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56-day prescribing: barriers, facilitators and interventions for extending periods of treatment (Annexes)

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56-day prescribing: barriers, facilitators and interventions for extending periods of treatment

Annexes

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Introduction

This Annex document accompanies the final report of a study commissioned by Welsh Government to understand behaviours associated with extending periods of treatment, also referred to as extending prescribing intervals or 56-day prescribing. It provides supporting materials that underpin the analysis, findings and recommendations presented in the main report.

The annexes include supporting outputs of the quantitative analysis, supplementary questionnaire of GP practices and community pharmacies and rapid review of the literature on barriers, facilitators and interventions for extending prescribing intervals. It also sets out the number of participants engaged in data collection activities and a consolidated topic guide used for stakeholder engagement.

Each annex provides additional information to support the final report and should be read alongside the relevant chapters for ease of reference. The structure of the document is as follows

- **Annex A: Quantitative data analysis** presents the data sources used to carry out statistical analysis of prescribing and dispensing intervals and provides additional findings from the analysis
- **Annex B: Summary of participants** provides an overview of the number and type of stakeholders who took part in data collection activities
- **Annex C: Supplementary questionnaire results** sets out additional findings from the GP practice and community pharmacy questionnaire, included for completeness
- **Annex D: APEASE workshop results** presents summary statistics from stakeholder appraisal of proposed interventions using the APEASE framework
- **Annex E: Evidence from the research literature** describes behavioural barriers, facilitators and intervention evidence related to prescribing behaviours identified in the rapid review
- **Annex F: Topic guide for stakeholder engagement** consolidates topic guides used across interviews and focus groups in the Diagnose phase

A. Quantitative data analysis

This annex presents the results of the quantitative data analysis of prescribing intervals in Wales. Where descriptive results are already presented in the main report, this annex provides only the supporting technical material and refers the reader back to Chapter 5 of the main report.

Data sources used for this analysis were:

- GP practice analysis datasets (2022, 2023 and 2024) via NWSSP: practice name, ID, location, health board, dispensing status and number of registered GPs
- Age and gender patient counts datasets (January 2022, 2023 and 2024) via NWSSP: number and proportion of patients by age and gender
- Deprivation at GP practice level datasets (January 2022, April 2023 and April 2024) via StatsWales: proportion of patients living in the most deprived 20% of small areas in Wales and Welsh Index of Multiple Deprivation (WIMD) quintile of practice
- Rural or urban classification of GP practices, provided by the NWSSP.
- Prescribing intervals per practice (January 2022, 2023 and 2024) provided by the NWSSP for an agreed basket of medicines used to monitor the change in prescribing intervals

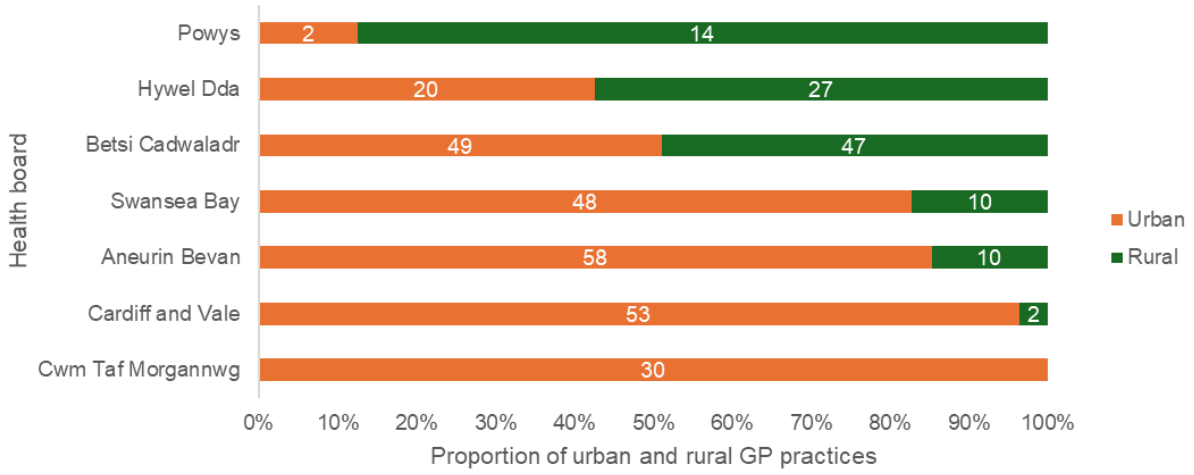
Structure and characteristics of GP practices and community pharmacies in Wales

This section outlines the distribution and characteristics of GP practices, patient populations and community pharmacies across Wales. The analysis aimed to identify structural factors that influence prescribing behaviours related to prescribing intervals and assess their implications.

Between January 2022 and January 2024, the number of GP practices in Wales fell by 4% (from 390 to 374), while the patient population grew by 1% to 3.3 million. The decline in GP practices was most pronounced in South Wales, where Aneurin Bevan UHB, Cwm Taf Morgannwg UHB, Cardiff and Vale UHB and Swansea Bay UHB saw three-to-four practices close or merge with another. The GP workforce also shrank slightly, with a 1% reduction in full-time equivalent (FTE) GPs and a 3% drop in the GP-to-patient ratio (to 5.0 FTE GPs per 10,000 patients). Notably, Powys tHB saw a 10% increase in GP coverage, contrary to the national trend. As of January 2024, 30% of GP practices were in rural areas, with Powys tHB having the highest proportion (88% rural,

Figure 1).

