard in the foreground is paved and has some greenery and a black metal fence.

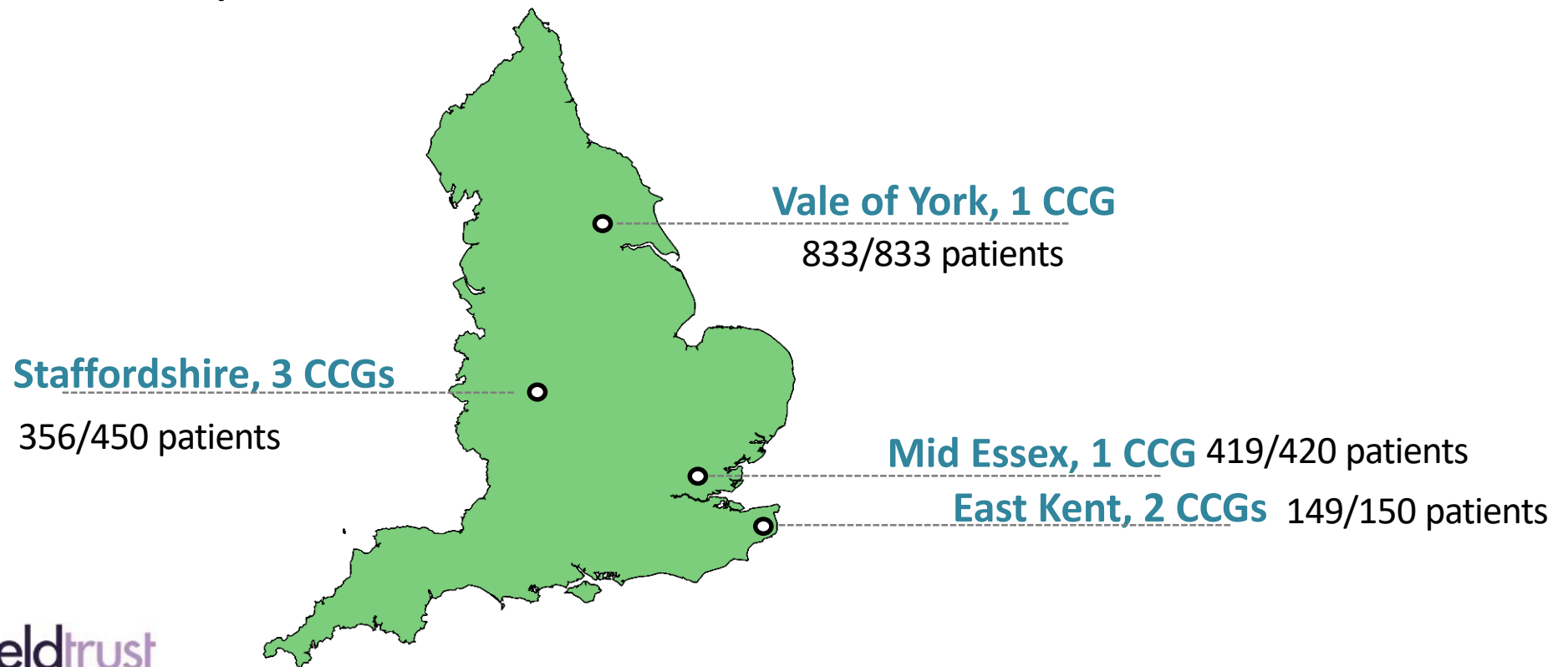
- Independent research charity and think tank
- Aims to improve quality of health and social care
- Evidence based research and policy analysis
- Informing and generating debate

