Rheumatology Advances in Practice, 2024, **8(2)**, rkae053
https://doi.org/10.1093/rap/rkae053
Original Article

British Society for Rheumatology
RHEUMATOLOGY ADVANCES IN PRACTICE
OXFORD

Clinical science

Trust performance in managing inflammatory arthritis over time in England and Wales: a latent class analysis approach

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Abstract

Objectives: To evaluate trust-level performance in time to initiation of DMARD therapy in patients with early inflammatory arthritis (EIA), with identification of the change in performance trajectories over time and investigation of trust characteristics associated with this change.

Methods: We included 130 trusts from the UK contributing to the National Early Inflammatory Arthritis Audit (NEIAA) from 2018 to 2020. The primary outcome was days from referral to initiation of DMARD therapy in patients with EIA. Latent class growth mixture models were applied to identify distinct groups of trusts with similar trajectories of performance change over time. We used mixed effects linear and multinomial logistic regression models to evaluate the association between delay in treatment and trust-level characteristics.

Results: The mean time to DMARD initiation was 53 days (s.d. 18), with an average 0.3-day decrease with each month over time. Four latent trajectories were identified in our cohort, with >77% of individual trusts showing ongoing improvements in decreasing treatment waiting times. Prior to separating by latent class, time to DMARD initiation was shorter in trusts with higher rheumatology staffing, a local EIA treatment pathway and those with access to musculoskeletal ultrasound. Trusts with more nurses in the rheumatology department were less likely to be in the worst performance group [odds ratio 0.69 (95% CI 0.49, 0.93)].

Conclusion: In this cohort study, we observed a reduction in treatment waiting time over time. Trusts with better staffed and improved EIA clinical structure are likely to initiate definitive treatment earlier in patients with EIA.

Lay Summary

What does this mean for patients?

Prompt initiation of disease-modifying anti-rheumatic drugs (DMARDs) for patients with rheumatoid arthritis helps reduce rates of disease progression. We used data from the National Early Inflammatory Arthritis Audit to investigate how long it takes for people with early inflammatory arthritis (EIA) to start DMARDs in different National Health Service (NHS) trusts in England and Wales. We observed a reduction in treatment waiting time over time. NHS trusts with better staffing and a clear EIA treatment pathway were likely to start treatment earlier. This study shows that service quality has improved over time and provides evidence of what contributes to hospitals' performance in initiating DMARD therapy quickly. This information will support further interventions that aim to improve the quality of care in rheumatology.

Keywords: rheumatology, rheumatic diseases, healthcare quality, DMARD, treatment, trajectory.

Key messages

- There is substantial variation across the country even though time to treatment for people diagnosed with inflammatory arthritis in the UK has improved in recent years.
- Better-staffed units that have established treatment pathways tend to have better hospital-level performance.
- There is a need to focus health improvement strategies on reducing the pronounced performance gap among hospitals.

Introduction

Early initiation of DMARDs for patients with RA is essential, with strong evidence that prompt treatment reduces the rate of disease progression [1–3]. The UK National Institute for Health and Care Excellence (NICE) has published quality standards for the diagnosis and treatment of RA (QS33) to ensure continual improvement in the quality of healthcare provided and that patients receive timely and effective care [4]. These guidelines recommend that adults with active RA should receive a DMARD within 6 weeks of referral from

Received: 1 November 2023. **Accepted:** 20 March 2024

primary care [4]. The National Early Inflammatory Arthritis Audit (NEIAA) is a national quality improvement initiative aimed at monitoring and improving the quality of care delivered to individuals with early inflammatory arthritis (EIA), thereby facilitating improvements in England and Wales. In the most recent NEIAA report published in October 2022, it was noted that 65% of patients with RA were prescribed DMARDs within 6 weeks of referral [5].

Previous research has shown that staffing and performance in relation to inflammatory arthritis care vary widely across hospitals in the UK [5–7]. The hospital trust at which patients receive care is an important predictor of clinical outcomes [8]. This is likely to be driven by a range of factors at different levels, including macro-level factors such as shared care arrangements and relationships with general practitioners, and meso-level factors such as staffing and resources [9–13]. On a patient level, the treatment provided to those presenting for the first time with inflammatory arthritis varies enormously around the country [5–7]. The performance of individual trusts in the management of patients with EIA remains unknown. Previously published NEIAA annual reports focused on static national and regional performance for a given year. However, these reports do not capture performance at the trust level or dynamic trends over time.

