Appendix 3.

Our unit of observation is each valid PAM response. As the questionnaire was sent out twice, it is possible for patients to have two recorded PAM responses on record. For each PAM response, exposure, outcomes and study covariates are calculated. The main outcome variables were counts per year for different aspects of health care utilisation for a one year period, for each patient, calculated for a period six months either side of when the PAM score was collected.

Table – Main analysis

Relationship tested	**Outcomes**	**Model type**	**Cohort**	**Other model info (offsets, coefficient interpretation).**
Association between counts of utilisation and PAM Level	1) Contact with a General Practitioner 2) Emergency department attendance 3) Elective admissions (excluding regular admissions, i.e. for dialysis) 4) Emergency admission 5) Attended outpatient appointment 6) Minor self-referral to an emergency department	Mixed-effects negative binomial, repeated measurement regression models with a log link.[1,2]	12,270 observations from 9,348 patients	Both unadjusted, and adjusted controlling for other observable confounders*. Coefficients were interpreted by calculating rate ratios for the differences in the predicted counts of the outcome variables between the PAM levels, using level 1 (the least activated) as the reference level.
Association between counts of wasteful utilisation and PAM Level	1) "Did not attend" a GP contact 2) "Did not attend" an outpatient appointment	Mixed-effects negative binomial, repeated measurement regression models with a log link.[1,2]	12,270 observations from 9,348 patients	Both unadjusted, and adjusted controlling for other observable confounders*, with the addition of a covariate to control for total GP or outpatient utilisation. Coefficients were interpreted by calculating rate ratios for the differences in the predicted counts of the outcome variables between the PAM levels, using level 1 (the least activated) as the reference level.

Association between likelihood of 30 day emergency readmission and PAM level, for observations where an admission that could have led to a readmission occurred.	1) Likelihood of experiencing a 30-day emergency readmission to hospital	Mixed-effects logistic, repeated measurement regression models with a log link.[2]	1,577 observations from 1,438 patients	Models are adjusted, controlling for observable confounders*, and an offset is included for the number of admission in the observation period that could have led to a readmission. Coefficients were interpreted by calculating odds ratios for the differences in the odds between the PAM levels, using level 1 (the least activated) as the reference level.
Association between the likelihood of an elective/emergency admission being overnight and PAM Level	1) Likelihood of an elective admission resulting in an overnight stay 2) Likelihood of an emergency admission resulting in an overnight stay	Mixed-effects logistic, repeated measurement regression models with a log link.[2]	Elective admissions: 2848 observations from 2555 patients Emergency admissions: 1620 observations from 1481 patients	Models are adjusted, controlling for observable confounders*, and an offset is included for the number of elective/emergency admissions in the observation period that could have led to an elective/emergency overnight stay. Coefficients were interpreted by calculating odds ratios for the differences in the odds between the PAM levels, using level 1 (the least activated) as the reference level.
Association between length of stay for overnight elective/emergency admissions and PAM Level	1) Length of stay for elective admissions that are at least an overnight stay 2) Length of stay for emergency admissions that are at least an overnight stay	Mixed-effects negative binomial, repeated measurement regression models with a log link.[1,2]	Elective length of stay: 679 observations from 635 patients Emergency length of stay: 1248 observations from 1152 patients	Models predict total length of stay in an observation period for overnight elective/emergency admission, are adjusted, controlling for observable confounders*, and an offset is included for the number of overnight elective/emergency admissions in the observation period. Coefficients were interpreted by calculating rate ratios (RRs) for the differences in the predicted length of stay for the two outcomes between the PAM levels, using level 1 (the least activated) as the reference level.

Interaction term analysis

All subgroup models were mixed-effects negative binomial, repeated measurement regression models with a log link,[1,2] adjusted for the same covariates for each outcome, however with an additionally dummy variable indicating each subgroup that interacts with the categorical variable for PAM Level..

The model were the same structure as those described in 'Table – Main analysis', however, an interaction term between a dummy variable indicating whether the patient associated with the PAM observation, has a condition or characteristic of interest and the categorical variable for PAM Level is included, rather than PAM Level on its own.

Coefficients were interpreted by calculating rate ratios for the differences in the predicted counts of the outcomes between the PAM levels, using level 1 (the least activated) as the reference level. Rate ratios are interpreted at the appropriate value of the interaction term, i.e. when the dummy variable is equal to one, for those with condition or characteristic of interest, and for mental health, age and IMD equal to zero for observations with no such condition or characteristic.

All subgroup analysis were performed for counts of healthcare utilisation, namely; the number of completed contacts with a general practitioner (face-to-face or telephone contacts), the number of appointments with specialists in hospital-based outpatient settings that the patient attended, the number of attendances at emergency departments, the number of emergency inpatient admissions to hospital, the number of non-regular elective inpatient admissions to hospital, the number of contacts with a general practitioner that the patient did not attend, the number of outpatient appointments that were not attended, and the number of emergency department attendances that were classified as being for conditions of minor severity and that were self-referrals by the patient.

Table – Subgroup analysis

Subgroups	**Cohort**
Mental health long-term condition, or no mental health long-term condition	3,516 observations where patients had a Mental Health long-term condition, and 8,754 observations where patients did not have a Mental Health long-term condition.
Two or more long-term conditions	7,940 observations where patients had two or more long-term conditions.
Three or more long-term conditions	4,174 observations where patients had three or more long-term conditions.
Aged below 75, or aged 75 and over	8,442 observations where patients were aged below 75 and 3,820 observations where patients are aged 75 and over.

In the lowest IMD quintile, or in the four least deprived IMD quintiles.	6,490 observations were in the lowest IMD quintile, 5,780 observations were in the four least deprived IMD quintiles.

Table - Sensitivity analysis

Relationship tested	**Outcomes**	**Model type**	**Cohort**	**Other model info (offsets, coefficient interpretation).**
Sensitivity analysis - association between eight counts of utilisation in the six months following PAM collection and PAM Level	Eight main counts of utilisation	Mixed-effects negative binomial, repeated measurement regression models with a log link.[1,2]	12,270 6-month observations from 9,348 patients.	Models are adjusted controlling for other observable confounders*. Coefficients were interpreted by calculating rate ratios (RRs) for the differences in the predicted counts of the outcome variables between the PAM levels, using level 1 (the least activated) as the reference level.

Bibliography

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