What we are doing

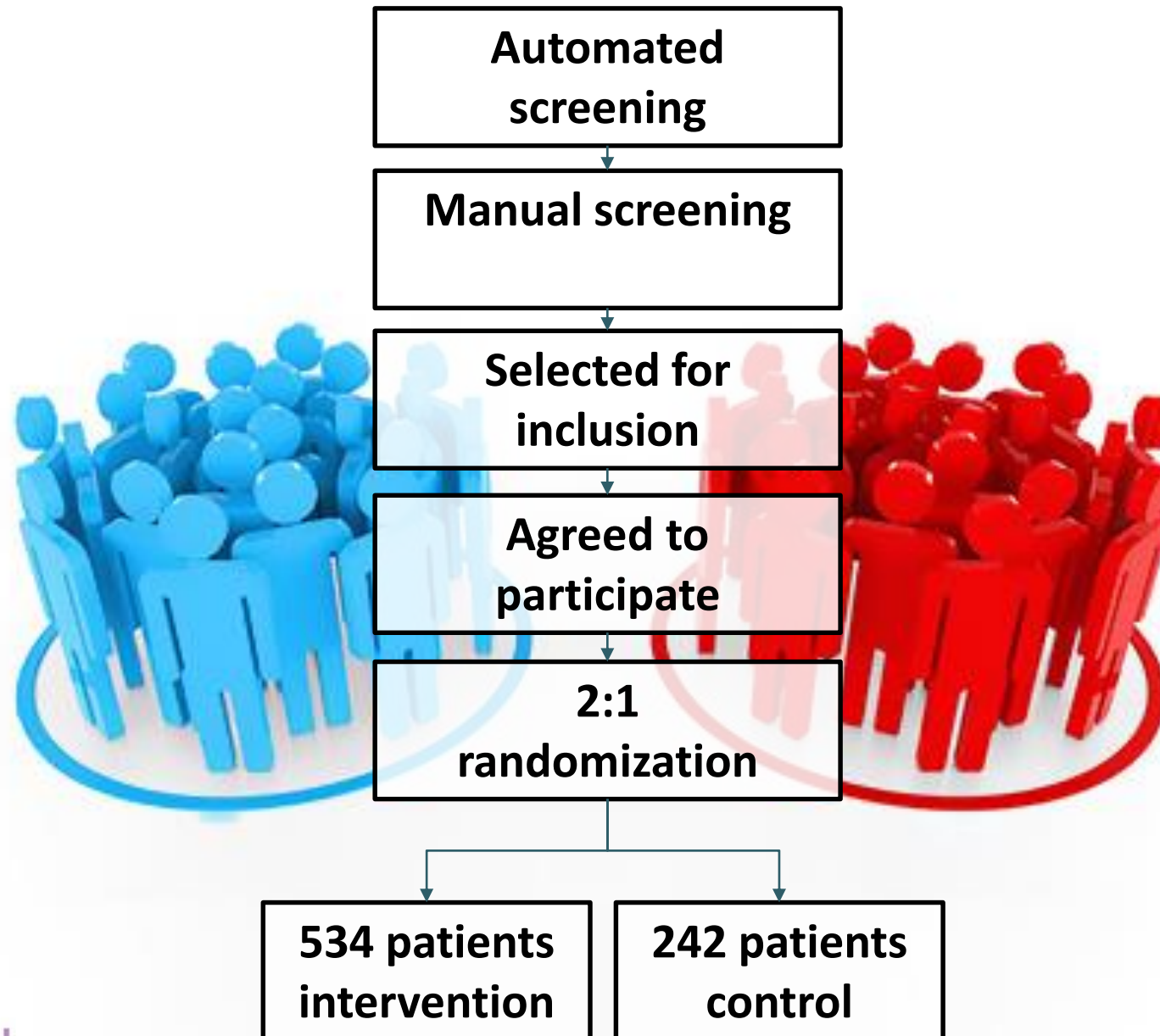
- Evaluation of digital innovations
- Digital transformation in acute care
- Use of the volunteer workforce
- Prison health
- NIHR-funded Rapid Evaluation Team in collaboration with UCL

Randomised controlled trial overview

- Trial started in 2015
- Aim to recruit 3,000 patient by May 2021
- 27 health coaches working in nine CCGs
- 1,757 patients recruited to date