To address this gap in knowledge, our overarching objective was to define trust-level drivers of performance, including how performance changes over time. To this end, we developed the following three specific aims: use latent class modelling to define national trends in trust performance variability over time, describe which trust-level characteristics associate with delays in treatment at a national level and explain how trust characteristics predict changes in performance over time.

Method

Data source

The NEIAA is a nationwide audit designed to improve the care and outcomes of patients with EIA in England and Wales [5]. Rheumatology services in the National Health Service (NHS) are overseen by one or more hospitals formed as part of an NHS Trust and the majority of these trusts operate as a single unit with common staff providing care across usually one or two hospital sites. A total of 131 trusts or health boards offering rheumatology care and treating patients with suspected EIA in England and Wales contributed data to the NEIAA. Data are collected from clinicians through an online portal, prompting users to complete mandatory fields and sense-checking fields. In addition to clinical data on individual patients, the NEIAA collects organizational data on an annual basis, including staffing ratios and clinic structure. For the purposes of this study, baseline organizational data were utilized for trusts participating in the NEIAA from 1 May 2018 to 10 March 2020. All the names of the trusts were anonymized.

The primary outcome for our study was time to treatment, which was defined as the number of days from primary care referral (the date the referral letter was received) to initiation of a DMARD (the date of the first DMARD prescription) in patients with newly diagnosed EIA. The EIA cohort was defined as patients selected by their treating physician as requiring DMARD initiation with a treat-to-target strategy. While most patients had a diagnosis of RA, patients with PsA, undifferentiated inflammatory arthritis and axial SpA with peripheral joint involvement were also eligible. Log transformation was applied for treatment waiting times because of their right skewness. After transformation, 3-month rolling averages of treatment delays were calculated. Missing data on DMARD treatment waiting times for any of the study months were excluded from the analyses, as this study's focus was to evaluate the longitudinal performance of trusts.

Independent variables

Trust-level characteristics included the number of full-time consultants and rheumatology specialist nurses at each trust, the number of these clinicians and nurses per 100 000 catchment population in the rheumatology department, having an EIA referral pathway agreed upon with primary care, having dedicated EIA clinics, having a locally agreed EIA treatment pathway, having access to musculoskeletal ultrasound and having access to musculoskeletal ultrasound on the same day as the assessment.

We calculated the mean decile of the Index of Multiple Deprivation (IMD) for all patients enrolled in the NEIAA under each trust, as an indicator of the trust-level IMD score. The IMD is the official measure of small-area relative deprivation in England and Wales, which combines a set of domains, including income, employment, health and disability, crime, barriers to housing and services, living environment and education, skills and training [14]. A lower level of IMD denotes less social deprivation in that area. We extracted outpatient attendances from the Hospital Outpatient Activity Report 2021–2022, taken from NHS Digital Hospital Episodes Statistics (HES) data, as an indicator of the number of patients seen in rheumatology departments at each trust. The HES is a comprehensive database that captures detailed information about admissions, emergency department attendances and outpatient appointments at NHS hospitals in England. Patients' attendance by organization in Wales is based on the Outpatient Activity Minimum Dataset (OP MDS; 2019), which records patient-level information on outpatient activity in the NHS in Wales. For trusts without the most recently updated outpatient attendance data available at the time of publication, we used data from past publications.

Statistical analysis

To explore whether there were distinct groups of trusts with similar trends in performance change over time, we used latent class growth mixture models (LCGMMs) [15]. We followed the Guidelines for Reporting on Latent Trajectory Studies checklist for reporting latent growth analyses [16] (Supplementary Table S1, available at *Rheumatology Advances in Practice* online). Models with different trajectory shapes, including linear and non-linear parameters, such as quadratic and cubic, were considered with extraction of one to five latent classes. The best fitting model was determined using a combination of lower Akaike information criterion (AIC), lower Bayesian information criterion (BIC) [17, 18], lower sample size–adjusted Bayesian information criterion (SABIC) [19], the Lo–Mendell–Rubin adjusted likelihood ratio test (LRT) [19, 20], entropy [19], higher posterior probability, which is ≥70% [21], and no classes with <10% of the overall cohort size [18, 22]. For the LRT, *P*-values <0.05 indicate the model identified is a significantly better fit to the data than one less class model. Entropy >0.8 indicated an