Figure 1: Urban-rural classification of GP practices, by health board



Description of

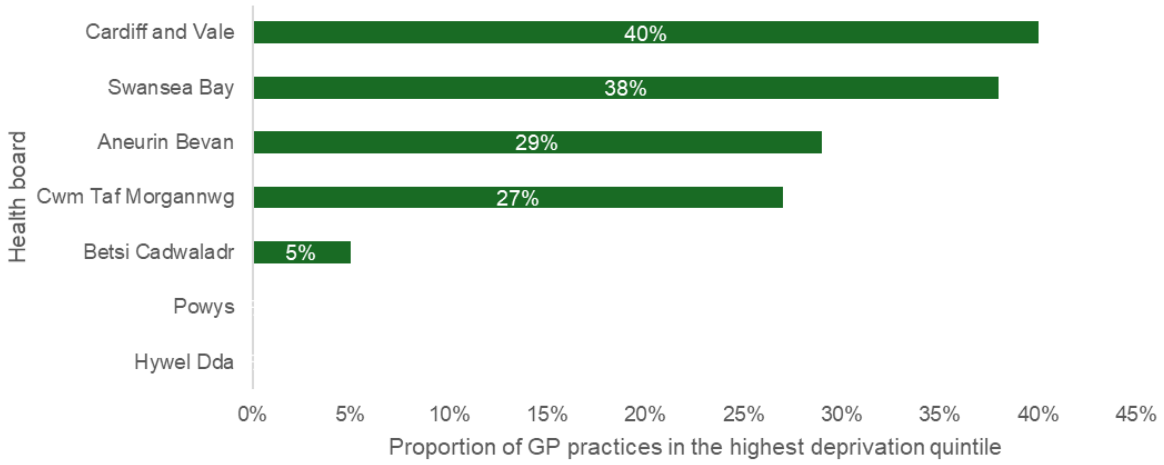
Figure 1: A horizontal stacked bar chart comparing the share of urban (orange) and rural (green) GP practices across health boards. Most health boards were predominantly urban, while Powys tHB stood out as mainly rural. Hywel Dda UHB and Betsi Cadwaladr UHB showed a more balanced mix.

Source: Rural or urban classification of GP practices, provided by NWSSP.

Dispensing practices (that are authorised to supply medicines directly) are concentrated in rural health boards, especially Powys tHB (75% of practices), Betsi Cadwaladr UHB (36%) and Aneurin Bevan UHB (17%). Given that prescribing behaviour in dispensing practices was outside the scope of this study, the absence of these practices is likely to affect the observed patterns unevenly across health boards.

Socioeconomic deprivation is unevenly distributed: In 2023, 76 of 372 practices were located in areas of highest deprivation (i.e., in the highest deprivation quintile, based on the number and percentage of each patient population living in the 20% most deprived small areas). Cardiff and Vale UHB had the highest concentration of practices in the most deprived quintile (40%), followed by Aneurin Bevan UHB, Cwm Taf Morgannwg UHB, and Swansea Bay UHB (from 29 to 34%). Powys tHB and Hywel Dda UHB had none in the most deprived quintile (**Figure 2**).

Figure 2: Proportion of GP practices in highest deprivation quintile, by health board

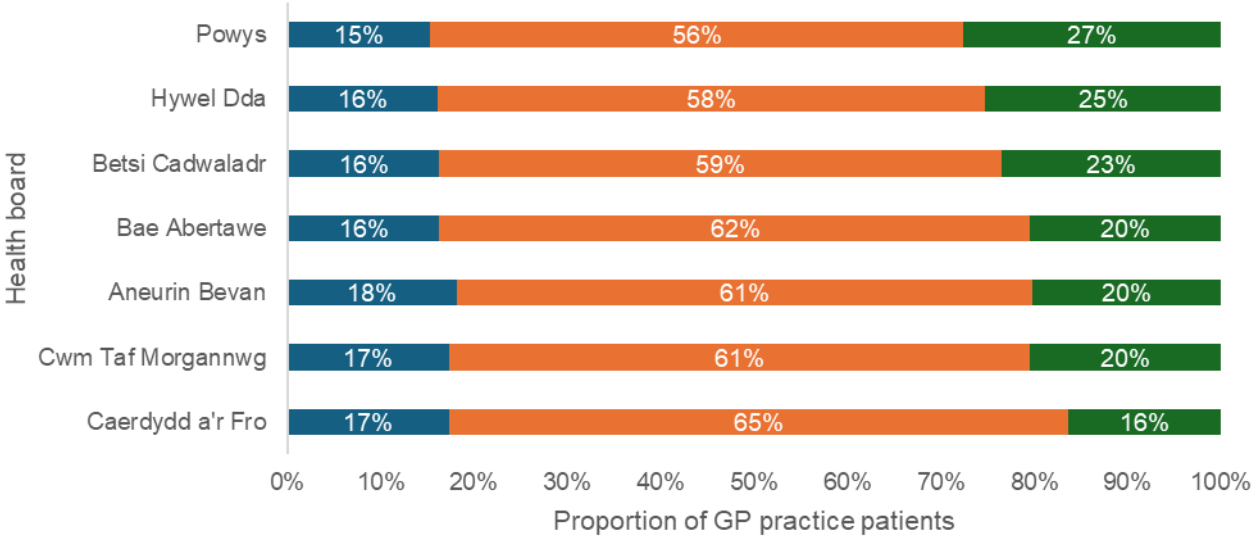


Source: Deprivation at GP practice level datasets (January 2022, April 2023 and April 2024) via StatsWales

Description of **Figure 2**: A horizontal bar chart showing the proportion of GP practices located in the most deprived quintile (WIMD quintile 1) across Welsh Local Health Boards. Cardiff and Vale UHB has the highest proportion at 40%, followed by Swansea Bay UHB at 38%. Aneurin Bevan UHB (29%) and Cwm Taf Morgannwg UHB (27%) have moderate proportions. Betsi Cadwaladr UHB shows a notably lower proportion at 5%, while Hywel Dda UHB and Powys tHB have no visible bars, indicating 0%. The x-axis displays percentages from 0% to 45%, and the y-axis lists the seven health boards.

Patient age profiles also vary. As Figure 3 shows, Powys tHB had the oldest patient profile (27% aged 65+), followed by Hywel Dda UHB (25%) and Betsi Cadwaladr UHB (23%). Cardiff and Vale UHB had the lowest proportion of patients aged 65+ (16% aged 65+), but the highest proportion aged 16–64 (65%). Aneurin Bevan UHB had the highest proportion of children, at 18% of patients.

Figure 3: Age distribution of GP practice patient population, by health board



Description of **Figure 3**: A horizontal stacked bar chart showing the age distribution of GP practice patients across health boards. Most patients were aged 16–64 (green), with smaller proportions aged 0–15 (purple) and 65 and over (blue). Cardiff and Vale UHB had the highest share of working-age patients, while Powys tHB had the largest proportion of older patients. The x-axis displays percentages from 0% to 100%, and the y-axis lists the seven health boards.

Source: Data on GP practice patient age profiles provided by NWSSP. Data bars may not total 100% due to rounding.