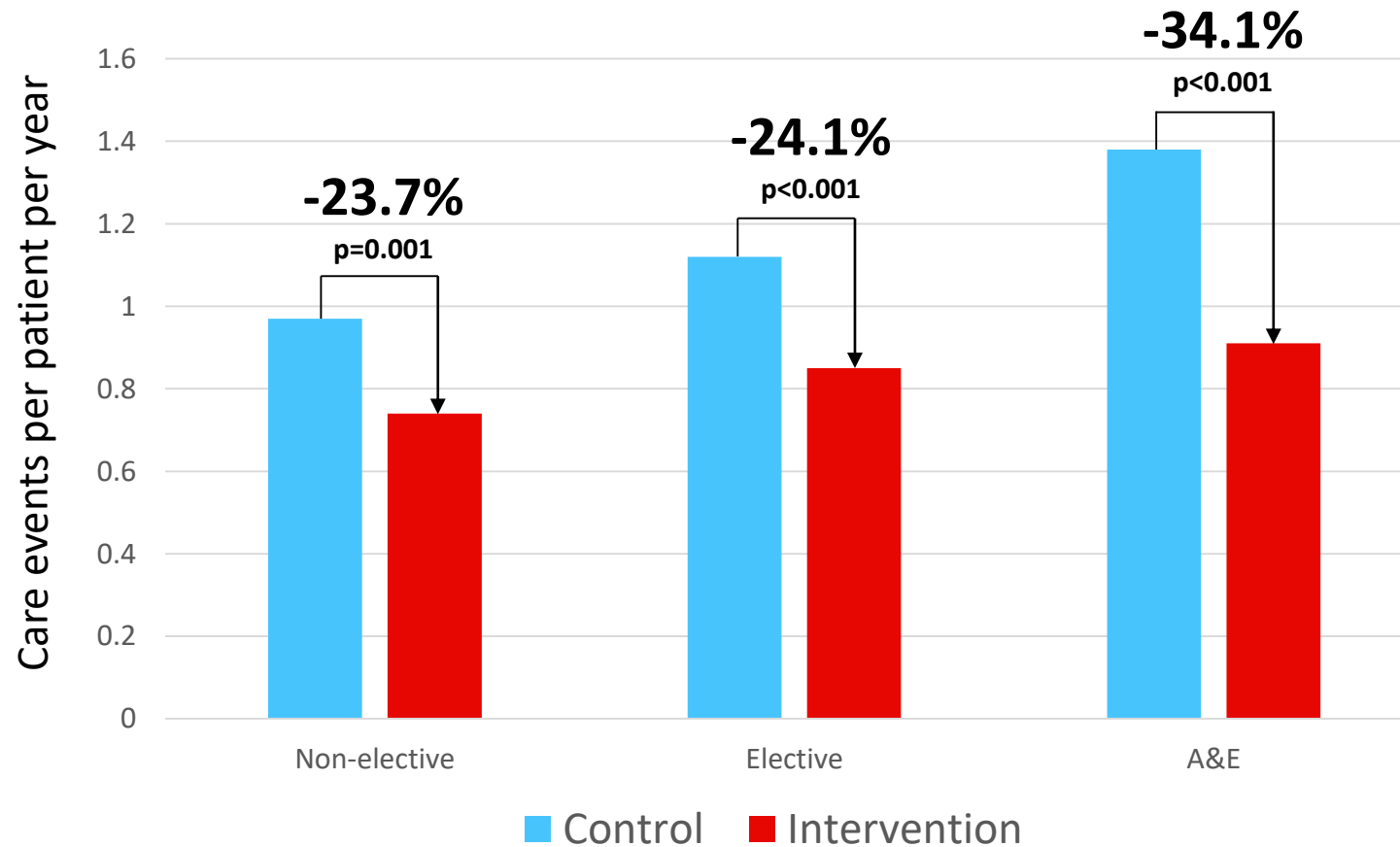
Randomised controlled trial design



Randomised control trial recruitment, Vale of York

Group	No of Patients	Days in Study		
		Average	Min	Max
Control	242	610.1	35	1107
Intervention	534	639.5	30	1109

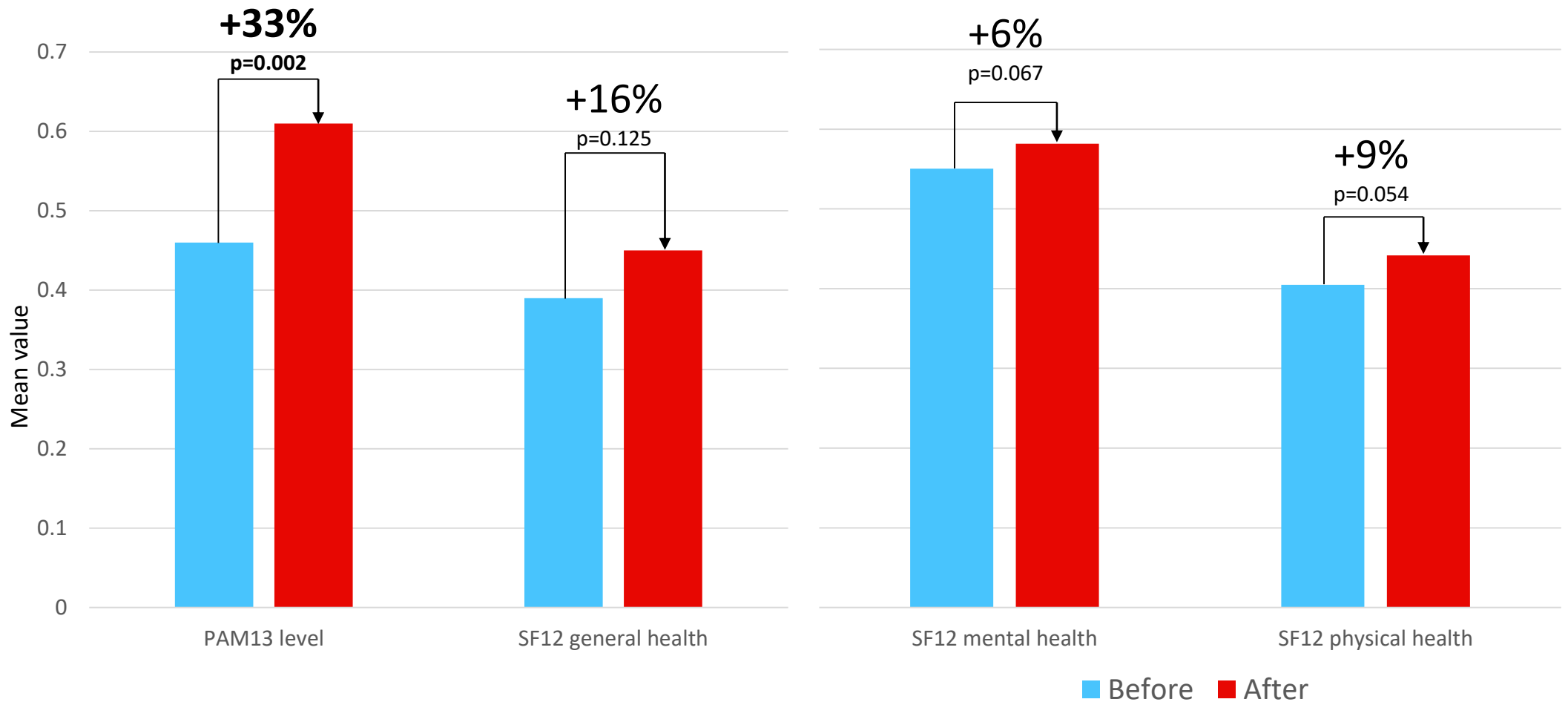
Preliminary results – Vale of York CCG, n=776