acceptable classification accuracy [20, 23]. When more than one model appeared to be a good fit to the data, the statistical fit was considered alongside model parsimony, with the more parsimonious solution preferred. After determining the optimal number of trajectory classes, baseline characteristics across different latent class groups were described. Individual trust trajectories within each latent class were visualized with separate line plots. For the primary model, multiple separate linear mixed effects regression models were performed to evaluate the association between treatment delay and trust-level characteristics in the overall sample. All mixed effects linear regression models included random intercepts for class. We then used multinomial logistic regression analysis with each independent variable modelling exploring trust-level factors that predict latent class membership, with the larger class as the reference group. Analyses were performed using the lcmm, lme4 and nnet packages in R (version 4.2.2; R Foundation for Statistical Computing, Vienna, Austria).

Ethical approval

No informed patient consent was required, as the NEIAA has permission from the Secretary of State for Health to collect data for the purposes of national audit. Ethical approval for secondary use of the NEIAA was obtained (Clinical Advisory Group Reference: 19/CAG/0059; Research Ethics Committee reference: 19/EE/0082).

Results

Trust characteristics

Of the trusts involved in the NEIAA, 130 of 131 (99%) reported DMARD treatment waiting times among EIA patients in each month of the study period from 1 May 2018 to 10 March 2020 and were eligible for our analysis. Overall, the mean DMARD treatment waiting time was 53 days (s.d. 18; range 12–296), with an average of a 0.3-day decrease with each month over time. In this cohort, ≈57% of EIA patients who were eligible for DMARD treatment received a prescription within 42 days (as per NICE guideline recommendations). The mean treatment waiting time was less than the NICE standard in 49 of 130 trusts (38%). On average, all included trusts had a mean of four full-time working equivalent rheumatology consultants and four clinical nurse specialists. Around 75% of the trusts had an EIA referral pathway agreed upon with primary care, a mean of 75% had dedicated EIA clinics, 83% had locally agreed EIA treatment pathways, 95% had access to musculoskeletal ultrasound and 44% had access to musculoskeletal ultrasound on the same day as the assessment.

Latent class mixed model selection

Model fit statistics for models with two to five classes are shown in Supplementary Table S2, available at *Rheumatology Advances in Practice* online. The AIC, BIC and SABIC decreased as the number of classes increased from two through five, indicating a better fit of the model with a greater number of classes. Although five-class models had a lower BIC, the high number of classes might represent overfitting. Models with five classes had small group sizes, with <10% of all included trusts in some classes. Models with four classes show a better fit than the three-class solution in LRT with a significant P-value (entropy = 0.91, $P < 0.001$). We thus selected the models with four classes as the best fitting and most parsimonious for the modelling.

Latent class of performance

Our final model identified four trajectory classes (Fig. 1 and Supplementary Figs S1 and S2, available at *Rheumatology Advances in Practice* online). Class 1 [49 of 130 trusts (38%)] improved their performance over time, eventually meeting the NICE quality statement within 6 weeks of referral. Class 2 [30 trusts (23%)] did not show improvement over time and did not attain the quality standard over the 2-year study period. Class 3 [35 trusts (27%)] remained relatively stable around the critical metric. Class 4 [16 trusts (12%)] was identified as the best-performing over time. In summary, >77% of individual trusts showed ongoing improvements in shortening their treatment waiting times, with almost 77% of them (classes 1, 3 and 4) reaching the recommended time by NICE.

Trust-level characteristics and treatment delays

Characteristics of the trusts across performance groups, based on first treatment waiting times, are shown in Table 1. Mixed effects models were estimated to determine trust-level factors associated with overall performance in the sample; prior to separating by latent class, trusts with more rheumatology consultants [$\beta = -0.82$ days per consultant (95% CI −1.28, −0.36)] and rheumatology nurses [$\beta = -0.11$ days per nurse (95% CI −0.56, 0.34)] were more likely to provide a faster DMARD prescription to patients. In addition, shorter times were observed for trusts that had a locally agreed EIA treatment pathway [$\beta = -7.68$ days (95% CI −11.55, −3.81)] and those with access to musculoskeletal ultrasound [$\beta = -7.54$ days (95% CI −12.65, −2.42)] (Table 2).