The number and composition of community pharmacies also varied across health boards. As of January 2024, Betsi Cadwaladr UHB had the most pharmacies (142), dominated by independents (67%), while Cwm Taf Morgannwg UHB had a higher share of regional chains.

Factors influencing uptake of longer prescribing intervals

The research team undertook analysis of the data relating to average prescribing intervals among non-dispensing GP practices and found that intervals varied substantially across health boards in 2024. Detailed analysis and interpretation of trends in prescribing intervals (including variation between health boards, upward trends over time and distributional differences) is presented in Chapter 5 of the main report.

Mixed effects modelling

As set out in Chapter 5 of the main report, the study used mixed effects modelling to identify factors influencing prescribing intervals in non-dispensing GP practices. The analysis indicated the variation in prescribing intervals was primarily associated with differences between individual GP practices rather than differences between health boards. This highlights the potential importance of practice-level decisions. Detailed findings are set out below.

The findings were as follows:

- **marginal R^2 = 0.272**: this means the fixed effects alone (such as year, rurality, age structure, and deprivation) explained 27.2% of the variation in prescribing intervals. These general factors had a moderate influence
- **conditional R^2 = 0.872**. When both fixed and random effects were included, the model explained 87.2% of the variation; this indicates that an additional **60%** of the variation was explained by differences between individual GP surgeries and regional structures

Intercept

The intercept in the model represented the estimated average prescription length for a non-dispensing GP practice in 2022, assuming all other factors are held at their average values. It is important that this figure is higher than the overall average reported in earlier sections. This is because the intercept reflects a baseline case rather than the average across all observations. It provides a reference points for interpreting the effects of other variables in the model.

Time trends

The model indicates that prescribing intervals gradually increased between 2022 and 2024. Prescribing intervals in 2023 were a day longer on average compared to 2022, while periods were two days longer on average in 2024. This trend may reflect evolving practices or policy changes over the years.

Population characteristics

Practices with a higher proportion of patients aged 65 and over tended to issue longer prescribing intervals. These practices are likely to process a higher volume of prescriptions as older patients often have one or more complex or chronic conditions requiring sustained treatment. The reasons for longer prescribing intervals in these practices is unclear; while many older patients will not be suitable for extended prescribing intervals, it may indicate an impact on prescribers' motivations to reduce the volume of prescriptions being processed.

Conversely, practices serving a higher proportion of patients from the most deprived areas were associated with shorter average prescribing periods, which may warrant further exploration. Rurality did not show a statistically significant effect once other factors were controlled for.

Regional differences

The model found that most variation in prescribing intervals occurs at the level of individual GP practices, rather than between health boards or local clusters (Table 1). This suggests that practice-level factors (such as internal policies, preferences and material constraints) were more influential in shaping prescribing behaviours than board-level factors.

Table 1: Fixed effects estimate from the mixed effects model

Factor	Estimate	Std. Error	t-value	p-value
Intercept	46.0199	1.8419	24.9845	<0.00001

Year (2022)	1.1787	0.1525	7.7312	<0.0000100001
Year (2023)	2.1732	0.1705	12.7441	<0.0000100001
Proportion of items within the basket of medicines used to monitor trends in prescribing intervals	-1.6054	0.1234	-13.0084	<0.0000100001
Urban	-0.5185	0.6730	-0.7705	0.4416
Proportion of patients aged 65 and over	0.2626	0.0552	4.7603	<0.00001
Proportion of patients in the top 20% most deprived LSOAs	-0.0352	0.0132	-2.6598	0.0082

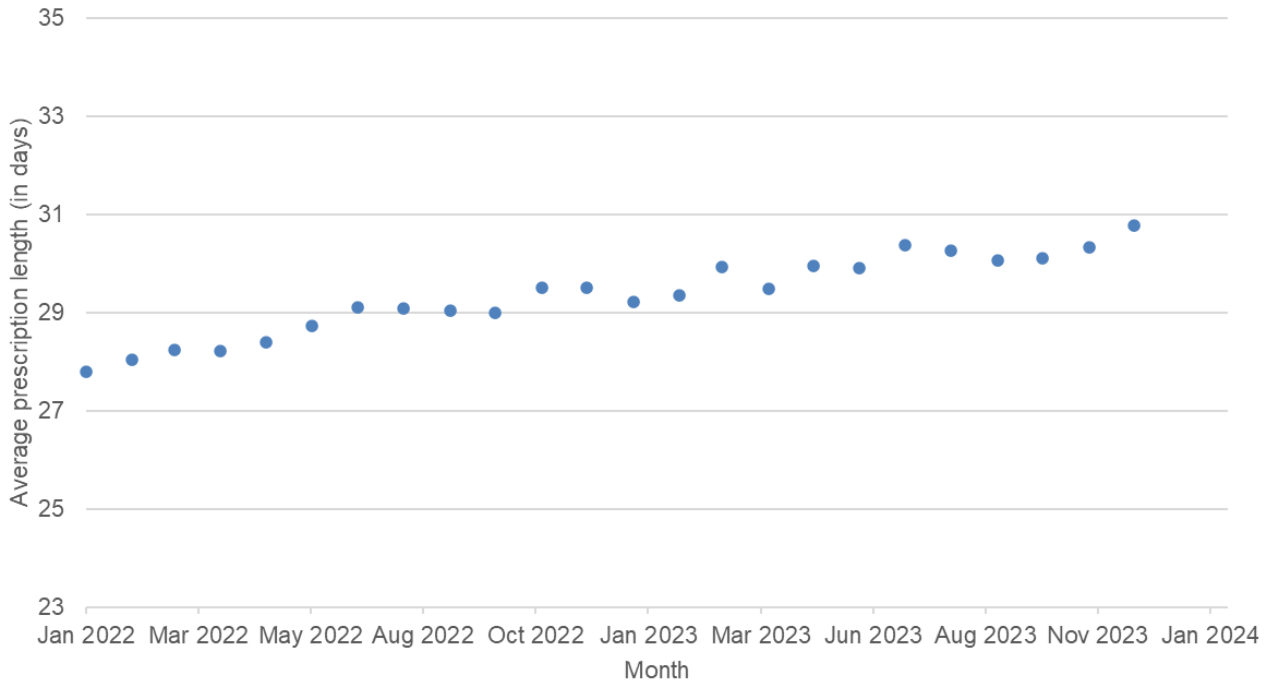
ARIMA modelling

The ARIMA method was used to track how prescription lengths changed over time, from early 2022 to early 2024 across the whole of Wales. It helped the research team understand whether the new guidance on prescribing intervals had an effect and how that effect played out month by month.