Results: Self-reported Quality of Life and patient activation, n=288

- Tools: SF12 and PAM13
- Before and after study
- Patients improved their ability to manage their own health
- Significantly improved physical health outcomes, but no significant change in mental or general health
- Activation level was a significant predictor for general, physical and mental health

Results: Self-reported Quality of Life and patient activation, n=288

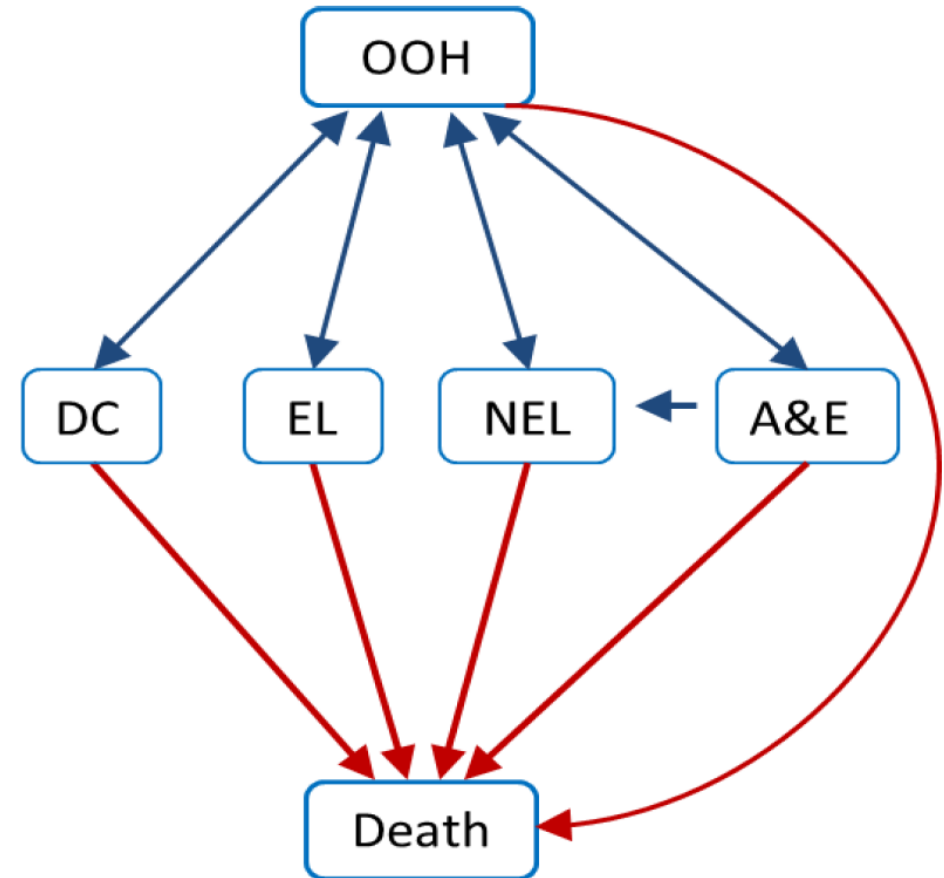




Marc Farr, PhD Chief Analytical Officer East Kent Hospitals University NHS FT

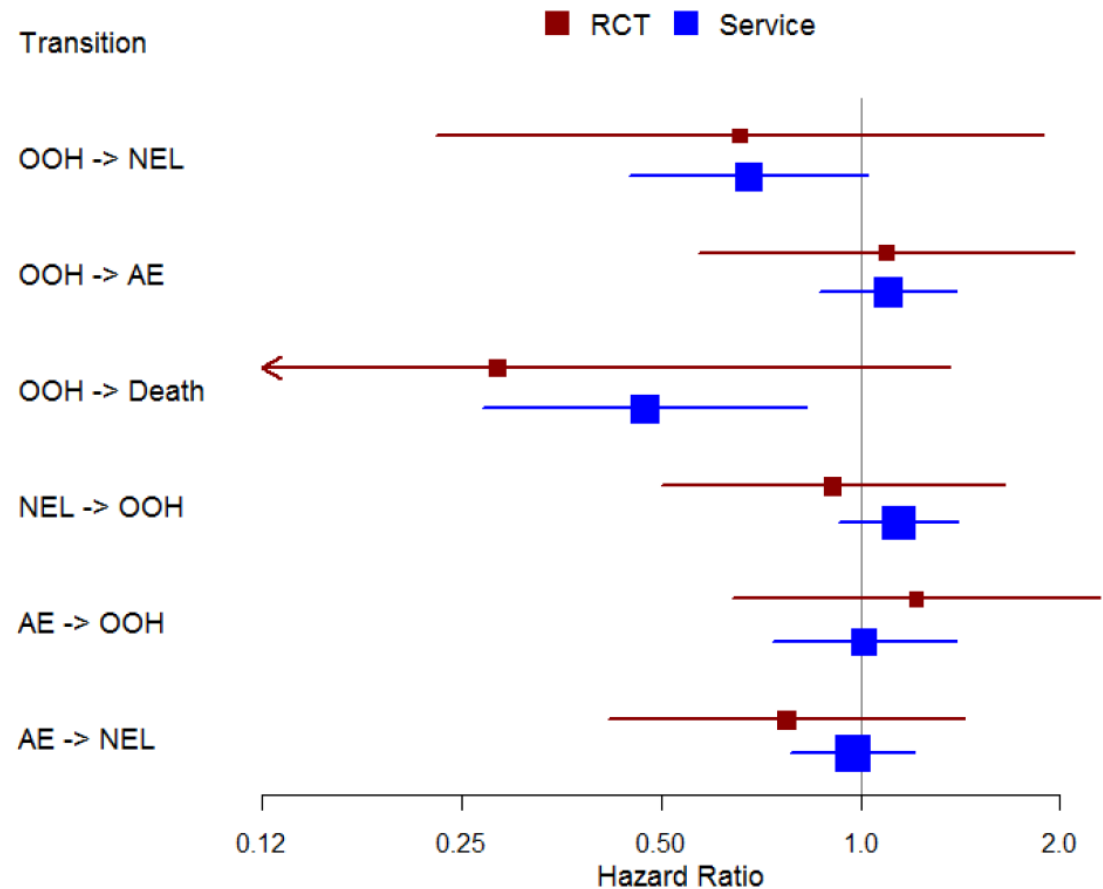
The East Kent Hospitals University NHS FT deployment

- 568 patients in the service and 119 in the RCT group
- Evaluated transition between UEC states for intervention vs control
- Semi-Markov approach