The association between trust characteristics and trajectory class

Multinomial logistic regression models allowed the examination of trust-level characteristics associated with class membership (Table 3). Class 3, the second largest class, with relatively stable performance around the quality metric, was selected as the reference group for comparisons. As was observed in the mixed models, employing more nurses was associated with better performance. Specifically, there was significantly lower odds of a trust being in class 2, the worst performing class, compared with class 3 [odds ratio (OR) 0.69 (95% CI 0.49, 0.93)]. Although differences in the comparisons with classes 1 and 4 with 3 are non-significant, they potentially indicate low staffing as a key barrier to initiating DMARD treatment.

Having a locally agreed EIA treatment pathway, an EIA referral pathway agreed upon with primary care and dedicated EIA clinics were not statistically significantly related to class membership, although effect sizes between some classes were large. Findings were compatible with the mixed effects models and estimation issues and high levels of uncertainty in the estimates were observed due to the small number of trusts in some classes. A similar pattern was seen with IMD; this was again not statistically significant, although the effect was consistent with the direction observed in the mixed models.

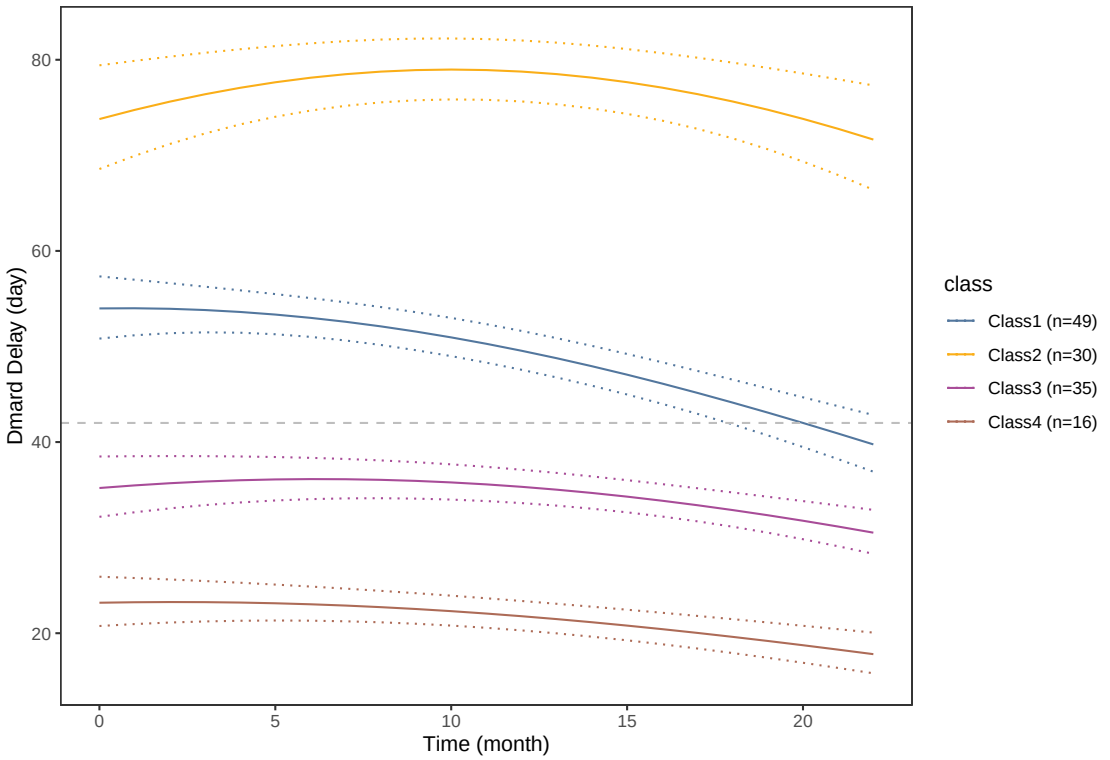

Figure 1. Four-class model of trajectories of DMARD waiting time over a 2-year period. Class1: improved their performance over time, eventually meeting the NICE quality standard. Class2: no improvement over time and did not attain the quality standard. Class3: remained relatively stable around the critical metric. Class 4: best performing over time

Discussion

This trust-level cohort study evaluated the performance in starting DMARD treatment for EIA diagnoses for individual trusts over time. Between 2018 and 2020, there was a substantial decrease in waiting times for initiation of DMARD therapy. Hospitals showing the greatest improvements were those that were initially the lower performing. There is substantial variation in trust-level performance on a month-to-month basis.