Test for stationarity

The time series was visually inspected, showing a steady upward trend, suggesting non-stationarity (Figure 4). The Augmented Dickey-Fuller (ADF) test confirmed non-stationarity at the 5% level. Testing for stationarity is crucial because non-stationary data can lead to biased statistical inferences. Lag length was optimised using Akaike Information Criterion (AIC) and Schwarz Bayesian Information Criterion (SBIC), both indicating a clear trend rather than drift.

Figure 4: Changes in prescribing intervals, January 2022 to January 2024



Description of Figure 4: Scatter plot showing the trend in average (mean) prescription length (in days) across all prescribers from January 2022 to January 2024. Prescription durations start at around 27 days in early 2022 and rise steadily over the two-year period, reaching approximately 32 days by January 2024. The increase is gradual, with minor fluctuations, but the overall pattern indicates a consistent upward trend in prescribing intervals over time. Variation between adjacent months is modest, suggesting incremental changes rather than abrupt shifts. The x-axis displays the months in increments from January 2022 to January 2024 and the y-axis shows average prescription length per practice (in days).

Source: Data on prescribing intervals by prescriber type provided by NWSSP.

Transform to stationarity

First-order differencing was applied, removing the trend and stabilising the mean. The ADF test confirmed the differenced series was stationary. This is the 'integrated' part of ARIMA, with the series integrated of order one (I=1).

Model identification and selection

Next, the model examined autocorrelation in the stationary series to determine the appropriate Autoregressive (AR) and Moving Average (MA) components. AR(p) captures the relationship between a value and its previous values, while MA(q) captures the relationship between a value and past error terms.

Autocorrelation plots suggested an MA(1) process, but due to the short series, automatic model selection was used. Several ARIMA models were compared using AIC; ARIMA(1,1,0) with drift was best-fitting. Models compared were:

- one autoregressive term (AR=1)
- first-order differencing (I=1)
- no moving average term (MA=0)
- a drift term, indicating a small upward trend

Residuals were checked for normality and autocorrelation. The Ljung-Box test confirmed no autocorrelation, indicating the model captured the data structure well.

Check for structural breaks

The time series was analysed for structural breaks, sudden changes in trend or variance that were potentially linked to the introduction of a policy aimed at increasing prescription lengths. Monthly averages showed a gradual upward trend with no abrupt changes. This aligns with expectations, as the policy was designed to be implemented gradually and with a patient-centred approach, rather than causing abrupt changes.

B. Summary of participants

This annex sets out the number of participants engaged in the research, by stakeholder type and type of data collection activity (Table 2).

Table 2: Summary of participants by data collection activity and stakeholder type

Stakeholder type	Activity	No. participants
Health board leads (primary care pharmacy)	Focus group	16
Health board leads (primary care pharmacy)	Interview	2
GP practice staff	Interview	28
GP practice staff	Questionnaire	20
Community pharmacy staff	Interview	11
Community pharmacy staff	Questionnaire	14
Patients	Interview	1
Patients and representatives (PAPIG attendees)	Focus group	5 – 10 (part of larger meeting)
Community Pharmacy Collaborative members	Focus group	10
PCC Leads (PCCLs)	Focus group	15 – 20 (part of larger meeting)
Digital Health and Care Wales (DHCW) leads	Focus group	3
APEASE workshop attendees (community pharmacy, general practice and medicines management representatives)	APEASE workshop	14

C. Supplementary questionnaire results

This annex sets out the responses to the supplementary questionnaire for GP practices and community pharmacies. The questionnaire received responses from 14 community pharmacies and 20 non-dispensing GP practices. Due to the low response rate and incomplete coverage, the findings cannot be generalised or used to draw conclusions about the prevalence of views and experiences captured. Therefore, these findings are included in the annex for completeness but not included in the main body of the report.

Most respondents (59%, or 20 out of 34) were non-dispensing GPs. Respondents reflected a range of roles. Almost half of non-dispensing GP respondents (45%, or 9 out of 20) were practice managers or deputy practice managers, while almost a third (30%, or 6 out of 20) were practice pharmacists and 28% (5 out of 20) were GPs and 10% (2 out of 20) were prescription clerks.

Half of community pharmacy respondents were community pharmacists (50%, or 7 out of 14), while a third (36%, or 5 out of 14) were pharmacy managers and a fifth (21%, or 3 out of 14) were pharmacy technicians. Of these, two (14% out of 14) were CPCLs.

Progress to review prescribing intervals

Organisations reported varying stages of implementing the updated All Wales guidance on prescribing intervals. A small proportion (11%, or 2 out of 20 GP practices) had already transitioned all suitable patients, while others were actively making adjustments during medication reviews; this included 62% (8 out of 14) of community pharmacy respondents and 78% (14 out of 20) of GP practice respondents. Some respondents reported that few patients had been switched, including 30% (4 out of 14) of community pharmacy respondents and 6% (1 out of 20) of GP practice respondents.

Two main strategies were used. Some organisations proactively identified suitable patients and extended their prescribing intervals, including 14% (2 out of 14) of community pharmacy respondents and 28% (5 out of 20) of GP practice respondents. Other responses indicated alternative methods or uncertainty about the approach, particularly among community pharmacies, where involvement in decision-making appeared more limited.

Practices cited a range of influences on their chosen approach, including continuation of existing routines, clinical considerations (such as patient complexity, age, and medication type), and operational constraints like staffing and administrative workload. Some reported errors when non-clinical staff-initiated changes, leading to a preference for clinical oversight and written communication. System upgrades and prescription requests also shaped implementation.

Financial concerns were raised by pharmacies, particularly around drug supply and income. In some cases, respondents were unaware of the rationale or not involved in decision-making.

Experience of reviewing prescribing intervals

Experiences varied widely. Almost half (44%, or 8 out of 20) of GP practice respondents reported the change was neither easy nor difficult, while 39% (7 out of 20) found it somewhat or extremely easy and 17% (3 out of 20) found it somewhat difficult.