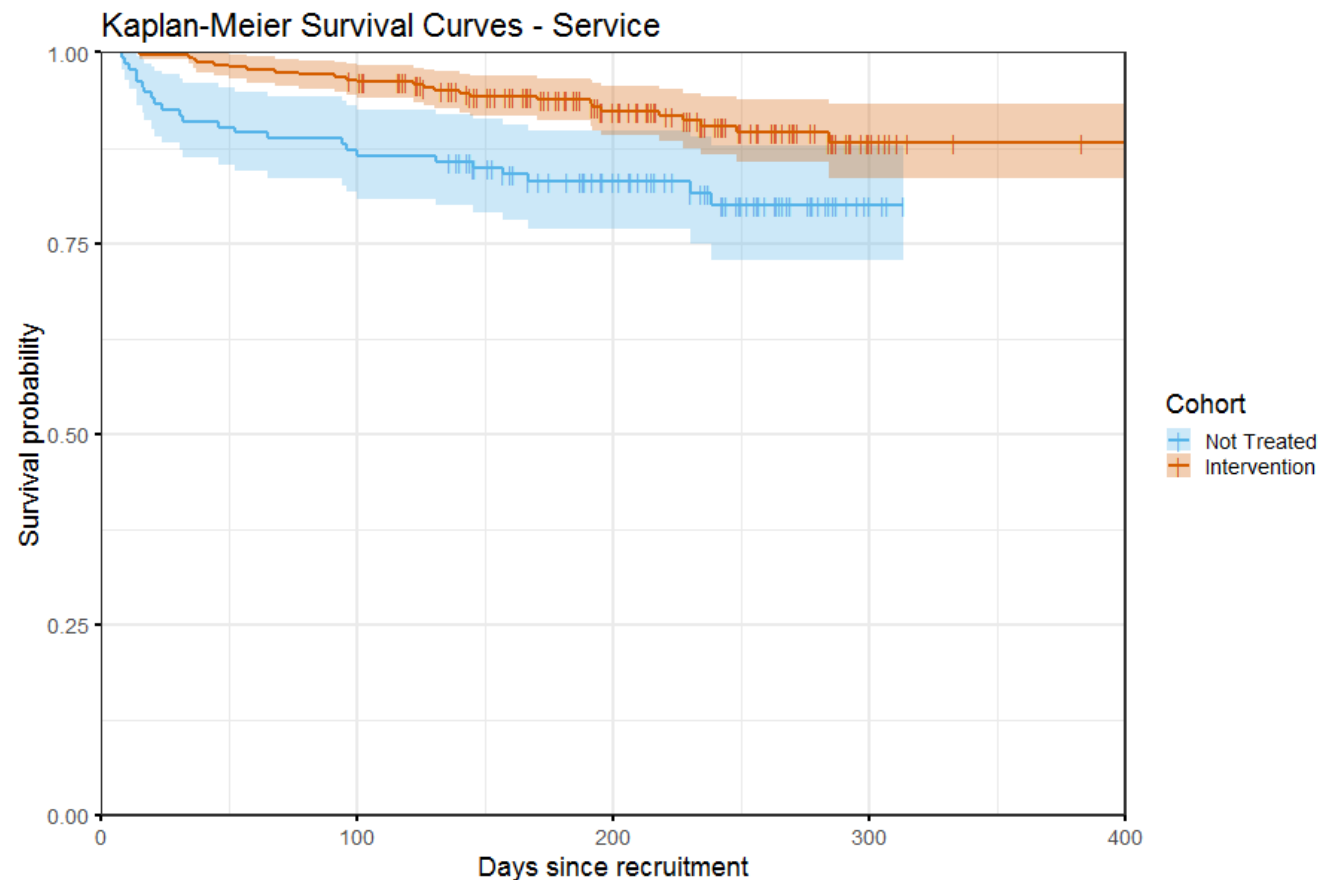
Activity savings

- Hazard Ratios
- For the Service, the intervention group had two times higher chance of survival
- 32% reduction ($p=0.06$) in the probability of non elective admission