Having more nurses was associated with a reduced time to starting treatment in both the mixed and latent class models. A similar trend was seen with a higher volume of consultants. Trusts with EIA referral pathways, dedicated EIA clinics and musculoskeletal ultrasound at first assessment were also seen to have a reduced time to start treatment. Trusts with patients who were on average from more deprived areas had longer waiting times to start treatment in mixed models, though there was considerable uncertainty in the latent class models and these effects were not significant. Together, these findings provide information that can direct quality improvement initiatives in the future.

In our study, the number of days to initiation of DMARD therapy after referral decreased over time. This finding is consistent with past annual NEIAA reports, in which an increasing number of patients were established on a DMARD within 42 days [5]. There is compelling evidence that the time from symptom onset to referral and then access to clinical assessment is decreasing [5], and the trend of reducing the waiting time for DMARDs is likely to be a downstream benefit of these changes.

While the audit has been driving up healthcare quality at a national level, some trusts are consistently poor performers, with a subset that did not have any improvement in treatment delay over time. Understanding what predicts trust performance is crucial. The British Society for Rheumatology workforce report describes that there is a positive relationship between the number of consultants and specialist nurses in a department and the likelihood of achieving the NICE metric [24]. At a national level, we were able to confirm these associations. However, using our latent class approach, we did not observe a strong association between staffing and class membership. The difference in predictors between our linear mixed model and the latent class model can be explained by several factors. Good performance and the ability to improve performance are distinct constructs. In other words, staffing numbers may contribute to the overall delivery of care, but they may not necessarily determine the trajectory of improvement over time. In addition, healthcare systems are complex and influenced by multiple factors beyond staffing numbers. There are many factors that impact service quality, such as the ratio of substantive staff to locum staff, the financial status of the healthcare trust and staff motivation. These factors were not captured in the models but could play a significant role in determining membership in different performance classes. Another potential explanation for the observation could be patient-level factors, which we did not include in the study (e.g. the rate of clinic non-attendance or compliance with medication).

The largest effect sizes, dramatically exceeding the null, were observed in the best-performer class with either the EIA clinic or referral pathway or both. This finding supports the claim that access to an EIA clinic can lead to quicker treatment and improved clinical outcomes for patients with

Table 1. Characteristics of trusts stratified by trajectory

Characteristics	All ($n = 130$)	Class 1 ($n = 49$)	Class 2 ($n = 30$)	Class 3 ($n = 35$)	Class 4 ($n = 16$)
IMD decile, mean (S.D.)	5.4 (1.2)	5.2 (1.1)	5.3 (1.3)	5.4 (1.2)	5.8 (1.3)
Number of WTE consultants, mean (S.D.)	4.2 (2.1)	4.3 (2.1)	3.3 (1.5)	4.3 (2.0)	5.4 (2.9)
Number of WTE consultants per 100 000 patients in rheumatology, mean (S.D.)	45.6 (105.3)	60.9 (167.2)	32.5 (17.1)	38.1 (20.2)	38.0 (23.3)
Number of WTE rheumatology nurses, mean (S.D.)	3.7 (2.3)	3.8 (2.1)	2.9 (1.5)	4.2 (3.3)	4.1 (1.2)
Number of WTE nurses per 100 000 patients in rheumatology, mean (S.D.)	40.9 (83)	54.3 (130.1)	28.6 (15.7)	35.2 (19.3)	34.2 (26.0)
Having an early arthritis referral pathway agreed upon with primary care, %	75.1	71.2	62.6	82.1	100
Having dedicated early arthritis clinics, %	75.3	73.7	69.8	72.5	100
Having dedicated early arthritis clinics and early arthritis referral pathway, %	64.3	56.8	55.2	68.9	100
Referrals made via early arthritis referral pathway, %	59.5	62.1	44.9	62.9	71.1
Having a locally agreed early arthritis treatment pathway, %	83.2	72.1	84.6	91.5	100
Having access to musculoskeletal ultrasound, %	95.1	95.2	92.0	99.6	91.7
Having access to musculoskeletal ultrasound on the same day as assessment, %	44.4	35.5	47.3	47.1	63.6

Class1: improved their performance over time, eventually meeting the NICE quality statement. Class2: no improvement over time and did not attain the quality standard. Class3: remained relatively stable around the critical metric. Class 4: best performing over time.