Community pharmacy respondents were more likely to report difficulty or uncertainty: 27% (3 out of 14) reported it was somewhat difficult, 18% (2 out of 14) said it was extremely difficult, and 18% (2 out of 14) said it was neither easy nor difficult. More than a third (36%, 5 out of 14) did not know.

Views and preferences for reviewing prescribing intervals

Respondents highlighted the importance of patient-centred implementation, ideally integrated into existing processes such as medication reviews and supported by clear communication. Suggested approaches included targeting patients with stable conditions and fewer medications, allocating clinical time, using text messages and developing patient lists.

Community pharmacies raised concerns about financial risk, stock costs, and safety. Some called for the policy to be reconsidered, citing a lack of support, while others requested resources, coordinated planning and collaboration with pharmacists.

GP practices generally viewed extended prescribing intervals as beneficial for GP practices: 60% (9 out of 15) reported they would be extremely beneficial and a further 27% (4 out of 15) said they would be very or moderately beneficial. One respondent (7%) reported they would be slightly beneficial, and none reported they would not be at all beneficial. One respondent did not know.

Community pharmacies were more mixed: 14% (1 out of 7) reported extended intervals would be extremely beneficial for GP practices and 43% (3 out of 7) said they would be very or moderately beneficial. One respondent (14%) said they would not be at all beneficial, while none reported they would be slightly beneficial and 29% (2 out of 7) did not know.

GP practice respondents were more likely than pharmacy respondents to report benefits for community pharmacies. Among GP practices, 53% (8 out of 15) said the changes would be extremely or very beneficial, 20% (3 out of 15) reported moderate benefits, and 7% (1 out of 15) said they would be slightly beneficial. None reported no benefit, while 20% (3 out of 15) did not know. By contrast, 29% (2 out of 7) of community pharmacy respondents said the change would be moderately beneficial, 14% (1 out of 7) said slightly beneficial and 57% (4 out of 7) said not at all beneficial; a further 20% (3 out of 15) did not know.

Suggested changes to support adoption

Respondents emphasised flexibility based on individual patient needs, warning against blanket policies. Key concerns included safety, medication synchronisation and storage challenges. Pharmacies called for payment reform and protection of dispensing income. Suggested improvements included automating prescriptions and adjusting pack sizes. Communication enhancements and national campaigns were recommended, along with

clearer guidance, defined exemptions, and recognition of wider impacts. Rollout of EPS and the NHS Wales App were noted as ways to improve efficiency and reduce GP workload.

D. APEASE Workshop Results

This annex sets out descriptive statistics summarising participants' ratings of interventions covered in the APEASE workshop (Table 3). The results do not cover every intervention proposed, as not all were discussed in sufficient depth during the workshop.

Table 3: APEASE workshop results

Intervention	Acceptability					Practicability					Effectiveness					Affordability					Side effects					Equity				
	Average	N	Min	Max	SD	Average	N	Min	Max	SD	Average	N	Min	Max	SD	Average	N	Min	Max	SD	Average	N	Min	Max	SD	Average	N	Min	Max	SD
KPIs and monitoring	6.89	9	5	8	1.05	7.37	8	7	8	0.52	7.37	8	6	9	1.06	5.43	7	2	8	1.90	0.87	8	-1	3	1.55	0.375	8	-1	3	1.41
Collaboration approach: GPs and CPs	6.6	5	5	8	1.14	4.2	5	2	6	1.48	7.6	5	7	8	0.55	4.4	5	2	6	1.82	3.2	5	2	4	0.84	1	5	-2	2	1.73
Expand CP's role	7.17	6	6	8	0.75	5.33	6	4	8	1.63	8.2	5	7	10	1.09	6.5	5	4	10	2.64	2.5	4	0	4	1.73	3.33	3	0	5	2.89
Implement at-ion roadmap	7	5	6	8	0.71	6.5	4	4	9	2.38	6.5	4	6	7	0.58	6.5	4	6	8	1	2	4	0	4	1.82	0.75	4	0	3	1.5
Patient communica-tions	7.67	3	6	9	1.53	8	2	8	8	0	8.5	2	8	9	0.71	8	2	8	8	0	5	2	-1	5	4.24	2.5	2	0	5	3.53

E. Evidence from the research literature on interventions aimed at prescribing behaviour

This annex summarises the research literature on barriers and facilitators to the behaviours required in implementing extended prescribing intervals and the evidence on interventions aimed at changing prescribing behaviour.

Barriers and facilitators to the behaviours required in extending prescribing intervals

As there is limited published evidence specifically evaluating policies to extend prescribing intervals, this annex draws on broader literature examining the behavioural elements that shape how prescribing decisions are made. The behavioural elements used in the Integrated Model capture the drivers, constraints and system features that influence whether prescribers issue longer prescriptions. Evidence from adjacent settings, including adherence to guidelines, dispensing patterns and electronic health record systems, is therefore directly relevant because it describes the underlying mechanisms that influence decisions related to prescription intervals in practice.

Motivation barriers and facilitators

Professional attitudes and organisational factors may facilitate motivations to extend prescribing intervals as these same factors shape prescribers' willingness to change established prescribing routines more generally. Qualitative interviews with physicians and pharmacists in the Netherlands suggested that participants were motivated to provide an individualised prescribing and dispensing approach by an intention to manage medication waste (Smale et al., 2023).

Practitioners are also more likely to implement prescribing guidance when supported by effective communication and collaboration. Interviews with practitioners in the Netherlands suggested that strong organisational leadership, awareness and collaboration facilitated the implementation of individualised approaches to prescribing and dispensing (Smale et al., 2023). A cross-sectional survey of community pharmacists in Japan found that participants measured to have high assertiveness were more likely to initiate prescribing changes that improved medication safety (Ishii et al., 2023). This supports findings of a systematic review that confidence in the benefits of guidelines, understanding of their rationale and peer support and engagement encourages adoption of prescribing guidelines (Paksaite et al., 2020), which is directly relevant because extended intervals also require prescribers to adjust routine practice in line with guidance.