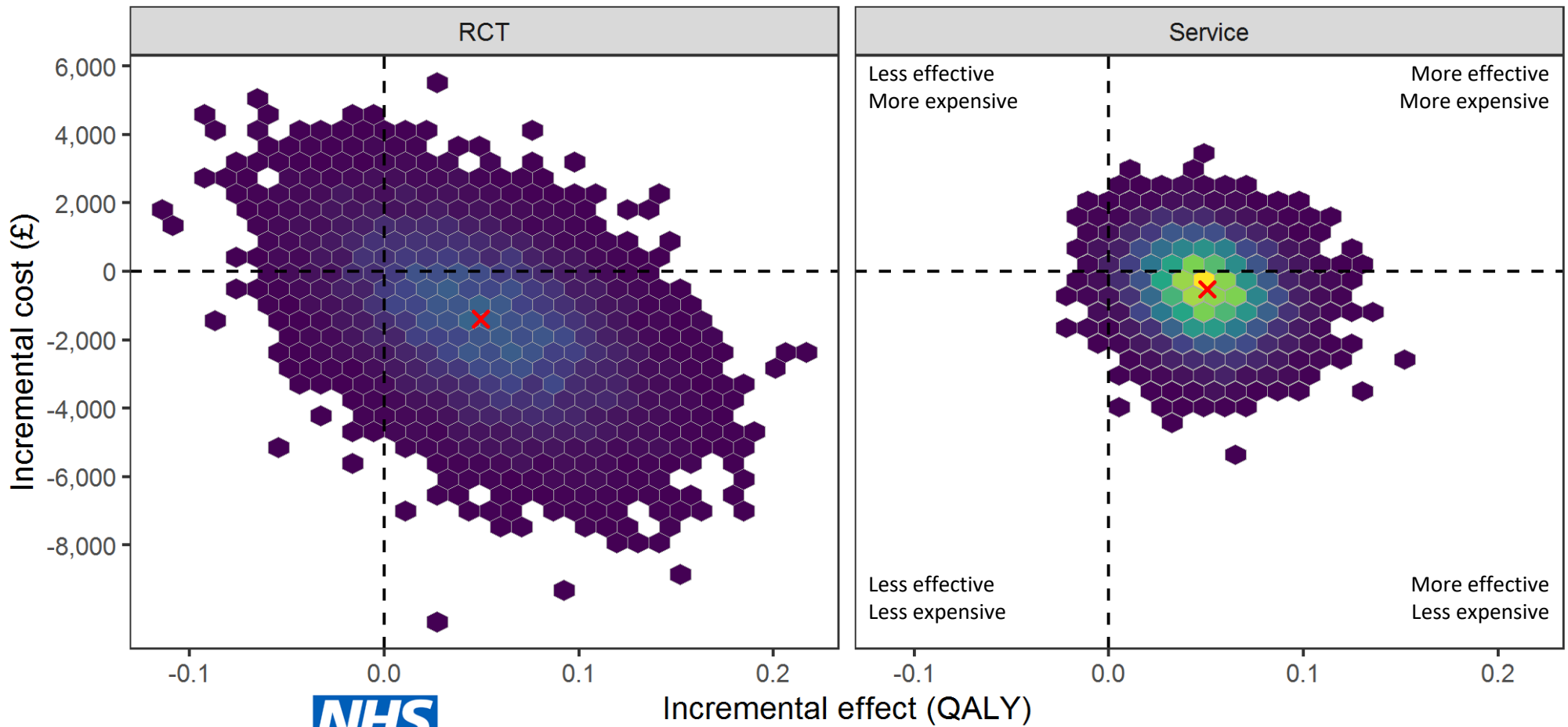


Reducing mortality

- The intervention group had lower mortality rates for both Service and RCT. For service there was a 49% reduction with 6 month cumulative survival probability of 94%.



Incremental cost-effectiveness planes



Cost savings and health economic assessment

	Incremental Cost	Incremental Effect (QALY)	ICER
RCT	-£ 1,390	0.049 (17.8 days)	-£ 28,375
Service	-£ 515	0.050 (18 days)	-£ 10,307

Team effort and distinction!

Predicting and preventing avoidable urgent and emergency care: measuring impact across activity, mortality and cost benefits

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¹East Kent Hospitals University NHS Foundation Trust, ²Health Navigator Ltd., ³Ashford Clinical Commissioning Group



Problem

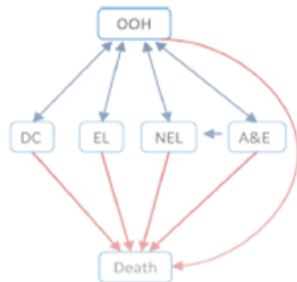
- 24-35% of Urgent and Emergency care (UEC) is avoidable¹. This means compromised care for many of our most vulnerable patients, a cost to the NHS of £6bn per year.
- Measuring the impact of interventions capable of addressing this significant problem remain largely unexplored.
- Limitations in study design, analytical methodologies and data scientific skillsets impact current understanding of high intensity UEC prevention.

Solution

- We deployed a locally trained AI predictive algorithm to identify patients with high probability of non-elective bed day consumption.
- High-risk patients were then recruited to a nurse-led health coaching programme as part of a multicentre RCT led by the Nuffield Trust and industry experts.
- The intervention impacted patient reported outcomes, UEC consumption, hospitalisation costs and patient mortality.
- Here we overview an analytical approach to holistically evidence impact across elective and non-elective hospital functions.