Table 2. Linear mixed effect models for the relationship between characteristics and treatment delay

Characteristics	Regression coefficient (95% CI)	*P*-value
IMD decile	−0.55 (−0.89, −0.22)	0.001
Number of WTE consultants	−0.82 (−1.28, −0.36)	<0.001
Number of WTE consultants per 100 000 patients in rheumatology	0.02 (0.01, 0.04)	0.001
Number of WTE rheumatology nurses	−0.11 (−0.56, 0.34)	0.628
Number of WTE nurses per 100 000 patients in rheumatology	0.03 (0.01, 0.04)	<0.001
Having an early arthritis referral pathway agreed upon with primary care	−0.51 (−3.35 −2.32)	0.722
Having dedicated early arthritis clinics	0.17 (−2.60, 2.94)	0.905
Having dedicated early arthritis clinics and early arthritis referral pathway	−0.14 (−2.60, 2.32)	0.909
Referrals made via early arthritis referral pathway	−18.00 (−19.98, −16.02)	<0.001
Having a locally agreed early arthritis treatment pathway	−7.68 (−11.55, −3.81)	<0.001
Having access to musculoskeletal ultrasound	−7.54 (−12.65, −2.42)	0.004
Having access to musculoskeletal ultrasound on the same day as assessment	1.26 (−0.89, 3.40)	0.250

Table 3. Independent associations of characteristics with latent class membership reference group (stable and met)

	OR (95 CI%)		
Characteristics	Class 1 ($n = 49$)	Class 2 ($n = 30$)	Class 4 ($n = 16$)
IMD decile	0.86 (0.6, 1.24)	0.90 (0.60, 1.36)	1.32 (0.80, 2.19)
Number of WTE consultants	1.00 (0.79, 1.26)	0.75 (0.55, 1.01)	1.26 (0.93, 1.7)
Number of WTE consultants per 100 000 patients in rheumatology	1.00 (1, 1.01)	0.99 (0.97, 1.02)	1.00 (0.99, 1.01)
Number of WTE rheumatology nurses	0.94 (0.77, 1.14)	0.68 (0.49, 0.93)	0.98 (0.76, 1.27)
Number of WTE nurses per 100 000 patients in rheumatology	1.00 (1, 1.01)	0.99 (0.97, 1.02)	1.00 (0.99, 1.01)
Having an early arthritis referral pathway agreed upon with primary care	0.5 (0.15, 1.73)	0.33 (0.09, 1.22)	NA
Having dedicated early arthritis clinics	1.06 (0.36, 3.18)	0.87 (0.27, 2.86)	NA
Having dedicated early arthritis clinics and early arthritis referral pathway	0.56 (0.20, 1.62)	0.53 (0.17, 1.67)	NA
Referrals made via early arthritis referral pathway	0.89 (0.17, 4.76)	0.09 (0.01, 0.59)	4.09 (0.32, 52.98)
Having a locally agreed early arthritis treatment pathway	0.22 (0.05, 1.04)	0.49 (0.09, 2.81)	NA
Having access to musculoskeletal ultrasound on the same day as assessment	0.60 (0.22, 1.65)	1.01 (0.33, 3.07)	2.05 (0.47, 9)

Class 1: improved their performance over time, eventually meeting the NICE quality standard. Class 2: no improvement over time and did not attain the quality standard. Class 3: remained relatively stable around the critical metric (reference group). Class 4: best performing over time.

confirmed inflammatory arthritis [25]. Such clinics provide a comprehensive range of services (e.g. ultrasound, X-ray, blood sampling, access to physiotherapists and occupational therapists) to patients in a single appointment, meaning that suspected cases of inflammatory arthritis are confirmed or discharged and treatment can be initiated more quickly. The pathway we refer to here is from primary care through referral to secondary care; however, it is important to note that

each rheumatology department may also have departmental pathways or guidance that can inform and drive management steps with varying degrees of urgency.