Choice barriers and facilitators

Several studies have demonstrated a relationship between dispensing status and shorter prescribing intervals, showing that funding models directly shape decisions about prescription duration. Dispensing practices are paid to dispense medications directly to patients, which means that shorter prescribing intervals would result in greater financial renumeration. A quasi-experimental study of GP prescribing in England found that

dispensing practices consistently prescribed shorter average durations for the seven medications examined; an increase in the proportion of patients eligible for dispensing was significantly associated with shorter prescriptions (Holdroyd et al., 2025). A retrospective cohort analysis of prescribing data in England found dispensing status was the strongest predictor of prescription duration, with the proportion of prescriptions at 28-days higher (by 64%) than in non-dispensing practices (MacKenna et al., 2025). While the current study does not examine prescribing behaviours associated with dispensing practices, the evidence illustrates how funding models can either support or hinder the choice to extend prescribing intervals.

Financial incentives also influence community pharmacies' motivations. Multiple studies have identified that dispensing fees tied to prescription volumes are a barrier to engaging community pharmacists in extending prescribing intervals (Doble et al., 2017; Miani et al., 2017). Current reimbursement structures have been associated with shorter prescription durations (MacKenna et al., 2025; af Geijerstam, 2024). These findings may not fully reflect the Welsh context, where recent changes to the Community Pharmacy Contractual Framework (CPCF) and the introduction of a compensation mechanism related to extended prescribing intervals may influence community pharmacists' motivations, but indicate similar influence of incentive structures on decisions related to prescribing intervals.

When practitioners are financially motivated to extend prescribing intervals, external constraints may influence their choice to do so. Practitioners interviewed in the Netherlands reported limited time and financial resources were constraints, described by the authors as "bounded rationality" (Smale et al., 2023, p. 1370). This is supported by a systematic review of behavioural barriers and facilitators to adopting prescribing guidelines, which found time restrictions were the most dominant barrier in the literature (Paksaite et al., 2020), suggesting that even when practitioners are motivated to undertake a prescribing behaviour, such as to extend intervals, they may not always have the capacity to choose this option.

Execution barriers and facilitators

System and technological constraints can limit or facilitate practitioners' capability in terms of influencing prescribing decisions. Evidence in England found some electronic health record (EHR) systems default to 28-day prescriptions, with policies varying regionally (MacKenna et al., 2025). Where defaults remain, prescribers may be more likely to accept and continue using shorter intervals, while longer defaults may facilitate longer prescribing intervals (Mehta et al., 2025).

Procedures that standardise prescribing and dispensing practices can limit flexibility to meet patients' individual needs. A cohort analysis of prescribing data in England between 1998 and 2009 observed a general decrease in mean prescribing intervals, which may have been influenced by the promotion of rigid 28-day prescribing policies in some areas (Davies and Taylor, 2013). The study found that a tendency for medication to be supplied in patient-ready packs of 28 or 56 days further limits opportunities for prescribers and dispensers to tailor quantities to individual patient needs. This may reflect the cognitive burden of individualising prescriptions (Paksaite et al., 2020), which is also relevant when assessing which patients are suitable for extended intervals.

While prescribers may choose to implement extended prescribing intervals, patient characteristics can limit the pool of patients for whom they would be suitable. The percentage of patients with chronic conditions was associated with shorter prescribing intervals in English practices (MacKenna et al., 2025). Patients with multiple chronic conditions may require more frequent monitoring and may be prescribed restricted medications that prohibit longer prescribing intervals, such as Schedule 2 or 3 controlled drugs that are restricted to intervals of up to 30 days. This suggests that the clinical profile of the practice population may limit the proportion of patients for whom extended intervals are clinically appropriate.

Socioeconomic factors may inform the proportion of eligible patients for extended prescribing intervals, as they influence both clinical need and prescribing patterns. A recent analysis of prescribing data in Wales, in which statins, anxiolytics, hypnotics and antidepressants were significantly more likely to be prescribed to patients in areas in the highest deprivation quintile against the Welsh Index of Multiple Deprivation (Boldero et al., 2024). Other medicines showed no difference (e.g., anticoagulants), while hormone replacement therapy was significantly more prescribed in the least deprived quintile, highlighting how socioeconomic context shapes the distribution of medicines for which extended intervals may be appropriate.

Outcome barriers and facilitators

Evidence on medication waste is mixed. There is weak evidence to suggest that longer prescribing intervals are associated with higher medication wastage (King et al., 2018; Miani et al., 2017). In England, a retrospective cohort analysis found that prescription lengths of 60 days or more were associated with greater wastage per prescription (Doble et al., 2017). Wastage may occur when patients request prescriptions early or treatment changes mid-cycle. However, when comparing total costs, longer intervals were associated with overall cost savings. A systematic review of international literature to inform prescribing policy in Australia (af Geijerstam et al., 2024) noted that no randomised controlled trials have been conducted to establish causality and that some cost-benefit assessments have not accounted for all behaviours and costs associated with shorter intervals.

Conversely, evidence suggests that longer prescribing intervals improve medication adherence, an intended benefit of extending intervals in Wales. A multinational systematic review of primary care studies found moderate-quality evidence across nine studies that longer prescriptions improve adherence. Six cohort studies reported reduced adherence for prescriptions shorter than 90 days, while three studies found that prescriptions exceeding 90 or 100 days were associated with better adherence compared to 30- or 34-day prescriptions (King et al., 2018).

There is weak evidence that longer prescribing intervals reduce inconvenience for patients, as well as healthcare resource use and pharmacy costs (af Geijerstam et al., 2024). A longitudinal study of hypertension prescribing in China reported that a longer prescription policy reduced annual outpatient visits and pharmacy visits for hypertensive patients and decreased annual drug costs at pharmacies, but did not reduce hospitalisations or overall

outpatient costs (Yu et al., 2025), indicating that extended intervals may shift some types of healthcare utilisation without affecting others.

Interventions aimed at changing prescribing behaviours

This section summarises the research literature on interventions that have been shown to affect the behavioural elements assessed in the Integrated Model in other prescribing contexts. Although these interventions were not designed specifically to increase prescribing intervals, they target the underlying processes, such as decision-making, capability, organisational support and system design, that also determine whether practitioners adopt longer intervals. As such, the evidence below helps identify mechanisms that could support behaviour change relevant to implementing extended prescribing intervals.

Educational interventions

Educational interventions are designed to increase individuals' psychological and physical capabilities by strengthening their knowledge, skills, and abilities to engage in a behaviour and to reinforce reflective motivation (e.g., the processes involved in planning and decision-making). In the context of extended prescribing intervals, educational interventions can play a key role because they target the same knowledge, confidence and decision-making processes that underpin changes to prescribing intervals; these include increasing awareness and understanding of the policy benefits, supporting decision-making, and promoting collaboration between stakeholders.