- We are reporting on PROMS, activity, costs and patient mortality.

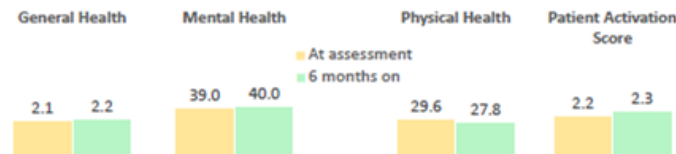
Methodology

- Multi-state Markov models describe patient activity, which at any time can occupy one of possible few states. This enables the modelling across urgent and emergency care.
- The evaluation covers transition rates between the following states: out of hospital (OOH), day case (DC), elective (EL), non-elective (NEL) admission, A&E attendance or Death.



Patient Reported Metrics

- Patients were asked to self-report upon first assessment and again 6 months after, using SF-12 quality of life and PAM13 patient activation surveys. At the time of measurement only 16 6-month questionnaires had been logged.
- The SF12 scores range from 1-5 for General Health and 1-100 for Mental and Physical health. The PAM13 patient activation scores ranges from 1-4.



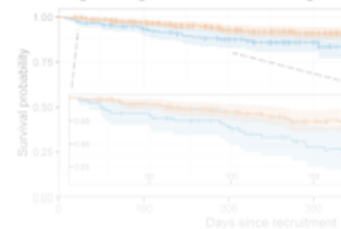
Activity savings

- Hazard Ratios (HR) express the potential for a transition between UEC states for the intervention group relative to the control.
- For the Service, the intervention group had two times higher chance of survival (HR 0.47, 95% CI 0.27 – 0.83) and lower probability of non-elective admissions, albeit the latter statistically significant at 10% (HR 0.68, 95% CI 0.45 – 1.02).
- Similar findings were reported for the RCT, but with higher uncertainty and variance.



Mortality

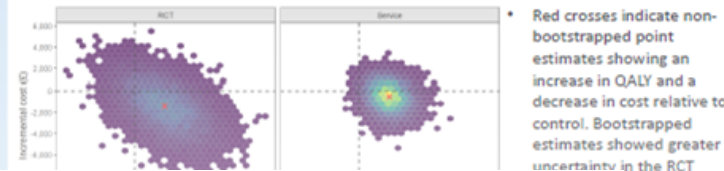
- The intervention group had lower mortality rates for both groups, there was a 49% reduction with 6-month cumulative survival.
- Stratification by age band and sex showed a varied pattern, but group was not large enough for conclusive findings.