Prior studies have proven a positive association between deprivation and worse patient outcomes [26] and between early treatment and better patient outcomes [2]. Moreover, one study suggested that those who are less deprived have milder clinical outcomes in EIA [27]. Our study explored an association between deprivation and healthcare quality but suggested a possible difference compared with this indirect evidence. Our study showed a non-statistically significant trend towards better performance in trusts with more deprived patients. The probable reason for this discrepancy is that the level of IMD among patients in the corresponding trusts may not accurately reflect the deprivation of this trust. Future research should consider applying a more appropriate variable at the trust level, such as the financial deficit of the healthcare facility, representing social and economic status.

We have looked at all the available trust-level variables and nothing came out as significant in all of these except for the number of whole-time equivalent (WTE) nurses. This dataset includes both organization-level data and patient-level data; e.g. whether patients were referred by a dedicated EIA pathway. In the supplementary analysis including patient-level data, we found that trusts with more patients referred via the EIA pathway have a significantly lower probability of membership in the worst performance class.

Public reporting such as audits has spurred quality improvement to varying degrees at the hospital level [28, 29], resulting in audit and feedback as widely applied components for quality improvement initiatives [30, 31]. Annual reports from the NEIAA assessing the quality of care provided across all rheumatology departments in England and Wales have been publicly available since 2019. The effectiveness of a national audit in rheumatology in terms of changing clinician behaviour is not well understood. Our findings support the hypothesis that care providers identified as low performers do improve over time. However, a challenge in annual reporting is that this only gives a snapshot in time that may have attenuated observed year-to-year variability in performance and is a year later than real time. We have demonstrated that it is important to consider not only the static performance of a trust at one given time point, but to recognize that variation occurs on a month-by-month basis within the year. More time-sensitive quality improvement interventions need to be applied to account for this, such as live dashboards.

Our study has several strengths. To our knowledge, this is the first study to identify distinct performance groups of trusts over time in initiating definitive management in EIA. This study included a large sample size, drawn from almost all rheumatology departments in England and Wales, with little missing baseline data.

Limitations of this study include recall and reporting bias, with the use of a dataset relying upon manual data collection and potentially more likely to inflate estimates relative to key metrics, such as treatment waiting times. Data completeness has previously been shown to be a quality indicator in the NEIAA [32]: better-performing trusts were more likely to contribute to the database. Missing data were low in this study, but it may be that some trusts failed to include some patients. Finally, these predictor measures are drawn from baseline data, which is less likely to account for the change over time. For example, we did not identify the fluctuation of staffing levels and access to trust services, as this information is collected annually. Staffing data are collected at the hospital level, while the number of patients attending in rheumatology is collected at the trust level. These might reduce the power of our analysis and increase the risk of type 2 errors.

Conclusion

This study demonstrated that, across all trusts, the time to initiate DMARD treatment after diagnosis of an EIA has fallen since the inception of the NEIAA in 2018. Trusts that are better staffed and have established EIA pathways might perform better. This study also shows that variation in treatment performance across trusts changes over time. Our latent class modelling approach to nationwide data has identified groups of trusts based on their performance over time. Almost all characteristics that we currently capture, including deprivation and staffing levels, do not explain this latent class membership. To improve care for individuals with EIA, we should try to increase our understanding of variations in performance.

Supplementary material

Supplementary material is available at *Rheumatology Advances in Practice* online.

Data availability

Data from the NEIAA used to produce this analysis are available upon request, subject to the approval of the Healthcare Quality Improvement Partnership and the British Society for Rheumatology.

Funding

Z.Y. is funded by the China Scholarship Council. M.D. and K.B. receive funding support from the National Institute for Health and Care Research.

Disclosure statement: J.G. has received honoraria from AbbVie, Biovitrum, BMS, Celgene, Chugai, Galapagos, Gilead, Janssen, Eli Lilly, Novartis, Pfizer, Roche, Sanofi, Sobi and UCB. M.R. has received honoraria from Eli Lilly, Galapagos, Biogen and Menarini and support for attending meetings from Eli Lilly, Pfizer, Janssen and UCB. K.B. has received funding from Versus Arthritis and Pfizer Global Medical Grants for Quality Improvement in Rheumatology Practice, honoraria from Menarini and Galapagos and support for attending meetings from UVBioTek. E.D. has received support for attending conferences from UCB. The remaining authors have declared no conflicts of interest.

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Rheumatology Advances in Practice, 2024, 8, 1–7
https://doi.org/10.1093/rap/rkae053
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