Evidence found in the literature supports the effectiveness of educational interventions in improving desired prescribing behaviour. Studies show that systematic education programmes, including WHO prescribing guide training and academic detailing, significantly enhance prescribing competency and reduce medication errors (Kamarudin et al., 2013). Educational outreach visits targeting GPs and pharmacists have been found to improve clinical decision-making and antibiotic prescribing practices (Rodrigues et al., 2019). A one-off educational intervention delivered to regional prescribing advisers did not significantly change prescribing outcomes but increased engagement (Curtis et al., 2024). Multifaceted education programmes with pharmacists that combine feedback and training have reduced non-adherence to guidelines in hospitals from approximately 30% to 21.8% (Bos et al., 2017) and a systematic review concluded education-focused interventions (audit/feedback, outreach) are consistently effective (Ostini et al., 2009). Although these studies do not focus on prescribing intervals specifically their use to target prescribers' knowledge, confidence and decision-making makes them relevant for understanding how educational interventions could support the implementation of extended prescribing intervals.

Enablement interventions

Enablement interventions are those that provide individuals with the necessary support to improve their ability to change. They aim to enhance individuals' physical and psychological capabilities, as well as their physical and social opportunities, and automatic motivation. The physical and social opportunities are the external factors that make the execution of a behaviour possible. Automatic motivation refers to the often-unconscious processes, such

as habits and impulses, that shape behaviour. In the context of this research, enablement strategies focus on creating infrastructure, resources, and systems that facilitate practitioners and patients in acting on their intentions.

Emerging ideas that included enablement strategies ranged from developing structured adoption roadmaps to promoting collaboration between community pharmacists and GPs through expanding community pharmacists' roles and responsibilities. Other ideas included allocating staff to support operational change and using targeted communication campaigns to empower patients to take an active role during consultations.

A body of evidence supports the effectiveness of enablement strategies in improving prescribing practices; these same mechanisms, including support, collaboration and structured processes, may help facilitate execution of extended prescribing intervals. For instance, pharmacist-led audit and feedback interventions significantly improved prescribing outcomes in primary care (Carter et al., 2023). Similarly, pharmacist-led personalised feedback to prescribers was perceived to positively influence prescribing behaviour and reduce repeat errors (Lloyd et al., 2018). The integration of pharmacists into GP teams also enhanced collaboration, workload management, and clinical support (Hazen et al., 2024). Moreover, combining audit and feedback with pharmacist involvement and structured tools such as checklists reduced prescribing errors and improved guideline use (Høgli et al., 2016; Donnelly et al., 2015).

Overall, the evidence indicates that enablement interventions, especially those that combine structured planning and interprofessional collaboration, are effective mechanisms for removing barriers and supporting behavioural change.

Environmental restructuring interventions

Environmental restructuring interventions seek to modify the physical and social contexts in which a behaviour occurs, as well as influence automatic motivation. This is highly relevant for extended intervals because prescription duration decisions are strongly shaped by defaults, workflow structures and contractual environments; interventions could consist of system-level or contractual changes or built-in defaults to make the desired behaviour easier, more intuitive, or socially reinforced.

Emerging ideas that involved environmental restructuring included integrating extended prescribing intervals into routine monitoring and reporting systems, making prescriptions with extended intervals the default option in electronic prescribing software to reduce reliance on individual discretion, and updating pharmacy contracts to redesign conflicting financial incentives.

Empirical evidence demonstrates that modifying default or contextual features of the prescribing environment can significantly encourage desired prescribing behaviours. For example, changing the default statin prescription duration in electronic health records from 30 to 90 days increased long-term prescribing from 70.7% to 91.7% following intervention, an adjusted increase of 20.3 percentage points, and reduced disparities (Mehta et al., 2025). In interventions for other purposes, contextual aids such as pocket-sized guidelines and checklists reshaped prescribing environments and improved

compliance (Høgli et al., 2016; Donnelly et al., 2015). Moreover, integrating pharmacists into general practice teams changed the team structure and context, improving prescription optimisation (Hazen et al., 2024).

Taken together, the evidence suggests that environmental restructuring, particularly when integrated into digital systems, professional workflows, and contractual frameworks, can reduce reliance on individual motivation and embed desired prescribing behaviours into routine practice, promoting a sustainable system-level change.

I. Topic guide for stakeholder engagement

This annex presents a consolidated topic guide used for stakeholder engagement with health board, practice and pharmacy stakeholders. It has been consolidated to show prompts and questions for different stakeholder groups. Where focus groups were held in limited timeslots, an abridged version of the topic guide was used. The formatting has been condensed for publication purposes. The annex also includes a patient topic guide used in fieldwork with patients and their representatives.

Consolidated topic guide

Introduction

To begin, I'd like to hear a little about you and your role.

1. Details of role:
    - Role and responsibilities (e.g., consultations, prescribing / dispensing, management)
    - Involvement with prescribing / dispensing intervals
    - If GP practice / community pharmacy: Length of time in role.
2. [If GP practice / community pharmacy] Details of practice / pharmacy:
    - Size and location of the practice / pharmacy (e.g., no. GPs / staff, typical no. patients, urban/rural)
    - Needs and characteristics of patients (e.g., deprivation, age)
    - Local community pharmacies / GP practices
    - Involvement in Primary Care Cluster (e.g., policy input, collaboration).
3. [If GP practice / community pharmacy] Typical process for prescribing medication at the practice / pharmacy:
    - Staff who are involved, and when.
    - How patients request repeat prescriptions, and when (e.g., at practice, digital, through pharmacy)
    - How pharmacies receive / pharmacy collects prescriptions (e.g., paper scripts, order digitally).

Prompt for: specific policies or procedures around prescribing in organisation.

Initial response to the policy

Now, I'd like to hear your initial response to the policy to extend periods of treatment.

As a reminder, the All Wales Guidance on Prescribing Intervals in October 2022 recommended that prescribers move patients to prescribing intervals longer than 28 days, where this is clinically appropriate.

4. Understanding of reasons for extending average prescribing intervals:
    - Why it is important
    - What benefits it would bring (for pharmacies, practices and patients)
    - What drawbacks it would bring.

Prompt for: capacity, staffing, quality of care, health outcomes, convenience.