Cost Savings and QALYs

- Average cost was lower in both the Service (£515) and RCT (£1,390) intervention groups compared to the controls. Including QALYs (Quality Adjusted Life Years) effects from evidenced reduced mortality, the RCT was more effective as it had a higher incremental cost-effectiveness ratio (ICER) than Service.
- Cost to the CCG was measured by income to the Trust, including the cost of Proactive Health Coaching intervention.
- Additional non-acute costs were not taken into account.
- Effectiveness was measured by QALYs. Both costs and QALYs were standardised per patient year.

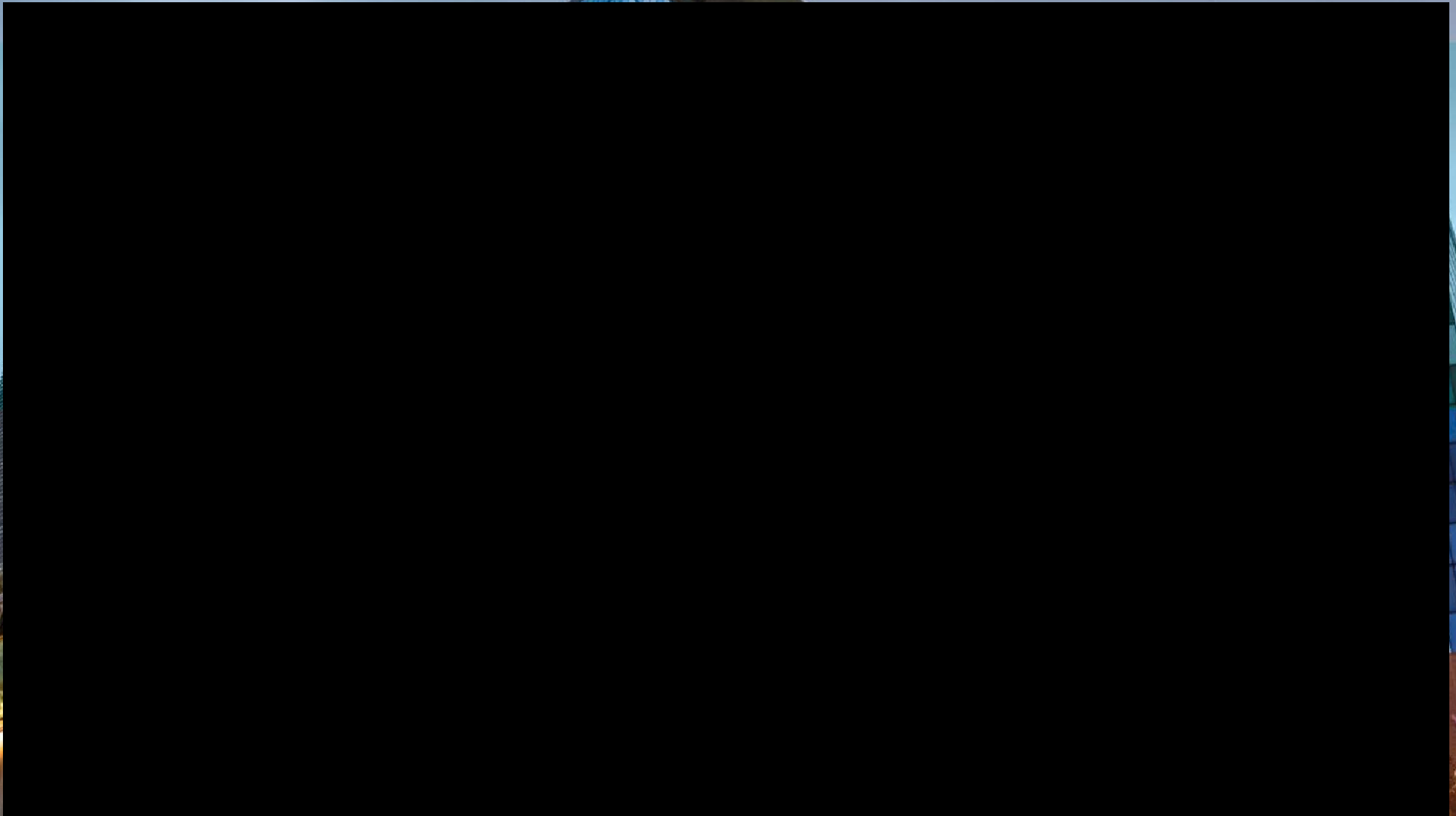
	Incremental Cost	Incremental Effect (QALY)	ICER
RCT	-£ 1,390	0.049 (17.8 days)	-£ 28,375
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- Red crosses indicate non-bootstrapped point estimates showing an increase in QALY and a decrease in cost relative to control. Bootstrapped estimates showed greater uncertainty in the RCT.



Patient testimonials



Thank you