5. Responses to the policy from staff and patients.
6. Alignment with other practice / pharmacy priorities, including:
    - New unified GMS contract for GP practices / new contractual framework for community pharmacy (CPCF)
    - Performance indicators and policy priorities
    - Primary Care Clusters.

Introducing the change

Next, I'd like to hear how you have rolled out this change in your practice / pharmacy / health board.

7. How the practice / pharmacy / health board approached the policy:
    - Target average days of treatment (e.g., 56-days, flexible/ patient-needs led)
    - Patients or medicine groups to target
    - Review targeted patients systematically, or case-by-case
    - Bulk prescriptions (i.e., repeat script to be dispensed over 12-months).
8. How the practice / pharmacy / health board planned to introduce the change:
    - Following guidance and advice (e.g., CPW, health board, NHS Wales)
    - Discussions with practices, pharmacies and patients
    - Impact or risk assessments
    - Collaboration with other organisations / practices / pharmacies or the Primary Care Cluster.
9. Information the practice / pharmacy / health board received to introduce the change:

- From whom (e.g., health board, NHS Wales, Welsh Gov, CPW stakeholder groups and unions, such as BMA)
- How helpful the information was.

10. Factors that helped them when introducing the policy:

Prompt for: support from senior management, information and guidance, awareness of staff and patients, collaboration with Primary Care Cluster, GP practices, pharmacies, health board).

11. Factors that they found more difficult when introducing the policy:

Explore prompts above.

Implementing and maintaining the change

Now, I'd like to focus on the progress you've made at a practice / pharmacy / health board level to support a change in prescribing intervals, and the barriers and facilitators that staff face in implementing and maintaining them.

12. Progress made at a practice / pharmacy / health board level to change prescribing intervals:
    - Areas with greatest progress (e.g., length and range of intervals, identifying participants to change, making changes with patients, ensuring skills to make those changes)
    - Areas which need the greatest improvement
    - How progress is monitored.
13. Support given to colleagues and patients to manage the change:
    - Support to whom (e.g., prescribers / dispensers, support staff, patients, pharmacies / practices)
    - Type of support (e.g., training, guidance, communications, IT services)
    - Usefulness of the support.
14. Aspects that have worked well for changing prescribing intervals.

Explore for each of the following stakeholders in-depth:

- Patients: contacting patients; raising awareness; explaining benefits; deciding appropriate intervals; monitoring exclusions
- Practices: allocating responsibilities; reporting progress; timing of changes; skills and staffing; IT systems; communicating with pharmacies

- Community pharmacies: estimating stock needs; supplying enough medication; collaborating with practices; communicating to patients
- Health boards and primary care clusters: monitoring progress; raising awareness; issuing guidance; providing hands-on support.

15. Aspects that have worked less well for changing prescribing / dispensing intervals:

Explore above prompts.

16. Factors that have helped to change prescribing / dispensing intervals:

Prompt for: collaboration, awareness, guidance, skills, capacity, funding, communication.

17. Factors that have made it more difficult to change prescribing / dispensing intervals:

Explore above prompts.

Looking forward

Finally, I would like to explore early outcomes of the policy and your thoughts on the steps that are needed moving forward.

18. Changes that have occurred because of the change in prescribing intervals:

Explore for positive changes and unintended consequences.

- Practice (average prescribing intervals; workload and capacity for clinical services; contact with patients and pharmacies)
- Patients (visits to practice and pharmacy; convenience; suitability of treatment)
- Community pharmacies (average dispensing intervals, workload and capacity for clinical services; contact with patients and practices; costs, income and medicine supply).

19. Action needed to facilitate a further change in prescribing intervals.

Prompt for:

- Role of Primary Care Cluster Community Pharmacy Leads (PCCPLs)
- Collaboration between community pharmacies and practices
- Sharing best practice and learning
- Ensuring safety and adherence
- Awareness and skills for changing prescribing intervals.

We have reached the end of our interview; I really appreciate all the time you have dedicated to us today. Is there anything else you would like to share that we haven't covered during the interview?

Patient topic guide

Introduction

To begin, I'd like to hear a little about you.

1. Involvement with practice:
    - Relationship to practice / cluster (e.g., patient/carer, patient representative)
    - [If applicable] How they became involved with patient liaison forum
2. [If GP practice / community pharmacy] Details of practice / pharmacy:
    - Number of repeat prescriptions they require
    - How they request prescriptions
    - How they collect medication (e.g., paper script to pharmacy, digital order)
    - How they review medications with their doctor, and when
    - Whether they discuss changes in the length of prescriptions, and when.

Understanding of the policy

Now, I'd like to hear your understanding of the policy to extend periods of treatment.

As a reminder, the All Wales Guidance on Prescribing Intervals in October 2022 recommended that prescribers move patients to prescribing intervals longer than 28 days, where this is clinically appropriate.

3. How they learned about the policy, if at all.

Prompt for: communications from the practice or pharmacy (emails, letters, calls, text messages), in consultations, at reception or at community pharmacy, from health board or NHS Wales, from the news).

4. Understanding of reasons for extending average prescribing intervals:
    - Why it is important
    - What benefits it would bring (for pharmacies, practices and patients)
    - What drawbacks it would bring.

Prompt for: contact with GPs and pharmacies, transport, storing medicines, remembering to take medicines, time.

Making the change

Next, I'd like to hear more about the change to prescription lengths.

5. Views on their current repeat prescription plan:

Explore the pros and cons of:

- Length of their repeat prescriptions
- Requesting prescriptions
- Collecting medication (e.g., paper script to pharmacy, digital order)
- Reviewing medications with their doctor
- Storing and remembering to take their medication
- Discussing changes in the length of prescriptions with their doctor.

6. Changes that have occurred / could occur because of changing the length of their repeat prescriptions.

Explore positive changes and unintended consequences:

- Visits to practice and/or pharmacy
- Convenience
- Suitability of treatment
- Storing medication
- Taking medication
- Aligning with others in the household

7. Questions or concerns they had / would have before changing the length of their repeat prescriptions:

Prompt for: contact with doctors, safety, changing dose, discussing treatment.

8. Support that would help them to feel comfortable with a longer period of treatment:

Prompt for: information and guidance, reminders, phone calls.

We have reached the end of our interview; I really appreciate all the time you have dedicated to us today. Is there anything else you would like to share that we haven't covered during the interview?